

2025 FLINN SCIENCE CATALOG REFERENCE MANUAL

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P.O. Box 219, Batavia, IL 60510-0219

Prices effective January 1, 2025
Pricing and availability are subject to change.
Please check www.flinnsci.com for current pricing.



Dear Educators,

It is an honor to welcome you to this year's Flinn Scientific catalog! I'm humbled to lead a company with a rich history of championing science education, equipping classrooms and labs, inspiring students, and supporting the teachers who bring learning to life.

At Flinn Scientific, we understand the important role that safe, effective, and engaging science instruction plays in shaping students' futures. I'm personally committed to ensuring that Flinn continues as your trusted partner for reliable and innovative instructional materials that are rigorously vetted for safety, align with educational standards, and foster hands-on learning that captivates young minds across all science disciplines and levels.

We are especially proud to offer extensive safety training options, including online courses and custom professional learning solutions tailored for your school or district. These resources empower educators to maintain safe learning environments and keep safety at the forefront of every lab experience, no matter the grade level or lab setting.

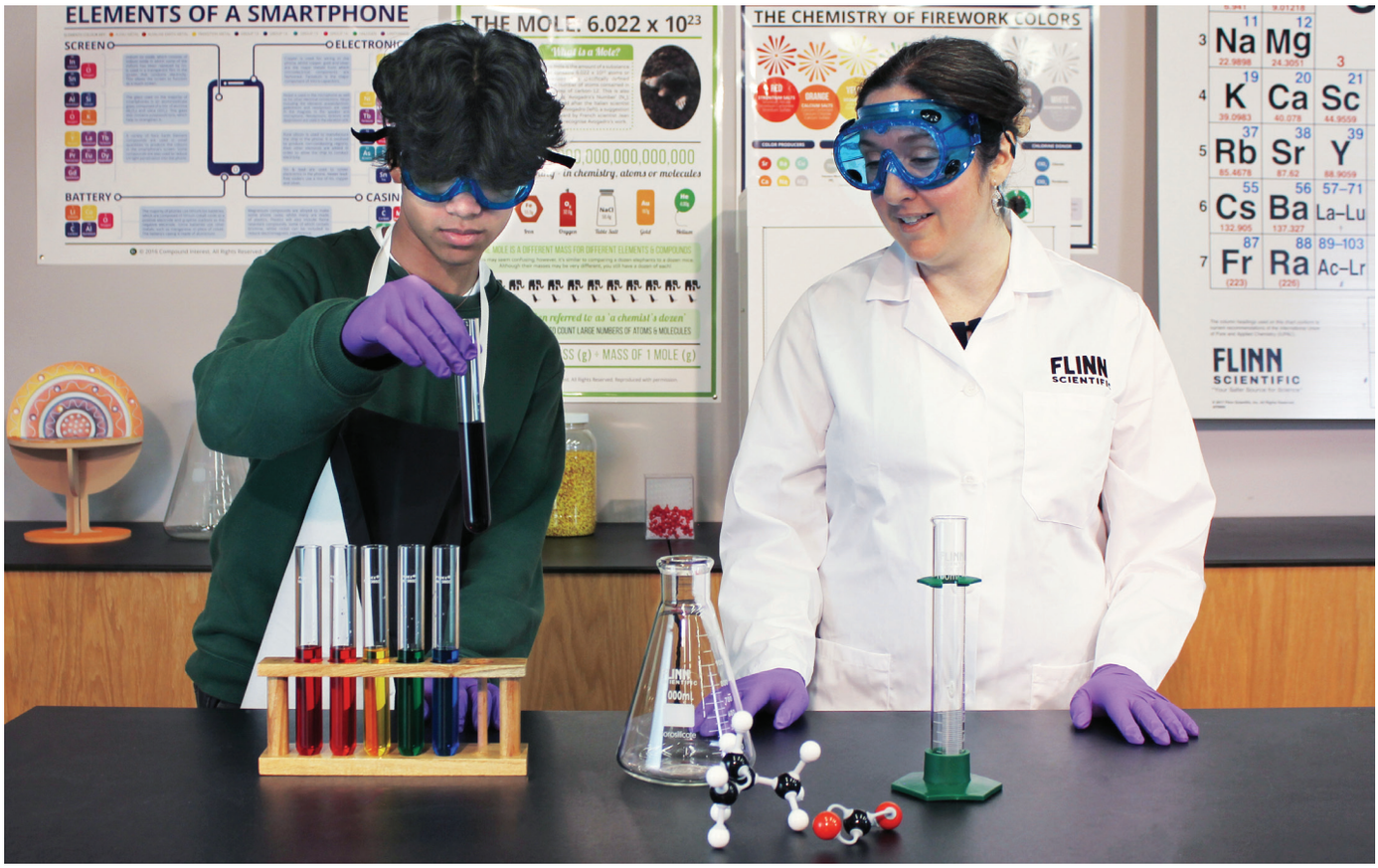
Our mission is to provide you with the highest quality materials, support, and value, allowing you to focus on what you do best: teach. Whether you have a compliment, suggestion, or concern, I welcome your feedback and want to thank you in advance for your support. We strive to continue to provide you with exceptional customer service, and the very best in supplies, safety information and instructional resources that you have come to expect.

Thank you for trusting Flinn Scientific as your partner in science education. We look forward to another year of learning, discovery, and inspiration together.

With sincere gratitude,

Mac Gamse
CEO, Flinn Scientific
mgamse@flinnsci.com

Experience The FLINN Difference



Helping you do more hands-on science for more than 45 years.

Dedicated to innovation, Flinn delivers unmatched selection of products and resources that engage students, advance scientific literacy, and prioritize lab safety—empowering educators to inspire the next generation of scientists.

Kelly Wiseman-Silva
Chemistry Earth & Environmental Science
Riverside, CA

I rely on Flinn for "everything! The quality of the products can't be beat. And I trust that I will get exactly what I need."

Safety is always our top priority.

Our safety posters may make you smile, but our message is serious!

I rely on Flinn for "Lab ideas and materials, safety information, chemicals, and much, much more!"

Emily Brinks
Biology, Chemistry, Physics & Physical Science Forensics
Owosso, MI

Easier hands-on science.

Developed by staff scientists and educators, our budget-friendly kits help students actively explore complex science concepts, fostering curiosity and critical thinking through real-world applications. Satisfaction guaranteed.

I rely on Flinn for "Lab kits that are equipped with supplies and ready-to-go activities. I have very little planning time because I teach several sciences. Kits that are quick to prep and ready to go are my favorite."

Jowanna Jones
Biology, Earth & Environmental Science, Forensics
Loving, NM

Custom kits for exactly what you need!

Need something tailored? Flinn's custom kits align with your curriculum and ensure safe, high-quality science experiences that meet your classroom needs.

Exceptional customer experience is our goal.

Our Illinois-based customer care team is dedicated to helping every customer have a great experience.

John Zielinsky
Chemistry
Orlando, FL

I rely on Flinn for "reliable guidance, equipment, and the materials I need for teaching science."



SAFETY FIRST...ALWAYS



Now available as stand-alone solutions. Our comprehensive and discipline-specific high school safety courses cover everything your students need to know to "do" science safely including:

- appropriate lab attire (including how to correctly wear PPE),
- safe chemical handling,
- working with instruments and apparatus, and
- what to do in the event of an accident.

Let Flinn help you create the safest learning environment possible for your students. One accident is one too many.

HS Chemistry Lab Safety Course for Students

EL9008	Classroom Set (1-30)
EL9009	Classroom Set (31-60)
EL9010	Classroom Set (61-100)

HS Physics Lab Safety Course for Students

EL9012	Classroom Set (1-30)
EL9013	Classroom Set (31-60)
EL9014	Classroom Set (61-100)

HS Biology Lab Safety Course for Students

EL9016	Classroom Set (1-30)
EL9017	Classroom Set (31-60)
EL9018	Classroom Set (61-100)

Give your students the safety advantage. Book a professional learning session for your staff and take their training to the next level, with in-person and virtual options to fit your schedule and budget.

PD 1000
(Full Day In-Person Training)

PD1001
(Half Day In-Person Training)

EL9020
(3-Hour Virtual Training)

SAFETY FREE RESOURCES

Safety Contracts and Exams

Start every course right by having students and parents/guardians sign a safety contract. Then, reinforce safe practices with FREE safety exams. All exams and contracts are available in Spanish and English for elementary, middle, and high school.

Lab Safety Guides

Need to reopen your lab after a prolonged period of disuse? Need to shut it down in a hurry? We have the practical knowledge needed to keep your lab in top condition, no matter its status.

Safety Demonstrations

Use our FREE safety demonstrations to ensure your students understand the critical need for following proper safety protocol.



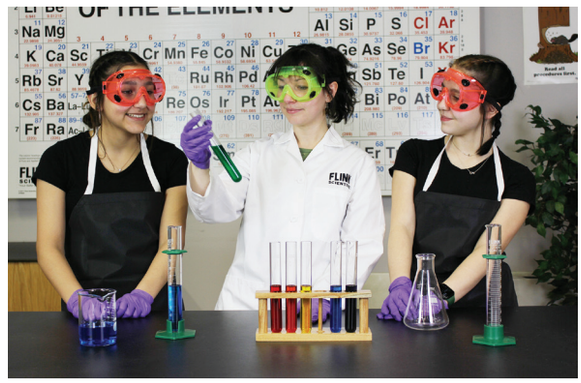
Safe Labs Start with Flinn

We're answering the safety call with everyday essentials, custom cabinets, PPE, and cleanup materials. All our products are rigorously tested, so you can trust them.

SAFETY BEGINS WITH THE FLINN SCIENCE CATALOG & REFERENCE MANUAL

This *Flinn Science Catalog & Reference Manual* is your year-round reference guide for all things lab safety and chemical-related. For more than 45 years science teachers have trusted us to provide critical safety information and practices to make student lab work as safe as possible. Keep turning the pages for...

- Basic chemical and lab safety,
- Toxic material information,
- Safety Data Sheets, and
- Expert how-to tips for equipment storage and handling.



Talk to an Expert

Have a question about an experiment or how to implement Lab Safety Certifications in your classroom? Our safety experts are available to help! Call **1-800-452-1261** to set up a 1-on-1 training session.

WHAT TEACHERS SAY:

"I keep my Flinn catalog handy for science safety information. It is a great reference! I can always be sure I am following the right safety protocols when I use Flinn.
I feel like Flinn is looking out for me because they have taken time to do the research about proper safety techniques and requirements. They publish safety information in their catalogs so that all might reference it. They provide free videos too!"

MELISSA CABLE SLEEPER
INDIAN RIVER, FL

CUSTOM KITS BUILT JUST FOR YOU

Did you know we offer customized kits for your classroom and lab?

For more than 45 years, Flinn has partnered with educators to build customized kits for classrooms, summer programs and museums.

All disciplines from K-16!

Partner with Flinn to create hands-on kits for grades K-16 that meet your curriculum standards, time constraints and budget!

Our staff scientists are here to help.

Work with Flinn scientists to design custom kits that are sure to engage and delight your students.



For more information about Flinn's custom solutions, visit us at **flinnsci.com/customizable-flexible-science-kits/** or call **1-800-452-1261**



In the Lab, Safety Must Come First

SciMatCo Cabinets are Built to Safely Store Hazardous Chemicals and Substances

Safety

- Our wood and plastic cabinets do not react with acid or corrosives as metal cabinets do
- Wood cabinets are the safest choices for flammables since wood is a thermal insulator

Long life

- Wood or plastic cabinets last many years since they never rust or corrode
- Rugged 1" exterior plywood construction withstands the most abusive environments
- All cabinets come with a 5 year warranty

Code and standards compliant

- Meet and exceed OSHA, NFPA, IFC and UFC standards
- UL listed (flammables)

Corrosive cabinets contain no metal hardware, shelf supports or hinges; there is nothing to rust or corrode.

SciMatCo Bench Top Acid Cabinet
SE8063
$975.00



SciMatCo
SCIENTIFIC MATERIALS COMPANY, INC.

Why Use Wood for a Safety Cabinet?

	WOOD	METAL
HEAT INSULATION	Thermal Insulator In a fire, wood cabinets merely char on the outside keeping the heat from penetrating to inside.	Heat Conductor In a fire, metal cabinets become ovens, quickly conducting heat to the cabinet's interior. X
STRUCTURAL INTEGRITY	High In a fire, wood cabinets keep their shape and do not distort or bend.	Low In a fire, metal cabinets bend or distort, opening their contents to the flames. X
MATERIAL COMPATIBILITY AND REACTIVITY	Compatible/Non-Reactive Per IFC code, wood or plastic construction is "nonreactive with hazardous material stored"—never rust or corrode.	Incompatible /Reactive Metal cabinet construction (even stainless steel) is reactive with corrosives stored within—metal will quickly oxidize, rust and corrode. X

Submit an Idea for a Kit

Scan the QR code to submit a kit idea!

Do you want to join in on this?

Some of our greatest kits have been designed by teachers.

We would ask that you submit your name, school, and email along with a brief description of the potential. We will review and reach out. If your idea is selected, you could earn royalties and have your name featured in the Flinn catalog and on our website.

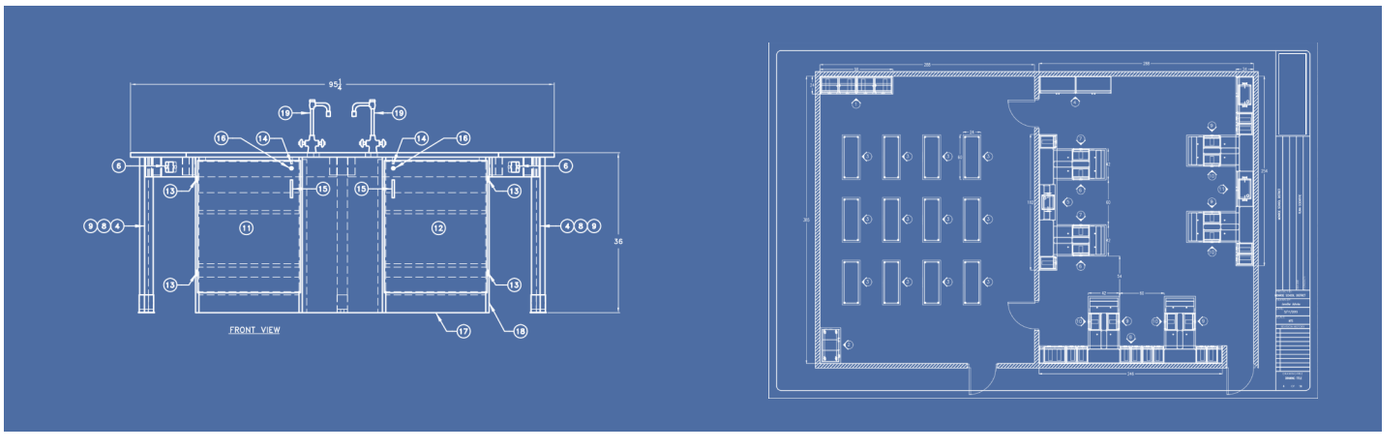








Is Your School Renovating or Building a Science Laboratory?

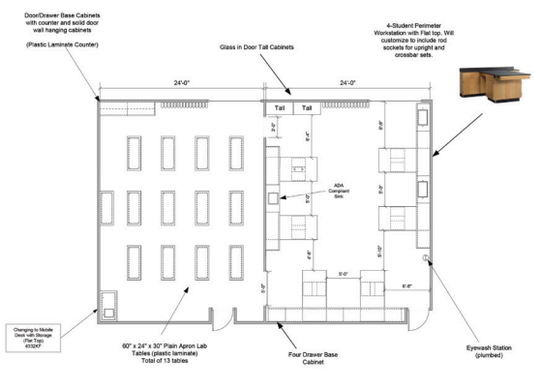


Flinn's Lab Design team is your partner when building or renovating a new science laboratory.

Let us help you design a safe and effective science learning space. Our experienced designers will work with you to develop a plan for your new space that meets your needs and your budget. And our services are free!

As your partner, we will design an environment that enhances the collaborative nature of the science lab and incorporates the unique requirements of the various science disciplines. The priorities and interests of all your stakeholders are considered and at the end of the process, you will have a comprehensive design package that you can present to everyone involved—teachers, administrators, architects, community members, and even donors.

Initial Design Plan



Completed Lab



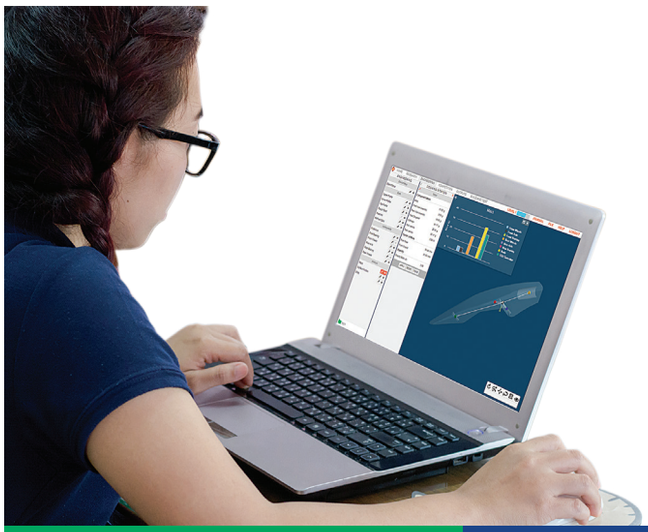
Free Lab Design Consultation

Flinn Scientific's experienced lab design team is ready to help you design the new laboratory of your dreams!

Our design specialists understand the unique needs of the science laboratory and will work with you to assist with all aspects of the process.

Call us today!

Contact Flinn and ask to speak to a Lab Design specialist today!
1-800-452-1261
labdesign@flinnsci.com



WHITEBOX LEARNING® EMPOWERS STUDENTS TO WORK LIKE REAL ENGINEERS

WhiteBox Learning is a web-based standards-aligned STEM learning system that exposes middle and high school students to the engineering design process in the most real-world way.

WhiteBox Learning
A Flinn Scientific Company

Exposing ALL Students to Real-World Engineering

WhiteBox Learning teaches the engineering design process in the most real world way—with 3D models, unlimited design iterations, and a challenging competition. The system addresses various learning styles, providing ALL students with an engaging way to gain exposure to engineering design and the STEM career cluster for Career and Technical Education (CTE).

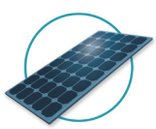
Powerful Analytical Tools for Teachers

The Teacher Control Center (TCC) gives you the management and monitoring tools to set up classes, assign applications, and adjust content based on student need. The TCC tracks metrics that include time-on-task, assessments, and individual student and overall class progress and performance.

Funding Options

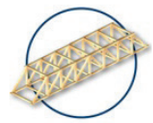
WhiteBox Learning can be funded with Perkins Grant to improve secondary and post-secondary CTE programs and STEM federal funding sources, including 21st Century Community Learning Center Grants, Title I and Title IV.

Explore Our 12 STEM Applications:


SOLAR 2.0

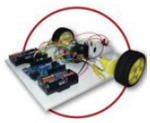

KIDWIND 2.0


SURVIVAL SHELTER 2.0


STRUCTURES 2.0

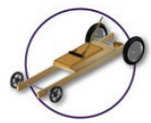

GREEN CAR 2.0


ROCKETS 2.0


ROVER 2.0


GLIDERS 2.0


DRAGSTER 2.0


MOUSETRAP CAR 2.0


PROSTHETICS 2.0


DRONE

WHAT TEACHERS SAY:

"I have never had any other curriculum that was as complete a package as the WhiteBox System... it is by far the best thing I have ever put in my classroom. Plus, the kids absolutely love it!"

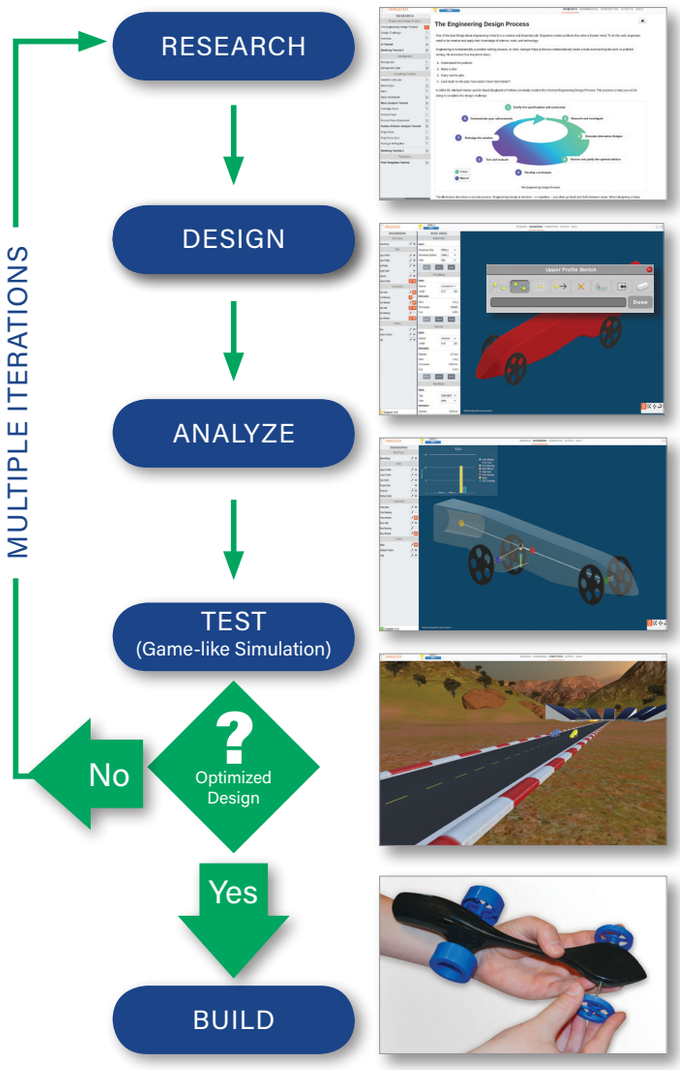
ROCKY SHEPHERD
MIDDLE SCHOOL STEM TEACHER, WEATHERFORD, OH

WHITEBOX LEARNING

How it Works

Integrating 3D design and analysis tools, game-like simulation and all the custom plans and materials necessary to build a physical model, WhiteBox Learning promotes critical and higher-order thinking. Students are empowered with the tools and information necessary to ask and answer their own questions about their designs in a unique and effective cycle called "informed iteration." A familiar interface guides students through the phases of engineering design and scientific inquiry:

INFORMED ITERATION PROCESS



RESEARCH — Study principles of engineering design and problem solving, theory-based content, quizzes, worksheets, and tutorials.

DESIGN — Students engage in a CAD-like, but highly focused interface to complete virtual designs.

ANALYZE — Students apply STEM knowledge learned in research within the context of their own virtual designs.

TEST — Students test each design iteration within a game-like simulation for classroom, district, and even national competition!

BUILD — Students can build or 3D print a physical model of their very own optimized virtual design.

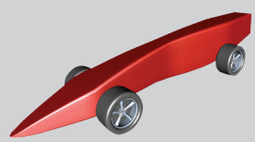
TECH & LEARNING BEST OF SHOW AT TCEA WINNER

PLATINUM WINNER 2020 NEW PRODUCT AWARD THE JOURNAL

in the STEM/STEAM Program/Curriculum category—Drone

Compete with Whitebox Nationals!

WhiteBox Nationals is a competition students encounter during the test phase where they move through five increasingly challenging levels as they test their 3D model designs. To move in level, students must meet or exceed required level scores based on quiz and worksheet results, number of design iterations and design performance. Student excitement builds and their motivation grows as they research and learn the science and math needed to optimize their design as they strive to improve their rank in competitions.



LEARN MORE

www.WhiteBoxLearning.com

FLINN
Only Authorized
US Distributor

BIO-RAD Explorer

Only available from Flinn Scientific

The Bio-Rad Explorer Program brings practical biotech concepts to your labs like never before. With activities ranging from actual DNA extraction to solving the Giant Panda conservation problem through antibody diagnostics, Bio-Rad is expanding both the Flinn catalog and the minds of your soon-to-be scientists.



FB2565
pGLO™ Bacterial Transformation Kit
See More on Page 520



FB2571
Genes in a Bottle Kit
See More on Page 521



FB2542
GMO Investigator Real-Time PCR Starter Kit
See More on Page 522



FB2502
Photosynthesis and Cellular Respiration Kit for General Biology
See More on Page 523



FB2572
ELISA Immuno Explorer Kit
See More on Page 523



FB2707
Virus Detection and Transmission Kit
See More on Page 521

BIO-RAD

Comprehensive Safety Training and In-Person Audits for Teachers and School Administrators!

What is required of you?



The OSHA Laboratory Standard (29 CFR 1910.1450), requires that schools provide training opportunities for teachers related to the safe use, storage and disposal of chemicals and hazardous materials; safe laboratory practices; maintenance of a chemical hygiene plan and appointment of a chemical hygiene officer; and methods for monitoring the laboratory environment to ensure teacher and student safety.

How can Flinn Help?

Flinn now provides both on-site and virtual training for teachers and administrators to ensure that they as well as the schools and districts they represent can enact chemical hygiene plans in accordance with the OSHA Laboratory Standard. As part of this service Flinn audits schools' chemical hygiene plans and offers pointed guidance on how to provide safe laboratory experiences for students, reduce liability risk, uphold the duty of care owed students, and properly purchase, inventory, store, and dispose of chemicals.

Flinn provides an expert point of contact for post-training questions and implementation guidance.



Training sessions are half-day or full-day.



Can be delivered on-site or virtually.



Training sessions are tailored to meet the needs of individual departments, schools, and districts.

Please reach out to your account representative or email labsafety@flinnsci.com if you would like to learn more or begin the process of scheduling a session.

Real Hands-on Learning for **Middle School Students**

Introducing FLINNeverydayscience™ For Middle School

Flinn's Everydayscience kits aren't watered-down experiments that rely on sims. These are learning activities that include:

- **Real Data.** Real experimental data gathered in the Flinn lab.
- **Real Skills.** Experimental Design Challenges promote science practice skills.
- **Real Student Work.** Hands-on data collection and analysis.
- **Lab-Tested.** All procedures have been tested to make sure they work and don't waste your time.
- **Videos for the Teacher.** Videos walk you through the introductory procedures.

Developed by our staff of scientists and science educators, this selection of easy-to-use engaging hands-on labs brings challenging concepts to life!



Electrical Conductors and Insulators
AP11809
Build your own conductivity meter to test the conductivity of household solids and liquids.
$57.70



Matter is Conserved
AP11807
Students study the law of conservation of matter using models.
$68.45



Discover Newton's Second Law
AP11808
Students gather first-hand data to form a deep understanding of Newton's Second Law.
$115.35



Energy Flow in an Ecosystem
AP11817
Students create both a food chain and a food web using organisms from their assigned habitat.
$65.15

Save Prep Time.

Reduce Waste.

Developed by Scientists.

Catalog No.	Description	Price	Catalog No.	Description	Price
AP11797	Hovercraft Forces	$ 55.85	AP11810	True Mirror Reflections	$107.70
AP11798	Hot and Cold	71.25	AP11811	Water Cycle in a Bottle	67.25
AP11799	Fingerprint Identification	91.15	AP11812	Natural Selection and Adaptation	46.35
AP11800	Density Quest	130.25	AP11813	Waves and Energy	70.15
AP11801	Atoms, Molecules, Compounds are Everywhere	129.15	AP11814	The Greenhouse Effect	55.25
AP11802	Cellular Respiration and Exercise	58.75	AP11815	Water-Fearing vs. Water-Loving	90.25
AP11803	Build Your Own Spinning Pyramid	68.35	AP11816	Crazy about Chromatography	90.25
AP11804	Red Cabbage Indicator Bird	67.75	AP11817	Energy Flow in an Ecosystem	65.15
AP11805	Blood Types and Inheritance Patterns	52.35	AP11818	Is It Chemistry?	66.15
AP11806	Investigating Lenses and Images	98.50	AP11819	Changing Colors	125.35
AP11807	Matter is Conserved	68.45	AP11820	The Solar System	52.35
AP11808	Discover Newton's Second Law	115.35	AP11821	Water and Motion	97.00
AP11809	Electrical Conductors and Insulators	57.70			

Real Data. Real Student Work.
Real Skills for Middle School Students



Hovercraft Forces
AP11797

With this FlinnEverydayScience™ lab, build a mini hovercraft and use it to describe various types of motions.

$55.85



Hot and Cold
AP11798

With this FlinnEverydayScience lab, students design an experimental procedure to determine the best material for a commercial handwarmer.

$71.25



Fingerprint Identification
AP11799

With this FlinnEverydayScience lab, students investigate fingerprint patterns and fingerprinting techniques

$91.15



Density Quest
AP11800

With this FlinnEverydayScience lab, measure the density of various metals and then analyze the results to select an appropriate metal for a medical device application.

$130.25



Atoms, Molecules, Compounds are Everywhere
AP11801

With this FlinnEverydayScience lab, students build models of molecules and ionic compounds to understand how materials' structures determine their properties.

$129.15



Cellular Respiration and Exercise
AP11802

With this FlinnEverydayScience lab, learn about aerobic cellular respiration through the color change of bromothymol blue, then explore how exercise can affect the rate of cellular respiration.

$58.75



Build Your Own Spinning Pyramid
AP11803

With this FlinnEverydayScience lab, build your own spinning pyramid!

$68.35



Red Cabbage Indicator Bird
AP11804

With this FlinnEverydayScience lab, students investigate acids, bases, and the pH scale using the colorful red cabbage indicator.

$67.75



Blood Types and Inheritance Patterns
AP11805

With this FlinnEverydayScience lab, build a model of red blood cells based on blood type. Then explore the genetics of blood types with Punnett squares and solve a paternity problem.

$52.35

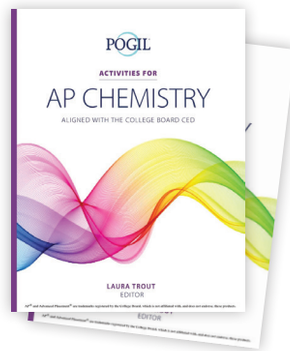
POGIL®

The POGIL Project and Flinn Scientific are proud to announce the 2nd edition of POGIL AP® Chemistry.

Edited by Laura Trout
ACS 2024 James Bryant Conant Award Winner

The 2nd Edition Includes:

- Alignment to the 2024 AP Chemistry Curriculum and Exam Description (CED).
- New emphasis on the development of process skills with integrated opportunities for students to evaluate their progress.
- More inclusive: clearer diagrams, reduced language barriers, student names removed or diversified.
- Includes 16 additional, all-new activities (total of 46 versus 30 in previous edition).
- Alignments to the current College Board AP Chemistry Course and Exam Description.
- Revised activities to increase focus on process and inquiry skills.
- 16 new activities that focus on challenging concepts for students. (based on ten years of student exam data).



AP11683
$97.00

Vernier®
SCIENCE EDUCATION

Go Direct®

Simplify your lab setup. Elevate student learning.

Vernier Go Direct sensors empower students to investigate scientific concepts with hands-on real-time data collection.



TC1708
Go Direct Soil Moisture
$149.00



TC1716
Go Direct Weather System
$158.00



TC1694
Go Direct Ethanol Vapor
$169.00

See more on page 537

NEWPATH LEARNING®

3D MODELS

Life Science



Frog Dissection

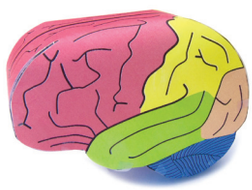
AP11685
$34.95



Cell Cycle/Mitosis

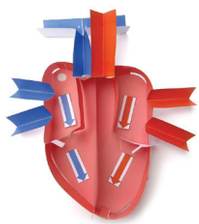
AP11691
$34.95

Human Body



Human Brain

AP11695
$34.95



Human Heart

AP11698
$34.95

Earth Science



Climate Change

AP11703
$44.95



Water Cycle

AP11708
$34.95

Science Curriculum Mastery® Games

Features Ready-to-Use Learning Centers for Reinforcement & Review

Use game-based learning to build student skills on key, standards-based curriculum topics! Each Classroom Edition is leveled by grade, covers 25 key concepts and provides enough materials for an entire class of up to 36 students to use simultaneously. Engaging graphics and illustrated review questions provide the perfect means for assessment preparation and are ideal for classroom use, after-school/summer school programs, learning centers and independent study.

Each Curriculum Mastery Game set features:

- 750 Illustrated, self-correcting review questions – 30 cards for each of 25 curriculum topics
- 12 Double-sided, laminated game boards accommodating lesson times from 5 to 30 minutes
- Game pieces and dice for use by up to 36 students
- Illustrated Teacher's Guide

The accompanying Teacher's Guide includes:

- Correlations to curriculum standards
- Learning objectives
- Easy-to-follow instructions
- Recommended classroom integration techniques



AP11713



AP11714

High School

Catalog No.	Description	Price/Each
AP11713	High School Biology Curriculum Mastery® Game – Class-Pack Edition	$119.95
AP11714	High School Earth Science Curriculum Mastery Game – Class-Pack Edition	119.95
AP11715	High School Physics Curriculum Mastery Game – Class-Pack Edition	119.95
AP11716	High School Chemistry Curriculum Mastery Game – Class-Pack Edition	119.95



AP11660



AP11662

Middle School

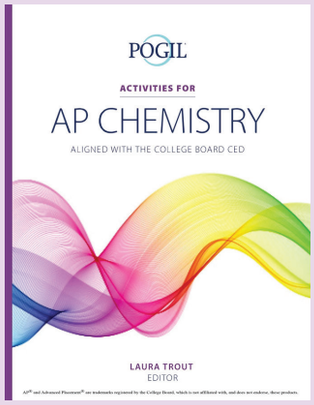
Catalog No.	Description	Price/Each
AP11660	Middle School Life Science Curriculum Mastery Game – Class-Pack Edition	$112.15
AP11661	Middle School Earth Science Curriculum Mastery Game – Class-Pack Edition	112.15
AP11662	High School Physical Science Curriculum Mastery Game – Class-Pack Edition	112.15

POGIL® Activities for AP® Chemistry, 2nd Edition, Digital + Hard Copy

Flinn Scientific is excited to join with The POGIL® Project to publish this series of student-centered learning activities for advanced placement chemistry. Integrate scientific practices, reasoning and inquiry in the AP Chemistry curriculum with 46 interactive, guided-inquiry learning activities in 7 major topic areas:

- Chemical Reactions and Stoichiometry
- Atomic Structure and the Periodic Table
- Thermodynamics and Kinetics
- Oxidation and Reduction
- Bonding
- Properties of Gases
- Equilibrium Systems

The second edition of POGIL Activities for AP Chemistry builds on the first edition (2015). New activities have been added, other activities have been extensively revised, and a strong emphasis on process skills is woven through all activities. All activities in the 2nd Edition are aligned with the 2024 Curriculum and Exam Description for AP Chemistry, which is produced by the College Board. Alignment information is presented at the end of each activity, in the Teacher Resources section.



The activities' effectiveness is enhanced by several features. Each activity has a "Teacher Resources" section, with clear learning objectives, process skill goals, prerequisites, assessment questions, and teacher tips. Within each activity, stop signs signal strategic points for pacing, checking in with the instructor, and reflection on learning through reporting out opportunities or other strategies. Key icons mark questions that directly address the learning objectives. Each activity also includes optional extension questions. These questions go beyond the stated learning objectives and help to differentiate the POGIL classroom experience for learners in the areas of work pace, need for homework or extra practice, and expanding on or applying concepts.

Contact Flinn for a special free license agreement to obtain permission to post the student activities on a password-protected school website.

The Table of Contents and a sample student activity is available in the Resources section. The teacher's version of this sample activity, which includes answers and teacher tips, is available by calling or emailing Flinn Scientific.

Catalog No.	Description	Price/Each
AP11683	POGIL® Activities for AP® Chemistry, 2nd Edition, Digital + Hard Copy	$97.00

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WWW.FLINNSCI.COM

Crime Scene 2: Kidnapped!



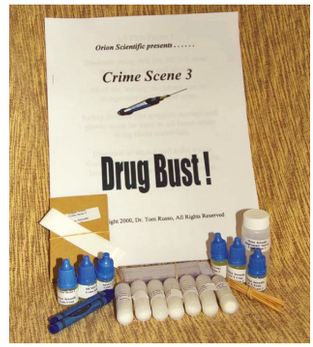
A kidnapping case for the ages. The son of a wealthy industrialist has been abducted. The whereabouts of Jason is unknown. A cursive note has been recovered by the parents and mansion employees and handed over to the police. Blood samples, handwriting, fiber, ink, finger prints and other forensics have been turned over to the crime lab by the investigation team upon collection at the scene of the crime. Can you put together a scientific trail to implicate and convict the kidnapper in.

Includes:

- Kit manual with SDS
- Plastic slides
- Toothpick stirring rods
- Crayon markers
- Ink samples
- Paper samples
- Fiber samples
- 7 blood samples (simulated)
- Anti A, anti B and anti Rh antisera (simulated)

Catalog No.	Description	Price/Each
AP11574	Crime Scene 2: Kidnapped!	$78.00

Crime Scene 3: Unknown Powder



Drugs, sex and rock and roll are part of the underground life at Bellehomme School.

While heralded as one of the most prestigious schools of the country, the Bellehomme school provides a fertile ground for distribution of the most novel illicit drug on the underground market. Tylorine is readily available via the underground connections from someone in the area. The drug has been confiscated from students in lockers, school bags and even in students clothing. Traces of the drug can be detected in urine samples collected under court order from students via parental cooperation. The key is to find out who and where the drug has leaked into the school or its premises. Can you put the pieces together for an arrest.

Includes:

- Kit manual with SDS
- Plastic slides
- Toothpick stirring rods
- Crayon markers
- Drug samples (simulated)
- Urine samples (simulated)
- Isopropyl alcohol for chromatography
- Paper for chromatography
- Cash samples (simulated)

Catalog No.	Description	Price/Each
AP11575	Crime Scene 3: Unknown Powder	$78.00

Crime Scene 4: Terror from Paradise



The international flight from Franistan to the US is about the take off from Franistan and land in the USA. The problem is that Franistan has become a hotbed of terrorist activities. This has become a concern for the US Department of Homeland Security. You have been authorized to look in to the possibility that some or all of the passengers abord a flight might be harboring both chemical and biological agents which can cause death and destruction of not only the flight, but also the personnel at either end of the flight plan. Can you help determine which, if any, of the passengers can be terrorists? **All tests are simulations. There are no toxic chemicals or pathogenic lifeforms in the kit.*

Includes:

- Kit manual with SDS
- Plastic slides
- Toothpick stirring rods
- Crayon markers
- A photo of the new leader of Franistan
- A photo of the individuals on board the plane
- A CD with a graphic interview with the leader of the Franistanian resistant movement
- Test strips from swabs taken from the luggage of the passengers
- Test solutions, reagents for C-4 explosives, bacteria, and a potent poison
- Copies of audio printouts of conversations of the terrorists

Catalog No.	Description	Price/Each
AP11576	Crime Scene 4: Terror from Paradise	$82.00

The Mysterious Liquid from Area 51



A subcontractor made his way into the darker areas of Area 51. Area 51 is reported to be a secretive base in the desert which is restricted to all except the special military and civilian contractors. The base has been rumored to contain alien artifacts and alien technology which is of great interest to military for obvious reasons. The subcontractor has not been heard from since a solitary fax was interrupted while being transmitted. A sample of an alien liquid has been smuggled out to interested parties. Your job is to characterize the "novel" liquid from Area 51!

Includes:

- Laboratory manual with instructions
- Crayon markers
- Toothpick stirrers
- Microscope slides

Samples of:

- Area 51 liquid
- Oil
- Alcohol
- Sugar
- Sodium bicarbonate
- Sodium chloride
- Hydrochloric acid
- Sodium hydroxide
- Testing liquids
- Testing solids
- Capillary tubes (capillary action test)
- US pennies (surface tension test)

Catalog No.	Description	Price/Each
AP11577	The Mysterious Liquid from Area 51	$78.00

Environmental Analysis: Carter Creek



The thriving community of Carterville has been growing in leaps and bounds. After a long stretch of a bad economy, Carter Creek Paper and Plastics has doubled its business. This means more jobs, opportunities, and $$$ for the area! There is a dark cloud on the horizon for the Carterville area. The creek has been polluted! Your students have been hired by a local chemical testing laboratory to find the nature of the contamination and locate its source.

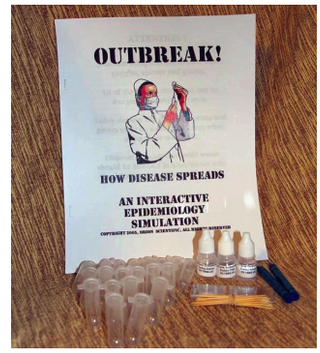
Contains no phthalates, mercury, or lead products or samples. For 24 students working in pairs.

Includes:

- 10 plastic slides
- 15 toothpicks (stirrers)
- 2 crayons
- 8 water samples in 3 ml dropper bottles
- 8 soil samples in 3 ml screwcap tubes
- 5 testing solutions (universal indicator, D Test, Polycrit, LeadStat, and MercuTest)

Catalog No.	Description	Price/Each
AP11578	Environmental Analysis: Carter Creek	$90.00

Outbreak! Health Education



It seems that communicable diseases spred faster than modern medicine can react to the distribution to the population. The net effect is that hundreds, thousands and sometimes millions of individuals are infected. Some are fatal. Some debilitating. How does this happen? How can an invisible invader cause so much sickness and death from a single infection?

This kit allows students to simulate the spread of communicable disease within the population of a class. No real bacteria or viruses are used for this lab. The effects can be easily traced using this kit. It is a truly eye-opening experience for all.

Includes:

- Laboratory manual with instructions
- Labels for identifying samples
- Microscope slides
- Crayon markers
- Toothpick stirrers

Samples of:

- Viral/bacterial infective liquid
- Testing liquid for infection
- Tubes for sampling and exchanging fluids

Catalog No.	Description	Price/Each
AP11579	Outbreak! Health Education	$76.00

HAVE A QUESTION?
1-800-452-1261
PLEASE CALL US

Fast Food Frenzy



"Do you want fries with that?" Well, do you? Do you really know what nutritional value your fast-food meal has to offer? Is it really the best choice for a breakfast, lunch or dinner? Is it the best choice? What exactly is contained in the galaxy of food you find in that paper bag? While the kit does not give the quantities of the major food groups, you can determine the nature of the contents of the meal.

Includes:

- Kit manual with SDS
- Plastic slides
- Toothpick stirring rods
- Crayon markers
- $3.00 cash to help purchase a child's size meal
- Answer sheet (pictorial) with results shown
- Test reagents for sugar, fat, protein, etc. (qualitative not quantitative)
- Sample vials for student testing
- Extraction vials for removing nutrients from parts of the meal
- Sample droppers for testing individual nutrients

Catalog No.	Description	Price/Each
AP11580	Fast Food Frenzy	$78.00

Narc Lab: A Simulation



This kit will allow students to simulate typical laboratory tests for narcotics in urine specimens. The drug test reagents, drugs themselves, urine specimens, positive and negative controls in this kit are simulated. There are no narcotics, human or animal urine or dangerous reagents used in these tests.

The tests themselves follow the same protocol that a police, forensic or hospital laboratory investigator would use to test for the presence of the following narcotics or controlled substances: THC – tetrahydracannibinol (the active ingredient in marijuana), cocaine – (benzoylecgonine metabolites) break down products of crack or cocaine in the urine.

A complete set of directions, notes, background material and answers are provided for the teacher. Directions for students are also provided.

Includes:

- The kit provides enough material for 200 or more repetitions
- Each student can perform all the tests included in the kit
- Special glassware or microplates are not required
- Plastic slides are provided
- These test can also be run in small (8 x 50 mm) test tubes or in the wells of a 96 well microplate
- The chemicals provided are non-toxic and can be handled with normal laboratory procedures
- All material in this kit can be discarded down the drain
- The chemicals in this kit will not harm pipes or septic systems

Catalog No.	Description	Price/Each
AP11581	Narc Lab: A Simulation	$60.00

Plastic-Backed Thermometer



Plastic-backed thermometer reads in both Celsius and Fahrenheit scale. ±2° accuracy; non-toxic.

Catalog No.	Description	Price/Each
AP11602	Plastic-Backed Thermometer	$1.50

Digital Monocular Microscope with Top Bracket, Mechanical Stage



Discover the microscopic world with this digital monocular microscope. This microscope allows viewing at 4X, 10X, and 40X magnification.This microscope features the ability to connect a smartphone or computer to the built-in Wi-Fi, allowing you and your students to record or take images of what is being viewed in real-time. An attachable ipad bracket is included to mount a phone or tablet to the microscope for easy access as the sample is viewed.

Available with a mechanical stage or stage clips.

SPECIFICATIONS

- Monocular head with built-in camera
- PL10 x 18 mm eyepiece
- Achromatic objective 4X, 10X, and 40X
- N.A. = 1.25 Abbe condenser
- LED illumination
- Built-in Wi-Fi to connect to iOS, Android, and Chromebook
- 100V–240V rechargeable with 3 rechargeable batteries

Catalog No.	Description	Price/Each	Price/5+ Each
AP11609	Digital Monocular Microscope with Top Bracket, Mechanical Stage	$710.00	$653.00

MicroBrite Pro 60x-120x LED Lighted Zoom Pocket Microscope with Smartphone Digiscoping Clip



The MicroBrite Pro LED lighted pocket microscope includes both the microscope and the smartphone digiscoping clip. This is a powerful 60x–120x power pocket microscope that is lightweight and portable. This hand-held microscope features a built-in LED light that provides a bright, clear image. It is pocket-sized so it can be brought anywhere. The smartphone digiscoping clip allows users to use the built-in camera application on their smartphone to take images and record video of their subject matter and share with students or teachers.

Catalog No.	Description	Price/Each
AP11604	MicroBrite Pro 60x–120x LED Lighted Zoom Pocket Microscope with Smartphone Digiscoping Clip	$22.00

MicroBrite Plus Smartphone Digiscoping Clip



The MicroBrite Plus Smartphone Digiscoping Adaptor Clip is a separate accessory for users who already own the MicroBrite Pro Microscope. The smartphone digiscoping clip allows users to use the built-in camera application on their smartphone to take images and record video of their subject matter and then send the content to family, colleagues, and friends.

Catalog No.	Description	Price/Each
AP11605	MicroBrite Plus Smartphone Digiscoping Clip	$7.00

Snap Circuits® Discover Coding



For nearly 20 years, future engineers all over the world have learned basic electricity with Snap Circuits kits. Now, Snap Circuits is taking the next generation into the world of coding! Download the Snap Circuits App and control Snap Circuits projects using your smartphone or tablet to control lights, sounds and a motor! Discover Coding is a great introduction to coding, using easy graphical coding. More advanced coders can move up to BLOCKLY coding.

Three ways to control: real-time control, easy-to-use graphical coding, and BLOCKLY code. Learn the basics of coding, then code your own patterns of lights, sounds and moving parts. Ages 8+.

Features:

- Learn about circuitry, electronics, and much more
- Illustrated, easy-to-use, full-color project manual explains electrical and coding concepts and includes exciting coding challenges
- Over 30 Snap Circuits parts, including the new Bluetooth-powered SC Controller
- 5 Control Outputs: Control up to 5 circuit paths together or independently to create different circuits and projects

Catalog No.	Description	Price/Each
AP11643	Snap Circuits Discover Coding	$98.99

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WWW.FLINNSCI.COM

Snap Circuits Bric: Structures



Kids can use their imagination to combine Snap Circuits with ordinary building bricks and make endless combinations of construction and circuitry. With patent-pending, Bric-2-Snap technology, kids can wire up their brick builds with Snap Circuits lights, sounds, moving parts and 3-D circuits to invent almost anything and make it go!

Kids love to create and invent from what they have at home. Instead of just building a structure, now kids can learn how to build the circuit that makes the lights on a skyscraper illuminate or that makes the gears on a drawbridge move! Elenco's team of engineers has come up with a great way for kids to Learn By Doing® and be creative with their everyday, building bricks. There's no limit to what kids can create with Snap Circuits Bric: Structures!

Includes:

- 20 Snap Circuits component parts
- Over 140 fully compatible building bricks
- Full-color, easy-to-read project manual
- 75 Bric-2-Snap adapters

Catalog No.	Description	Price/Each
AP11647	Snap Circuits Bric: Structures	$58.99

Snap Circuits My Home



Electricity is everywhere—even in your home. Whether you live in a city skyscraper or a house in the country, our homes are powered by electricity. It's not magic, it's science, and it's easy to learn. Build a house or city tower with real, working, 3-D circuits, just like the ones you use every day. With seven colorful base grids to make your structure your own, learn how electricity travels and powers your home.

- How does the electric company get power to your house?
- How does power travel inside your walls?
- What happens when you turn on a light?
- What happens when the power goes out?
- What are fuses and circuit breakers and how do they work?

Whether an engineer, artist, or businessperson, get empowered for your future and learn how the electricity in your world works! Electronics is easy and fun with MyHome!

Features:

- Seven colored base grids to make your structure your own
- Learn about circuitry, security systems, dimmer switches, automatic lights, alarms, motion detectors, fan speeds, appliance motors, generators, and much more
- Illustrated, easy-to-use, full-color project manual
- Approximately 60 parts and 25 projects

Catalog No.	Description	Price/Each
AP11649	Snap Circuits My Home	$89.00

Snap Circuits Motion



Snap Circuits Motion contains over 50 parts and over 165 projects to complete—all projects focused on concepts of motion and physics. Experiment with gears ratios using various gears and pulleys. Experiments include: Color changing lighted fan, air "fountain", motion detector and so much more! Fun projects let kids learn while they play! With its easy-to-follow instructions, Snap Circuits gives your child a hands-on education to discover how electrical circuits—like those found in everyday devices kids are familiar with—function and operate. They'll also gain valuable lessons in building and following instructions. The project manual includes large color illustrations and simple directions for each project.

Features:

- Over 50 parts and over 165 project to complete—all motion and physics focused
- Experiment with gears ratios using various gears and pulleys
- Gain valuable lessons in assembly and following instructions
- Project manual includes large color illustrations and simple directions for projects

Catalog No.	Description	Price/Each
AP11650	Snap Circuits Motion	$115.00

Sponge Spicule Lab



This two-part classroom activity comes with six distinct sponge samples, each with a unique spicule type. Each kit has enough tissue for approximately 80 students working in pairs. A written procedure for set-up and teacher preparation is included, along with a student worksheet and key. The lab requires only simple lab tools (tweezers, microscope and slides) and household bleach.

Catalog No.	Description	Price/Each
AP11761	Sponge Spicule Lab	$45.95

PaperFin Printing Kit



The PaperFin Printing Kit revolutionizes the traditional art of fish printing (Gyotaku) by eliminating ink and introducing a safe, non-toxic alternative. This kit allows you to create lifelike replicas of fish specimens, leaves, and other biological treasures. Whether you're teaching marine biology, ecology, or simply fostering creativity, our ink-free process provides an engaging and educational experience.

Contains 4 sheets of 11¼" x 17¼" specially coated printing paper. 4 inkless printing towelettes. Comes with detailed instructions, and mailed in stay flat envelope.

Features:

- **Ink-Free Technology**: Say goodbye to messy ink! Our patented solution towelette reacts with specially coated paper, allowing you to capture intricate details without the need for artistic skills.
- **Safe and Clean**: No more stained hands or toxic chemicals. Our process is environmentally friendly and suitable for all ages.
- **Inspired by Tradition**: We honor the ancient Japanese art of Gyotaku, which historically used ink to print fish. Our innovation preserves the essence of this practice while making it accessible to everyone.
- **Simple Steps**: Dab or wipe the towelette onto the fish, place the paper on top, and gently rub. Voilà! A stunning print emerges.
- **Versatile Use**: From classroom projects to personal keepsakes, our kits cater to beginners and seasoned anglers alike.
- **Alternative Taxidermy**: Create lasting memories without harming wildlife. Hang your prints proudly as unique wall art.

Catalog No.	Description	Price/Each
AP11762	PaperFin Printing Kit	$28.00

Turtle Dichotomous Key Activity



This activity is a great introduction to using a dichotomous key for species identification. The kit includes eight distinct sea turtle models. Each turtle is 2" length the kit comes complete with all the paperwork needed for background information.

Catalog No.	Description	Price/Each
AP11763	Turtle Dichotomous Key Activity	$16.95

Density Flow Original Model



Demonstrate important density concepts to an entire classroom. Challenge students to use scientific inquiry techniques to explore geology, meteorology, freshwater and saltwater systems. Using the illuminated flow of colored fluids, students can visualize abstract concepts related to plate tectonics, isostasy, sea-floor spreading, air masses, fronts, air pressure, winds, ocean currents, thermoclines, haloclines, upwelling, El Niño and more.

Materials Included:

- 1 acrylic tank with three partitions (44"L x 6"H x 3¾"W)
- 3 wooden tank/light supports
- 1 36" LED light
- 1 container of salt
- 6 medium suction cups
- 3 rubber stoppers (00, 2, 2)
- 1 weighted bottle (250 mL)
- 1 battery-powered air pump
- 1 drain hose assemblage
- 3 thermometers
- 4 "D" cell batteries
- 2 boxes of assorted food coloring
- 1 dry erase marker, black
- 2 plastic bottles (1000 mL)
- 1 sheet of static cling images
- 1 ruler
- 1 stir stick
- 1 set of two blocks (Africa & South America)
- 1 set of two blocks (continental crust)
- 1 set of two blocks (oceanic crust)
- 95-page curriculum manual with student pages and keys

Catalog No.	Description	Price/Each
AP11827	Density Flow Original Model	$475.00

Round Reagent Bottle with Screw Cap



With DIN thread GL 45, pouring ring and PP screw cap. Excellent chemical resistance. Minimal thermal expansion. Transparent—contents and volume can be quickly checked. Easy labeling-thanks to large labeling field. Practicality-easy to read, permanent graduations.

Catalog No.	Description	Size (mL)	Price/Each
AP11833	Round Reagent Bottle with Screw Cap	100	$10.15
AP11834		250	11.15
AP11835		500	12.25
AP11836		1000	13.25

Extension Clamp, Heavy-Duty, Large



This 3-prong heavy-duty extension clamp is made of an electroplated zinc alloy and features dual prong adjustments. Prongs open to approximately 3½". Coated with non-slip PVC sleeves. The 6" extension rod is made of stainless steel. Total length of clamp is 10".

Catalog No.	Description	Price/Each
AP11838	Extension Clamp, Heavy-Duty, Large	$45.40

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Electromagnet Coil Kit, Set of 3



Turn the electricity produced by the hand generator into a powerful electromagnet with the Electromagnet Coil Set. This great hands-on device lets students see the properties of an electromagnet in action. Students determine how the strength of an electromagnet is affected by the number of turns in the coil and by the nature of the material inserted into the coil. Includes one 200-turn coil, one 100-turn coil and 4 different cores: aluminum, copper, glass and iron. The electromagnet coils can also be used with a 6V battery. Coils measure 48 mm x 17 mm diameter; cores measure 55 mm x 5 mm diameter. Set of 3.

Catalog No.	Description	Price/Each
AP11839	Electromagnet Coil Kit, Set of 3	$215.00

Triple Replacement Flints, for Lighters Purchased 2024 or Later, Pkg. of 5



Triple flint striker for igniting burners.

Catalog No.	Description	Price/Each
AP11840	Triple Replacement Flints, for Lighters Purchased 2024 or Later, Pkg. of 5	$3.80

Ribbed Matting, 15' Roll



Clear polyethylene ribbed matting. Perfect floor, shelf, or drawer liner goes down quickly and lies flat. Ribs hold dirt until it can be wiped away. As a shelf and drawer liner, heavy weight matting is 5x as thick as normal shelf liner. Easily cut with regular scissors but it won't tear! Also useful under drums or carboys. Heavy weight matting .036" thick. Provided as a 15' roll and 30" wide.

Catalog No.	Description	Price/Each
AP11841	Ribbed Matting, 15' Roll	$44.40

Nerd Words—A Science Words Game



Nerd Words: Science has two teams competing to decipher one-word clues to find the correct science terms. Teams bet points as an indication of their confidence. Speed and accuracy are rewarded while incorrect answers cost you your wager. Prove your mastery of biology, chemistry, physics, and earth science by out scoring your rivals.

Catalog No.	Description	Price/Each
AP9441	Nerd Words—A Science Words Game	$29.99

Ecosystem—A Habit Building Card Game



Ecosystem is a biologically derived card drafting game. Player choose, pass, and arrange eleven different card types consisting of organisms ranging from bees to bears and environments like streams and meadows. Earn points by aligning animals with habitats where they most flourish. Biodiversity is rewarded while monocultures are penalized. Each time you play, you build a one-of-a-kind ecosystem, striving to balance the delicate connections between all living things.

Catalog No.	Description	Price/Each
AP9442	Ecosystem—A Habit Building Card Game	$16.99

Math Rush—A Fast Paced Math Card Game



Math Rush: Addition & Subtraction is a quick-paced card game where players must work as a team to sequence the solutions of their addition and subtraction equations, all the while racing against the clock! The equations might be simple, but the strategy and challenge involved with working together to complete the required goals under the pressure of time makes this game enjoyable for all audiences.

Catalog No.	Description	Price/Each
AP9461	Math Rush—A Fast Paced Math Card Game	$12.99

HAVE A QUESTION?
1-800-452-1261
PLEASE CALL US

Advanced Thermostat Kit



This apparatus helps students to observe energy transfer and conversion and investigate the systems that keep homes comfortable and safe. The suggested activities will: explore the relationship between parallel circuits and current; understand how thermostats and circuit breakers operate; and compare the energy efficiency of LEDs to incandescent bulbs.

Includes:

- 6V DC connections
- 5 bulb sockets
- 5 6V incandescent bulbs
- Activity guide
- Multimeter connections
- Bimetallic bar wwitch
- 5 LED bulbs
- Advanced thermostat apparatus
- Multimeter
- 5 on/off switches
- Candle

Additional Supplies Needed: 6V DC power supply and stopwatch

Catalog No.	Description	Price/Each
AP9477	Advanced Thermostat Kit	$60.00

Reflection-Refraction Kit



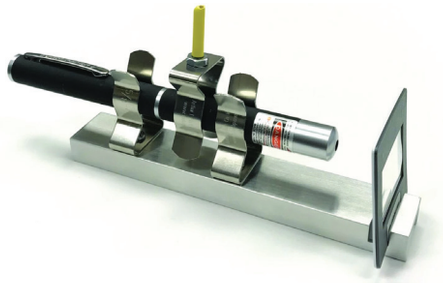
Introduce students to the basic concepts of light reflection and refraction with this economical kit. Guided activities include reflection of light at a plane mirror and the refraction of light at a water interface.

Includes:

- Clear protractor
- Activity guide
- Semicircular refraction cell, 12 cm Dia. x 2½ cm H
- Pair of mirror support clips
- Cork mat, 15 x 15 cm
- Acrylic plane mirror, 10 x 10 cm
- 4 steel T-pins

Catalog No.	Description	Price/Each
AP9727	Reflection-Refraction Kit	$15.00

Laser Diffraction Kit



The Laser Diffraction Kit lets students create, view, and measure diffraction and interference patterns The kit includes two laser pointers—red and green (requires two "AAA" batteries per laser, not included)—along with a convenient mounting base and a slide set of diffraction objects. The lasers are Class 3R, and are each 6" long x ½" diameter.

Two of the included slides have various double slit patterns. One slide has a fixed slit separation with the slits on either side varying in width. The other has the slit width constant with varying slit separations.

For investigating single slit patterns, one of the slides contains five slits of varying widths. An additional slide carries a traditional diffraction grating with 300 lines/mm.

The unique base securely holds the included standard laser pointers. An included clip allows you to hold the laser button on during experiments. Measurements of the light patterns are easy to read when the laser patterns are projected against a wall. Includes activity guide.

Catalog No.	Description	Price/Each
AP9816	Laser Diffraction Kit	**$108.00**

FLINNconnect™ Digital Courseware: General Biology Lab and Instructional Course Content

FLINNconnect is a new program that gives you instructional material aligned to a full year of high school biology along with customizable and downloadable laboratory instructions for 32 experiments. The instructional material covers 20 units and includes text, images, in-unit assessments, end-of-unit assessments, lab videos, concept videos, and animations.

Each unit includes one to two questions that students explore by doing one of the program's 32 labs. Each lab kit includes the consumable materials, chemicals, and special equipment needed to support 1–2 classrooms of 30 students working in groups of 3–4. You can choose to assign students a single unit or all of the units, and you can edit the content in the units to emphasize the topics you cover and deemphasize the ones you don't. The units can be used as the primary reference material students use, as a supplement to a textbook, as a supplement to lesson plans you have already built, or as homework. You can view data on strengths and weaknesses by topic for individual students as well as an entire class.

The experiments have been carefully chosen based on how well they align to the main topics of biology and their engagement level. The labs will excite students at the same time they help them understand abstract ideas and the natural world. You can choose to do any single lab, or all of the labs, based on what best suits your curriculum and students.

Features:

- Cell Structure and Function
- DNA and DNA Replication
- Evolution
- Protists and Fungi
- Introduction to Biology
- Climate Change
- Classification and Biodiversity
- Plant Growth, Development, and Reproduction
- Ecosystems
- Meiosis
- Bacteria
- Human Diseases
- Invertebrates
- Genetics: Heredity
- Photosynthesis and Respiration
- The Cell Cycle
- Molecular Genetics
- Viruses
- Human Systems
- Vertebrates

Catalog No.	Description	Price/Each
EL1040	**FLINNconnect** Digital Courseware: General Biology Lab and Instructional Course Content	**$279.00**

Fluorescent Magic Sand



Magic Sand is regular sand that has been dyed and coated with a hydrophobic material—a substance that repels water. The coating on the outside of the magic sand repels water and keeps the sand dry. Simply remove the sand from the water with a spoon...it is perfectly dry. Available in three fluorescent colors. Comes in one pound packages.

Catalog No.	Description	Color	Price/Each
AP11842	Fluorescent Magic Sand	Blue	**$15.00**
AP11843		Pink	**15.00**
AP11844		Green	**15.00**

HAVE A QUESTION?
1-800-452-1261
PLEASE CALL US

LED Light Fixture, Magnetic



With a modern, minimalist look and a compact footprint, this simple and stylish grow light garden is the perfect small-space solution for starting seeds and keeping houseplants happy and healthy. Made from durable, rust-proof galvanized steel with attractive and protective green powder coating, the frame is lightweight—but it packs heavyweight growing power, illuminated by energy-efficient, full-spectrum LED grow lights.

Designed with convenience in mind, the assembly process couldn't be easier—you'll be on your way to growing in 10 minutes or less! Customize your grow setup with adjustable shelves to accommodate taller houseplants, and moveable magnetic LED light bars to position lights where your plants need them most. Rolling casters up the convenience even more, making it easy to scooch and reposition your light garden as needed. Includes one magnetic 16W LED grow light per tier (4 total). Add more to maximize growing space!

- **A Brilliant Addition:** Add more fixtures to your plant stand to grow light-hungry plants
- **Plant-Boosting Brightness:** 2x bright high-output lights don't require height adjustments
- **Adjustable Convenience:** Moveable magnetic LEDs focus light where your plants need it
- **Energy-Saving and Long-Lasting:** LEDs use half the electricity and last 5 times longer than fluorescents

Specifications:

- High-output LED, aluminum, polycarbonate with 2 magnetic clips (light fixture)
- Each fixture 22½" L x 2¼" W x 1⅜" H
- 24W LED specs:
  - Color temperature: 6,400K
  - PPFD: 110.8 µmol/(m2-s)
  - Lumens: 3960 lm
  - Lifespan: 50,000 hrs
- Weight: 2 lbs

Catalog No.	Description	Price/Each
AP11905	LED Light Fixture, Magnetic	**$89.99**

Experience the **Flinn Difference.**

Flinn is 100%

TESTED

Every product we sell has gone through thorough in-depth testing in our lab, so you can trust them in yours.

PRICE-MATCHED

If you find a lower nationally advertised catalog price for an identical item, we will match that price.

GUARANTEED

We guarantee that no sale is complete until you are 100% satisfied.

ALIGNED

Our learning solutions support all current national and state science standards including NGSS.



FREE Safety Poster

You heard right, it's free! Place your first chemical order with us, and receive this Flinn Scientific Lab Safety poster on us.

SAFE, ACCURATE & STATE-OF-THE-ART CHEMICAL INVENTORY MADE EASY

FLINNchemventory™

Take your chemical inventory system to the next level with Flinn's enhanced Chemventory. Chemventory is a cloud-based system that allows multiple users to access a comprehensive and personalized database from any location or device.

Secure Cloud-Based Centralized Location

Chemventory can be accessed from any computer or tablet with an Internet connection. You can invite other teachers, lab managers, and/or administrators to view or update your centralized database as needed. Chemventory also gives your district the ability set up multiple storerooms at all schools.

Chemical & Lab Match-Up

The ability to match up chemicals with Flinn's digital labs is state-of-the-art addition. If you are a Flinn customer with digital lab access, simply select chemicals from your database and then search associated digital labs that use those chemicals. You can also select a lab and it will show you all of the chemicals and materials required, your on-hand supplies and then options to purchase any items you may not have.

Customize Your Database

Populate your Chemventory by selecting from a list of Flinn chemicals or manually adding information about your current stock. The flexibility of Chemventory allows you to classify each chemical by school name, chemical storeroom location, and shelf/cabinet location. Sort your list by category or look up chemicals by keyword, Flinn catalog number or alphabetical index.

Experience Chemventory™



I want to teach Chemical Reactions. I wonder if I have enough tools and chemicals? Let me check inventory!



This is great! I can search my current inventory of products, search the lab I want to do and see which chemicals I need, or search labs from my current inventory of chemicals.*



Success! Staying organized with Chemventory made it easy to find labs to teach based on what I have or get missing resources for labs I want to teach.



Managing my inventory with Chemventory™ means that I can begin a lab with confidence knowing all the supplies needed are on hand. And if I am out of anything, Chemventory™ streamlines reordering. I can even ask Chemventory™ to suggest a lab using materials I have on hand.

*Ability to search and pair up labs and content requires a subscription to PAVO, Flinn's gateway to award-winning digital content and labs.

WHAT TEACHERS SAY:

"I use Chemventory as our school's chemical management system. It has made cataloging and keeping track of our chemicals easy. And I LOVE the labels, plus all the information is easy to find."

AMY MELBY
YUMA HIGH SCHOOL, YUMA, COLORADO

Chemicals

Flinn Scientific is the leading chemical supplier to science educators across North America. **Find the chemicals you need for your academic chemistry labs and classroom activities.**

32 Flinn Chemicals

30 Flinn Chemical Safety Label

28 How to Use the Catalog/Reference Manual Chemicals Section

29 Should I Purchase This Chemical?



How to Use the Catalog/Reference Manual **Chemicals Section**

Product Name, Quality, Concentration, etc.:

The full chemical name is shown. An alternate name is sometimes shown. A chemical formula is provided as well as the formula weight. The purity grade is included.

Reagent: Highest purity available—conforms to specifications established by the chemical industry or American Chemical Society. Each batch undergoes an extensive analysis to determine its purity and level of impurities. Use for AP® labs and qualitative and quantitative analyses. Guaranteed to give the best results in your lab.

Laboratory Grade: High purity chemicals that meet industry standards. Well suited for most general experiments and demonstrations.

Hazard Alert:

Hazard data is provided to alert the science teacher to the hazardous character of each chemical.

Storage Number:

Number refers to the compatible chemical family in which this item should be stored. A detailed table of these families and even their most compatible shelf order is found in the Safety Reference section of this catalog.

Disposal Number:

Suggested disposal techniques for small, laboratory quantities of chemicals are provided in the back of this *Flinn Scientific Catalog/Reference Manual*. The number shown in the chemical listing refers you to a specific and suggested disposal method for that particular product.

Shelf Life:

Through a detailed literature and reference book search, we have attempted to provide a general statement about the anticipated shelf life expectancy of laboratory chemicals in a school setting. Since conditions vary from school building to school building, our shelf life designations are estimates only.

Definition of terms used to describe shelf life—

Excellent: The substance should have a long, useful life under varied storage conditions.

Good: If stored under reasonable conditions of temperature and humidity (25 °C at 50% or less relative humidity), the substance should have a long, useful life.

Fair: If stored under reasonable conditions, the product's useful life may be three years or fewer.

Poor: Substance does not store well under reasonable conditions.

Indefinite: A term used frequently to communicate that the substance has no fixed or definable life expectancy.

Deliquescent: Substances that tend to absorb atmospheric water and become liquids.

Efflorescent: Combined water molecules lost by hydrates when exposed to air, which can possibly result in partial decomposition.

Hygroscopic: A substance that absorbs moisture from the air.

Soluble:

The extent to which a substance would lose its form and become molecularly or ionically dispersed in a solvent to become a solution. Limited space prevents us from listing every possible solvent.

Color and Odor:

Meaningful terminology is used to characterize color and odor. This information is provided as a chemical identity tool. For a complete chart of chemical color/odor identification and mystery substance identification procedures, please contact us.

Hydrochloric Acid

12 Molar

ACS reagent
37 wt %
(sp. gr. = 1.19 at 20 °C)
HCl
F.W. 36.46

H0031	100 mL	**$ 10.47**
H0004	500 mL	**21.63**
H0005	2.5 liters	**37.60**
H0006*	2.5 liters	**53.00/1**
		310.20/6

(Packaged in PVC-coated bottle)

★ **HAZARD ALERT:** Highly toxic by ingestion or inhalation; severely corrosive to skin and eyes.

Storage: Inorganic #9 in a dedicated acid cabinet. If one is not available, store in a Flinn *Saf-Cube*™. See special storage tip under full listing on page 56–57.

Cap Safety Color Code: Blue

Disposal: #24b

Shelf Life: Good if stored safely.

Soluble: Water

Color and Odor: Colorless liquid with very strong chlorine odor.

CAS No. 7647-01-0

Incompatability: Avoid storing hydrochloric acid anywhere in the vicinity of formaldehyde. A ***potent carcinogen,*** chloromethoxychloromethane, is formed when hydrochloric acid and formaldehyde react in air. This serious potential problem further emphasizes the need to store hydrochloric acid in a dedicated acid cabinet.

Safety Purchase Suggestion: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of hydrochloric acid and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.

*Hydrochloric acid is exactly as described under Catalog Number H0005 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are safely retained in a PVC outer envelope. The PVC-coated bottle is a safer package for science teachers.

CAS Number:

CAS means Chemical Abstract Service. Think of this number as an identification number—unique to each substance. A more detailed explanation of CAS numbers is found on page 25 of this catalog.

Safety Purchase Suggestion:

If, in our opinion, you should exercise special caution in acquiring a substance, we alert you to that need.

Technical Note:

We have used this to provide technical information; uses, solution preparation, contents or product descriptions.

Catalog Number, Unit of Measure and Price:

Each product has been assigned a catalog number. The unit of measure is almost always specified in metric terms.

Should I Purchase **This Chemical?**

6

Does your school or district prohibit the use of certain chemicals in your science laboratory? This is a growing problem! Banning chemicals from the school science laboratory without giving thought to how often the chemical is used or its educational value and hazard level is similar to banning a textbook from the classroom. Teaching professionals must have available to them every teaching tool possible to educate our nation's young people. Flinn Scientific has adopted the philosophy that:

"Chemicals in any form can be safely stored, handled or used if the physical, chemical and hazardous properties are fully understood and the necessary precautions, including the use of proper safeguards and personal protective equipment, are observed."

Important Questions to Ask Before Purchasing a Chemical

1 What is the relative hazard level of the chemical?

Is the chemical reactive to water or air? Is it corrosive, flammable or hazardous by inhalation? Is the chemical irritating to body tissue or carcinogenic? In other words, how can this chemical hurt me?

2 How often is the chemical used in laboratory experiments and/or demonstrations?

Is the chemical commonly used in a high school setting?

3 What is the educational value of using the chemical?

What specific topic or lesson does the chemical help teach or illustrate? If the chemical is commonly used in other laboratory activities, you can generally say it has educational value. If the chemical is infrequently used and extremely hazardous, then we suggest you review the specific laboratory activity to judge its educational value for yourself. Further investigation may identify a less hazardous substitute. Only you, the teaching professional, can ultimately decide the chemical's educational value.

4 Have I used this substance before?

Am I familiar with the use of the chemical? Have I tried the experiment before? Do I feel comfortable using this chemical?

Remember, try all experiments and demonstrations first before using them in the classroom.

5 Is my laboratory facility equipped for the safe use of this chemical?

Do I have the correct type and size of fire extinguisher? Do I have an eyewash? Is my room properly ventilated?

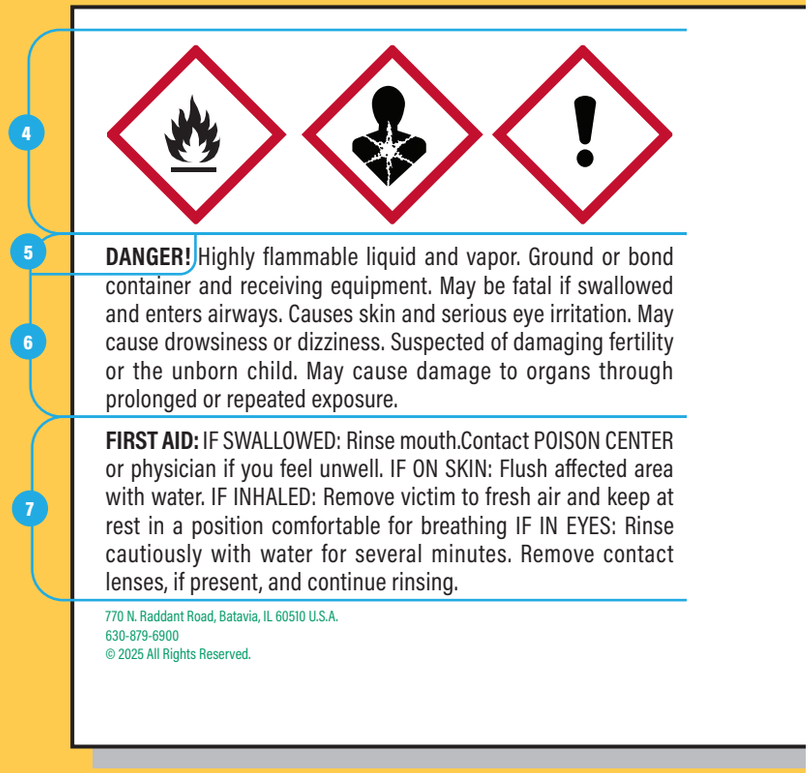
6 How will I dispose of this chemical?

Will this chemical require special disposal procedures? Does my school have a waste disposal program in place? Will the chemical have to be disposed of properly by a licensed hazardous waste disposal company?

If you have trouble answering one or more of these six questions, call us. Our technical staff will be more than happy to give you expert advice! Call us at 800-452-1261.

THE FLINN CHEMICAL SAFETY LABEL **SOLVES CHEMICAL PROBLEMS**

The Flinn chemical safety label has been specifically designed to fit the needs of the middle and high school science teacher. How should I properly store my chemicals? What safety aids should be available to me when using the chemical? How toxic is toxic? What is the shelf life of the chemical? How do I safely dispose of the chemical? Is the chemical hazardous? These questions and many more are answered by the Flinn chemical safety label.



1 Product Name, Quality, Concentration, etc.

Full chemical name is shown and sometimes a common alternative name. The chemical formula and formula weight is immediately below the name. The quality of the substance (e.g., reagent, laboratory grade) is clearly indicated. See page 22 of this catalog for quality or grade explanations.

2 Hazard Alert

Hazard and safety precaution information is provided to alert the science teacher to the hazardous character of each chemical. This information is helpful when storing, dispensing or using the product.

3 Large Hazard Warning

A large, brief and specific hazard warning is shown. Many substances have multiple hazard characteristics (e.g., corrosive and inhalation irritant). This single line and dominant warning restates the most hazardous nature of the substance.

4 Hazard Pictograms

Graphical pictures with characteristic symbols to convey specific hazard information. There are eight pictograms. See page 702 for more information about pictograms.

5 Signal Word

Indicates the relative severity of a hazard and alerts the reader to potential hazards. The GHS signal words are "Danger" or "Warning," with "Danger" being the more severe.

6 Warning Information

This section contains Hazard and Precautionary Statements. Hazard Statements are assigned based on a hazard class and category to describe the hazards of a product. Precautionary statements describe recommended measures that should be taken to minimize or prevent adverse effects from exposure to a hazardous product.

7 First Aid

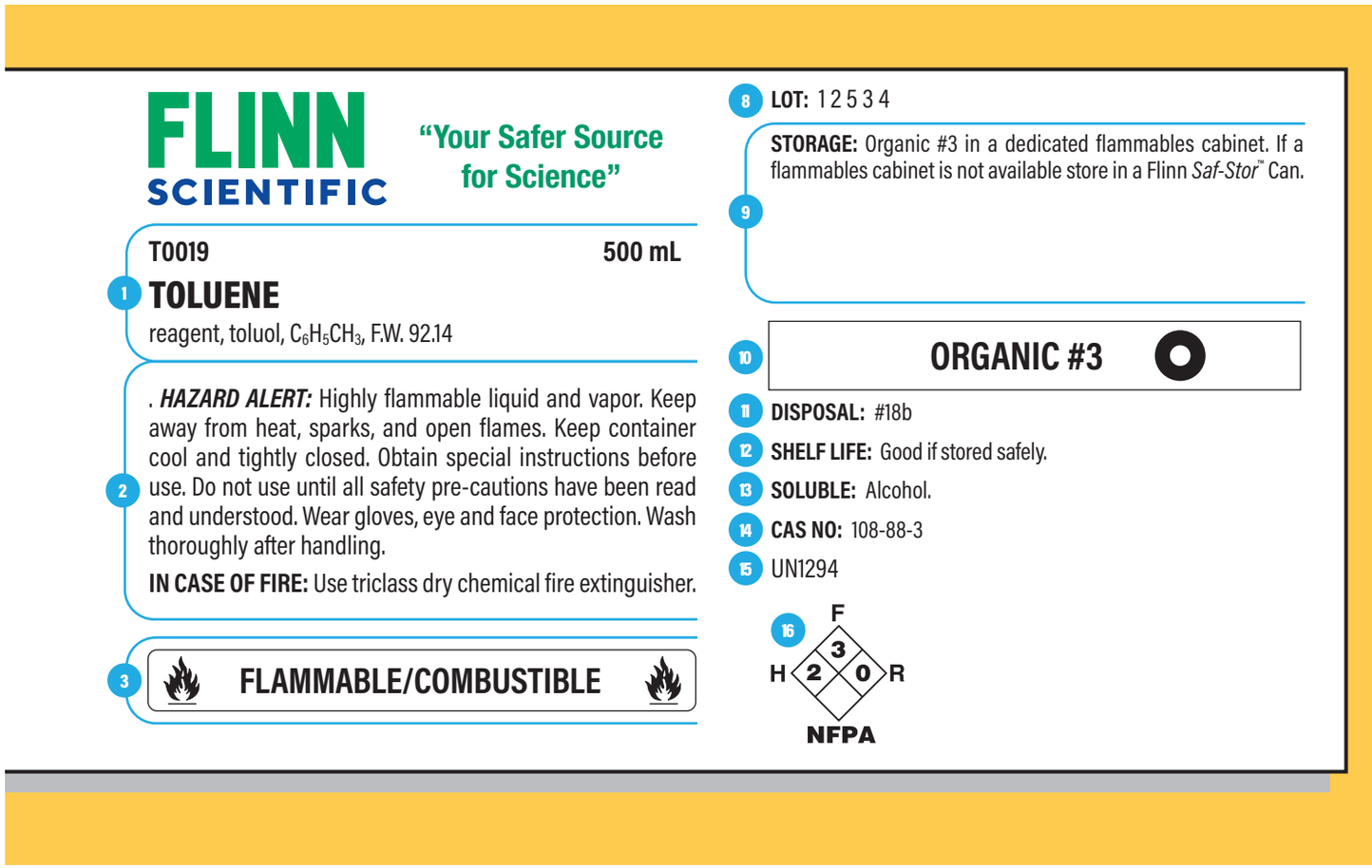
We have provided basic first aid recommendations, but always seek professional medical assistance whenever injury takes place in the laboratory.

8 Lot Number

The fingerprint of the chemical you have purchased. A series of numbers that identifies for Flinn Scientific what the chemical is, how it was packaged, when it was packaged, who the chemical manufacturer is, etc. Lot numbers are a very important part of any chemical label!

9 Flinn Storage Method/Number

Number refers to the compatible chemical family in which this item should be stored. For example: Inorganic #9 refers to the family that includes all inorganic acids except for nitric acid. A detailed table of these families and even their most compatible shelf order are found on pages 721–725 of this *Flinn Scientific Catalog/Reference Manual.*



10 Storage Method/Number, Enlarged

The Flinn compatible family storage number is enlarged so you can easily locate it and return the chemical container to its proper storage location.

11 Suggested Disposal Method

Suggested disposal techniques for small, laboratory quantities of chemicals are provided in this *Flinn Scientific Catalog/Reference Manual* on pages 736–753. The number shown in the chemical listing refers you to a specific and suggested disposal method for that particular product.

12 Shelf Life

A general statement about anticipated shelf life. Since conditions vary widely, the statement is general and should be accepted in that context. The shelf life data are based on exhaustive literature searches.

13 Soluble

In what solvent(s) is this substance soluble? We have listed the common solvents. Limited space may, in a few cases, prevent us from listing all of the possible solvents.

14 Chemical Abstract Service (CAS) Registry Number

CAS means Chemical Abstract Service. The CAS is operated by the American Chemical Society (ACS), a society of professional chemists. The CAS maintains resource information on thousands of chemicals. The CAS number is the single identifying number for each specific substance.

15 UN Number

The UN (United Nations) number is a worldwide identifying number for a substance in commerce or transport. This number is meaningful to shippers and hazardous material handlers.

16 NFPA Code

To protect the professional firefighter, NFPA (National Fire Protection Association) has established a numerical code that rates chemicals *under fire conditions* in four categories: health, flammability, reactivity and unusual reactivity. Within each category, a system has been established with five numerical ratings (0–4). Number 4 is a severe hazard and number 0 is no special hazard. This rating system is on our label because a few state laws require it. Unfortunately, the NFPA numerical ratings exist for a very limited number of chemicals, and the numbers represent hazard *under fire conditions* as opposed to normal laboratory use. This *under fire conditions* rating system tends to distort hazard characteristics. We urge teachers to depend more on the hazard warnings, pictograms and signal words shown elsewhere on each label.

A

Acetaminophen

laboratory grade, powder
$CH_3CONHC_6H_4OH$
F.W. 151.16

A0309	25 g	$12.25

★ **HAZARD ALERT:** Harmful if swallowed. Irritating to skin, eyes and mucous membranes. Possible sensitizer. LD_{50} 1944 mg/kg.
Storage: Organic #2 in a poison cabinet.
Disposal: #26a
Shelf Life: Indefinite, if stored properly.
Soluble: Soluble in ethyl alcohol, acetone, ethyl acetate; not water.
Color and Odor: White, odorless solid.
CAS No. 103-90-2

Acetanilide

laboratory grade, flake
$CH_3CONHC_6H_5$
F.W. 135.17

A0004	100 g	$42.30

★ **HAZARD ALERT:** Body tissue irritant; moderately toxic by ingestion. LD_{50} 800 mg/kg.
Storage: Organic #2
Disposal: #20
Shelf Life: Indefinite
Soluble: Hot water; alcohol and other organic solvents.
Color and Odor: White flake, odorless.
CAS No. 103-84-4
Technical Note: Not for human consumption.

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Acetic Acid

glacial acetic acid, ethanoic acid
CH_3CO_2H
F.W. 60.05

17.4 Molar	A0177	100 mL	$11.50
ACS reagent	A0005	500 mL	21.20
	A0006	2.5 liters	52.55
	A0007*	2.5 liters	53.60

(*Packaged in PVC-coated bottle)

★ **HAZARD ALERT:** Corrosive to skin and tissue; moderate fire risk (flash point: 39 °C); moderately toxic by ingestion and inhalation. LD_{50} 3310 mg/kg. TLV 25 mg/m^3.
Storage: Organic #1 inside a dedicated acid cabinet. *Store away from nitric acid.* If acid cabinet is not available store in Flinn *Saf-Cube*™. Acetic acid crystallizes at 16.6 °C. Room temperature is normally about 25 °C. So, a 10-degree reduction from room temperature will cause the material to crystallize. Return the substance to a warm environment and it will return to a liquid state. Such a freezing/defrosting process does not alter the nature of the substance.

Continued on next column.

Our Philosophy

Flinn Scientific believes that "Chemicals in any form can be safely stored and handled if the physical, chemical and hazardous properties are fully understood and the necessary precautions, including the use of proper safeguards and personal protective equipment, are observed."

Acetic Acid *continued*

Disposal: #24a
Shelf Life: Indefinite if stored properly. Cap safety color code: Brown.
Soluble: Miscible with water, alcohol, glycerol and ether. Insoluble in carbon disulfide.
Color and Odor: Colorless liquid with pungent vinegar odor.
CAS No. 64-19-7
Safety Purchase Suggestion: Buy and store only small quantities. Please consider buying PVC (polyvinyl chloride)–coated acid bottle—Flinn *Plas-Pak*™.
*Acetic acid is exactly as described under catalog number A0006 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are retained in a PVC outer envelope. The PVC-coated bottle is a safer package for science teachers.

Acetic Acid Solution

6 Molar	A0186	500 mL	$12.45
(pH 1.7)	A0187	1 liter	18.25
1 Molar	A0095	1 liter	12.60
(pH 2.4)			
0.1 Molar	A0096	1 liter	12.35
(pH 2.9)			

★ **HAZARD ALERT:** Corrosive liquid.
Storage: Organic #1
Disposal: #24a
Shelf Life: Good; store in a dedicated acid cabinet.
Color and Odor: Colorless liquid with strong vinegar odor.
Technical Note: 6 Molar is 36–37% by weight acetic acid.

Acetic Acid

4–8%
see Vinegar

Acetic Anhydride

$(CH_3CO)_2O$
F.W. 102.09

Reagent	A0156	100 mL	$11.40
	A0008	500 mL	24.85
Laboratory grade	A0305	500 mL	$18.90

★ **HAZARD ALERT:** Strongly irritating and corrosive; moderate fire risk (flash point 49 °C); causes severe eye damage; wear eye protection; have access to eyewash. Vapors are strongly irritating; open and dispense in a hood. Reacts (sometimes delayed) violently with water. Moderately toxic by ingestion and inhalation. LD_{50} 1780 mg/kg. TLV 24 mg/m^3.
Storage: Organic #1 inside a dedicated acid cabinet. If one is not available store in a Flinn *Saf-Cube*™.
Disposal: #24a
Shelf Life: Good if stored safely.
Soluble: Slowly soluble in H_2O forming acetic acid; forms ethyl acetate in solution with alcohol.
Color and Odor: Colorless liquid with strong vinegar odor.
CAS No. 108-24-7

Acetone

reagent grade
CH_3COCH_3
F.W. 58.08

A0009	500 mL	$	9.80
A0010	4 liters		44.30/1
			171.92/4
A0081	20 liters		163.80

★ **HAZARD ALERT:** Dangerous fire risk; flammable; slightly toxic by ingestion and inhalation. LD_{50} 5800 mg/kg. PEL: 2400 mg/m^3
Storage: Organic #4 inside a dedicated flammables cabinet. If one is not available store in a Flinn *Saf-Stor*™ Can. Avoid contact with strong oxidizing agents or with halogenated compounds. Avoid buying 20-liter containers unless you have approved flammable storage area or cabinet.
Disposal: #18a. U-Listed (U002); purchase small amounts for effective inventory control.
Shelf Life: Good if stored safely.

ACETONE continued on next page.

Acetone *continued*

Soluble: Miscible with water, alcohol, and many organic solvents.
Color and Odor: Colorless liquid with a sweet, fingernail polish remover odor.
CAS No. 67-64-1

Acetylsalicylic Acid

aspirin
laboratory grade, granular
$2\text{-}CH_3CO_2C_6H_4CO_2H$ **A0158** 100 g **$11.95**
F.W. 180.16

★ **HAZARD ALERT:** An allergen; may cause bleeding after ingestion; 10-gram dose may be fatal. LD_{50} 200 mg/kg. TLV 5 mg/m^3.
Storage: Organic #1 in a poison cabinet.
Disposal: #26a
Shelf Life: Poor unless stored in dry environment. Store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol, chloroform and ether.
Color and Odor: White solid. When fresh—odorless; as it ages—vinegarlike.
CAS No. 50-78-2
Safety Note: Not for human consumption.
Technical Note: See aspirin for aspirin tablets.

Acetylsalicylic Acid

in aspirin tablet form
see Aspirin, Tablets

Acid Potassium Phthalate

see Potassium Hydrogen Phthalate

Adenosine Triphosphate, Disodium Salt

ATP
powder
$C_{10}H_{14}N_5O_{13}P_3Na_2 \cdot 3H_2O$ **A0083** 1 g **$31.60**
F.W. 605.19

Storage: Organic #2
Disposal: #26a
Shelf Life: Good; store in freezer.
Soluble: Water; insoluble in most organic solvents.
Color and Odor: White, odorless powder.
CAS No. 51963-61-2

Adipoyl Chloride/Hexane Solution

0.25 Molar **A0185** 100 mL **$24.45**
(4.6 grams adipoyl chloride
in 100 mL hexane)

★ **HAZARD ALERT:** Flammable liquid; corrosive; stench.
Storage: Organic #3 in a dedicated flammables cabinet.
Disposal: #18b
Shelf Life: Fair
Color and Odor: Colorless liquid with hexanelike odor.
Technical Note: To prepare nylon, you will need a second solution, hexamethylenediamine/sodium hydroxide solution (see page 60).

Agar

base media for bacteriological cultures

Laboratory grade	**A0256**	25 g	**$ 11.10**
100 mesh, granular	**A0012**	100 g	**22.87**
	A0013	500 g	**83.43**
Bacteriological grade	**A0084**	100 g	**$23.81**
powder	**A0085**	500 g	**72.60**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Slowly soluble in hot water.
Color and Odor: Buff, odorless solid.
CAS No. 9002-18-0
Technical Note: Nutrients must be added to agar for microbial growth. See tables of culture media and ingredients on page 53.

Agarose

low EEO, < 0.15	**A0132**	10 g	**$29.14**
electrophoresis grade	**A0307**	25 g	**78.30**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26a
Shelf Life: Good, if kept dry.
Soluble: Soluble in boiling water.
Color and Odor: Buff, odorless solid.
CAS No. 9012-36-6

Albumin, Egg

protein, laboratory grade, fine powder

Egg albumin	**A0258**	25 g	**$ 10.80**
	A0014	100 g	**18.25**

Storage: Organic #2
Disposal: #26a
Shelf Life: Fair to poor; altered by heat and moisture; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water.
Color and Odor: Light yellow solid with slightly musty odor.
CAS No. 9006-59-1

Alcohols

see individual alphabetical listings; e.g., Ethyl Alcohol

Alcohol, Burner Fuel

see Ethyl Alcohol, burner fuel

Alconox®

see Cleaner, Alconox®

Alkaline Potassium Iodide

see Winkler's Solution #2

Alka-Seltzer®

tablets **A0111** pkg./24 **$13.40**

Special Note: For laboratory use only; not for human consumption.

Alum

see Aluminum Potassium Sulfate

Aluminum, Foil

Al
A.W. 26.98

Household type	**A0019**	each roll	**$3.70**
0.0007" thick			
12" wide x 25' long roll			
Heavy-Duty type	**A0020**	each roll	**$9.60**
0.0015" thick			
18" wide x 25' long roll			

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Shiny, silverlike, odorless solid.
CAS No. 7429-90-5

Diluting an Acid

When diluting an acid, always add the acid (slowly) to the water and never the reverse. Otherwise, severe spattering may occur. Always add acid to water.

Aluminum, Granular

5 mesh and finer

A0022	100 g	$ 11.15
A0223	500 g	28.10

For storage, disposal, etc., see Aluminum, Foil, A0019.

Aluminum, Powder

100 mesh

A0021	100 g	$17.60
A0222	500 g	42.85

★ **HAZARD ALERT:** Fine metal powders form an explosive mixture with air. TLV 15 mg/m^3 as dust.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Light gray, odorless solid.
CAS No. 7429-90-5
Incompatibility: Strong oxidizing agents, metal oxides, sulfur, halogens, ammonium nitrate, carbon dioxide, alcohols and silver nitrate.

Aluminum, Sheet

each piece 12" x 12"

#22 Gauge 0.025" thick	A0017	Weight: approx. 200 grams	$21.05
#30 Gauge 0.010" thick	A0018	Weight: approx. 100 grams	$19.15

For storage, disposal, etc., see Aluminum, Foil, A0019.

Aluminum, Shot

2–5 mesh

A0262	100 g	$ 9.80
A0023	500 g	19.05

For storage, disposal, etc., see Aluminum, Foil, A0019.

Aluminum, Strips

0.010" thick
each strip 6" x ½"

A0178	pkg./10	$7.50

For storage, disposal, etc., see Aluminum, Foil, A0019.

Aluminum, Wire

16 gauge
approx. 0.94 ft/g

A0175	100 g	$17.10
A0121	500 g	37.55

For storage, disposal, etc., see Aluminum, Foil, A0019.

Aluminum Chloride

crystal
$AlCl_3 \cdot 6H_2O$
F.W. 241.43

Reagent	A0225	100 g	$21.00
	A0026	500 g	78.00
Laboratory grade	A0179	500 g	$89.00

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant. LD_{50} 3311 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 7784-13-6

Aluminum Chloride

reagent, anhydrous
$AlCl_3$
F.W. 133.35

A0139	100 g	$35.50

★ **HAZARD ALERT:** Reacts very violently with water; corrosive to all body tissue. LD_{50} 3450 mg/kg.
Storage: Inorganic #9 in a dedicated acid cabinet inside a Flinn *Chem-Saf* ™ Bag.
Disposal: #1b. ***Treat this material carefully.***

Continued on next column.



Aluminum Chloride *continued*

Shelf Life: Poor; constantly evolves hydrochloric acid. Do not store in a warm, humid environment.
Soluble: Water; reacts violently with water.
Color and Odor: Light yellow solid with strong hydrochloric acid odor.
CAS No. 7446-70-0
Incompatibility: Water
Safety Purchase Suggestion: Buy only a small quantity, but if you cannot provide safe, dry, cool storage, do not buy this item at all.

Aluminum Nitrate

reagent, crystal
$Al(NO_3)_3 \cdot 9H_2O$
F.W. 375.13

A0029	100 g	$ 10.60
A0030	500 g	24.95

★ **HAZARD ALERT:** Strong oxidizer; slightly toxic by ingestion. LD_{50} 3671 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Soluble: Soluble in cold water and alcohol; decomposes in hot water.
Color and Odor: White solid with very slight ammonia odor.
CAS No. 7784-27-2

Aluminum Nitrate Solution

0.1 Molar
(as $Al(NO_3)_3 \cdot 9H_2O$)

A0277	500 mL	$8.00

Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Aluminum Potassium Sulfate

alum, crystal
$AlK(SO_4)_2 \cdot 12H_2O$
F.W. 474.39

Reagent	A0032	500 g	$ 22.70
	A0033	2 kg	45.00
Laboratory grade	A0180	500 g	$10.90
	A0181	2 kg	32.30

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7784-24-9

Aluminum Sulfate

$Al_2(SO_4)_3 \cdot 18H_2O$
F.W. 666.42

Reagent	A0035	500 g	$20.40

crystal

★ **HAZARD ALERT:** Severe eye irritant.

ALUMINUM SULFATE continued on next page.

Aluminum Sulfate *continued*

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 17927-65-0
Technical Note: The laboratory grade is approximately $18H_2O$, contains about 0.3% iron, and is a tan or brown color.

Amino Acids
see individual listings

Amino Acid Collection
FLINN EXCLUSIVE

A complete "sampler" collection of the 20 naturally occuring amino acids—alanine, arginine, aspartic acid, asparagine, cysteine, glycine, glutamic acid, glutamine, histidine, isoleucine, leucine, methionine, lysine, phenylalanine, serine, threonine, tryptophan, tyrosine, valine and cystine. 1 g each. Useful for biochemistry activities, such as amino acid chromatography, acid–base studies, qualitative tests for proteins and amino acids. Perfect for cooperative class projects!

	AP7238	20 x 1 g	**$96.95**

5-Amino-2,3-Dihydro-1,4-Phthalazinedione
see Luminol

Ammonia, Concentrated
see Ammonium Hydroxide and Ammonium Hydroxide solutions

Ammonium Carbonate
reagent, lump
$(NH_4)_2CO_3$
F.W. 96.09

	A0226	100 g	**$12.80**
	A0043	500 g	**20.30**

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water (decomposes in hot water).
Color and Odor: White solid with strong ammonia odor.
CAS No. 506-87-6
Technical Note: Decomposes to ammonia and carbon dioxide at temperatures over 58 °C (136 °F).

Ammonium Chloride
sal ammoniac
granular
NH_4Cl
F.W. 53.49

Reagent	**A0266**	100 g	**$ 8.60**
	A0044	500 g	**14.60**
Laboratory grade	**A0045**	500 g	**$ 10.70**
	A0046	2 kg	**24.70**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 1650 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; hygroscopic; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water and glycerol; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 12125-02-9

Ammonium Chloride Solution
1 Molar
(as NH_4Cl)

	A0278	500 mL	**$7.40**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Ammonium Dichromate
reagent, crystal
$(NH_4)_2Cr_2O_7$
F.W. 252.06

	A0048	500 g	**$32.00**

★ **HAZARD ALERT:** *Known carcinogen.* Very strong oxidizing agent; dangerous fire risk; dusts and solutions are toxic; irritant to eyes and skin. Possible reproductive/fertility hazard.
Storage: Inorganic #8
Disposal: #12a
Shelf Life: Fair; decomposes with slight heating; keep away from all organic materials.
Soluble: Water and alcohol.
Color and Odor: Orange, odorless solid.
CAS No. 7789-09-5
Incompatibility: Reducing agents, such as powdered metals, form an explosive mixture with magnesium metal powder. Avoid contact with oxidizable (flammable) organic compounds.
★ **SPECIAL HAZARD ALERT:** The "volcano" experiment or demonstration is a popular use of ammonium dichromate. When heated to decomposition, ammonium dichromate produces nitrogen, water, and chromium(III) oxide. Chromium compounds are known carcinogens. Because of this risk, the "volcano" demonstration should be conducted under a well-ventilated hood or outdoors. This demonstration should never be done in a closed, poorly ventilated room. Strict hygiene should be observed before and after the combustion.

Ammonium Dihydrogen Phosphate
see Ammonium Phosphate, Monobasic

Ammonium Ferrous Sulfate
see Ferrous Ammonium Sulfate

Ammonium Hydroxide
14.8 Molar
ACS reagent
28–30% NH_3
NH_4OH
F.W. 35.05

	A0051	500 mL	**$16.20**
	A0052	2.5 liters	**32.10**
	A0227*	2.5 liters	**44.65**

(*Packaged in PVC-coated bottle)

★ **HAZARD ALERT:** Both liquid and vapor are extremely irritating—especially to eyes. Dispense in a hood and be sure an eyewash is accessible. Moderately toxic by ingestion and inhalation. Serious respiratory hazard. LD_{50} 350 mg/kg.
Storage: Inorganic #4 in a dedicated base cabinet. If one is not available store in a Flinn *Saf-Cube*™.
Disposal: #10
Shelf Life: Indefinite if stored safely.
Color and Odor: Colorless liquid with strong ammonia odor.
CAS No. 1336-21-6
Cap Color Code: Green
Safety Purchase Consideration: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of ammonium hydroxide and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.
*Ammonium hydroxide is exactly as described under catalog number A0052 but in a PVC-coated bottle. In the event of breakage, base and glass shards are safely retained in a PVC outer envelope. The PVC-coated bottle is a safer package for science teachers.

How Is Your Housekeeping?
OSHA standards state "all places of employment, passageways, storerooms and service rooms shall be kept clear and orderly and in sanitary condition." Common sense says good housekeeping is an attitude and the cornerstone of any good safety program. Safety inspectors check housecleaning practices first. A clean lab is a safer lab.

Ammonium Hydroxide Solution

(as NH_4OH)

6 Molar	**A0192**	500 mL	**$ 10.30**
3 Molar	**A0193**	500 mL	**8.95**
1 Molar	**A0097**	1 liter	**13.05**
0.1 Molar	**A0098**	1 liter	**13.55**

For hazard alert, storage, disposal, etc., see Ammonium Hydroxide, A0174.

Ammonium Metavanadate

reagent, powder

NH_4VO_3	**A0211**	25 g	**$25.02**
F.W. 116.99	**A0176**	100 g	**67.76**

★ **HAZARD ALERT:** Highly toxic; body tissue irritant; liberates poisonous ammonia gas if heated. LD_{50} 58.1 mg/kg.

Storage: Inorganic #8

Disposal: #27d. P-Listed (P119); purchase small amounts for effective inventory control.

Shelf Life: Indefinite

Soluble: Slightly in cold water.

Color and Odor: Light yellow, odorless solid.

CAS No. 7803-55-6

Ammonium Molybdate

ammonium molybdate (VI) tetrahydrate

crystal

$(NH_4)_6Mo_7O_{24} \cdot 4H_2O$

F.W. 1235.86

Reagent	**A0054**	100 g	**$44.80**
Laboratory grade	**A0306**	100 g	**40.00**

★ **HAZARD ALERT:** Skin and eye irritant; moderately toxic by ingestion. LD_{50} 333 mg/kg.

Storage: Inorganic #8

Disposal: #6

Shelf Life: Indefinite

Soluble: Water; not alcohol.

Color and Odor: White, odorless solid.

CAS No. 12054-85-2

Ammonium Nitrate

pearls

NH_4NO_3

F.W. 80.04

Reagent	**A0241**	100 g	**$ 9.71**
	A0055	500 g	**21.75**

Continued on next column.

Ammonium Nitrate *continued*

Laboratory grade	**A0056**	500 g	**$12.16**
	A0057	2 kg	**39.05**

★ **HAZARD ALERT:** Strong oxidizer; may explode if heated under confinement; may explode at temperatures greater than 210 °C; explodes more readily if contaminated with combustible material; slightly toxic by ingestion; body tissue irritant. LD_{50} 2217 mg/kg.

Storage: Inorganic #8 away from all combustibles. We recommend that this dangerous substance be kept in a Flinn *Saf-Stor*™ Can.

Disposal: #26b

Shelf Life: Poor; hygroscopic; store in a Flinn *Chem-Saf* ™ bag.

Soluble: Water, alcohol and alkalis.

Color and Odor: White, odorless solid.

CAS No. 6484-52-2

Safety Purchase Suggestion: Do not store large quantities.

Technical Note: The granular lab grade material is easier to work with than the crystalline reagent, which tends to clump together. The lab grade material gives excellent results in quantitative thermochemistry experiments.

Incompatibility: Acids, chlorates, combustible materials, flammable liquids, nitrites, sulfur, carbon, organic compounds and metals (especially finely divided metals).

Ammonium Oxalate

laboratory grade, crystal

$(NH_4)_2C_2O_4 \cdot H_2O$	**A0058**	100 g	**$18.50**
F.W. 142.11			

★ **HAZARD ALERT:** Moderately toxic by ingestion and inhalation; corrosive to body tissue.

Storage: Inorganic #2

Disposal: #26a

Shelf Life: Indefinite

Soluble: Water

Color and Odor: White, odorless solid.

CAS No. 6009-70-7

Ammonium Persulfate

ammonium peroxydisulfate

reagent, crystal

$(NH_4)_2S_2O_8$	**A0059**	500 g	**$22.15**
F.W. 228.21			

★ **HAZARD ALERT:** Oxidizer; fire risk in contact with organic substances. Corrosive; moderately toxic. LD_{50} 689 mg/kg.

Storage: Inorganic #6

AMMONIUM PERSULFATE continued on next page.

Flinn Bases
The Safer Choice

Ammonium hydroxide is an essential part of any chemical laboratory, but is also one of the more hazardous substances. Flinn makes it safer by providing PVC-coated bottles, Flinn *Saf-Cube*™ and premixed solutions.



Safer Bottles

For your safety, please order the 2.5 L ammonium hydroxide in the PVC-coated bottle (A0227)—these bottles are lifesavers!

▶ See free video at flinnsci.com.

Saf-Cube™

All 14.8 M ammonium hydroxide bottles are shipped in Flinn *Saf-Cubes*™ for your protection. Don't throw these valuable containers away. They make great storage containers if no acid cabinet is available.

Premixed Solutions

Consider buying Flinn premixed ammonium hydroxide solutions. They save time and are safer to store than concentrated bases. If you make your own solutions remember...

Always Add Base to Water!



Ammonium Persulfate *continued*

Disposal: #12a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 7727-54-0

Ammonium Phosphate, Monobasic

ammonium dihydrogen phosphate
crystal
$NH_4H_2PO_4$
F.W. 115.03

Laboratory grade	**A0060**	500 g	**$25.80**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in water.
Color and Odor: White, odorless solid.
CAS No. 7722-76-1

Ammonium Phosphate, Dibasic

diammonium hydrogen phosphate
reagent, crystal
$(NH_4)_2HPO_4$
F.W. 132.06

	A0061	500 g	**$24.18**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7783-28-0

Ammonium Sulfate

crystal
$(NH_4)_2SO_4$
F.W. 132.15

Reagent	**A0062**	500 g	**$16.35**
Laboratory grade	**A0168**	500 g	**$11.35**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 2840 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol or acetone.
Color and Odor: White, odorless solid.
CAS No. 7783-20-2

Ammonium Sulfide

light solution

Reagent	**A0063**	100 mL	**$43.75**

★ **HAZARD ALERT:** Contact with acids or acid fumes may liberate flammable and poisonous hydrogen sulfide gas. Strong skin and mucous membrane irritant; toxic by skin absorption; vapor harmful. Even low concentrations may cause headache and general discomfort.
Storage: Inorganic #5; keep tightly closed; yellow color intensifies as substance ages.
Disposal: #23
Shelf Life: Good if stored safely; store in a Flinn *Chem-Saf* ™ Bag and then inside a Flinn *Saf-Stor* ™ Can.
Soluble: Water, alcohol and alkalis.
Color and Odor: Yellow/red liquid with rotten egg odor.
CAS No. 12135-76-1 as ammonium sulfide
Technical Note: The true sulfide form is only stable at a very low temperature (i.e., 0 °C), and in the absence of water. The light solution (so-called "yellow") contains approximately 20% $(NH_4)_2S$ or 8% sulfur and 8% ammonia and is the common commercial solution.

Ammonium Thiocyanate

crystal
NH_4SCN
F.W. 76.13

Reagent	**A0066**	500 g	**$39.00**
	A0213	100 g	**12.20**
Laboratory grade	**A0148**	500 g	**$26.80**

★ **HAZARD ALERT:** Moderately toxic by ingestion. LD_{50} 750 mg/kg.
Storage: Inorganic #7
Disposal: #26a
Shelf Life: Poor; deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol, acetone, and ammonia.
Color and Odor: White or light pink, odorless solid.
CAS No. 1762-95-4
Incompatibility: Dangerous when heated to decomposition (170 °C) or in contact with acids—fumes containing toxic HCN may be produced.

Ammonium Vanadate

see Ammonium Metavanadate

Isoamyl Alcohol

see Isopentyl Alcohol

n-Amyl Alcohol

1-pentanol
reagent
$CH_3(CH_2)_4OH$
F.W. 88.15

	A0067	500 mL	**$20.00**

★ **HAZARD ALERT:** Moderate fire risk; slightly toxic by ingestion and inhalation; severe body tissue irritant.
Storage: Organic #2 in a dedicated flammables cabinet; if one is not available, store in a Flinn *Saf-Stor* ™ Can.
Disposal: #18b
Shelf Life: Good, if stored properly.
Soluble: Alcohol
Color and Odor: Colorless liquid with bananalike odor.
CAS No. 71-41-0
Incompatibility: Can react vigorously with oxidizing agents.

tert-Amyl Alcohol

see tert-Pentyl Alcohol

Amylase

enzyme, powder

	A0283	10 g	**$16.05**
	A0303	25 g	**23.35**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Tan solid with malty odor.

Are You Receiving Fresh Chemicals?

You're always guaranteed to receive high-quality chemicals from Flinn Scientific. Our very deliquescent materials are packaged in a PVC-coated bottle inside a Flinn *Chem-Saf*™ bag with a packet of desiccant to ensure freshness. Does your chemical supplier do this?



Antimony

Sb
A.W. 121.75

Lump	**A0110**	100 g	**$25.85**

Storage: Inorganic #1
Disposal: #27d
Shelf Life: Indefinite
Soluble: Insoluble in water.
Color and Odor: Gray, odorless solid.
CAS No. 7440-36-0
Incompatibility: The poisonous gas stibine may be formed by the action of acidic reducing agents on antimony and its compounds.

L-Arabinose

pectin sugar
$C_5H_{10}O_5$
F.W. 150.13

	A0301	25 g	**$162.30**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and glycerol; not in alcohol or ether.
Color and Odor: White, odorless solid.
CAS No. 87-72-9

L-Ascorbic Acid

vitamin C
reagent, powder
$C_6H_8O_6$
F.W. 176.13

	A0078	100 g	**$17.45**

Storage: Organic #1
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 50-81-7

Aspirin, Tablets

acetylsalicylic acid	**A0201**	bottle 100 tablets	**$13.56**

★ **HAZARD ALERT:** An allergen; may cause bleeding after ingestion; 10-gram dose may be fatal.
Storage: Organic miscellaneous
Disposal: #26a
Shelf Life: Poor unless stored under cool, dry conditions.
Color and Odor: White tablet with slight vinegar odor.
Safety Note: Not sold for human consumption.
Technical Note: See also acetylsalicylic acid.

ATP

see Adenosine Triphosphate Disodium Salt

Azure B

Methylene Blue contains a small amount of Azure B stain and can be substituted for many Azure B staining procedures.

Shelf Life of Chemicals

The safe shelf life of chemicals varies from product to product. Some, like potassium metal and ether, can become potentially more dangerous. Others may become less chemically active. If you sometimes wonder why an experiment did not work, the chemical could be the problem. Review the shelf life information provided in this Catalog/Reference Manual. Purchase particularly hazardous chemicals in small quantities so that they are completely used up in a short time—preferably in less than a year.

See free video about chemical shelf life at flinnsci.com.

B

Bacteriological Media

see table of culture media, page 53, and individual catalog listings

Baking Powder

Typical composition: sodium aluminum sulfate, calcium sulfate, calcium phosphate and cornstarch

	B0001	229 g	**$6.00**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Good if kept dry; store in Flinn *Chem-Saf* ™ Bag.
Soluble: Water
Color and Odor: White, odorless solid.
Safety Note: Not for human consumption.

Baking Soda

see Sodium Bicarbonate

Barfoed's Reagent

test for glucose
contains: copper(II) acetate, acetic acid and water

	B0061	100 mL	**$10.45**

★ **HAZARD ALERT:** Copper(II) acetate is moderately toxic.
Storage: Inorganic #2
Disposal: #24a
Shelf Life: Indefinite
Color and Odor: Light blue/green liquid with faint vinegar odor.

Barium Chloride

crystal
$BaCl_2 \cdot 2H_2O$
F.W. 244.28

Reagent	**B0004**	100 g	**$ 10.30**
	B0005	500 g	**21.25**
Laboratory grade	**B0170**	100 g	**$ 8.05**
	B0006	500 g	**15.20**

★ **HAZARD ALERT:** Highly toxic by ingestion; store in a Flinn *Chem-Saf* ™ Bag. LD_{50} (intraperitoneal mouse) 118 mg/kg.
Storage: Inorganic #2
Disposal: #27h
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 10326-27-9
Safety Purchase Suggestion: Buy and store only small quantities packaged in an unbreakable container.

Barium Chloride Solution

(as $BaCl_2 \cdot 2H_2O$)

1 Molar	**B0143**	500 mL	**$12.40**
0.1 Molar	**B0144**	500 mL	**$11.50**

★ **HAZARD ALERT:** Toxic by ingestion.
Storage: Inorganic #2
Disposal: #27h
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Barium Hydroxide

large crystal
$Ba(OH)_2 \cdot 8H_2O$
F.W. 315.50

Reagent	**B0009**	100 g	**$14.60**
	B0174	500 g	**32.67**
Laboratory grade	**B0155**	100 g	**$ 10.85**
	B0072	500 g	**21.37**

★ **HAZARD ALERT:** Toxic by ingestion.

BARIUM HYDROXIDE continued on next page.

Barium Hydroxide *continued*

Storage: Inorganic #4
Disposal: #27h
Shelf Life: Poor; absorbs carbon dioxide from the air; keep tightly closed in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol and ether.
Color and Odor: White, odorless solid.
CAS No. 12230-71-6

Barium Nitrate

crystal
$Ba(NO_3)_2$
F.W. 261.35

Reagent	**B0010**	100 g	**$ 10.40**
	B0011	500 g	**24.75**
Laboratory grade	**B0232**	500 g	**$15.20**

★ **HAZARD ALERT:** Strong oxidizer; potentially serious fire risk; may be harmful if swallowed. LD_{50} 355 mg/kg.
Storage: Inorganic #3
Disposal: #27h
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 10022-31-8

Barium Nitrate Solution

(as $Ba(NO_3)_2$)

0.1 Molar	**B0148**	500 mL	**$8.60**

★ **HAZARD ALERT:** Toxic by ingestion.
Storage: Inorganic #3
Disposal: #27h
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Benedict's Qualitative Solution

for analysis of reducing sugars
contains: sodium citrate, sodium carbonate and copper(II) sulfate

B0171	100 mL	**$ 5.65**
B0015	500 mL	**7.25**
B0016	1 liter	**10.85**
B0172	4 liters	**29.95**

★ **HAZARD ALERT:** Skin and eye irritant.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Light blue, odorless liquid.



Benedict's Qualitative Solution B0015

Benedict's Quantitative Solution

for quantitative sugar determinations
contains: sodium citrate, sodium carbonate, copper(II) sulfate, potassium thiocyanate, and potassium ferrocyanide

B0062	500 mL	**$14.80**

★ **HAZARD ALERT:** Moderately toxic; skin and eye irritant.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Light blue, odorless liquid.

Benzaldehyde

laboratory grade
C_6H_5CHO
F.W. 106.13

B0017	100 mL	**$27.20**

★ **HAZARD ALERT:** Reacts with strong oxidizers; slightly toxic by inhalation or ingestion; irritating vapor; combustible. LD_{50} 1300 mg/kg.
Storage: Organic #3
Disposal: #2
Shelf Life: Fair; oxidizes to benzoic acid; yellows on prolonged storage; protect from light; keep tightly closed in a Flinn *Chem-Saf*™ Bag.
Soluble: Miscible with alcohol, ether, and some volatile oils; slightly soluble in water.
Color and Odor: Colorless liquid with almond odor.
CAS No. 100-52-7
Incompatibility: Potassium permanganate, sodium peroxide and other oxidizing agents.

Benzene

reagent
C_6H_6
F.W. 78.11

B0018	500 mL	**$48.60**

★ **HAZARD ALERT:** *Known carcinogen;* strict observance of safety precautions must be practiced, i.e., use a hood, wear gloves, use eye or face protection. Flammable; dangerous fire risk; moderately toxic by ingestion, inhalation, and skin absorption. Possible reproductive/fertility hazard. LD_{50} 930 mg/kg. TLV 0.5 ppm TWA.
Storage: Organic #3 in a Flinn *Chem-Saf* ™ Bag and then inside a Flinn *Saf-Stor* ™ Can. If packaged in glass, the container must be protected against possible breakage.
Disposal: #18b. U-Listed (U019); purchase small amounts for effective inventory control.
Shelf Life: Good if stored safely.
Soluble: Miscible with alcohol, ether, acetone, carbon tetrachloride, carbon disulfide, and acetic acid. Slightly soluble in water.
Color and Odor: Colorless liquid with gasolinelike odor.
CAS No. 71-43-2
Incompatibility: Dangerous in contact with chlorine or oxidizing agents.
Technical Note: Avoid buying and storing this *known carcinogen* unless you employ strict hygiene practices. Consider substituting cyclohexane, toluene or xylenes.

A Strong Base and the Human Eye

A strong base like ammonium hydroxide is capable of rapid and extensive eye damage. In fact, tissue damage to the human eye may occur in just the first 30 seconds of exposure. The use of chemical splash goggles and prompt access to a functional eyewash are essential when ammonium hydroxide and other strong bases are used. If chemicals are to be used, chemical splash goggles must be worn!

Benzin
see Petroleum Ether

Benzoic Acid
laboratory grade, flake

C_6H_5COOH	**B0197**	100 g	**$14.60**
F.W. 122.12	**B0020**	500 g	**20.25**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant; combustible. LD_{50} 1700 mg/kg.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Alcohol, ether, chloroform, carbon disulfide, and carbon tetrachloride. Only slightly soluble in water.
Color and Odor: White solid with maple syrup odor.
CAS No. 65-85-0

Benzyl Alcohol

$C_6H_5CH_2OH$	**B0132**	100 mL	**$18.45**
F.W. 108.14			

★ **HAZARD ALERT:** Reacts ***violently*** with strong oxidants; body tissue irritant; slightly toxic by ingestion and inhalation; combustible; may form explosive peroxides on concentration. LD_{50} 1230 mg/kg.
Storage: Organic #2 inside a Flinn *Chem-Saf* ™ Can.
Disposal: #18b
Shelf Life: Good if stored safely and away from oxidants.
Soluble: Miscible with alcohol, ether and chloroform; slightly soluble in water.
Color and Odor: Colorless liquid with slight floral odor.
CAS No. 100-51-6

BHT
see 2,6-Di-t-Butyl-4-Methylphenol

Bial's Reagent
Test for pentoses
see page 619 for preparation

Bile Salts
sodium salts of glycocholic and taurocholic acids

powder	**B0038**	100 g	**$39.85**

Storage: Organic #1
Disposal: #26a
Shelf Life: Good, but only if kept dry.
Soluble: Water and alcohol.
Color and Odor: Yellow/brown solid with putrid beef odor.

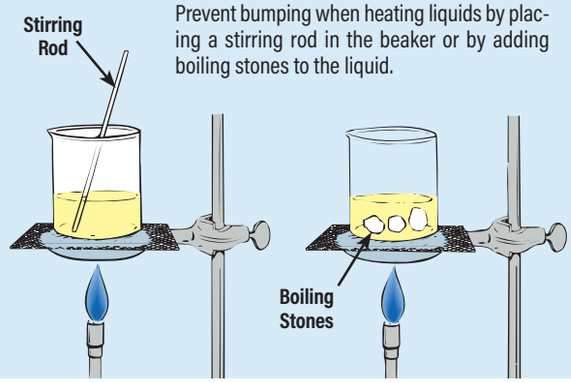
Biotechnology Chemicals
see page 462

Bismuth
Bi
A.W. 208.98

Lump	**B0048**	100 g	**$32.00**
Granular	**B0142**	100 g	**$135.80**

Continued on next column.

Heating a Liquid
Prevent bumping when heating liquids by placing a stirring rod in the beaker or by adding boiling stones to the liquid.



★ **HAZARD ALERT:** Flammable in finely divided form such as dust. Slightly toxic by inhalation or ingestion. LD_{50} 5000 mg/kg.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Nitric and hydrochloric acid.
Color and Odor: Metallic silver, odorless solid.
CAS No. 7440-69-9

Biuret Test Solution
Solution changes color from blue to purple in the presence of protein.
Contains: copper sulfate and 30% w/v aqueous sodium hydroxide.

B0050	100 mL	**$ 5.90**
B0051	500 mL	**9.50**
B0230	1000 mL	**15.55**

★ **HAZARD ALERT:** Corrosive liquid; especially dangerous to eyes.
Storage: Inorganic #4
Disposal: #10
Shelf Life: Good
Color and Odor: Royal blue, odorless liquid.

Biuret Quantitative Assay Solution
Assay solution for quantitative analysis of proteins.
Contains: copper(II) sulfate, potassium iodide and potassium sodium tartrate in 0.2 M NaOH

B0237	500 mL	**$10.50**

★ **HAZARD ALERT:** Irritating to skin and eyes.
Storage: Inorganic #4
Disposal: #10
Shelf Life: Fair
Color and Odor: Blue, odorless liquid.

Bleach
see Sodium Hypochlorite Solution

Bluing Solution, Flinn
for growing beautiful salt crystal gardens

B0235	500 mL	**$8.90**

Storage: Miscellaneous inorganic.
Disposal: #26b
Shelf Life: Indefinite
Soluble: Suspension in water.
Color and Odor: Blue, odorless liquid.

Bluing, Laundry

Mrs. Stewart's	**B0220**	8 oz.	**$10.05**

For hazard alert, storage, disposal, etc., see Bluing Solution, Flinn, B0235.

Boiling Stones

boiling chips	**B0136**	100 g	**$17.70**
4 mesh*	**B0079**	250 g	**32.80**

Storage: Miscellaneous inorganic.
Disposal: #26a
Color and Odor: Gray/white, odorless solid.
Technical Note: Prevents bumping. High purity alundum granules. Hard, porous surface; will not crumble or powder. Resists most chemicals except strong alkalies and concentrated sulfuric acid.
*approximately 7–9 mm

Borax
see Sodium Borate, Tetra

Borax Carmine
histological staining solution
This solution must be freshly prepared before use. See page 620 for preparation instructions.

Boric Acid

H_3BO_3
F.W. 61.83

Laboratory grade powder	**B0081**	500 g	**$12.90**

★ **HAZARD ALERT:** Slightly toxic by ingestion; irritant to skin in dry form. Possible reproductive/fertility hazard. LD_{50} 2660 mg/kg.
Storage: Inorganic #9
Disposal: #24b
Shelf Life: Indefinite
Soluble: Water, alcohol, and glycerol.
Color and Odor: White, odorless solid.
CAS No. 10043-35-3

Brass Sheet

each piece 12" x 12"

#30 gauge 0.010" thick	**B0027**	each	**$45.78**

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Brass, odorless solid.

Brass Shot

	B0234	100 g	**$17.60**

For storage, disposal, etc., see Brass Sheet, B0027.

Brass Strips

each strip 6" x ½" x 0.01"	**B0231**	pkg./6 strips	**$18.85**

For storage, disposal, etc., see Brass Sheet, B0027.



Brass Shot
B0234
Brass Strips
B0231

Brimstone

see Sulfur, Roll

Bromcresol Green

indicator, sodium salt
pH 3.8 yellow to 5.4 blue
reagent
$C_{21}H_{13}Br_4NaO_5S$
F.W. 720.02

	B0040	5 g	**$28.60**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Light brown, odorless solid.
CAS No. 62625-32-5

Bromcresol Green Indicator Solution

0.1%, alcoholic

	B0151	100 mL	**$7.80**

★ **HAZARD ALERT:** Flammable liquid. Contains ethyl alcohol; toxic by ingestion.
Storage: Organic #9 in a dedicated flammables cabinet.
Disposal: #26b

Continued on next column.

Bromcresol Green Indicator Solution *continued*

Shelf Life: Indefinite
Color and Odor: Dark green to blue liquid with alcohol-like odor.

Bromcresol Green Indicator Solution

0.04%, aqueous

	B0064	100 mL	**$7.85**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Dark green to blue, odorless liquid.

Bromine—Quietly Destructive

Bromine attacks metals. Bromine vapor leaves a container and slowly but surely destroys all nearby metal surfaces. Our heat-sealed, single-use ampule solves this bromine vapor problem. If you already have bromine in a capped bottle and want to minimize further damage, place the bottle in a plastic bag and seal it with a twist tie. Then place the bagged bromine bottle inside a paint can containing cat litter (see Flinn *Chem-Saf*™ Bags and *Saf-Stor*™ Cans on page 653). Replace the metal can about every 18–24 months.

Bromine

Br_2
F.W. 159.83

	B0149	3 x 1 g ampules	**$22.10**

Due to Flinn's unique safety packaging, truck shipment is no longer required. The total volume of bromine in these ampules is about 1 mL.

★ **HAZARD ALERT:** Highly toxic by inhalation and ingestion; severe skin irritant; very strong oxidizer; reacts violently with many organic compounds; very hazardous substance even in this small ampule. LD_{50} 2600 mg/kg. TLV 0.66 mg/m^3.
Storage: Inorganic #2. Store in ampule (before single use). Since the bromine is in a sealed, glass ampule it will not present a vapor problem.
Disposal: #12a
Shelf Life: As packaged, excellent. This is meant to be a one-time-use product.
Soluble: Most organic solvents; slightly in water.
Color and Odor: Dark red/brown with irritating, chlorinelike odor.
CAS No. 7726-95-6
Technical Note: Keep a supply of sodium thiosulfate solution (hypo) on hand as a neutralizer when working with bromine.

Bromine Water

	AP4502	kit	**$26.75**

Safely prepare fresh bromine water in any amount in less than five minutes with the Flinn Bromine Water Preparation Kit. Never again worry about the storage, handling, and use of elemental bromine. With this kit, you've eliminated the most corrosive chemical from your stockroom.
Kit contains all the ingredients and instructions to prepare 500 mL of fresh bromine water using a traditional redox reaction.

BROMINE WATER on next page.



Bromine Water Kit
AP4502

Bromine Water *continued*

★ **HAZARD ALERT:** Toxic by inhalation and ingestion; skin irritant.
Disposal: #12a
Shelf Life: Fair. Bromine vapors degrade bottle caps over time. To avoid corrosion of metals in storage area, always store in a Flinn *Saf-Stor*™ Can.
Color and Odor: Red/brown with irritating, chlorinelike odor.
Technical Note: Keep a supply of sodium thiosulfate solution (hypo) on hand as a neutralizer when working with bromine.

Simple and Safe Bromine Packaging

Elemental bromine is sold in a sealed 1-g ampule. The ampule is scored to allow the science instructor to easily break it into 50 mL of distilled water to prepare bromine water.



Bromobenzene

phenyl bromide
C_6H_5Br **B0138** 100 mL **$45.75**
F.W. 157.02

★ **HAZARD ALERT:** Moderate fire risk; skin irritant; slightly toxic by ingestion and inhalation. LD_{50} 2383 mg/kg.
Storage: Organic #4
Disposal: #4b
Shelf Life: Indefinite
Soluble: Miscible with most organic solvents; insoluble in water.
Color and Odor: Colorless liquid with moth ball odor.
CAS No. 108-86-1

1-Bromobutane

n-Butyl bromide
reagent grade, 99%
$CH_3CH_2CH_2CH_2Br$ **B0238** 100 mL **$20.75**
F.W. 137.03

★ **HAZARD ALERT:** Flammable liquid and vapor; dangerous fire risk. Irritating to eyes, skin and respiratory tissue; may cause serious eye irritation. Slightly toxic by ingestion. LD_{50} 2761 mg/kg.
Storage: Organic #4 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #4b
Shelf Life: Fair; volatile liquid. Store in a cool, dry place.
Soluble: Alcohol and ether; insoluble in water.
Color and Odor: Colorless to light brown liquid with characteristic odor.
CAS No. 109-65-9

Bromphenol Blue

indicator, sodium salt
pH 3.0 yellow to 4.6 purple
reagent, powder
$C_{19}H_8Br_4O_5SNa$ **B0044** 5 g **$21.80**
F.W. 691.97

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Dark green, odorless solid.
CAS No. 34725-61-6

Eliminate Mystery Substances at Their Source

Become a label fanatic! Eliminate future mystery substances by labeling all chemical solutions and preparations when they are made. Today's unlabeled bottle is tomorrow's mystery substance. See the Safety Reference section for chemical bottle labels, shelf storage labels and GHS pictogram stickers.

Bromphenol Blue Indicator Solution

0.04%, aqueous
B0065 100 mL **$7.70**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Dark purple, odorless liquid.

Bromthymol Blue

indicator, sodium salt
pH 6.0 yellow to 7.6 blue
powder
$C_{27}H_{27}Br_2O_5SNa$
F.W. 646.38
Reagent **B0046** 5 g **$24.10**
Laboratory grade **B0233** 5 g **13.65**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Blue-green, odorless solid.
CAS No. 34722-90-2

Bromthymol Blue Indicator Solution

0.04%, aqueous
B0173 100 mL **$ 4.33**
B0047 500 mL **8.62**
B0228 1000 mL **11.83**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Blue-green, odorless liquid.

Buffer Solutions

concentrated
pH accuracy ±0.02 at 25 °C.
pH 4.00 when 1 volume is diluted to 5 volumes
B0098 500 mL **$14.90**
pH 7.00 when 1 volume is diluted to 25 volumes
B0099 500 mL **21.05**
pH 10.00 when 1 volume is diluted to 10 volumes
B0100 500 mL **15.30**

★ **HAZARD ALERT:** Low and high pH concentrates (pH 4 and 10) should be treated as strongly acidic and alkaline solutions, respectively.
Storage: With Inorganic #2 family for convenience.
Disposal: #26b
Shelf Life: Much better than prepared buffers that are ready to use. Concentrates last longer and take up less shelf space.

Buffer Solutions

pH accuracy ±0.02 at 25 °C
500 mL bottle

Catalog No.	pH Value	Price
B0087	2.00	**$16.75**
B0088	3.00	**15.95**
B0089	4.00 (red)	**8.20**
B0090	5.00	**16.50**
B0091	6.00	**16.50**
B0092	7.00 (green)	**8.20**
B0093	8.00	**16.75**
B0094	9.00	**16.00**
B0095	10.00 (blue)	**8.45**
B0096	11.00	**16.50**
B0097	12.00	**16.70**

★ **HAZARD ALERT:** Buffers in low pH range are strongly acidic; those in high pH range are strongly alkaline.
Storage: Best and most conveniently stored together with proper recognition and precaution for their individual acid or alkaline nature. Keep bottles tightly closed.

BUFFER SOLUTIONS on next page.

Buffer Solutions *continued*

Disposal: #26b
Shelf Life: Ready-to-use Buffer Solutions' shelf life varies depending on pH value—from good to poor. The higher the pH value, the shorter the shelf life. Storage conditions vary so widely that it isn't possible to be specific about shelf life. Concentrated buffers, buffer capsules and buffers in Chemvelopes® all have better long-term shelf life than standard buffers.
Technical Note: The pH 4, 7 and 10 buffer solutions are dyed for convenience to allow easy identification and prevent confusion. These three buffers are the standards used to calibrate pH meters.

Buffer Capsules

B0227 contains 11 capsules, one of each pH value, and is great for preparing solutions of pH 2–12 for pH indicators.



Buffer Capsules

pH accuracy ±0.02 at 25 °C
stable dry powder in capsules
quickly and completely soluble
each capsule makes 100 mL of buffer solution
10 capsules per vial

Catalog No.	pH Value	Price/Vial
B0101	2.00	**$11.85**
B0102	3.00	**12.25**
B0103	4.00	**11.90**
B0104	5.00	**12.25**
B0105	6.00	**12.25**
B0106	7.00	**11.90**
B0107	8.00	**12.25**
B0108	9.00	**12.25**
B0109	10.00	**11.90**
B0110	11.00	**11.85**
B0111	12.00	**12.25**
B0227*	2.00–12.00	**19.15**

*This special package contains 11 capsules, one of each pH value.
★ **HAZARD ALERT:** Low and high pH buffer solutions should be treated as strongly acidic and alkaline solutions, respectively.
Storage: Wherever convenient—no special storage requirements.
Disposal: #26a
Shelf Life: Indefinite; consume minimal shelf space and are very stable.

Buffer Envelopes

Chemvelopes®
each envelope makes 500 mL of buffer solution
5 envelopes of a single pH per carton
pH accuracy ±0.02 at 25 °C

Catalog No.	pH Value	Price/Carton
B0112	2.00	**$18.43**
B0113	3.00	**18.80**
B0114	4.00	**18.15**
B0115	5.00	**18.43**
B0116	6.00	**18.43**
B0117	7.00	**18.80**
B0118	8.00	**18.80**
B0119	9.00	**18.80**
B0120	10.00	**18.80**
B0121	11.00	**18.20**
B0122	12.00	**18.80**
B0123*	2.00–11.00	**37.80**

*This special package contains 10 envelopes, one envelope of each pH value from 2 to 11.
★ **HAZARD ALERT:** Low and high pH buffer solutions should be treated as strongly acidic and alkaline solutions, respectively.
Storage: Wherever convenient—no special storage requirements.
Shelf Life: Excellent; very stable and convenient to store.
Technical Note: Aluminum foil, polyethylene, and paper protective envelopes. Envelopes keep buffers dry and free-flowing. Each envelope makes 500 mL when added to distilled water. Included in the package is a 7-mL dispensing vial of a buffer preservative. The preservative contains an effective antifungal, antibacterial agent. In addition, the preservative is a universal indicator that tints neutral solutions green, acid solutions orange-red, and basic solutions blue.

Buffer Solution Preservative

Colorless	**B0175**	60 mL	**$19.50**
Indicating	**B0176**	60 mL	**22.00**

Technical Note: Buffer solutions, particularly basic pH buffers, tend to act as a media for fungus and bacteria growth. This buffer preservative contains a highly effective anti-fungal, anti-bacterial agent to provide long-term protection for buffer solutions and does not affect pH value. The preservative is available in two forms:
- preservative only (colorless) (B0175)
- preservative with indicator (B0176)

If the preservative with indicator is used, the buffer will be tinted green for neutral solutions, orange-red for acid solutions and blue for basic solutions. Please specify whether you want clear, non-indicating preservative or the preservative with indicator. Three drops of preservative provides ample protection and, in the case of the indicating preservative, a distinct tint for 100 mL of buffer solution.

HOW TO

Understand Buffer Solutions and pH

What is pH?

The pH scale represents the acidity or alkalinity of an aqueous solution. pH is defined as the negative logarithm of the hydrogen ion concentration of a solution. $pH = -\log[H^+]$.

Absolutely pure water is the standard used in determining pH value. Since pH measurements depend on the chemical properties of water, the pH scale is not accurate for nonaqueous solutions. The pH scale was established with a range of 0 to 14 pH units. The low end of the scale is acid, the high end alkaline, with pH 7.00 at the mid-point as neutral.

Each unit on the pH scale represents a tenfold difference in acidity level. For example, pH 4 is ten times as acidic as pH 5. A pH 3 solution has ten times the acidity level of a pH 4 solution and 100 times the acidity level of a pH 5 solution.

What is a buffer?

A buffer is a chemical substance that resists changes in pH upon the addition of excess strong acid or strong base.

A buffer solution contains both a weak acid and its conjugate weak base. The weak acid component neutralizes any excess strong base added to the solution while the weak base component neutralizes any excess strong acid that may be added. As a result, a buffer solution maintains a constant hydrogen ion concentration despite the addition of relatively large quantities of acid or base.

Science teachers should know that water (distilled or deionized) has no "buffer effect." In fact, the use of "dip and read" test papers will quickly influence the pH of the pure water. Almost always, the test paper used in such water will read pH 5.00 after the paper has been dipped in the water even though the actual pH of the water may be entirely different. In this example, the test paper itself has had an effect on the pH value of the water. Good quality water is not a substitute for a buffer.

What are pH test papers?

pH papers are made with special indicator dyes that react (change color) at specific pH values. Two pH units is the useful limit for most indicators and indicator papers. No further perceptible color change will occur regardless of a further pH change in the solution being tested. For example, using a test paper with a pH range of 6.00 to 8.00, a reading can be successfully taken if the pH falls between the aforementioned points. If the pH is actually below 6.00 or higher than 8.00, the test paper cannot detect that change and will simply change color to one extreme or the other of its 2.00 pH unit range.

pH papers may not be reliable in aqueous solutions containing proteins or alkaloids (e.g., nitrogen-based substances of plant origin like nicotine).



Buffer Solutions
B0089, B0092, B0095

Burner Fuel
see Ethyl Alcohol (burner fuel)

Butanoic Acid
see Butyric Acid

2-Butanone
see Methyl Ethyl Ketone

n-Butyl Alcohol
1-butanol
reagent

$CH_3(CH_2)_2CH_2OH$	**B0177**	100 mL	**$ 10.85**
F.W. 74.12	**B0032**	500 mL	**14.85**

★ **HAZARD ALERT:** Moderate fire risk; moderately toxic by ingestion and inhalation; eye irritant; absorbed by skin. LD_{50} 790 mg/kg. TLV 152 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet; if one is not available, store in a Flinn *Saf-Stor* ™ Can.
Disposal: #18b. U-Listed (U031); purchase small amounts for effective inventory control.
Shelf Life: Fair; substance may oxidize.
Soluble: Miscible with alcohol and ether; soluble with water.
Color and Odor: Colorless liquid with strong wine odor.
CAS No. 71-36-3

tert-Butyl Alcohol
2-methyl-2-propanol
laboratory grade

$(CH_3)_3COH$	**B0055**	500 mL	**$16.25/1**
F.W. 74.12			**94.68/6**

★ **HAZARD ALERT:** Moderate fire risk; slightly toxic by ingestion and inhalation; eye irritant; absorbed by skin. LD_{50} 2743 mg/kg. TLV 303 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet; if one is not available store in a Flinn *Saf-Stor* ™ Can.
Disposal: #26b
Shelf Life: Fair
Soluble: Miscible with alcohol and ether; soluble in water.
Color and Odor: Colorless liquid with camphor odor.
CAS No. 75-65-0
Technical Note: Melting point is 25 °C; this substance may be a solid at room temperature.

n-Butyl Bromide
see 1-Bromobutane

sec-Butyl Bromide
see 2-Bromobutane

Butyric Acid
butanoic acid
laboratory grade

$CH_3CH_2CH_2COOH$	**B0139**	100 mL	**$23.10**
F.W. 88.11	**B0035**	500 mL	**49.45**

(All above packaged in PVC-coated bottles)

Continued on next column.

Butyric Acid *continued*

★ **HAZARD ALERT:** Obnoxious odor; stench agent; strong irritant to skin and eyes; flammable liquid; moderately toxic by ingestion and skin absorption. LD_{50} 2000 mg/kg.
Storage: Organic #1 inside a Flinn *Chem-Saf* ™ Bag and then inside Flinn *Saf-Stor* ™ Can.
Disposal: #24a
Shelf Life: Indefinite if stored properly.
Soluble: Water; miscible with alcohol and ether.
Color and Odor: Colorless liquid with penetrating, obnoxious vomit odor.
CAS No. 107-92-6
Special Precaution: Remove cap slowly and vent the container under a hood. This is particularly important if the butyric acid is at or above room temperature.

C

Cadmium Chloride
reagent, crystal

$CdCl_2 \cdot 2½H_2O$	**C0193**	25 g	**$28.60**
F.W. 228.34			

★ **HAZARD ALERT:** *Known carcinogen;* dust inhalation especially toxic. LD_{50} 88 mg/kg.
Storage: Inorganic #2 in a Flinn *Chem-Saf* ™ Bag in a poisons cabinet.
Disposal: #27f
Shelf Life: Indefinite
Soluble: Water and acetone.
Color and Odor: White, odorless solid.
CAS No. 7790-78-5
Safety Purchase Suggestion: Avoid this substance on school premises. If you do use it, practice strict hygiene.

Cadmium Nitrate
reagent, crystal

$Cd(NO_3)_2 \cdot 4H_2O$	**C0003**	100 g	**$70.35**
F.W. 308.49			

★ **HAZARD ALERT:** *Known carcinogen;* moderately toxic by inhalation and ingestion; strong oxidizer; fire and explosion risk. Possible reproductive/fertility hazard. LD_{50} 300 mg/kg.
Storage: Inorganic #3 in a Flinn *Chem-Saf* ™ Bag.
Disposal: #27f
Shelf Life: Indefinite
Soluble: Water, ammonia and alcohol.
Color and Odor: White solid with slight nitric acid odor.
CAS No. 10022-68-1
Safety Purchase Suggestion: Avoid this substance on school premises. If you do use it, practice strict hygiene.

Caffeine
alkaloid
laboratory grade, powder

$C_8H_{10}N_4O_2$	**C0344**	25 g	**$12.40**
F.W. 194.20			

★ **HAZARD ALERT:** *Very toxic;* as little as 65 mg can be life-threatening. LD_{50} 192 mg/kg.
Storage: Organic #2
Disposal: #5
Shelf Life: Fair to poor; may lose water (effloresce) and decompose in air. Store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Chloroform; partially in water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 58-08-2
Safety Purchase Suggestion: Avoid this substance on school premises. If you do use it, practice strict hygiene.

Calcium

reagent grade, turnings	C0345	10 g	$ 8.43
Ca	C0007	25 g	13.45
A.W. 40.08	C0008	100 g	29.87
	C0009	500 g	78.90

★ **HAZARD ALERT:** Contact with water or moisture evolves flammable hydrogen. Flammable in finely divided form. Avoid contact with oxidizers; skin irritant.

Storage: Inorganic #1 in a Flinn *Chem-Saf* ™ Bag and then inside a Flinn *Saf-Stor* ™ Can.
Disposal: #3
Shelf Life: Good; but only if stored under airtight conditions.
Soluble: In acid; decomposes in water.
Color and Odor: Gray/black, odorless solid.
CAS No. 7440-70-2

Calcium Acetate

calcium ethanoate
laboratory grade, powder

$Ca(C_2H_3O_2)_2 \cdot H_2O$	C0262	100 g	$ 8.95
F.W. 176.19	C0010	500 g	17.85

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; hygroscopic.
Soluble: Water; slightly in alcohol.
Color and Odor: White solid with slight vinegar odor.
CAS No. 62-54-4

Calcium Carbide

laboratory grade, lump

CaC_2	C0346	100 g	$12.60
F.W. 64.10	C0011	500 g	18.10

★ **HAZARD ALERT:** Exposure to water or moisture evolves flammable acetylene gas; corrosive to eyes and skin. 500 grams of calcium carbide will yield approximately 150 liters of flammable acetylene.

Storage: Inorganic #5 in a Flinn *Saf-Stor* ™ Can.
Disposal: #25
Shelf Life: Good if stored under dry conditions.
Soluble: Decomposes in water.
Color and Odor: Gray/black solid with garliclike odor.
CAS No. 75-20-7
Incompatibility: Water, dilute acids, halogens, silver nitrate, copper compounds, and heavy metals.

Calcium Carbonate

powder
F.W. 100.09

Laboratory grade	C0347	100 g	$ 9.10
$CaCO_3$ precipitated	C0012	500 g	14.15
Natural chalk	C0013	500 g	$13.10
ground limestone			

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Excellent
Soluble: Slightly in water; in acids with evolution of carbon dioxide.
Color and Odor: White, odorless solid.
CAS No. 471-34-1
Technical Note: Laboratory grade $CaCO_3$ is precipitated $CaCO_3$ with a purity of 98–99%. Natural chalk is ground limestone, 96% purity.

Calcium Carbonate

for generating carbon dioxide
see Marble Chips

Calcium Chloride

dihydrate
$CaCl_2 \cdot 2H_2O$
F.W. 147.02

Reagent	C0196	100 g	$ 10.62
powder	C0015	500 g	25.40
Laboratory grade	C0018	500 g	$ 7.88
flake	C0019	2 kg	20.26

★ **HAZARD ALERT:** Slightly toxic by ingestion.

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; deliquescent; keep bottle tightly closed and store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 10035-04-8

Calcium Chloride

anhydrous
4–8 mesh granules

$CaCl_2$	C0016	500 g	$ 9.40
F.W. 110.99	C0017	2 kg	22.50

★ **HAZARD ALERT:** Toxic by ingestion. LD_{50} 1000 mg/kg.
For storage, disposal, etc., see Calcium Chloride, C0018.
CAS No. 10043-52-4
Technical Note: An effective drying agent for desiccators and drying tubes.

Calcium Chloride

for drying, see Drierite®.

Calcium Chloride Solution

(as $CaCl_2 \cdot 2H_2O$)

1 Molar	C0233	500 mL	$11.50
0.1 Molar	C0234	500 mL	7.35

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Calcium Ethanoate

see Calcium Acetate

Calcium Hydroxide

powder
$Ca(OH)_2$
F.W. 74.10

Laboratory grade	C0022	500 g	$11.35

★ **HAZARD ALERT:** Skin irritant; avoid dust inhalation. TLV 5 mg/m^3.

Storage: Inorganic #4
Disposal: #10
Shelf Life: Fair to poor; absorbs carbon dioxide from air; keep tightly closed; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Slightly in water; soluble in glycerol or acids; insoluble in alcohol.
Color and Odor: Gray/white, odorless solid.
CAS No. 1305-62-0

Calcium Hydroxide Solution (Saturated)

see Limewater Solution

Compatible Chemical Families

Storing chemicals in alphabetical order can result in incompatible neighbors. For example, barium peroxide and benzaldehyde react violently together and should not be stored near each other. Chemicals should be stored in compatible chemical families. See pages 726–730 for details on the Flinn Suggested Chemical Storage Pattern.

Calcium Nitrate

crystal
$Ca(NO_3)_2 \cdot 4H_2O$
F.W. 236.16

Reagent	**C0025**	100 g	**$11.10**
	C0026	500 g	**21.20**
Laboratory grade*	**C0350**	100 g	**$ 9.35**
	C0166	500 g	**15.50**

★ **HAZARD ALERT:** Strong oxidizer; potential fire risk in contact with organic material; may explode if shocked or heated. Slightly toxic. LD_{50} 3900 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Fair to poor; deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol and acetone.
Color and Odor: Colorless, odorless solid.
CAS No. 13477-34-4
*Laboratory grade may only be a 2–3 hydrate.

Calcium Nitrate Solution

(as $Ca(NO_3)_2 \cdot 4H_2O$)

0.5 Molar	**C0235**	500 mL	**$10.55**
0.1 Molar	**C0236**	500 mL	**9.10**

Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

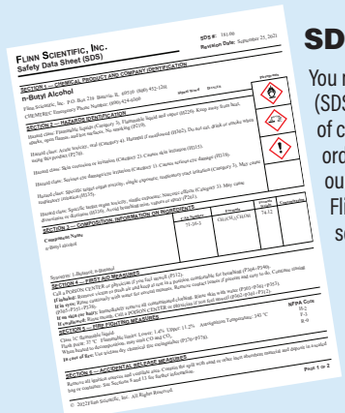
Calcium Oxide

CaO
F.W. 56.08

Reagent	**C0027**	500 g	**$21.55**
powder			
Laboratory grade	**C0028**	500 g	**$11.30**
lump	**C0029**	2 kg	**29.25**

★ **HAZARD ALERT:** Corrosive; dangerous in contact with organic material; exposure to water or moisture evolves heat. A lump of calcium oxide may disintegrate violently when water is added. Wear eye protection when handling this substance. TLV 2 mg/m³.
Storage: Inorganic #4.
Disposal: #10
Shelf Life: Fair to poor; protect from moisture; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Acid; reacts with water to form calcium hydroxide and evolves heat.
Color and Odor: Off-white, odorless solid.
CAS No. 1305-78-8
★ **SPECIAL HAZARD ALERT:** Avoiding moisture contact is important in storing this substance. Science teachers frequently report cracked glass bottles. We suggest high humidity exposure may have resulted in the generation of sufficient heat to crack or break the glass bottle. Flinn's product is

Continued on next column.



SDS Library

You need up-to-date Safety Data Sheets (SDSs) to safely use, store or dispose of chemicals. With your first chemical order of the year, you can find all of our SDSs at flinnsci.com. Count on Flinn as your safer source for science supplies.

Calcium Oxide *continued*

not packaged in glass; however, that does not negate the need to keep this substance dry. We package this substance in a plastic bottle. The bottle is in a plastic bag and contained within the bag is a desiccant to reduce or absorb moisture. Continue to store this material under similar conditions. Buy only small quantities of this substance.

Calcium Sulfate

reagent, powder
dihydrate
$CaSO_4 \cdot 2H_2O$ **C0198** 100 g **$15.30**
F.W. 172.17 **C0031** 500 g **30.65**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in water.
Color and Odor: White, odorless solid.
CAS No. 10101-41-4

Calcium Sulfate

plaster of paris
hemihydrate
$CaSO_4 \cdot ½H_2O$ **C0033** 2 kg **$19.65**
F.W. 145.15

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor unless kept dry; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Slightly in water.
Color and Odor: Off-white, odorless solid.
CAS No. 10034-76-1

Calcium Sulfate

for drying—see Drierite®

Calgon®

see Sodium Hexametaphosphate

Camphor

laboratory grade
$C_{10}H_{16}O$ **C0354** 25 g **$11.00**
F.W. 152.25

★ **HAZARD ALERT:** If heated, flammable and explosive vapors evolve; moderately toxic. LD_{50} (mouse) 1310 mg/kg. TLV 12 mg/m³.
Storage: Organic #4
Disposal: #18b
Shelf Life: Indefinite
Color and Odor: White solid with penetrating, aromatic chest rub odor.
CAS No. 76-22-2

Candles

Birthday type	**C0226**	pkg./24	**$2.16**
2½" x ¼"			
Color Flame	**AP7770**	pkg./12	**$5.35**
2¼" x ⅜"			
White	**C0229**	pkg./20	**$26.55**
5" x 1¼"			
plumber's candles			
Paraffin Candles	**AP4835**	pkg./10	**$9.00**
1.9 cm x 13 cm			

Storage: Miscellaneous nonhazardous organic materials.
Disposal: #26a
Shelf Life: Indefinite
Candle Use Suggestion: Mount candles on 3" x 5" cards to prevent students from using the lab bench top or expensive wire gauze squares for catching the melting wax. The cards make good drip catchers.

Carbolic Acid

see Phenol

Carbon

see Charcoal and Graphite listings

Carbon Rod

for use as inert electrodes in electrochemical cells — **C0410** — pkg./6 — **$13.60**

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Good
Color and Odor: Black, odorless solid.
CAS No. 7782-42-5

Carbon Dioxide Gas

Lecture bottle — **LB1005** — 0.5 lb (approximately 125 liters) — **$273.20**

Refillable cylinder — **LB1060** — 1.0 lb (approximately 210 liters) — **$449.25**

★ **HAZARD ALERT:** In solid form (solidified carbon dioxide—commonly known as dry ice) is very damaging to skin and eyes.
Storage: A cabinet dedicated to bottled gas storage.
Disposal: Completely empty lecture bottle in an operating fume hood then follow #26a.
Shelf Life: Indefinite
Soluble: Slightly soluble in water, hydrocarbons, and most organic solvents.
Color and Odor: Colorless, odorless solid.
CAS No. 124-38-9

Carbon Dioxide Gas Preparation: CO_2 gas can be produced from dry ice. One to two pounds of dry ice should provide sufficient gas for 40–50 students. You will have to set up a generator apparatus that will enable you to heat the dry ice by placing chunks in a water bath. The evolution of gas is not sufficient unless warmed by water. Your delivery tube (from the generator) should be rather long to allow the gas to reach room temperature. A drying tube will also have to be part of the apparatus to remove moisture.
Some teachers set up a CO_2 generator using a flask (about 250 mL size) into which is placed a long-stem funnel and delivery tube. Using about 25 grams of calcium carbonate (Flinn Catalog Nos. C0347, C0012 and C0013) and 6 Molar hydrochloric acid (Flinn Catalog No. H0033) will produce approximately 6 liters of CO_2 at room temperature and atmospheric pressure. A drying tube should be a part of the generation apparatus.

Catalase

from bovine liver oxidizing enzyme — **C0359** — 1 g — **$44.30**

Storage: Organic #1
Disposal: #26a
Shelf Life: Poor; keep refrigerated.
Color and Odor: Brown/gray, odorless solid.
CAS No. 9001-05-2

Technical Note: This enzyme is used to decompose hydrogen peroxide. Units of activity are shown on the bottle label and vary from lot to lot. Currently our label shows 3800 units per milligram solid. We also provide a technical data sheet to help you prepare catalase solutions. Catalase solution must always be very fresh. Even a solution that is just a few hours old will render poor results.
▶ See free How To video at flinnsci.com.

Caustic Potash

see Potassium Hydroxide

Caustic Soda

see Sodium Hydroxide

Cellulase

enzyme complex that degrades cellulose fine powder — **C0172** — 25 g — **$47.20**

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Buff liquid with ginger odor.
CAS No. 9012-54-8

Cerium(IV) Ammonium Nitrate

ceric ammonium nitrate reagent
$(NH_4)_2Ce(NO_3)_6$ — **C0287** — 25 g — **$29.95**
F.W. 548.23

★ **HAZARD ALERT:** Strong oxidizer; avoid contact with organic material; dangerous fire risk; skin irritant.
Storage: Inorganic #3
Disposal: #27f
Shelf Life: Good
Soluble: Water and alcohol.
Color and Odor: Orange/red solid with slight nitric acid odor.
CAS No. 16774-21-3

Cesium Chloride

laboratory grade, crystal
CsCl — **C0417** — 25 g — **$55.10**
F.W. 168.36

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 2600 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Somewhat hygroscopic, keep tightly closed.
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 7647-17-8

Technical Note: Produces a brilliant violet color in flame tests.

Chalk

see Calcium Carbonate

Charcoal, Granular

Coconut activated 6–12 mesh — **C0048** — 500 g — **$31.25**

★ **HAZARD ALERT:** Flammable solid.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag in a Flinn *Saf-Stor*™ Can.
Color and Odor: Gray/black, odorless solid.
CAS No. 7440-44-0

Technical Note: Activated charcoal is specially treated to increase internal surface area for high absorptivity.

Charcoal, Powder

activated charcoal powder — **C0047** — 500 g — **$35.95**

★ **HAZARD ALERT:** Flammable solid.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag in a Flinn *Saf-Stor*™ Can.
Color and Odor: Black, odorless solid.

Chlorine Water

saturated — **C0055** — 500 mL (Packaged in PVC-coated bottles) — **$13.50**

★ **HAZARD ALERT:** Toxic by ingestion or inhalation; strong, pungent odor;

CHLORINE WATER continued on next page.

Good-Bye to Chlorine and Bromine Water

Disposing of these two solutions is easy. How? Shake the contents of the bottle well. Unscrew the bottle cap and place the bottle under your efficiently operating fume hood. Both chlorine and bromine will vaporize and leave the bottle. Every now and then put the cap back on, shake the bottle, and again remove the cap. It does not take long for all the halogen to evaporate. You will be left with a bottle of water, which can be poured down the drain. How can you tell when all the halogen is gone? The odor is gone!

Chlorine Water *continued*

avoid contact with organic materials and powdered metals. TLV 1.5 mg/m^3 as elemental chlorine.

Storage: Inorganic #2

Disposal: Allow the chlorine water to stand in an open container ***under a hood*** in a well-ventilated, protected area. The chlorine will slowly leave the water and the container. The remaining water (now effectively de-gassed) can be put down the drain.

Shelf Life: Whether you buy ready-made chlorine water or make your own (see recipes below) the shelf life of our product or yours would be poor—perhaps six months at best.

Color and Odor: Pale yellow liquid with a pungent odor like a swimming pool.

CAS No. for chlorine gas is 7782-50-5

Safety Purchase Suggestion: Prepare this solution as you need it rather than buy it.

Chloroform

reagent

$CHCl_3$	**C0056**	500 mL	**$24.00**
F.W. 119.38			

★ **HAZARD ALERT:** *Possible carcinogen*. Prolonged inhalation may be fatal; toxic and narcotic by inhalation; ingestion may be fatal. Store in a Flinn *Saf-Stor*™ Can. Possible reproductive/fertility hazard. LD_{50} 695 mg/kg. TLV 49 mg/m^3.

Storage: Organic #4

Disposal: #27j

Shelf Life: Good if stored properly; keep from sources of light.

Soluble: Slightly in water; miscible with alcohol, ether, benzene, carbon disulfide, carbon tetrachloride.

Color and Odor: Clear liquid with a sweet anesthesia odor.

CAS No. 67-66-3

Incompatibility: Oxidizing agents, alkalis and alkali metals.

Chromatography Solvent

for paper and plant chromatography
contains 20% acetone and 80% petroleum ether

C0422	500 mL	**$18.88**

★ **HAZARD ALERT:** Mildly toxic by ingestion, inhalation and skin absorption. Irritating to body tissues.

Storage: Organic #4

Disposal: #18b

Shelf Life: Good

Color and Odor: Colorless liquid with natural gas-like odor.

Chromium

laboratory grade, chunk

Cr	**C0058**	100 g	**$26.35**
A.W. 52.0			

★ **HAZARD ALERT:** Highly toxic as dust or fumes. TLV 0.5 mg/m^3 as dust or fume.

Continued on next column.

Chromium *continued*

Storage: Inorganic #1

Disposal: #27f

Shelf Life: Indefinite

Soluble: Acids (except nitric); strong alkalis; insoluble in water.

Color and Odor: Gray, odorless solid.

CAS No. 7440-47-3

Chromium Nitrate

chromium(III) nitrate
reagent, crystal

$Cr(NO_3)_3 \cdot 9H_2O$	**C0061**	100 g	**$19.55**
F.W. 400.18			

★ **HAZARD ALERT:** Strong oxidizer; avoid contact with organic materials; slightly toxic by ingestion. LD_{50} 3250 mg/kg.

Storage: Inorganic #3

Disposal: #27f

Shelf Life: Good.

Soluble: Water and alcohol.

Color and Odor: Metallic gray/black, odorless solid.

CAS No. 7789-02-8

Chymosin

natural enzyme coagulant
for cheese-making

powder	**C0419**	5 g	**$14.35**

Storage: Miscellaneous, nonhazardous organic material.

Disposal: #26a

Shelf Life: Good if stored properly. Store in a cool (<10 °C) and dry place in a closed container.

Soluble: Water

Color and Odor: Buff solid with malty odor.

Technical Note: Used for cheese-making demonstrations and experiments. Prepare solutions fresh: dissolve 0.3 g chymosin in 100 mL of bottled water. Use two drops of solution per 10-mL sample size of milk. Optimum temperature for enzyme activity is 40 °C. Two grams of C0419 should be enough to coagulate more than 100 L of milk!

trans-Cinnamic Acid

3-phenyl-2-propenoic acid,(E)
reagent

$C_9H_8O_2$	**C0401**	500 g	**$123.00**
F.W. 148.159			

★ **HAZARD ALERT:** Causes skin and serious eye irritation. May cause respiratory irritation.

Storage: Organic #1

Disposal: #26a

Shelf Life: Good

Soluble: Very soluble in ethanol; soluble in diethyl ether, acetone and benzene.

Color and Odor: Tan, odorless.

CAS No. 140-10-3

HOW TO

Prepare Saturated Chlorine Water Solution

There are three common methods for preparing saturated chlorine water solution. Carry out all reactions and work with the chlorine water under a fume hood.

1. Very slowly bubble chlorine gas from a chlorine gas cylinder or lecture bottle into the required quantity of distilled water. Perform this process only under a fume hood.
2. Set up a chlorine gas generator using common lab glassware, equipment and chemicals. You will need a long-stem funnel and a delivery tube assembled into a two-hole stopper that will fit into a 250-mL Erlenmeyer or flat bottom flask. Place approximately 10 grams of manganese dioxide (MnO_2) (Flinn Catalog numbers M0023, M0025) into the flask. Now slowly add approximately 40 mL of hydrochloric acid (Flinn Catalog numbers H0031, H0004, H0005, H0006) and warm very slightly. Bubble the gas that is produced into a flask containing distilled water. This process should produce about one liter of chlorine water and must be performed under a fume hood.
3. Mix 100 mL of commercial bleach (like Clorox®) with 25 mL of 6 M hydrochloric acid (Flinn Catalog number H0033) and then dilute to one liter with distilled water. The solution will have a characteristic yellow-green or light green color. Do not immediately cover the container in which the solution is prepared as a great deal of chlorine is formed. Allow the solution to stand for a short period until it is stable. If the bleach is very fresh, it may take days before the solution stops bubbling. Only when the bubbling stops should you cap the bottle or container. You can be sure such a solution is saturated. If, at some later time, you are not sure it is still saturated, then either make fresh solution or add some bleach to your old solution. The wise option would be to make a fresh solution.

Safety Suggestion: Prepare the option you select only under a fume hood. Package only in glass containers with a cap that has a plastic cap liner.

Label the material as follows: *Solution causes severe burns. Avoid contact with skin, eyes or clothing. Avoid breathing vapors. Do not pipet by mouth. Wash areas of contact with copious quantities of water.*

Citric Acid

monohydrate
reagent, crystal
$C_6H_8O_7 \cdot H_2O$ F.W. 210.15

C0231	100 g	$ 8.75
C0065	500 g	23.50

★ **HAZARD ALERT:** Severe eye irritant. Slightly toxic by ingestion. LD_{50} 3000 mg/kg.
Storage: Organic #1
Disposal: #26a
Shelf Life: Substance efflorescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol, and ether.
Color and Odor: White, odorless solid.
CAS No. 5949-29-1

Citric Acid

anhydrous
laboratory grade, powder
$C_6H_8O_7$ F.W. 192.13

C0135	100 g	$15.58
C0136	500 g	16.34

For hazard alert, storage, disposal, etc., see Citric Acid, C0231.
Color and Odor: White, odorless solid.
CAS No. 77-92-9

Citric Acid, Trisodium Salt

see Sodium Citrate

Cleaner, Alconox®

powder
general purpose laboratory detergent

A0126	4 lb.	$ 65.00
A0127	25 lb.	312.75

Storage: Washing area.
Disposal: Dilute and place down the drain.
Shelf Life: Indefinite if kept dry.
Soluble: Water
Color and Odor: White solid with slight chlorine odor.

Cleaner, Dishwashing

household liquid dishwashing detergent — C0241 — 22 oz. dispenser bottle — $11.50

Storage: In washing area.
Disposal: Dilute with water and place down the drain.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: May vary.

Cleaner, Erada-Stain® Cream

Removes chemical, biological and silver nitrate stains from hands, glassware, and lab equipment. Biodegradable.

AP7330	6 oz.	$31.71

Storage: Washing area.
Disposal: #26a.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Pink cream with pleasant odor.



Cleaners
A0126, etc.

Cleaner, Liqui-Nox®

General purpose liquid laboratory detergent
phosphate free

L0045	1 qt.	$ 30.85
L0046	1 gal.	108.45

Storage: Washing area.
Disposal: Dilute with water and place down the drain.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Yellow, odorless liquid.

FLINNSCI.COM
VISIT US ONLINE

Cleaner, Simple Green®

general purpose liquid cleaner, phosphate-free, biodegradable; degreaser — C0405 — 32 oz. — $13.15

Storage: Washing area.
Disposal: Dilute with water and place down the drain.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Clear green liquid with sassafras odor.

Cobalt

laboratory grade, piece
Co A.W. 58.93

C0067	25 g	$44.00

★ **HAZARD ALERT:** *Possible carcinogen* as fume or dust. TLV 0.01 mg/m^3 as dust or fume. LD_{50} 6171 mg/kg.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Nitric acid.
Color and Odor: Silver/brown, odorless solid.
CAS No. 7440-48-4

Cobalt Chloride

cobalt(II) chloride
crystal
$CoCl_2 \cdot 6H_2O$
F.W. 237.95

Reagent	C0225	25 g	$12.98
	C0069	100 g	28.57
	C0070	500 g	103.90

COBALT CHLORIDE continued on next page.

Hazardous Shipping Fees

Certain items sold by Flinn are classified as hazardous materials by the U.S. Department of Transportation and therefore require special handling to ensure safe transport. A flat fee of $32 per order is added to cover these handling requirements and such items can only be shipped to schools, museums and science centers.

Cobalt Chloride *continued*

★ **HAZARD ALERT:** *Possible carcinogen* as fume or dust. Moderately toxic by ingestion; causes blood damage. Practice strict hygiene in the use of this substance. Possible reproductive/fertility hazard. LD_{50} 766 mg/kg.
Storage: Inorganic #2
Disposal: #27f
Shelf Life: Hygroscopic; keep tightly closed. Good if stored properly.
Soluble: Water, alcohol, and acetone.
Color and Odor: Red/violet, odorless solid.
CAS No. 7791-13-1

Cobalt Chloride Solution

0.1 Molar
(as $CoCl_2 \cdot 6H_2O$) **C0242** 500 mL **$8.75**

For hazard alert, storage, disposal, etc., see Cobalt Chloride, C0225.
Color and Odor: Pink, odorless liquid.

Cobalt Chloride, Test Paper

see Test Papers on page 193

Cobalt Nitrate

cobalt(II) nitrate
crystal
$Co(NO_3)_2 \cdot 6H_2O$
F.W. 291.05

Reagent	**C0071**	100 g	**$24.35**
	C0072	500 g	**74.30**
Laboratory grade	**C0412**	100 g	**24.50**
	C0413	500 g	**74.80**

★ **HAZARD ALERT:** Oxidizer; fire risk in contact with organic material; moderately toxic; *possible carcinogen.* Possible reproductive/fertility hazard. LD_{50} 691 mg/kg.
Storage: Inorganic #3
Disposal: #27f
Shelf Life: Poor; substance deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol, and most organic solvents.
Color and Odor: Brown/orange, odorless solid.
CAS No. 10026-22-9

Congo Red

biological stain/indicator
pH 3.0 blue to 5.0 red
$C_{32}H_{22}N_6Na_2O_6S_2$ **C0120** 10 g **$14.70**
F.W. 696.67

★ **HAZARD ALERT:** Possible reproductive/fertility hazard.
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Dark brown, odorless solid.
CAS No. 573-58-0
C.I. #22120

Congo Red Indicator Solution

0.1%, aqueous
C0128 500 mL **$15.05**

★ **HAZARD ALERT:** Possible reproductive/fertility hazard.
Storage: Organic #9

Continued on next column.

Total Lifetime Cost of a Chemical

Administrators who purchase low-priced chemicals may not appreciate the true "lifetime cost" of a chemical. The lifetime cost includes not only the cost to purchase the chemical, but also the cost of storage and disposal. Cheap chemicals are typically lower quality and packaged in inferior containers. This greatly increases the amount of chemicals needing expensive disposal. Save money by relying on Flinn to provide smaller quantities of higher quality chemicals in date-labeled packages.

Congo Red Indicator Solution *continued*

Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Orange/red, odorless liquid.

Copper, Foil

Cu **C0137** 100 g **$15.43**
A.W. 63.55 (100 g = approx. 1 sq. foot)
0.005" thick **C0138** 500 g **65.23**
(500 g = approx. 55" long x 12" wide)

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Copper, odorless solid.
CAS No. 7440-50-8

Copper, Granular

20 mesh and smaller **C0081** 100 g **$14.18**
C0082 500 g **50.90**

For storage, disposal, etc., see Copper, Foil, C0137.

Copper, Powder

C0086 100 g **$15.87**
C0087 500 g **63.89**

★ **HAZARD ALERT:** Metals, in fine powder form, always present a serious fire and explosion risk. TLV 1 mg/m^3 as dust or fume.
For storage, disposal, etc., see Copper, Foil, C0137.

Copper, Sheet

#22 gauge **C0369** **$30.82**
0.025" thick Each piece 6" x 12"
Weight: approx. 223 grams
C0079 **50.00**
Each piece 12" x 12"
Weight: approx. 445 grams
#30 gauge **C0370** **$24.04**
0.010" thick Each piece 6" x 12"
Weight: approx. 125 grams
C0080 **33.01**
Each piece 12" x 12"
Weight: approx. 210 grams

For storage, disposal, etc., see Copper, Foil, C0137.

Copper, Shot

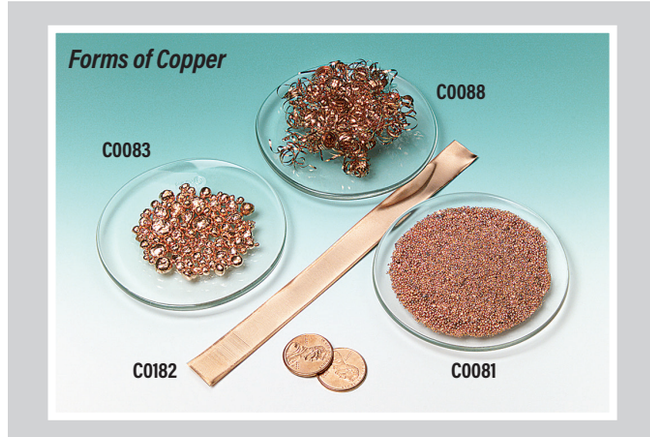
3–14 mesh **C0083** 100 g **$ 13.58**
C0084 500 g **47.40**

For storage, disposal, etc., see Copper, Foil, C0137.

Copper, Strips

1.2 x 15 cm **C0182** pkg./6 strips **$14.28**

For storage, disposal, etc., see Copper, Foil, C0137.



Copper, Turnings, Light

1–2 mm width

	C0088	100 g	$18.93
	C0089	500 g	53.50

For storage, disposal, etc., see Copper, Foil, C0137.

Copper, Wire, Bare

16 gauge 1.3 mm thick (128 ft/lb)	C0146	4 oz.	$ 10.43
	C0147	1 pound	26.73
18 gauge 1.0 mm thick (203 ft/lb)	C0148	4 oz.	$ 10.30
	C0149	1 pound	26.60
22 gauge 0.6 mm thick (516 ft/lb)	C0150	4 oz.	$ 10.61
	C0151	1 pound	31.94

For storage, disposal, etc., see Copper, Foil, C0137.

Copper(I)...Cuprous... Copper compounds in which the copper has an ionic charge or oxidation number of one.

Copper(I) Chloride

cuprous chloride, anhydrous
powder
CuCl
F.W. 98.99

Laboratory grade	C0112	100 g	$15.45
	C0134	500 g	46.05

★ **HAZARD ALERT:** Toxic; eye, skin and respiratory tract irritant. LD_{50} 140 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair; changes on exposure to air and light. Store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Acids, ammonia and ether; slightly in water; insoluble in alcohol and acetone.
Color and Odor: Pea green, odorless solid.
CAS No. 7758-89-6

Copper(II)...Cupric... Copper compounds in which the copper has an ionic charge or oxidation number of two.

Copper(II) Acetate

cupric acetate
laboratory grade, crystal
$(CH_3CO_2)_2Cu \cdot H_2O$ C0093 100 g $25.25
F.W. 199.65

★ **HAZARD ALERT:** Moderately toxic. LD_{50} 710 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water, alcohol, and ether.
Color and Odor: Blue/green, odorless solid.
CAS No. 6046-93-1

Copper(II) Bromide

cupric bromide
laboratory grade, crystal
$CuBr_2$ C0094 100 g $32.00
F.W. 223.37

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol and acetone.
Color and Odor: Grayish black solid with a brominelike odor.
CAS No. 7789-45-9

Copper(II) Carbonate

cupric carbonate
laboratory grade, powder
$Cu_2(OH)_2CO_3$ C0211 100 g $14.60
F.W. 221.11 C0095 500 g 39.83

★ **HAZARD ALERT:** Slightly toxic by ingestion and inhalation. LD_{50} 1350 mg/kg.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Acids; not in water.
Color and Odor: Light blue/green, odorless solid.
CAS No. 12069-69-1

Copper(II) Chloride

cupric chloride, dihydrate
crystal
$CuCl_2 \cdot 2H_2O$
F.W. 170.49

Reagent	C0096	100 g	$15.98
	C0097	500 g	42.00
Laboratory grade	C0281	100 g	$ 11.28
	C0161	500 g	25.25
	C0162	2 kg	96.70

★ **HAZARD ALERT:** Highly toxic by ingestion and inhalation. LD_{50} 140 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; substance deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water and alcohol.
Color and Odor: Light blue/green, odorless solid.
CAS No. 10125-13-0

Copper(II) Chloride

cupric chloride, anhydrous
laboratory grade, powder
$CuCl_2$ C0227 100 g $25.60
F.W. 134.45

For hazard alert, storage, disposal, etc., see Copper(II) Chloride, C0096.
Color and Odor: Light brown solid with slight vanilla odor.
CAS No. 7447-39-4

Copper(II) Chloride Solution

(as $CuCl_2 \cdot 2H_2O$)

0.5 Molar	C0381	500 mL	$12.00
0.1 Molar	C0382	500 mL	8.45

★ **HAZARD ALERT:** Toxic if ingested.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Light blue/green, odorless liquid.

Copper(II) Nitrate

cupric nitrate
crystal
$Cu(NO_3)_2 \cdot 3H_2O$
F.W. 241.60

Reagent	C0098	100 g	$17.52
	C0099	500 g	53.22

COPPER(II) NITRATE continued on next page.

Cans—Great Friends

Flinn Scientific packages calcium and other reactive metals in metal cans. Why? Because the package (i.e., the can) is the most protective container economically available to hold reactive substances. When you have to deal with chemicals that are unusually hazardous, consider using plastic bags and outer cans to provide additional protection for these "devils." Put your bottle into a bag and then into a can. See Flinn *Chem-Saf*™ Bags and *Saf-Stor*™ Cans on page 653.

Copper(II) Nitrate *continued*

Laboratory grade	**C0414**	100 g	**$18.24**
	C0415	500 g	**36.30**

★ **HAZARD ALERT:** Oxidizing material; dangerous in contact with organic material; moderately toxic. LD_{50} 940 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Poor; substance deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water and alcohol.
Color and Odor: Royal blue solid with slight nitric acid odor.
CAS No. 10031-43-3

Copper(II) Nitrate Solution

(as $Cu(NO_3)_2 \cdot 3H_2O$)

0.5 Molar	**C0244**	500 mL	**$10.40**
0.1 Molar	**C0245**	500 mL	**7.55**

★ **HAZARD ALERT:** Skin and eye irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Blue, odorless liquid.

Copper(II) Oxide

cupric oxide
reagent
CuO
F.W. 79.54

Powder	**C0100**	100 g	**$14.25**

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Acids; only with difficulty in water.
Color and Odor: Gray/black, odorless solid.
CAS No. 1317-38-0

Copper(II) Sulfate

cupric sulfate, pentahydrate
$CuSO_4 \cdot 5H_2O$
F.W. 249.69

Reagent	**C0102**	100 g	**$12.17**
crystal, fine	**C0103**	500 g	**23.73**
	C0104	2 kg	**91.47**
Laboratory grade	**C0105**	500 g	**$15.15**
crystal, medium	**C0106**	2 kg	**41.95**
Approx. ¼" to ½" dia.			
Laboratory grade	**C0373**	500 g	**$17.72**
crystal, large	**C0374**	2 kg	**43.12**
Approx. ½" to ¾" dia.			

Continued on next column.

Copper(II) Sulfate *continued*

Laboratory grade	**C0110**	500 g	**$14.25**
powder	**C0111**	2 kg	**43.19**

★ **HAZARD ALERT:** Skin and eye irritant; toxic by ingestion. LD_{50} 300 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair, slowly effloresces in the air.
Soluble: Water and methyl alcohol; slightly in ethyl alcohol and glycerol.
Color and Odor: Blue/white, odorless solid.
CAS No. 7758-99-8
Technical Note: Laboratory grade copper(II) sulfate pentahydrate powder contains up to 0.7% of an insoluble anticaking agent, magnesium carbonate. This additive is very effective in preventing clumping and hardening of the chemical and makes the powder free-flowing. If a transparent solution is needed, filter the mixture before use or add a small amount of 1 M hydrochloric acid.



Forms of Copper(II) Sulfate

Copper(II) Sulfate

cupric sulfate, anhydrous
reagent, powder
$CuSO_4$
F.W. 159.61

	C0107	100 g	**$22.36**
	C0108	500 g	**58.84**

For hazard alert, storage, disposal, etc., see Copper(II) Sulfate, C0102.
Color and Odor: Off-white, odorless solid.
CAS No. 7758-98-7

How To Read a GHS Label, Poster

FLINN EXCLUSIVE

Pictograms, signal words and hazard codes, oh my! This exclusive Flinn poster is a quick and easy reference for your chemical storeroom to help you remember and understand the changes made to chemical labels as a result of the Globally Harmonized System updates. With this reference, you will be able to identify where to look on the label to find key information, such as hazard alerts, precautionary statements and more. Includes a description of each pictogram with its respective hazards. The "right to know" has become "the right to understand!" 24" x 36".

Catalog No.	Description	Price/Each
AP7650	How To Read a GHS Label, Poster	**$19.90**



Copper(II) Sulfate Solution

(as $CuSO_4 \cdot 5H_2O$)

1 Molar	**C0246**	500 mL	**$10.75**
0.1 Molar	**C0247**	500 mL	**8.60**

★ **HAZARD ALERT:** Slightly toxic by ingestion.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Blue/green, odorless liquid.

Copper(II) Sulfate Stock Solution

20%
for preparing any strength of solution for determining specific gravity of blood and plasma
specific gravity: 1.100 20/20 °C

C0156 500 mL **$17.95**

★ **HAZARD ALERT:** Slightly toxic by ingestion.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Blue, odorless liquid.

Copper(II) Sulfate Electrolyte Solution

contains cupric sulfate and sulfuric acid

C0249 500 mL **$11.40**

★ **HAZARD ALERT:** Toxic; corrosive; acid solution.
Storage: Inorganic #2
Disposal: #24b
Shelf Life: Good
Color and Odor: Blue, odorless liquid.
Technical Note: Suitable for copper electroplating experiments and demonstrations.

Corn Oil

C0090 473 mL **$10.75**

Storage: Organic #3
Disposal: #26a
Shelf Life: Indefinite
Soluble: Organic solvents; slightly in alcohol; not water.
Color and Odor: Amber, odorless liquid.
CAS No. 8001-30-7

Corn Syrup

dextrose syrup **C0091** 16 oz. **$8.05**

Storage: Organic #2
Disposal: #26b
Shelf Life: Fair to good.
Soluble: Water; slightly in alcohol.
Color and Odor: Colorless, odorless liquid.
CAS No. 8029-43-4

Cotton

See page 100

Craftcast

see Polyurethane Foam System

Cream of Tartar

see Potassium Bitartrate

Crystal Violet

gentian violet
indicator/biological stain
pH 0.0 yellow to 1.8 violet-blue
reagent
$C_{25}H_{30}ClN_3$ **C0125** 10 g **$12.90**
F.W. 408.00

★ **HAZARD ALERT:** Moderately toxic by ingestion; body tissue irritant. LD_{50} 420 mg/kg.
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite

Continued on next column.

Crystal Violet *continued*

Soluble: Water and alcohol.
Color and Odor: Pea green solid with musty odor.
CAS No. 548-62-9
C.I. #42555

Crystal Violet Solutions

1%, Alcoholic	**C0133**	500 mL	**$17.60**
Hucker formula	**C0189**	500 mL	**$28.85**

for Gram staining

★ **HAZARD ALERT:** Flammable liquid.
Storage: Organic #9 in a dedicated flammables cabinet; if one is not available store in a Flinn *Saf-Stor*™ Can.
Disposal: #26b
Shelf Life: Good, if stored safely.
Color and Odor: Blue/violet liquid with alcohol odor.
Technical Note: Hucker formula contains crystal violet, ammonium oxalate and ethyl alcohol and is commonly used for Gram staining procedures.

Culture Media

These substances are also listed individually and in alphabetical order throughout the chemical section of this Catalog/Reference Manual.

Agar, Bacteriological	**A0084**	100 g	**$23.81**
	A0085	500 g	**72.60**
Dextrose Agar	**D0049**	100 g	**$89.00**
EMB Agar	**E0021**	100 g	**$63.95**
MacConkey Agar	**M0209**	100 g	**$56.80**
Mueller Hinton Agar	**M0203**	100 g	**$44.50**
Nutrient Agar	**N0019**	100 g	**$ 47.80**
	N0020	500 g	**139.00**
Nutrient Broth	**N0021**	100 g	**$40.00**
Potato Dextrose Agar	**P0098**	100 g	**$ 42.00**
	P0099	500 g	**145.69**

Culture Media Ingredients

Agar	**A0256**	25 g	**$ 11.10**
	A0012	100 g	**22.87**
	A0013	500 g	**83.43**
Bile Salts	**B0038**	100 g	**$39.85**
Gelatin	**G0004**	500 g	**$25.85**
Pepsin	**P0006**	25 g	**$13.55**
	P0007	100 g	**45.75**

Culture Media, Prepared

see page 474 for a complete listing of all prepared culture media

Cupric...Cuprous...

see Copper(II) and Copper(I)

Cyclohexane

laboratory grade
C_6H_{12} **C0113** 500 mL **$14.10/1**
F.W. 84.16 **82.50/6**

★ **HAZARD ALERT:** Dangerous fire risk; flammable liquid; slightly toxic by ingestion, inhalation and skin contact. TLV 1030 mg/m^3.
Storage: Organic #3 inside a dedicated flammables cabinet. If one is not available, store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Disposal: #18b. U-Listed (U056); purchase small amounts for effective inventory control.
Shelf Life: Indefinite if stored safely.
Soluble: Many organic solvents; insoluble in water.
Color and Odor: Colorless liquid with a rubber cement odor.
CAS No. 110-82-7

Cyclohexanol

laboratory grade
$C_6H_{11}OH$ **C0190** 500 mL **$61.45**
F.W. 100.16

★ **HAZARD ALERT:** Combustible; may form explosive peroxides. Do not distill to dryness. Slightly toxic by ingestion, inhalation, and skin absorption. LD_{50} 1400 mg/kg. TLV 206 mg/m^3.

Storage: Organic #2 away from any oxidizers.
Disposal: #18b
Shelf Life: Fair to poor; substance hygroscopic. Store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can. Avoid prolonged storage.
Soluble: Slightly in water; miscible with many organic solvents.
Color and Odor: Colorless with a camphorlike odor.
CAS No. 108-93-0
Technical Note: Melting point is 23–25 °C; this substance may be a solid at room temperature (68 ºF/20 ºC).

Cyclohexanone

cyclohexyl ketone
ACS Reagent, 99.8%
$C_6H_{10}O$ **C0289** 500 mL **$38.00**
F.W. 98.14

★ **HAZARD ALERT:** *Possible mutagen;* suspected of causing genetic defects. Use only in a hood or well-ventilated area. Moderate fire risk; flammable liquid and vapor. Moderately toxic by ingestion, inhalation and skin absorption; causes skin and serious eye irritation. LD_{50} 1620 µL/kg.

Storage: Organic #4 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b. U-Listed (U057); purchase small amounts for effective inventory control.
Shelf Life: Fair; store in a cool, dry place.
Soluble: Alcohol, ether and common organic solvents; partially soluble in water.
Color and Odor: Colorless, oily liquid with peppermint and acetone odor.
CAS No. 108-94-1
Technical Note: Reacts with hydrogen peroxide and nitric acid to form explosive peroxides.

Cyclohexene

laboratory grade
C_6H_{10} **C0141** 500 mL **$67.00**
F.W. 82.15

★ **HAZARD ALERT:** Flammable liquid; dangerous fire risk. Slightly toxic by ingestion and inhalation. May form explosive peroxides; do not distill to dryness. Strong, offensive odor. LD_{50} 1920 mg/kg. TLV 1010 mg/m^3.

Storage: Organic #3 in a dedicated flammables cabinet. If a flammables cabinet is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Poor. Substance may form explosive peroxides; avoid prolonged storage.
Soluble: Alcohol; not water.
Color and Odor: Colorless liquid with paint thinner odor.
CAS No. 110-83-8

D

Decanedioyl Chloride

see Sebacoyl Chloride

Alcohols and Explosions

Reports suggest that secondary alcohols, such as sec-butyl alcohol and isopropyl alcohol, can develop explosive organic peroxides. Organic peroxides are unlikely to be a problem if the alcohols are fresh. Solution: Always know the age of your chemicals (Flinn chemical labels are dated), and use only fresh materials. Also, do not distill any alcohols to dryness since this will concentrate any explosive peroxides that may have formed.

Dehydrating Agents

see Calcium Chloride, Drierite®, etc.

Deionized Water

see Water, Deionized

Desiccants

see Calcium Chloride, Drierite®, etc.

Detergents

see Cleaners

Dextrose

glucose, anhydrous
reagent, granular
$C_6H_{12}O_6$ **D0002** 500 g **$11.30**
F.W. 180.16 **D0015** 2 kg **34.25**

Storage: Organic #2
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 492-62-6

Dextrose

glucose, monohydrate
laboratory grade, powder
$C_6H_{12}O_6 \cdot H_2O$
F.W. 198.18 **D0005** 500 g **$11.30**

Storage: Organic #2
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 5996-10-1

Dextrose Agar

bacteriological culture media
D0049 100 g **$89.00**

Storage: With culture media.
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Buff solid with dry dog food odor.

Dextrose Solutions

see Glucose Solutions

2,6-Di-t-Butyl-4-Methylphenol

BHT, butylated hydroxytoluene
laboratory grade, crystals
$((CH_3)_3C)_2CH_3C_6H_2OH$ **D0058** 500 g **$34.70**
F.W. 220.36

★ **HAZARD ALERT:** Moderately toxic by ingestion and inhalation. Body tissue irritant. LD_{50} 890 mg/kg.

Storage: Organic #8
Disposal: #24a
Shelf Life: Good; reacts with oxygen; limit exposure to air.
Soluble: Alcohol, xylenes, and acetone.
Color and Odor: White, odorless solid.
CAS No. 128-37-0
Technical Note: A safer alternative for melting point determination: melting point is 69–71 °C.

para-Dichlorobenzene

1,4-dichlorobenzene
laboratory grade, crystal
$C_6H_4Cl_2$ **D0007** 500 g **$62.50**
F.W. 147.01
M.P. 53 °C

★ **HAZARD ALERT:** *Possible carcinogen.* Severe irritant to eyes, skin, and respiratory tract. Moderately toxic by ingestion. LD_{50} 500 mg/kg. The threshold

PARA-DICHLOROBENZENE continued on next page.

para-Dichlorobenzene *continued*

limit value (TLV) for this substance is 60 mg/m^3 in air. Provide a high degree of ventilation.
Storage: Organic #4
Disposal: #4b. U-Listed (U072); purchase small amounts for effective inventory control.
Shelf Life: Fair to poor; substance volatile; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Insoluble in water; soluble in many organic solvents.
Color and Odor: White solid with moth ball odor.
CAS No. 106-46-7
Safety Purchase Suggestion: Cetyl alcohol, stearic acid and t-octyl phenol are safer alternatives for melting point determinations. A safer alternative for enthalpy of fusion experiments might be acetamide.

DNA Samples for Electrophoresis

See page 512 for predigested, ready-to-run DNA samples for electrophoresis.

2,6-Dichloroindophenol, Sodium Salt

2,6-dichlorophenol indophenol
DPIP, DCIP or DCPIP
reagent, powder

$NaOC_6H_4N=C_6H_2(Cl_2):O$	**D0009**	1 g	**$12.80**
F.W. 290.09	**D0026**	5 g	**38.30**

Storage: Organic #8
Disposal: #5
Shelf Life: Poor, substance is hygroscopic; may contain up to 2 moles water of hydration.
Soluble: Water and alcohol.
Color and Odor: Dark green solid with throat lozenge odor.
CAS No. 620-45-1
Technical Note: Use a 0.025% solution for Vitamin C determination. Solution is blue in base, changes to red in acid. Solutions of this indicator have a poor shelf life; make fresh solution for best results.

2,4-Dichlorophenoxyacetic Acid

2,4-D; an auxin

$C_8H_6Cl_2O_3$	**D0056**	100 g	**$81.14**

★ **HAZARD ALERT:** Toxic by ingestion; severe eye irritant. LD_{50} 375 mg/kg
Storage: Organic #1
Disposal: #4c
Shelf Life: Indefinite
Soluble: Slightly soluble in water, soluble in alcohol.
Color and Odor: Buff/tan, odorless solid.
CAS No. 94-75-7
Technical Note: Use a 0.01–5.0 mg/L solution as a plant growth regulator.

2,4-Dinitrophenylhydrazine

2,4-DNPH
stabilized with 30–35% water

$2,4\text{-}(NO_2)_2C_6H_4NHNH_2$	**D0061**	100 g	**$211.60**
F.W. 198.14			

★ **HAZARD ALERT:** Flammable; toxic by ingestion. LD_{50} >500 mg/kg.
Storage: Organic #2
Disposal: #5
Shelf Life: Good, if stored safely.
Soluble: Slightly soluble in water and alcohol; soluble in dilute inorganic acids.
Color and Odor: Moist, reddish-orange solid; odorless.
CAS No. 119-26-6
Technical Note: Contains 30–35% water as a stabilizer. Dry solid is shock-sensitive. Used to test for and identify carbonyl compounds.

Disinfectant

see Lysol®

Distilled Water

see Water, Distilled

DNA

see Deoxyribonucleic Acid

Dodecanoic Acid

see Lauric Acid

Dodecyl Alcohol

lauryl alcohol, 1-dodecanol
laboratory grade, crystal

$CH_3(CH_2)_{11}OH$	**D0035**	100 g	**$33.35**
F.W. 186.34			

Storage: Organic #2
Disposal: #18b
Shelf Life: Indefinite
Soluble: Alcohol
Color and Odor: White solid with floral odor.
CAS No. 112-53-8
Technical Note: Melting point is 24 °C; material may be a liquid or fused solid.

Dodecyl Sulfate, Sodium Salt

sodium lauryl sulfate, sodium dodecyl sulfate, SDS
laboratory grade, powder

$CH_3(CH_2)_{11}OSO_3Na$	**D0024**	100 g	**$21.35**
F.W. 288.38			

★ **HAZARD ALERT:** Harmful if swallowed. Causes skin and serious eye irritation. May cause respiratory irritation. LD_{50} 1288 mg/kg.
Storage: Inorganic #2 or Organic #4.
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 151-21-3
Technical Note: Suitable for electrophoresis as an anionic detergent to denature proteins.

DPIP

see Dichloroindophenol

Drierite®

calcium sulfate, anhydrous
moisture absorbent, 8 mesh

Non-indicating white	**D0011**	454 g	**$25.80**
Indicating blue, changes to pink when saturated	**D0012**	454 g	**$43.50**

★ **HAZARD ALERT:** Possible allergen. Respiratory irritant.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Not meant to be put in solution.
Color and Odor: White or blue, odorless solid.
CAS No. 7778-18-9

Dyes

see Food Coloring Dyes

Purchase Suggestion

If you use a lot of gases, consider our refillable gas cylinders. They provide more gas, eliminate disposal problems and save you money.

See page 157 of this catalog/reference manual for more information.



E

EBT
see Eriochrome Black T

EDTA
see Ethylenediaminetetraacetic Acid

Electrophoresis Chemicals
see page 448

EMB Agar
eosin methylene blue
bacteriological culture media
powder **E0021** 100 g **$63.95**

Storage: With other culture media.
Disposal: #26a
Shelf Life: Very hygroscopic; keep dry; shelf life good if kept dry. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Pink/violet solid with malt odor.

Enviro-Bond™ 403
oil absorbing material
E0058 100 g **$13.50**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26a
Shelf Life: Indefinite
Soluble: Insoluble
Color and Odor: White, odorless solid.
Technical Note: Use with Marvel Mystery Oil (AP8927) to simulate an oil spill cleanup; please see page 301.

Epsom Salts
see Magnesium Sulfate

Eriochrome Black T
EBT, biological stain/indicator
E0024 25 g **$15.90**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Hot water; moderately soluble in alcohol.
Color and Odor: Black solid with new rubber odor.
CAS No. 1787-61-7
C.I. #14645
Technical Note: Prepare fresh 0.5 or 1% EBT solutions in ethyl alcohol for use as a metal ion (calcium and magnesium) indicator.

Ethanol
see Ethyl Alcohol

Ether, Ethyl
diethyl ether
contains peroxide inhibitor
$C_2H_5OC_2H_5$
F.W. 74.12

ACS Reagent	**E0048**	100 mL	**$ 32.00**
anhydrous	**E0001**	500 mL	**34.05/1**
			199.02/6

Continued on next column.

Heavy Metals
Heavy metals, including cadmium and cadmium compounds, are most dangerous if inhaled as a fume or fine dust. Water soluble compounds of heavy metals are also toxic, but inhalation and ingestion are extremely unlikely. If the cadmium you intend to use will not generate a dust that can be inhaled, prudent practice suggests that it is not necessary to ban the material. Many heavy metals serve useful purposes in everyday life. Know the substance, how it can hurt you and how it can be properly disposed of.

Ether, Ethyl *continued*

Laboratory grade	**E0003**	100 mL	**$35.00**
anesthesia		(All above package sizes packaged in PVC-coated bottles)	

★ **HAZARD ALERT:** ***Severe fire and explosion hazard;*** may form explosive peroxides; vapor harmful, use only under a hood or in a well-ventilated area. TLV 1210 mg/m^3. LD_{50} 1215 mg/kg.
Storage: Organic #4 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can. ***Never store this substance in an ordinary household refrigerator.*** Avoid storing longer than 3–6 months. Buy and store only small quantities. Abide by label expiration date.
Disposal: #15. U-Listed (U117); purchase small amounts for effective inventory control.
Shelf Life: Poor; avoid prolonged storage.
Soluble: Slightly in water; soluble in many common organic solvents.
Color and Odor: Colorless liquid with an aromatic, sweet, not unpleasant odor.
CAS No. 60-29-7
Safety Purchase Suggestion: Consider using an alternative, less hazardous substitute such as Flinn *Lull-A-Fly*™ to anesthetize *Drosophila*. *Lull-A-Fly* contains no ether.

Ether, Petroleum
see Petroleum Ether

Ethyl Acetate
reagent grade

$CH_3COOC_2H_5$	**E0005**	500 mL	**$13.90**
F.W. 88.11	**E0006**	4 liters	**73.00**

★ **HAZARD ALERT:** Dangerous fire hazard and explosion risk; irritating to skin and eyes; slightly toxic by inhalation, ingestion and skin absorption. LD_{50} 5620 mg/kg. TLV 1440 mg/m^3.
Storage: Organic #3 in a dedicated flammables cabinet. If one is not available then store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a. U-Listed (U012); purchase small amounts for effective inventory control.
Shelf Life: Good if stored safely.
Soluble: Slightly in water; soluble in many organic solvents.
Color and Odor: Colorless liquid with stronger and more pungent odor than acetone.
CAS No. 141-78-6
Technical Note for Biology Teachers: This substance has been suggested for use in insect morgues in lieu of other, more hazardous substances.

Ethyl Alcohol
absolute
not denatured
This is the alcohol that humans can consume. A federal and local license is required to sell such consumable alcohol. We do not have such a license and do not want to get one. If you need alcohol that contains no denaturant, go to your local liquor store and buy grain alcohol. It may be sold under another name, but what you are seeking is 100% pure grain alcohol. Store in a poison cabinet.

Ethyl Alcohol
reagent alcohol, anhydrous
specially denatured formulation 3A
plus 5% isopropyl alcohol

C_2H_5OH	**E0007**	500 mL	**$10.75**
F.W. 46.07	**E0008**	4 liters	**38.40**

★ **HAZARD ALERT:** Dangerous fire risk; flammable; addition of denaturant makes the product poisonous—it cannot be made non-poisonous. TLV 1880 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet. If a flammables cabinet is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #26b
Shelf Life: Excellent if stored safely.
Soluble: Miscible with water and many organic solvents.
Color and Odor: Colorless liquid with alcohol odor.
CAS No. 64-17-5

ETHYL ALCOHOL continued on next page.

Ethyl Alcohol *continued*

Safety Purchase Suggestion: Do not buy large quantities or large package sizes of ethyl alcohol unless you have safe and fire-resistant storage facilities on your school premises.

Ethyl Alcohol

anhydrous, ethanol
denatured with isopropyl alcohol and methanol
C_2H_5OH F.W. 46.07

E0012	500 mL	**$ 10.41**
E0013	4 liters	**37.74**

For hazard alert, storage, disposal, etc., see Ethyl Alcohol, E0007.
Color and Odor: Colorless liquid with alcohol odor.

Ethyl Alcohol

95% ethanol
denatured with isopropyl alcohol and methanol
C_2H_5OH F.W. 46.07

E0009	500 mL	**$ 8.27**
E0010	4 liters	**35.00/1 135.68/4**
E0011	20 liters	**157.60**

For hazard alert, storage, disposal, etc., see Ethyl Alcohol, E0007.
Color and Odor: Colorless liquid with alcohol odor.

Ethyl Alcohol

70% in water
denatured ethyl alcohol and water

E0030	500 mL	**$ 10.80**
E0031	4 liters	**29.25**

★ **HAZARD ALERT:** Toxic by ingestion.
Storage: Organic #2
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water and many common organic solvents.
Color and Odor: Colorless liquid with alcohol odor.

Organic Solvents for GC Analysis

Nine solvents—two alcohols, three esters, and four ketones—25 mL each, to do all of the experiments in the Vernier Mini GC lab manual! Solvents within each functional group class differ in the number of carbon atoms (CH_2 groups), giving rise to a progressive trend in boiling point and excellent separation by gas chromatography. Convenient set of solvents may also be used for boiling point or fractional distillation labs, qualitative analysis of organic functional groups, and identification of unknowns. Solvents include: methyl alcohol, ethyl alcohol, acetone, methyl ethyl ketone, methyl isobutyl ketone, 2-pentanone, ethyl acetate, propyl acetate, and butyl acetate. Requires a fume hood or well-ventilated area.

Catalog No.	Description	Price/Each
AP7480	Organic Solvents for GC Analysis	**$66.20**

Ethyl Alcohol (Burner Fuel, Safety)

Denatured ethyl alcohol with added sodium salt.
The added presence of the sodium causes the flame to be more visible, thus reducing the potential for accidental burns.

E0025	4 liters	**$40.40**

★ **HAZARD ALERT:** Dangerous fire risk; addition of denaturant makes the product poisonous—it cannot be made nonpoisonous.
Storage: Organic #2 in a dedicated flammables cabinet. If a flammables cabinet is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #26b
Shelf Life: Excellent if stored safely.
Soluble: Miscible with water and many organic solvents.
Color and Odor: Colorless liquid with alcohol odor.

Continued on next column.

Ethyl Alcohol (Burner Fuel, Safety) *continued*

Safety Purchase Suggestion: Do not buy large quantities or large package sizes of ethyl alcohol unless you have safe and fire-resistant storage facilities on your school premises.
Technical Note: *Never allow the use of duplicator fluid* for fueling alcohol burners. The products of combustion from duplicator fluids are extremely hazardous to your health and the health of your students.
Safer Alternative for Alcohol Burners: Consider acquiring portable gas burners that operate from small bottles of gas; see page 124. We suggest these portable gas burners are safer than alcohol burners. Yes, such burners are expensive, but if you calculate the real cost over the life of the burners, it may easily be equal to alcohol burners. A hot plate or these suggested gas burners are safer than alcohol burners.

Ethylenediaminetetraacetic Acid

EDTA
reagent, powder
$C_{10}H_{16}N_2O_8$ F.W. 292.25

E0017	100 g	**$19.20**

★ **HAZARD ALERT:** Toxic by ingestion.
Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in water; insoluble in most common organic solvents.
Color and Odor: White, odorless solid.
CAS No. 60-00-4

Ethylenediaminetetraacetic Acid, Disodium Salt

EDTA, disodium salt, dihydrate
reagent, powder
$C_{10}H_{14}N_2Na_2O_8 \cdot 2H_2O$ F.W. 372.25

E0019	100 g	**$20.00**

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; insoluble in most common organic solvents.
Color and Odor: White, odorless solid.
CAS No. 6381-92-6
Technical Note: The disodium salt is most convenient for the preparation of solutions for hard water analysis and is the most commonly used reagent. A 0.01 M disodium EDTA solution works well in this regard.

EDTA Solution

0.1 Molar
contains EDTA, disodium salt

E0059	500 mL	**$7.35**

Storage: Organic #1
Disposal: #26b
Shelf Life: Indefinite
Soluble: Aqueous solution; immiscible with nonpolar organic solvents.
Color and Odor: Colorless, odorless liquid.
Technical Note: Commonly used for hard water analysis and water softening experiments.

Ethylene Glycol

laboratory grade
$HOCH_2CH_2OH$ F.W. 62.07

E0020	500 mL	**$10.85**

★ **HAZARD ALERT:** Moderately toxic by ingestion, inhalation and skin absorption, but the ingestion of even small quantities can be lethal to some people. LD_{50} 4700 mg/kg. TLV 127 mg/m^3 as vapor and mist.
Storage: Organic #2
Disposal: #18b
Shelf Life: Substance is hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol, and acetone.
Color and Odor: Colorless liquid with auto anti-freeze odor.
CAS No. 107-21-1

Ethylenedinitrilotetraacetic Acid
see Ethylenediaminetetraacetic Acid

Ethyl Ether
see Ether, Ethyl

F

Ferric Ammonium Citrate
ammonium iron(III) citrate
(so called brown)
laboratory grade, powder

F0003 500 g **$47.50**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; substance deliquescent; affected by light; store in Flinn *Chem-Saf*™ Bag and then inside Flinn *Saf-Stor*™ Can.
Soluble: Water; not alcohol.
Color and Odor: Mustard, odorless solid.
CAS No. 1185-57-5

Ferric Ammonium Sulfate
ammonium iron(III) sulfate
reagent, crystal
$FeNH_4(SO_4)_2 \cdot 12H_2O$ **F0004** 100 g **$13.10**
F.W. 482.21

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance efflorescent; light sensitive; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: Light purple, odorless solid.
CAS No. 7783-83-7

Ferric(ous) Oxide
see Iron Oxide, Black

Ferric...Ferrous...
see Iron(III) and Iron(II)

Ferrofluid
See page 235

Ferrous Ammonium Sulfate
reagent grade, crystal
$Fe(NH_4)_2(SO_4)_2 \cdot 6H_2O$ **F0013** 100 g **$14.10**
F.W. 392.16 **F0014** 500 g **36.60**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 3250 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance deliquescent and affected by light; store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Soluble: Water; not alcohol.
Color and Odor: Light green, odorless solid.
CAS No. 7783-85-9

Foam
see Polyurethane Foam System

Food Coloring Dyes
Dye set **V0003** set **$7.75**
contains 0.25 oz. each of red, yellow, blue and green

Continued on next column.

Ethyl Ether
It's the end of the school year—have you checked the expiration date of your ethyl ether? We strongly recommend that ethyl ether not be stored for periods longer than 3 to 6 months. With age, ethyl ether may form explosive peroxides. If your ethyl ether is nearing its expiration date, dispose of it before leaving for the summer.

Food Coloring Dyes *continued*

Red food dye **V0006** 100 mL **$15.10**
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Various as above, odorless.

Food Dyes, FD&C
Set of seven
FD&C Red 3, Red 40, Yellow 5,
Yellow 6, Green 3, Blue 1 and Blue 2
AP7375 set **$48.95**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Varied colors; odorless.

Formalternate™, Concentrate
nonformaldehyde substitute
F0056* 500 mL **$25.20**

*Each 500 mL makes 5 liters of ready-to-use solution.
Storage: Organic #2
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Colorless odorless liquid.
Technical Note: Formalternate, F0056, can be used instead of formaldehyde for storage (not fixation) of biological specimens. F0056 is sold in concentrated form: Dilute 1 volume concentrate per 9 volumes water to make 10 volumes of solution. Complete use instructions are furnished. This solution is an alternative for formaldehyde for biological specimen storage only. It is not a chemical substitute.

Formic Acid
23 Molar **F0023** 500 mL **$29.95**
88% solution
ACS reagent
HCOOH
F.W. 46.03

★ **HAZARD ALERT:** Corrosive to skin and tissue; reacts violently with bases. Upon aging, decomposes to carbon monoxide and water thus creating potential explosive danger in a tightly sealed bottle. Explosions have occurred. Slightly toxic by ingestion and inhalation. LD_{50} 1100 mg/kg. TLV 9.4 mg/m^3.
Storage: Organic #1 in a dedicated acid cabinet; if one is not available store in a Flinn *Saf-Cube*™.
Disposal: #24a. U-Listed (U123); purchase small amounts for effective inventory control.
Shelf Life: Poor; research suggests it ages poorly and may be an explosion risk. Avoid extended storage.
Soluble: Water, alcohol, and ether.
Color and Odor: Colorless liquid with penetrating, strong vinegarlike odor.
CAS No. 64-18-6

Fructose
see Levulose

G

D-Galactose
anhydrous
$C_6H_{12}O_6$ **G0018** 100 g **$53.15**
F.W. 180.09

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Hot water and pyridine.
Color and Odor: White solid with malt odor.
CAS No. 59-23-4

Gallium
small pieces
Ga A.W. 69.72 **G0031** 2.5 g **$71.95**

Storage: Inorganic #1
Disposal: #27a
Shelf Life: Poor; moisture sensitive.
Soluble: Acid, alkali, and slightly in mercury.
Color and Odor: Silvery/white, odorless solid/liquid.
CAS No. 7440-55-3
Technical Note: Melting point is 29.8 °C; may be a liquid or fused solid.

Gases, Lecture Bottle
See individual listing in bottled gas section of Catalog and repeated under individual gas names (e.g., oxygen) in chemical listings.

Gelatin
laboratory grade, granular
medium Bloom **G0004** 500 g **$25.85**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Hot water; insoluble in most organic solvents.
Color and Odor: Buff solid with a faint, musty odor.
CAS No. 9000-70-8
Technical Note: Mix 25–30 g per liter of deionized water to make a firm gel.

Gelatin Capsules
see page 100

Gentian Violet
see Crystal Violet

Ghost Crystals
see page 301 in the Chemistry of Toys section

Gibberellic Acid
Gibberellin A_3
crystal
$C_{19}H_{22}O_6$ F.W. 346.41 **G0003** 1 g **$39.15**

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in water, methyl and ethyl alcohol and acetone; soluble in aqueous solution of sodium bicarbonate and sodium acetate.
Color and Odor: White, odorless solid.
CAS No. 77-06-5
Technical Note: See Technical Note under Gibberellic Acid, Potassium Salt for solution preparation instructions.

Glass Wool, Medium
G0023 454 g **$99.24**

★ **HAZARD ALERT:** Wear gloves when handling glass wool.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Insoluble except in hydrofluoric acid.

Glauber's Salt
see Sodium Sulfate

Glucose
For powder or granular material see Dextrose; for standard solutions of glucose see the glucose listings that follow this cross reference.

Glucose Solution
dextrose
standard solutions

1 mL = 10 mg	**G0024**	100 mL	**$10.95**
1 mL = 2 mg	**G0025**	100 mL	**11.35**
1 mL = 1 mg	**G0026**	100 mL	**11.35**

Continued on next column.

Glucose Solution *continued*

Storage: Organic #2
Disposal: #26b
Shelf Life: Poor; please acquire only small quantities since the shelf life is limited to one year once the bottle is opened.
Color and Odor: Colorless, odorless liquid.

Glucose-1-Phosphate, Disodium Salt
$C_6H_{11}Na_2O_9P \cdot 4H_2O$ F.W. 376.16 **G0005** 1 g **$59.00**

Storage: Organic #2
Disposal: #26a
Shelf Life: Good, if kept dry. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 56401-20-8

Glucose Test Strips
glucose test paper for urine sugar determination
package contains 100 test strips
T0004 1 pkg. **$25.49**

Storage: With test papers.
Disposal: #26a
Shelf Life: Indefinite

Glue, White
simple white glue
G0049 1 L **$15.35**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26a
Shelf Life: Fair
Soluble: Water
Color and Odor: White liquid with glue odor.

Glycerin
glycerol
$C_3H_5(OH)_3$
F.W. 92.10

ACS Reagent	**G0019**	100 mL	**$10.37**
for electrophoresis			
Laboratory grade	**G0007**	500 mL	**$14.46**
	G0008	4 liters	**97.48**

★ **HAZARD ALERT:** Some people are allergic to glycerin and may experience irritation to their skin and eyes. Contact with strong oxidants (chromium trioxide, potassium chlorate, potassium permanganate) may cause an explosion. LD_{50} 12600 mg/kg.
Storage: Organic #2
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water and alcohol; insoluble in some common organic solvents.
Color and Odor: Colorless, odorless liquid.
CAS No. 56-81-5

Glycerin Solution
15% v/v, aqueous solution
G0043 500 mL **$11.20**

For hazard alert, storage, disposal, etc., see Glycerin, G0007.

Glycerol
see Glycerin

Gram Iodine Solution
see Iodine Solution, Gram

What Does "Denatured" Mean When Describing Ethyl Alcohol?
A denaturant is added to ethyl alcohol to make it unfit for use as a beverage. Frequently, the denaturant added is methyl alcohol (wood alcohol), which is very toxic. Denatured alcohol is not subject to federal alcohol taxes for beverages. There are many formulations of denatured alcohol, but the goal is always the same—to make ethyl alcohol unfit for use as a beverage.

Graphite Powder

90–97% **G0010** 500 g **$32.00**

★ **HAZARD ALERT:** A fire risk as fine powder. TLV 2.5 mg/m^3.
Storage: Inorganic #4; store in a Flinn *Saf-Stor*™ Can.
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Gray/black, odorless solid.
CAS No. 7782-42-5

Guaiacol Solution, 0.2%

0.2% in isopropyl alcohol reducing agent for peroxidase enzyme activity studies forms orange product with hydrogen peroxide and peroxidase
G0054 100 mL **$10.45**

★ **HAZARD ALERT:** Flammable liquid, irritating to body tissues. Slightly toxic by ingestion and inhalation.
Storage: Organic #2 in a dedicated flammables cabinet. If a flammables cabinet is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a
Shelf Life: Good, if stored safely. Protect from heat and light.
Color and Odor: Colorless liquid, rubbing alcohol odor.

Guar Gum

laboratory grade, powder **G0040** 500 g **$31.45**
Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Buff solid with freshly cut grass odor.
CAS No. 39421-75-5
Technical Note: This material is most frequently used for preparing slime.

Gypsum

see Calcium Sulfate

H

Helium Gas

Lecture bottle	**LB1010**	2 cu. ft. (56 liters)	**$441.27**
Refillable cylinder	**LB1065**	3.6 cu. ft. (100 liters)	**$449.25**

★ **HAZARD ALERT:** Please do not allow students to inhale helium. Government health agencies and industrial safety representatives have taken strong stands against the practice of breathing helium to demonstrate the change in pitch that occurs when breathing a lighter-than-air gas. Breathing helium removes oxygen from the bloodstream, so it's not the same and actually worse than just "holding your breath."
Storage: In an area dedicated to bottled gases.
Disposal: Completely empty lecture bottle, then follow #26a.
Shelf Life: Indefinite
Soluble: Slightly in water; insoluble in alcohol.
Color and Odor: Colorless, odorless.
CAS No. 7440-59-7

n-Heptane

laboratory grade
C_7H_{16} **H0001** 500 mL **$41.00**
F.W. 100.21

★ **HAZARD ALERT:** Dangerous fire risk; flammable liquid; slightly toxic by inhalation. TLV 1640 mg/m^3.

Continued on next column.

Biological Chemicals

The catalase listing on this page is an example of how we provide more than just "bare bones" catalog copy that tells nothing about a substance except its name, package size and price. Flinn is the problem-solving supplier for biology teachers as well as chemistry teachers.

n-Hexane *continued*

Storage: Organic #3 in a dedicated flammables cabinet. If a flammables cabinet is not available, then store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Good if stored safely.
Soluble: Alcohol, ether, and chloroform; not water.
Color and Odor: Colorless liquid with paint thinner odor.
CAS No. 142-82-5

Hexamethylenediamine/Sodium Hydroxide Solution

for nylon demonstration
contains: hexamethylenediamine, 6 grams;
sodium hydroxide, 2 grams; distilled water, 100 mL;
red vegetable dye added to to give slight pink color.
H0032 100 mL **$8.75**

★ **HAZARD ALERT:** Slightly toxic by ingestion; corrosive to body tissue.
Storage: Organic #2
Disposal: #10
Shelf Life: Good
Color and Odor: Pink, odorless liquid.
Technical Note: You will need a second solution to prepare nylon. See sebacoyl chloride/hexane solution or adipoyl chloride/hexane solution for preparation of nylon.

n-Hexane

hexane
reagent grade, 95+%
$CH_3(CH_2)_4CH_3$ **H0058** 500 mL **$ 43.00/1**
F.W. 86.18 **250.26/6**

★ **HAZARD ALERT:** *Suspected teratogen.* Dangerous fire risk; highly flammable liquid and vapor. Causes skin irritation. Possible reproductive/fetility hazard. Narcotic at high concentrations; may cause drowsiness or dizziness; aspiration hazard if swallowed and enters airways. Chronic exposure to vapors may cause peripheral nervous system damage. Use only in a hood or well-ventilated area.
Storage: Organic #3 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Good if stored properly.
Soluble: Alcohol and ether; not miscible with water.
Color and Odor: Clear, colorless liquid with characteristic weak odor.
CAS No. 110-54-3
Technical Note: May cause damage to organs, including the reproductive system, through prolonged or repeated exposure. Do not breathe vapors, mist or spray. Use only in a hood or well-ventilated area.

Hexanes

mixture of n-hexane and other isomers
reagent grade
C_6H_{14} **H0046** 100 mL **$ 10.50**
F.W. 86.18 **H0002** 500 mL **15.70**
H0054 1 L **32.66**

★ **HAZARD ALERT:** Flammable liquid; dangerous fire risk; respiratory irritant. Possible reproductive/fetility hazard. TLV 176 mg/m^3.
Storage: Organic #3 in a dedicated flammables cabinet. If one is not available then store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Indefinite if stored safely.
Soluble: Acetone, alcohol, and ether; not water.
Color and Odor: Colorless liquid with paint thinner odor.
CAS No. 110-54-3

1,6-Hexanediamine

see Hexamethylenediamine

Hydrochloric Acid

12 Molar
ACS reagent
37 wt %
(sp. gr. = 1.19 at 20 °C)
HCl
F.W. 36.46

H0031	100 mL	**$ 10.47**
H0004	500 mL	**21.63**
H0005	2.5 liters	**37.60**
H0006*	2.5 liters	**53.00/1**
		310.20/6

(Packaged in PVC-coated bottle)

★ **HAZARD ALERT:** Highly toxic by ingestion or inhalation; severely corrosive to skin and eyes.

Storage: Inorganic #9 in a dedicated acid cabinet. If one is not available, store in a Flinn *Saf-Cube*™. See our special storage tip for additional information.

Cap Safety Color Code: Blue

Disposal: #24b

Shelf Life: Good if stored safely.

Soluble: Water

Color and Odor: Colorless liquid with very strong chlorine odor.

CAS No. 7647-01-0

Incompatability: Avoid storing hydrochloric acid anywhere in the vicinity of formaldehyde. A ***potent carcinogen,*** chloromethoxychloromethane, is formed when hydrochloric acid and formaldehyde react in air. This serious potential problem further emphasizes the need to store hydrochloric acid in a dedicated acid cabinet.

Safety Purchase Suggestion: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of hydrochloric acid and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.

*Hydrochloric acid is exactly as described under catalog number H0005 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are safely retained in a PVC outer envelope. The PVC-coated bottle is a safer package for science teachers.

SPECIAL STORAGE TIP: Hydrochloric acid fumes a lot—particularly when warm. These fumes are responsible for most of the corrosion damage in your acid storage area. To solve this problem, store hydrochloric acid bottle(s) in a tightly sealed plastic bag. ***Be sure*** to label the outside of the plastic bag since acid fumes will soon destroy the bottle label. Spray the label on the bottle with Krylon® plastic spray (AP1559, page 579) if you wish to preserve it.

Hydrochloric Acid, Gramolpak

(as HCl)

1 Molar	**H0039***	pkg.	**$17.10**
0.1 Molar	**H0042***	pkg.	**10.95**

For hazard alert, storage, disposal, etc., see Hydrochloric Acid, H0033.

*Gramolpak™ is a unique package that makes 1 liter with distilled water.



Hydrochloric Acid Solution

6 Molar	**H0033**	500 mL	**$ 10.87**
	H0056	1 L	**17.35**
3 Molar	**H0034**	500 mL	**10.80**
1 Molar	**H0013**	500 mL	**7.80**
	H0057	1 L	**12.90**
0.5 Molar	**H0035**	500 mL	**9.53**
0.25 Molar	**H0041**	500 mL	**9.29**
0.15 Molar	**H0036**	500 mL	**8.80**
0.1 Molar	**H0014**	500 mL	**8.33**

★ **HAZARD ALERT:** Toxic by ingestion or inhalation; severely corrosive to skin and eyes.

Storage: Inorganic #9 in a dedicated acid cabinet.

Disposal: #24b

Shelf Life: Good

Color and Odor: Colorless liquid with slight hydrochloric acid odor.

Hydrogen Gas

Lecture bottle	**LB1015**	2 cu. ft. (56 liters)	**$295.30**
Refillable cylinder	**LB1070**	3.6 cu. ft. (100 liters)	**$437.00**

★ **HAZARD ALERT:** Highly flammable gas; severe fire hazard.

Storage: In an area dedicated to bottled gases and *away from any source of heat or flame.*

Disposal: Completely empty lecture bottle in a good operating fume hood, then follow #26a.

Shelf Life: Indefinite if stored safely.

Soluble: Slightly in water, alcohol, and ether.

Color and Odor: Colorless, odorless.

CAS No. 1333-74-0

Hydrogen Peroxide

H_2O_2
F.W. 34.02

30% Reagent	**H0037**	100 mL	**$14.40**
(stabilized)	**H0008**	500 mL	**35.50**
6%	**H0028**	500 mL	**$ 10.55**
laboratory grade	**H0029**	3.8 liters	**29.90**
3%	**H0009**	473 mL	**$ 6.35**
laboratory grade	**H0038**	3.8 liters	**21.24**

★ **HAZARD ALERT:** 30% hydrogen peroxide requires special storage and handling procedures. It is a *very strong oxidizing agent* and *severely corrosive* to skin, eyes and respiratory tract. Many common substances, including iron and other transition metals, will catalyze the decomposition to produce copious amounts of oxygen gas and heat. The 30% solution is a dangerous fire and explosion risk—do not heat. Wear appropriate protective clothing. TLV 1.4 mg/m^3. Dilute 3% and 6% hydrogen peroxide solutions are weak oxidizers and skin and eye irritants.

Storage: Inorganic #6. We frequently find 30% hydrogen peroxide stored in school refrigerators. We do not recommend storing any laboratory chemicals in household-type refrigerators.

Disposal: #22a

Shelf Life: Fair to poor; when stored at room temperature, the substance decomposes at approximately 0.5% per year.

Soluble: Water and alcohol.

Color and Odor: Colorless, odorless liquid.

CAS No. 7722-84-1

Hydroxylamine Hydrochloride

laboratory grade, crystal
$H_2NOH \cdot HCl$ **H0019** 100 g **$19.80**
F.W. 69.50

★ **HAZARD ALERT:** Highly toxic by ingestion; strong tissue irritant. LD_{50} 141 mg/kg. Incompatible with sodium hydroxide and other strong bases; reacts to form hydroxylamine, which may explode when heated.

Storage: Organic #2

Disposal: #26a

Shelf Life: Slowly decomposes when moist. Keep cool and dry.

Soluble: Water; glycerol, and alcohol; insoluble in ether.

Color and Odor: White, odorless solid.

CAS No. 5470-11-1

How to Neutralize a Base Spill

The common answer is to use vinegar to neutralize a base spill. Don't do it. You will have to add gallons of vinegar, and this will only make the spill larger. Use anhydrous citric acid powder. It has three acid groups for neutralization, low toxicity and is easily poured onto a spill. Keep a supply of citric acid powder on hand any time you are working with bases. See page 578 for a complete listing of spill control materials.

I

Immersion Oil
R.I. 1.515, PCB free

Low viscosity	**I0051**	0.5 oz	**$13.50**
150 CS	**I0052**	1 oz	**21.00**
High viscosity	**I0054**	1 oz	**$78.00**
1250 CS			

Storage: Organic #3
Disposal: #18b
Shelf Life: Indefinite
Soluble: Insoluble in water.
Color and Odor: Colorless or slightly pale yellow, odorless oil.
Technical Note: Packaged in squeezable dropper-type bottles. Both oils meet or exceed DIN standards and are nondrying and nonhardening. Use low viscosity between the objective and slide; use high viscosity between the condenser and slide.

1,2,3-Indantrione Monohydrate
see Ninhydrin

Indicators
see individual listings or chart

Indigo Carmine
indicator and stain
pH 11.6 blue to 13.0 yellow
$C_{16}H_8N_2Na_2O_8S_2$ **I0022** 10 g **$15.70**
F.W. 466.37

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant. LD_{50} 2000 mg/kg.
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and slightly in alcohol.
Color and Odor: Violet, odorless solid.
CAS No. 860-22-0
C.I. #73015
Technical Note: To make a 0.25% solution, add 0.25 g of indigo carmine to 100 mL of 50% ethyl alcohol. Prepare fresh for use; solution does not store well. Color of the solution fades on standing.

Indole-3-Acetic Acid
reagent grade
$C_8H_6NCH_2COOH$ **I0002** 5 g **$48.80**
F.W. 175.19

Continued on next column.

Indole-3-Acetic Acid *continued*

Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Alcohol and ether; insoluble in water and chloroform.
Color and Odor: Light pink, odorless solid.
CAS No. 87-51-4
Technical Note: Use a 1.0–8.0 mg/L solution as a plant growth hormone.

Indophenol, Sodium Salt
see Dichloroindophenol, Sodium Salt

Ink, Black
can be used for chromatography
water soluble **I0028** 2-oz. bottle **$17.48**

Storage: Miscellaneous nonhazardous organic material.
Soluble: Water
Color and Odor: Black, odorless.

Instant Light
see Chemical Demonstration Kits, page 232

Iodine
resublimed
I_2
F.W. 253.81

Reagent	**I0006**	25 g	**$22.41**
crystals	**I0007**	100 g	**51.55**
Laboratory grade	**I0060**	100 g	**$46.35**
granules			

(All above sizes are packaged in wax-sealed, PVC-coated bottles)

★ **HAZARD ALERT:** Toxic by ingestion or inhalation. Reacts violently with reducing materials, sulfur, iron, alkali metals, metal powders and phosphorus. Irritates the skin; corrosive to eyes and respiratory tract. TLV 1.0 mg/m^3.
Storage: Inorganic #2
Disposal: #12a
Shelf Life: Fair; the substance sublimes. Reacts with and corrodes metal shelves or metal containers. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Many organic solvents; not water.
Color and Odor: Black/purple solid with unique, acrid odor.
CAS No. 7553-56-2
Technical Note: Iodine may be removed from clothing by washing the stain with a 10% solution of sodium thiosulfate and then rinsing with water.

Indicators, pH Ranges

Indicator	Flinn Catalog Nos.	pH Range	Color Change
Bromcresol Green	**B0040**	3.8–5.4	yellow to blue
Bromphenol Blue	**B0044**	3.0–4.6	yellow to purple
Bromthymol Blue	**B0046**	6.0–7.6	yellow to blue
Congo Red	**C0120**	3.0–5.0	blue to red
Crystal Violet	**C0125**	0–1.8	yellow to violet-blue
Indigo Carmine	**I0022**	11.6–13.0	blue to yellow
Malachite Green Oxalate	**M0129**	0.0–2.0 & 11.6–14.0	yellow to green blue-green to colorless
Methyl Orange	**M0076**	3.0–4.4	red to yellow
Methyl Red	**M0081**	4.4–6.2	red to yellow

Indicator	Flinn Catalog Nos.	pH Range	Color Change
p-Nitrophenol	**N0073**	5.6–7.6	colorless to yellow
Phenol Red	**P0188**	6.8–8.4	yellow to red
Phenolphthalein	**P0017, P0018, P0193, P0276**	8.2–10.0	colorless to pink
Thymol Blue	**T0025**	1.2–2.8 & 8.0–9.2	red to yellow yellow to blue
Thymolphthalein	**T0073**	9.3–10.5	colorless to blue
Universal Indicator	**U0001, U0002, U0009, U0011**	4–10	chart necessary
Universal Indicator, Rainbow Acid	**U0012**	1–7	chart necessary
Universal Indicator, Red Cabbage Extract	**U0014**	2–11	chart necessary

See individual indicator listings in alphabetical sequence in the chemical section of this catalog/reference manual. In many cases, the listing includes ready-made solutions of these indicators.

Iodine, Tincture

contains potassium iodide, iodine, water and ethyl alcohol

	I0009	100 mL	$ 9.40
	I0035	500 mL	25.15

(Both sizes packaged in PVC-coated bottles)

★ **HAZARD ALERT:** Contains ethyl alcohol; toxic by ingestion and inhalation; flammable liquid.
Storage: Inorganic #2, store as a flammable liquid.
Disposal: #12a
Shelf Life: Good, if stored safely.
Color and Odor: Brown/black liquid with iodine and alcohol odor.

Iodine Solution

iodine-iodide

0.1 Molar	I0039	500 mL	$19.56
0.05 Molar	I0048	100 mL	$ 10.23
	I0023	500 mL	17.15

★ **HAZARD ALERT:** Irritating to eyes and skin.
Storage: Inorganic #2
Disposal: #12a
Shelf Life: Fair to poor; store away from heat and direct light.
Color and Odor: Brown/red liquid with iodine odor.

Iodine–Potassium Iodide Solution

test solution for starch

	I0038	100 mL	$ 8.30
	I0027	500 mL	12.05

★ **HAZARD ALERT:** Irritating to eyes and skin.
Storage: Inorganic #2
Disposal: #12a
Shelf Life: Fair to poor; store away from heat and direct light.
Color and Odor: Amber liquid with slight iodine odor.
Technical Note: Turns purple in the presence of starch.

Iodine Solution, Gram

staining solution	G0036	100 mL	$7.65
iodine-iodide	G0009	500 mL	12.75

For hazard alert, storage, disposal, etc., see Iodine–Potassium Iodide Solution, I0038.
Color and Odor: Brown liquid with iodine odor.

Iodine Solution, Lugol's

Weigert's, vital stain solution

iodine-iodide	I0036	100 mL	$ 8.24
	I0010	500 mL	16.50

For hazard alert, storage, disposal, etc., see Iodine–Potassium Iodide Solution, I0038.
Color and Odor: Brown liquid with iodine odor.

Ion Exchange Resin

Ion Exchange Resin SBA	I0034	500 g	$196.24

strongly basic anion exchange resin, Dowex® 2-X8 20–50 mesh

Ion Exchange Resin SAC	I0043	100 g	$91.25

strongly acidic cation exchange resin, Dowex® 50X8 50–100 mesh

Storage: Miscellaneous organic.
Disposal: #26a
Shelf Life: Excellent
Color and Odor: Buff or brown, odorless solid.

Iron, Filings

fine, 65 mesh
Fe, A.W. 55.85

Pure iron	I0011	500 g	$ 9.70
	I0012	2 kg	29.50
Non-rusting alloy	I0059	500 g	$12.65

IODINE SOLUTION, GRAM continued on next page.

Iron, Filings *continued*

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Sulfuric, hydrochloric, and cold, dilute nitric acids.
Color and Odor: Gray/black, odorless solid.
CAS No. 7439-89-6
Technical Note: Pure iron filings quickly oxidize (rust) and can be messy. Flinn's iron alloy metal filings act just like iron filings for magnetism experiments, but resist oxidation. Use pure iron filings for iron sulfide or other chemistry experiments.

Iron, Galvanized

28 gauge, 2.5" square pieces

	I0064	pkg./5	$10.60

For storage, disposal, etc., see Iron, Sheet, I0015.

Iron, Nails

3" long, 10 penny nongalvanized steel	I0032	1 lb	$8.30

For storage, disposal, etc., see Iron, Sheet, I0015.

Iron, Powder

Laboratory grade	I0014	500 g	$17.50

★ **HAZARD ALERT:** Metals in fine powder form present a serious fire and explosion risk.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Good if kept dry and protected from fire. Store in a Flinn *Saf-Stor*™ Can.
Soluble: Sulfuric, hydrochloric and cold, dilute nitric acids.
Color and Odor: Gray, odorless solid.
CAS No. 7439-89-6

Iron, Sheet

mild steel

12" x 12" x 0.024", B&S gauge #24	I0015	each	$12.60

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Excellent
Color and Odor: Gray, odorless solid.

Iron, Strips

mild steel, 6" x ½" x 0.024"	I0058	pkg./10 strips	$9.35

For storage, disposal, etc., see Iron, Sheet, I0015.

Iron, Wire

wire, 18 gauge

1.2 mm diameter	I0050	25 g	$11.60
(100 cm = 8.8 g)	I0062	100 g	37.20

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Excellent
Color and Odor: Gray, odorless solid.
CAS No. 7439-89-6

Preparing an Iodine Solution?

Iodine crystals are not directly soluble in water, which is why most water-based iodine solutions call for potassium iodide as an ingredient. Iodine is soluble in potassium iodide solutions. As a general rule, start with approximately one-fourth of the final volume of water and add the required amount of potassium iodide. Once the potassium iodide has dissolved, add the iodine crystals. Stir until completely dissolved and bring the solution up to its final volume. Iodine solutions should be prepared under a fume hood.

Iron Oxide, Black

iron(II, III) oxide, ferric ferrous oxide, triiron tetraoxide, black iron oxide
laboratory grade, powder

Fe_3O_4	**F0012**	500 g	**$19.30**
F.W. 231.54			

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: In acids; not water.
Color and Odor: Black, odorless solid.
CAS No. 1317-61-9

Iron(II) Ammonium Sulfate

see Ferrous Ammonium Sulfate

Iron(II)...Ferrous... Iron compounds in which the iron has an ionic charge or oxidation number of two.

Iron(II) Chloride

ferrous chloride
reagent grade, crystal

$FeCl_2 \cdot 4H_2O$	**F0041**	25 g	**$14.95**
F.W. 198.81	**F0015**	100 g	**30.85**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; substance deliquescent and easily oxidized; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: Pea green solid with slight chlorine odor.
CAS No. 13478-10-9

Iron(II) Sulfate

ferrous sulfate
laboratory grade, granular

$FeSO_4 \cdot 7H_2O$	**F0016**	500 g	**$13.35**
F.W. 278.03			

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} (mouse) 1520 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance efflorescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: Light green, odorless solid.
CAS No. 7782-63-0

Iron(II) Sulfide

ferrous sulfide
laboratory grade, lump
H_2S generating

FeS	**F0042**	100 g	**$30.25**
F.W. 87.91			

★ **HAZARD ALERT:** Contact with acid liberates poisonous hydrogen sulfide gas; ***do not dispose of the product down a drain that might contain acid.*** Hydrogen sulfide gas is toxic and flammable.
Storage: Inorganic #5
Disposal: #26a

Continued on next column.

Before a Lab Even Starts

Many safety-conscious science teachers require students to pass a prelab quiz before starting any lab activity. The prelab quiz encourages students to understand laboratory and safety procedures before they even start. According to a recent teacher survey, the number-one reason for accidents in the science lab was "students' failure to carefully read and understand laboratory activity instructions." A prelab quiz may help solve this problem.

Shelf Life: Must be stored away from any source of moisture and away from any acid; store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Soluble: Acids; not water.
Color and Odor: Metallic gray, odorless solid.
CAS No. 1317-37-9

Iron(III)...Ferric... Iron compounds in which the iron has an ionic charge or oxidation number of three.

Iron(III) Ammonium Citrate

see Ferric Ammonium Citrate

Iron(III) Ammonium Sulfate

see Ferric Ammonium Sulfate

Iron(III) Chloride

ferric chloride
reagent, lump

$FeCl_3 \cdot 6H_2O$	**F0006**	100 g	**$12.45**
F.W. 270.32	**F0007**	500 g	**24.50**

★ **HAZARD ALERT:** Skin and tissue irritant; corrosive; slightly toxic by ingestion.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and other common organic solvents.
Color and Odor: Mustard solid with slight chlorine odor.
CAS No. 10025-77-1

Iron(III) Chloride Solution

(as $FeCl_3 \cdot 6H_2O$)

1.0 Molar	**F0069**	100 mL	**$ 10.55**
0.1 Molar	**F0045**	500 mL	**12.20**

★ **HAZARD ALERT:** May be skin and body tissue irritant.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Amber, odorless liquid.

Iron(III) Nitrate

ferric nitrate
reagent, crystal

$Fe(NO_3)_3 \cdot 9H_2O$	**F0008**	100 g	**$12.00**
F.W. 404.00	**F0009**	500 g	**22.10**

★ **HAZARD ALERT:** Strong oxidizer; skin and tissue irritant. LD_{50} 3250 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Fair to poor—deliquescent; Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: Light violet solid with slight nitric acid odor.
CAS No. 7782-61-8
Technical Note: Because of the poor shelf life of this chemical, we recommend purchasing prepared solutions whenever possible.

Iron(III) Nitrate Solution

(as $Fe(NO_3)_3 \cdot 9H_2O$)

0.2 Molar	**F0046**	500 mL	**$10.30**
0.1 Molar	**F0047**	500 mL	**9.35**

★ **HAZARD ALERT:** Skin and body tissue irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Amber, odorless liquid.

Iron(III) Nitrate Solution, Acidified

ferric nitrate plus nitric acid
for use in iron–thiocyanate complex ion equilibrium constant labs

0.2 Molar	**F0048**	500 mL	**$18.85**

★ **HAZARD ALERT:** Corrosive liquid; solution is 0.6 M in nitric acid.
Storage: Inorganic #3
Disposal: #24b
Shelf Life: Fair
Color and Odor: Very faint yellow to colorless; odorless.

Iron(III) Oxide

ferric oxide, hematite
reagent grade, powder

Fe_2O_3	**F0010**	500 g	**$22.85**
F.W. 159.69			

★ **HAZARD ALERT:** Skin, eye and respiratory irritant.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: In acids; not water.
Color and Odor: Rust, odorless solid.
CAS No. 1309-37-1
Technical Note: See Iron Oxide, Black, for the mixed iron(II, III) oxide, Fe_3O_4, also known as magnetite.

Iron(III) Sulfate

ferric sulfate
reagent grade, powder

$Fe_2(SO_4)_3 \cdot 7H_2O$	**F0031**	100 g	**$22.10**
F.W. 399.89 (as $Fe_2(SO_4)_3$)			

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; hygroscopic; keep tightly closed and protected from light; store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Soluble: Water
Color and Odor: Buff, odorless solid.
CAS No. 15244-10-7
Technical Note: Iron(III) sulfate has approximately 20% water content.

Isoamyl Alcohol

see Isopentyl Alcohol

Isobutyl Alcohol

2-methyl-1-propanol
reagent grade

$(CH_3)_2CHCH_2OH$	**I0017**	500 mL	**$20.05**
F.W. 74.12			

★ **HAZARD ALERT:** Flammable; slightly toxic; skin, eye, and respiratory irritant. LD_{50} 2460 mg/kg. TLV 152 mg/m^3.
Storage: Organic #2. Substance attacks plastic containers. Store in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b. U-Listed (U140); purchase small amounts for effective inventory control.
Shelf Life: Indefinite
Soluble: Alcohol and ether; partially in water.
Color and Odor: Colorless liquid with strong, alcohol-like odor.
CAS No. 78-83-1

Isopentyl Alcohol

isoamyl alcohol
reagent grade

$(CH_3)_2CHCH_2CH_2OH$	**I0031**	100 mL	**$19.05**
F.W. 88.15	**I0018**	500 mL	**44.80**

★ **HAZARD ALERT:** Slightly toxic by ingestion and inhalation; moderate fire risk; may form explosive peroxides, do not distill to dryness. LD_{50} 1300 mg/kg. TLV 361 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b

Continued on next column.

Isopentyl Alcohol *continued*

Shelf Life: Poor. May form explosive peroxides. Avoid prolonged storage.
Soluble: Slightly in water; miscible with alcohol and ether.
Color and Odor: Colorless liquid with strong, disagreeable, alcohol-like odor.
CAS No. 123-51-3

Isopropyl Alcohol

2-propanol, isopropanol
reagent grade, 99% purity

$(CH_3)_2CHOH$	**I0019**	500 mL	**$ 9.86**
F.W. 60.10	**I0020**	4 liters	**57.00/1**
			224.64/4

★ **HAZARD ALERT:** Flammable liquid; fire hazard; slightly toxic by ingestion and inhalation. LD_{50} 5045 mg/kg. TLV 983 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet. If a flammables cabinet is not available store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a
Shelf Life: Fair. May form explosive peroxides; avoid prolonged storage and do not distill to dryness. If in doubt about the age or condition of your isopropyl alcohol, do not use.
Soluble: Water, alcohol, and ether.
Color and Odor: Colorless liquid with rubbing alcohol odor.
CAS No. 67-63-0

Isopropyl Alcohol

70% rubbing alcohol	**I0021**	500 mL	**$ 10.10**
laboratory grade	**I0037**	4 liters	**52.50**

★ **HAZARD ALERT:** Moderate fire risk; flammable liquid; slightly toxic by ingestion and inhalation.
Storage: Organic #2 in a dedicated flammables cabinet. If a flammables cabinet is not available store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a
Shelf Life: Fair
Soluble: Water
Color and Odor: Colorless liquid with rubbing alcohol odor.

J

Janus Green B

biological stain (supravital stain)	**J0001**	5 g	**$44.80**

Storage: Organic #9
Disposal: #5
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Black/green, odorless solid.
CAS No. 2869-83-2
C.I. #11050

K

Kastle-Meyer Reagent

Used with hydrogen peroxide as a presumptive test for blood. Contains: ethyl alcohol, sodium hydroxide, phenolphthalein and zinc.

	AP7555	100 mL	**$13.25**

★ **HAZARD ALERT:** Alcohol solution; flammable liquid. Dilute sodium hydroxide is irritating to body tissues.
Storage: Organic #9
Disposal: #10
Shelf Life: Fair to poor.
Color and Odor: Pale gray, peach or yellow solution. Faint alcohol odor.

The Package Can Be Dangerous!

The low bid supplier may not always be the better choice. While you may save money on the front end, inappropriate packaging may cause special hazards. Always rely on Flinn for safe packaging and handling and disposal guidelines.

Kerosene
lamp oil
Odorless **K0002** 500 mL **$12.90**

★ **HAZARD ALERT:** Moderate fire risk; moderately toxic by ingestion, inhalation and skin absorption; skin and eye irritant. LD_{50} (rabbit) 2835 mg/kg.
Storage: Organic #3 preferably in a flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Excellent if stored safely.
Soluble: Many organic solvents.
Color and Odor: Liquid with slight oil odor.
CAS No. 8008-20-6

L

Laboratory Cleaners
see Cleaners

Lactose
laboratory grade, powder
$C_{12}H_{22}O_{11} \cdot H_2O$ **L0002** 500 g **$17.70**
F.W. 360.31
Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; insoluble or only slightly soluble in many organic solvents.
Color and Odor: White, odorless solid.
CAS No. 64044-51-5

Lampblack
see Charcoal

Lanolin
wool fat, anhydrous
laboratory grade **L0003** 500 g **$35.90**
Storage: Organic #3
Disposal: #26a
Shelf Life: Good if kept cool and dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Many organic solvents; insoluble in water.
Color and Odor: Yellowish solid with shoe polish odor.
CAS No. 8006-54-0

Latex
liquid, compounded **L0110** 1 liter **$33.20**

★ **HAZARD ALERT:** Possible allergen and skin irritant.
Storage: Organic #3
Disposal: #26b
Shelf Life: Fair; will turn pink if exposed to light.
Soluble: Most common organic solvents.
Color and Odor: White or light pink liquid; slight ammonia odor.
Technical Note: Compounded latex has additives that prevent discoloration, aging, and deterioration.

Laundry Bluing
see Bluing, Laundry

Hazardous Shipping Fee
Certain items sold by Flinn are classified as hazardous materials by the U.S.. Department of Transportation and therefore require special handling to ensure safe transport. A flat fee of $32 per order is added to cover these handling requirements and such items can only be shipped to schools, museums and science centers.

Lauric Acid
dodecanoic acid
laboratory grade, flake
$CH_3(CH_2)_{10}COOH$ **L0052** 100 g **$12.30**
F.W. 200.32 **L0044** 500 g **20.85**
M.P. 43–45 °C
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Insoluble in water; soluble in ether and benzene.
Color and Odor: White solid with candle wax odor.
CAS No. 143-07-7

Lauryl Alcohol
see Dodecyl Alcohol

Lead, Foil
Pb **L0109** 250 g **$34.85**
A.W. 207.19 (3" x 70")
0.006" thick

★ **HAZARD ALERT:** *Probable carcinogen.* Possible reproductive/fertility hazard.
Storage: Inorganic #1
Disposal: #27d
Shelf Life: Indefinite
Soluble: Dilute nitric acid; not water.
Color and Odor: Silvery/gray, odorless solid.
CAS No. 7439-92-1

Lead, Sheet
1/32" thick **L0072** 500 g **$23.45**
(6" x 14")

For hazard alert, storage, disposal, etc., see Lead, Foil, L0109.
Color and Odor: Gray, odorless solid.

Lead, Shot
Approx. 2 mm diam. **L0090** 250 g **$17.95**
L0008 500 g **24.35**

For hazard alert, storage, disposal, etc., see Lead, Foil, L0109.
Color and Odor: Gray, odorless solid.

Lead, Strips
15 x 1 cm, 0.8 mm thick
L0065 pkg./6 **$10.35**

For hazard alert, storage, disposal, etc., see Lead, Foil, L0109.
Color and Odor: Gray, odorless solid.

Lead Acetate
lead(II) acetate
laboratory grade, flake
$Pb(C_2H_3O_2)_2 \cdot 3H_2O$ **L0010** 500 g **$24.00**
F.W. 379.34

★ **HAZARD ALERT:** *Probable carcinogen;* eye, skin and respiratory irritant; slightly toxic. Possible reproductive/fertility hazard. *Avoid dispersing, breathing or inhaling dust.* LD_{50} 4665 mg/kg.
Storage: Inorganic #2
Disposal: #27f. U-Listed (U144); purchase small amounts for effective inventory control.
Shelf Life: Fair to poor; absorbs carbon dioxide when exposed to air, becoming insoluble in water. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, glycerin and slightly in alcohol.
Color and Odor: White solid with strong vinegar odor.
CAS No. 6080-56-4

Lead Chloride
lead(II) chloride
reagent, powder
$PbCl_2$ **L0011** 250 g **$28.20**
F.W. 278.12

★ **HAZARD ALERT:** *Probable carcinogen.* Moderately toxic by inhalation and ingestion. Possible reproductive/fertility hazard.

LEAD CHLORIDE continued on next page.

Lead Chloride *continued*

Storage: Inorganic #2 in a Flinn *Chem-Saf*™ Bag.
Disposal: #27f
Shelf Life: Indefinite
Soluble: Slightly in hot water; insoluble in cold water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 7758-95-4

Lead Nitrate

lead(II) nitrate
$Pb(NO_3)_2$
F.W. 331.20

Reagent	**L0014**	100 g	**$ 10.95**
crystal	**L0015**	500 g	**23.95**
Laboratory grade	**L0060**	500 g	**$21.20**

★ **HAZARD ALERT:** *Possible carcinogen.* Moderately toxic by inhalation and ingestion; strong oxidant; dangerous fire risk in contact with organic material; body tissue irritant. Possible reproductive/fertility hazard.
Storage: Inorganic #3
Disposal: #27f
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White solid with slight nitric acid odor.
CAS No. 10099-74-8

Lead Nitrate Solution

(as $Pb(NO_3)_2$)

1 Molar	**L0067**	500 mL	**$11.35**
0.5 Molar	**L0068**	500 mL	**10.85**
0.1 Molar	**L0069**	500 mL	**11.00**

For hazard alert, storage, disposal, etc., see Lead Nitrate, L0014.
Color and Odor: Clear, odorless liquid.

Lectin

mitosis activator (AP® Biology Investigation 7)
lyophilized powder extracted from red kidney beans

	L0114	10 mg	**$42.85**

★ **HAZARD ALERT:** Hemolytic; agglutinates human red blood cells. Use with appropriate personal protective equipment to limit exposure.
Storage: Organic miscellaneous.
Disposal: #26a
Shelf Life: Poor; keep frozen until use.
Soluble: Water
Color and Odor: White, odorless solid.
Technical Note: Typical concentration is 10 mg/200 mL. Refrigerate solution and use within one week.

Lemon Juice

	L0042	15 oz	**$8.95**

Storage: Organic #1
Disposal: #26b
Shelf Life: Limited; keep cool after opening.
Soluble: Water
Color and Odor: Yellow liquid with lemon odor.

Levulose

D-fructose
laboratory grade, crystal

$C_6H_{12}O_6$	**L0020**	100 g	**$ 10.35**
F.W. 180.16	**L0074**	500 g	**26.85**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water, alcohol, and ether.
Color and Odor: White, odorless solid.
CAS No. 57-48-7

Light Sticks

see pages 166, 301 and 384

Lime, Slaked

see Calcium Hydroxide

Limewater Solution

calcium hydroxide saturated solution

140 mg/100 mL	**L0021**	500 mL	**$ 6.15**
	L0022	4 liters	**13.45**

Storage: Inorganic #4
Disposal: #10
Shelf Life: Fair to poor; absorbs carbon dioxide from air. Keep your container tightly closed.
Color and Odor: Clear and colorless if left undisturbed, odorless.
Technical Note: Use for detecting carbon dioxide gas. The solution always contains some undissolved calcium hydroxide.

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Lipase

enzyme, powder **L0056** 25 g **$36.00**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Buff solid with decaying flesh odor.

Liqui-Nox®

see Cleaners

Lithium

sticks

Li	**L0057**	2.5 g	**$24.06**
A.W. 6.94	**L0024**	10 g	**45.60**

(Both sizes packaged under mineral oil in plastic bottles and then in a metal can for safer storage)

★ **HAZARD ALERT:** Dangerous; water-reactive; explosion risk; flammable solid. Use a Class D fire extinguisher or have a generous supply of dry sand to use as a fire extinguisher. Corrosive to skin, eyes and respiratory tract.
Storage: Inorganic #1 under dry kerosene or dry oil. Store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Disposal: #3
Shelf Life: Indefinite if stored safely. Do not store or use near water.
Soluble: In water and acids, releasing hydrogen gas.
Color and Odor: Silver/white, odorless solid.
CAS No. 7439-93-2

Lithium Carbonate

laboratory grade, powder

Li_2CO_3	**L0025**	100 g	**$26.00**
F.W. 73.89			

LITHIUM CARBONATE continued on next page.

Chemicals in Refrigerators

We commonly find flammables (like ether) and 30% hydrogen peroxide in school science department refrigerators. Found along with these items are lunches, apples and open cans of soda pop. Unless your school refrigerator is designed specifically for the storage of flammables, keep chemicals out of the refrigerator. Remember that sparking bimetallic switches activate both the refrigerator's compressor and internal light.

Lithium Carbonate *continued*

★ **HAZARD ALERT:** *Possible teratogen;* strong base when dissolved in water; substance is corrosive to eyes and respiratory tract. Possible reproductive/fertility hazard. Moderately toxic. LD_{50} 525 mg/kg.
Storage: Inorganic #4
Disposal: #10
Shelf Life: Poor; substance hygroscopic.
Soluble: Slightly in water; insoluble in alcohol; soluble in dilute acid.
Color and Odor: White, odorless solid.
CAS No. 554-13-2

Lithium Chloride

reagent grade, granular	**L0095**	50 g	**$15.03**
LiCl	**L0026**	100 g	**28.80**
F.W. 42.40	**L0075**	500 g	**102.00**

★ **HAZARD ALERT:** Moderately toxic by ingestion. LD_{50} 526 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance deliquescent; one of the most hygroscopic substances; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol.
Color and Odor: White, odorless solid.
CAS No. 7447-41-8

Lithium Chloride Solution

1 Molar

(as LiCl)	**L0096**	500 mL	**$9.00**

For storage, disposal, etc., see Lithium Chloride, L0095.
Color and Odor: Colorless, odorless liquid.

Lithium Nitrate

reagent grade, crystal			
$LiNO_3$	**L0097**	50 g	**$15.85**
F.W. 68.95	**L0027**	100 g	**25.15**

★ **HAZARD ALERT:** Strong oxidizer. Risk of explosion when heated with organic vapors. Body tissue irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Fair—deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 7790-69-4

Lithium Nitrate Solution

0.5 Molar

(as $LiNO_3$)	**L0071**	500 mL	**$11.90**

Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Lithium Sulfate

reagent grade, crystal			
$Li_2SO_4 \cdot H_2O$	**L0040**	100 g	**$46.55**
F.W. 127.96			

★ **HAZARD ALERT:** Slightly toxic. LD_{50} (for anhydrous salt) 613 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 10102-25-7

No Food in the Laboratory

There may be many food-grade items among the laboratory chemicals on the shelves in the chemical storeroom. Sugar, corn syrup and lemon juice are just a few examples. Each time one of these substances is used in the laboratory, take that occasion to reinforce the fact that in the lab setting, it is a chemical. Food is never consumed in a laboratory. Is it time to say goodbye to the coffee pot in the lab? You set the example!

Litmus Papers

see Test Papers, beginning on page 193

Litmus Solution

0.5% aqueous indicator solution	**L0028**	500 mL	**$17.15**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite if kept tightly closed. Store in a Flinn *Chem-Saf*™ Bag.
Color and Odor: Blue or amber liquid with cabbagelike odor.
Technical Note: Litmus solution may be either amber (pH <7) or blue (pH >7) depending on the pH of the solution.

Loeffler's Bacterial Stain

see Methylene Blue Solution, Loeffler's

Lugol's Iodine Solution

see Iodine Solution, Lugol's

Lull-A-Fly™

triethylamine with a scent added	**FB1438**	vial	**$13.65**

★ **HAZARD ALERT:** Flammable liquid; moderately toxic by ingestion and inhalation; use only in a *well-ventilated area*; corrosive to eyes or skin.
Storage: Organic #2
Disposal: #5
Shelf Life: Indefinite
Soluble: Alcohol and water.
Color and Odor: Colorless liquid with licorice odor.
Technical Note: The scent is added to reduce the undesirable ammonia odor. This substance does not act to anesthetize *Drosophila* as quickly or easily as ether. If the instructions are followed carefully, it is possible to perfect the anesthetic process. If you have tried other ether substitutes and did not like them, you will not like Lull-A-Fly™ since the material is the same (i.e., triethylamine). However, Lull-A-Fly is a much safer substance than ether.

Luminol

3-aminophthalhydrazide laboratory grade			
$C_8H_7N_3O_2$	**L0031**	1 g	**$11.71**
F.W. 177.17			

Storage: Organic #2
Disposal: #5
Shelf Life: Poor
Soluble: Alcohol
Color and Odor: Tan/yellow, odorless solid.
CAS No. 521-31-3
Technical Note: Reagent for detection of copper, iron, peroxides and cyanides. Oxidation results in a striking emission of light—chemiluminescence.

Exciting Chemiluminescence Activities

Flinn has exciting chemiluminescence demonstration kits. Each kit contains instructions, teacher notes and all the chemicals you need to perform the demonstration seven times. Look on page 231 for more information on these kits.



AP8983	Chemiluminescence Ammonia Fountain	**$55.80**
AP8627	Cool Light	**37.50**
AP8978	Energetic Light	**31.85**
AP8926	Fountain of Light	**50.25**
AP9118	Instant Light	**15.35**

Flinn Chemical Demonstration Kits are guaranteed to work and will save you time and money. Try one today!

Lycopodium
powder

Reagent	**L0033**	100 g	**$30.59**
Laboratory grade	**L0112**	100 g	**$28.40**
	L0113	500 g	**106.31**

★ **HAZARD ALERT:** Highly flammable powder. Possible allergen.
Storage: Organic #2 in a Flinn *Saf-Stor*™ Can.
Disposal: #26a
Shelf Life: Indefinite if stored properly.
Soluble: Generally insoluble in water and organic solvents.
Color and Odor: Yellow/white solid with fresh cut wood odor.

Lysol®
disinfectant **L0035** 12 oz **$10.80**

Storage: Miscellaneous organic.
Disposal: Dilute and place down the sink drain.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Brown/amber liquid with phenol odor.

M

MacConkey Agar
culture media
M0209 100 g **$56.80**

Storage: Miscellaneous, nonhazardous organic material.
Disposal: #26a
Shelf Life: Must be kept dry.
Soluble: Water
Color and Odor: Buff solid with strong, musty odor.
Technical Note: For the isolation of organisms capable of fermenting lactose. Mix 50 g of agar with 1000 mL of water. Bring to a boil and stir to dissolve completely. Sterilize at 121 °C at 15 lb of pressure for 15 minutes.

Magnesia
see Magnesium Oxide

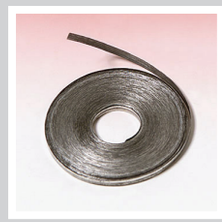
Magnesium Detection Reagent
qualitative
see 4-(p-Nitrophenylazo) resorcinol

Magnesium, Powder
laboratory grade
Mg **M0145** 25 g **$10.62**
A.W. 24.31

★ **HAZARD ALERT:** Powder form of this substance is a serious fire hazard; keep either dry sand or Flinn Class D Fire Extinguisher Powder available in case of a fire.
Storage: Inorganic #1 in a Flinn *Saf-Stor*™ Can.
Disposal: #26a
Shelf Life: Indefinite if stored safely.
Soluble: Acids; not water.
Color and Odor: Light gray, odorless solid.
CAS No. 7439-95-4

Magnesium, Ribbon
0.15 x 3.2 mm
Mg **M0001** 25 g (roll approx. 90 ft. long) **16.75**
A.W. 24.31

★ **HAZARD ALERT:** Flammable solid; burns with an intense flame; keep either dry sand or Flinn Class D Fire Extinguisher Powder available in case of a fire.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite if stored safely.
Soluble: Acids; not water.
Color and Odor: Silver/gray, odorless solid.
CAS No. 7439-95-4



Magnesium, Ribbon
M0139

Magnesium, Granules
reagent grade
Mg **M0212** 100 g **$21.24**
A.W. 24.31

★ **HAZARD ALERT:** Flammable solid; burns with intense flame.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite if stored safely.
Soluble: Acids; not water.
Color and Odor: Silver/gray, odorless solid.
CAS No. 7439-95-4

Magnesium Bromide
laboratory grade, crystal
$MgBr_2 \cdot 6H_2O$ **M0097** 100 g **$35.80**
F.W. 292.25

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; very deliquescent substance; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 13446-53-2

Magnesium Chloride
$MgCl_2 \cdot 6H_2O$
F.W. 203.33

Reagent	**M0146**	50 g	**$ 7.40**
crystal	**M0009**	100 g	**12.40**
	M0010	500 g	**22.90**
Laboratory grade	**M0011**	500 g	**$14.35**

flake

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White to slightly green, odorless solid.
CAS No. 7791-18-6
Technical Note: Loses H_2O, HCl and/or Cl_2 upon strong heating.

Magnesium Chloride Solution
(as $MgCl_2 \cdot 6H_2O$)

1.0 Molar	**M0164**	500 mL	**$18.75**
0.1 Molar	**M0121**	500 mL	**9.95**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

A Practical Goggle Policy
When the school owns the goggles, the school is responsible for their cleanliness. Schools invest in sterilizers, cleaning solutions and other means of ensuring sanitary goggles. Discuss with school administrators the practical aspects of the students each owning their own goggles. The students can purchase a pair of goggles from Flinn Scientific that can later be used later.

Magnesium Hydroxide

laboratory grade, powder
$Mg(OH)_2$ M0089 500 g $20.45
F.W. 58.34

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Dilute acids; solutions of ammonium salts; very slightly in water and alcohol.
Color and Odor: Gray/white, odorless solid.
CAS No. 1309-42-8

Magnesium Hydroxide Solution

saturated suspension of $Mg(OH)_2$ in water
M0122 500 mL $16.65

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Poor unless kept tightly closed; absorbs CO_2 from air.
Color and Odor: Milky white, odorless liquid.
Technical Note: This suspension contains approx. 300 g/L.

Magnesium Nitrate

crystal
$Mg(NO_3)_2 \cdot 6H_2O$
F.W. 256.43

Reagent	M0114	100 g	$ 10.25
	M0012	500 g	18.70
Laboratory grade	M0204	500 g	$15.65

★ **HAZARD ALERT:** Strong oxidant; fire and explosion risk in contact with organic material. Skin, eye, and respiratory tract irritant. LD_{50} 5440 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Fair to poor; substance deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: Color can vary from white to pale yellow, odorless solid.
CAS No. 13446-18-9

Magnesium Nitrate Solution

0.1 Molar
(as $Mg(NO_3)_2 \cdot 6H_2O$) M0123 500 mL $9.40

★ **HAZARD ALERT:** Skin and eye irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Magnesium Oxide

laboratory grade, powder
MgO M0013 100 g $12.65
F.W. 40.32 M0014 500 g 31.70

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Fair to poor; substance absorbs CO_2 and water from the air; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Slightly in water; soluble in acids and ammonium salt solutions.
Color and Odor: Off-white, odorless solid.
CAS No. 1309-48-4

How to Use a Fire Extinguisher

It seems so simple! Pull the pin, point the extinguisher nozzle, and press the lever that releases the extinguisher's contents. If you have never used a hand-held extinguisher, the time to learn is before an emergency occurs. Ask your local fire protection professionals for a lesson in fire extinguisher use. How to use a handheld extinguisher makes a great in-service session. Your local fire department will be glad to help.

Magnesium Sulfate

epsom salts, heptahydrate
crystal
$MgSO_4 \cdot 7H_2O$
F.W. 246.50

Reagent	M0016	100 g	$ 8.70
	M0017	500 g	28.85
Laboratory grade	M0018	500 g	$ 9.35
	M0019	2 kg	25.20

★ **HAZARD ALERT:** Irritates eyes and respiratory tract.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; substance hygroscopic.
Soluble: Water and glycerin; slightly in alcohol.
Color and Odor: Colorless, odorless solid.
CAS No. 10034-99-8

Magnesium Sulfate

anhydrous
laboratory grade, powder
$MgSO_4$ M0115 100 g $22.70
F.W. 120.39 M0020 500 g 40.35

For hazard alert, storage, disposal, etc., see Magnesium Sulfate, M0016.
Color and Odor: White, odorless solid.
CAS No. 7487-88-9

Magnesium Sulfate Solution

(as $MgSO_4 \cdot 7H_2O$)
0.5 Molar M0167 500 mL $13.70

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Malachite Green Oxalate

basic green 4
biological stain/indicator
pH 0.0 yellow to 2.0 green and
11.6 blue-green to 14.0 colorless M0129 10 g $17.15

★ **HAZARD ALERT:** Moderately toxic by ingestion. LD_{50} 275 mg/kg.
Storage: Organic #9
Disposal: #5
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Deep metallic green, odorless solid.
CAS No. 2437-29-8
C.I. #42000

Malachite Green Solution, 1%, Aqueous

1%, aqueous M0100 100 mL $14.70

Storage: Organic #9
Disposal: #26b
Shelf Life: Good if stored safely.
Color and Odor: Deep green, odorless solution.

Maleic Acid

butenedioic acid
powder
$HO_2CCH{=}CHCO_2H$ M0090 200 g $28.60
F.W. 116.07

★ **HAZARD ALERT:** Moderately toxic by ingestion; severe body tissue irritant. LD_{50} 708 mg/kg.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Water, alcohol, and acetone.
Color and Odor: White solid with faint tea odor.
CAS No. 110-16-7

Malonic Acid

propanedioic acid
crystal
$HO_2CCH_2CO_2H$ **M0091** 25 g **$13.35**
F.W. 104.06

★ **HAZARD ALERT:** Strong irritant; slightly toxic; when dissolved in water it is a strong acid; corrosive to eyes, skin and respiratory tract. Malonic acid has been used as a drug intermediate (precursor). This substance is regulated in some states like California. Check local regulations before purchasing. LD_{50} 1310 mg/kg.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White solid with faint beef bouillon odor.
CAS No. 141-82-2

Maltose

malt sugar
laboratory grade, powder
$C_{12}H_{22}O_{11}\cdot H_2O$ **M0021** 500 g **$24.35**
F.W. 360.32
Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; slightly in alcohol.
Color and Odor: Buff solid with fresh cut hay odor.
CAS No. 6363-53-7

Manganese

carbon free
chips
Mn **M0022** 500 g **$31.30**
A.W. 54.94

★ **HAZARD ALERT:** Irritant as a fume or dust; dust is flammable. TLV 0.2 mg/m^3 as dust.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Decomposes water; soluble in dilute acids.
Color and Odor: Gray/blue, odorless solid.
CAS No. 7439-96-5

Manganese Chloride

see Manganese(II) Chloride

Manganese Dioxide

manganese(IV) oxide
powder
MnO_2
F.W. 86.94

Reagent	**M0023**	100 g	**$18.20**
Laboratory grade	**M0205**	100 g	**$11.05**
	M0025	500 g	**10.85**

★ **HAZARD ALERT:** Body tissue irritant.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite if stored safely.
Soluble: Hydrochloric acid; insoluble in water.
Color and Odor: Gray, odorless solid.
CAS No. 1313-13-9

Manganese(II) Chloride

manganous chloride
reagent grade, crystal
$MnCl_2\cdot 4H_2O$ **M0027** 100 g **$12.90**
F.W. 197.91 **M0028** 500 g **40.15**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 1484 mg/kg.
Storage: Inorganic #2
Disposal: #27f

Continued on next column.

Manganese(II) Chloride *continued*

Shelf Life: Fair to poor; substance deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: Pink, odorless solid.
CAS No. 13446-34-9

Manganese(II) Nitrate Solution

manganous nitrate
45–50%, aqueous
$Mn(NO_3)_2$ **M0029** 500 mL **$31.95**
F.W. 178.94

★ **HAZARD ALERT:** Slightly toxic by ingestion; corrosive to body tissues.
Storage: Inorganic #3
Disposal: #27f
Shelf Life: Indefinite
Color and Odor: Pink liquid with faint nitric acid odor.
CAS No. 20694-39-7
Technical Note: Manganese(II) nitrate solution has a density of 1.53 g/mL and is between 3.9–4.3 M.

Manganese(II) Sulfate

manganous sulfate
powder
$MnSO_4\cdot H_2O$
F.W. 169.01

Reagent	**M0030**	100 g	**$14.80**
Laboratory grade	**M0206**	500 g	**$30.80**

★ **HAZARD ALERT:** Body tissue irritant.
Storage: Inorganic #2
Disposal: #27f
Shelf Life: Poor; substance hygroscopic.
Soluble: Water; not alcohol.
Color and Odor: Rose, odorless solid.
CAS No. 10034-96-5

Manganous Peroxide

see Manganese Dioxide

Marble Chips

limestone, calcium carbonate
for CO_2 generation **M0032** 500 g **$ 7.10**
M0033 2 kg **13.10**

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: In acids with evolution of CO_2; slightly in water.
Color and Odor: Gray/white, odorless solid.
CAS No. 471-34-1

Marvel Mystery Oil

Synthetic petroleum-based product for environmental oil-spill simulations. See page 301.

Menthol

laboratory grade, crystal
$C_{10}H_{20}O$ **M0104** 100 g **$54.75**
F.W. 156.26

★ **HAZARD ALERT:** Slightly toxic by ingestion and inhalation; body tissue irritant; severe eye irritant. LD_{50} 3300 mg/kg.
Storage: Organic #2
Disposal: #18b
Shelf Life: Indefinite

MENTHOL continued on next page.

We Didn't Know About It Yesterday!

We have added the hazard alert about the peroxidizable character of some alcohols, such as 2-octanol, to our chemical listings. This development may not be new; however, one of the many benefits of the *Flinn Scientific Catalog/Reference Manual* is that it keeps science teachers up-to-date.

Menthol *continued*

Soluble: Alcohol, many organic solvents, and acetic acid.
Color and Odor: White/clear solid with peppermint odor.
CAS No. 2216-51-5

Metal Electrode Set

contains six strips (6" x ½", zinc 5" x ½")
one each of aluminum, brass,
copper, iron, lead and zinc metals

	AP4602	pkg.	**$11.70**

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Excellent

Methanol

see Methyl Alcohol

Methyl Alcohol

methanol, absolute (anhydrous)
CH_3OH
F.W. 32.04

Reagent	**M0054**	500 mL	**$ 8.62**
	M0055	4 liters	**30.64/1 118.92/4**
Laboratory grade	**M0207**	4 liters	**$31.39**

★ **HAZARD ALERT:** Flammable; dangerous fire risk; toxic by ingestion (ingestion of as little as 15 mL has caused blindness). TLV 262 mg/m^3. LD_{50} 5628 mg/kg.

★ **SPECIAL HAZARD ALERT:** Laboratory accidents involving methyl alcohol occur when vapor in the air ignites and travels back to the source, causing a flash fire. Always cap the bottle of methyl alcohol and remove it from the area prior to performing any demonstration involving open flames, sparks or heat. Use only a small amount and always perform demonstrations behind a safety shield. Please visit flinnsci.com to access publication No. 10497, *Methyl Alcohol Safety,* for more detailed safety information and instructions.

Storage: Organic #2 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.

Continued on next column.

Methyl Alcohol *continued*

Disposal: #18a. U-Listed (U154); purchase small amounts for effective inventory control.
Shelf Life: Good if stored safely.
Soluble: Miscible with water and alcohol.
Color and Odor: Colorless liquid with alcohol odor.
CAS No. 67-56-1

Safety Purchase Suggestion: Please consider the use of anhydrous ethyl alcohol (E0012, etc.) as a substitute. Ethyl alcohol is a good substitute for methyl alcohol for most laboratory experiments and as a burner fuel. Avoid purchasing 20-liter cans of this substance unless you have approved, dedicated flammables storage.

2-Methyl-2-Butanol

see tert-Pentyl Alcohol

3-Methyl-1-Butanol

see Isopentyl Alcohol

Methyl Cellulose Solution

3%, aqueous, quieting solution

	M0171	100 mL	**$10.55**

Storage: Organic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Cloudy/colorless, odorless liquid.

Methyl Ethyl Ketone

2-butanone
laboratory grade
$CH_3COC_2H_5$
F.W. 72.11

	M0060	500 mL	**$16.45**

★ **HAZARD ALERT:** Flammable, dangerous fire risk; narcotic by inhalation. LD_{50} 2737 mg/kg. TLV 590 mg/m^3.

Storage: Organic #4 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.

Disposal: #18b. U-Listed (U159); purchase small amounts for effective inventory control.

METHYL ETHYL KETONE continued on next page.

Mercury and Mercury Spills

For more than 40 years, Flinn Scientific has embraced the philosophy that chemicals can be safely used if the necessary safety precautions are thoroughly understood. Nevertheless, in July 2008, Illinois joined 15 other states that have banned the use of thermometers, barometers and other instruments containing mercury. At least 11 states also prohibit the use of elemental mercury in schools and hospitals. The laws limit the ability of manufacturers to sell mercury or mercury-added products. The purpose of laws banning the sale of mercury is to eliminate nonessential uses of mercury and reduce its environmental release. In response to these laws, Flinn Scientific has discontinued the sale of elemental mercury, mercury compounds and mercury thermometers.

Health and Environmental Effects of Mercury

Mercury is a volatile, highly toxic liquid and a serious environmental hazard. The vapor pressure of mercury at room temperature is more than 100 times greater than the permissible exposure limit for mercury in air (0.01 mg/m^3). The threat increases at higher temperatures. Exposure to mercury vapor occurs when mercury is spilled or products that contain mercury break. The high surface tension and low viscosity of liquid mercury are reflected in its common name, quicksilver. These properties cause mercury to break up into small droplets that are easily trapped or hidden. Small amounts of mercury are easy to overlook and add up over time. There have been reports of 15–20 pounds of spilled mercury found in labs! Inhalation and absorption of mercury leads to nervousness, insomnia, depression, headache, fatigue, tremors, muscle atrophy and cognitive decline. Mercury is a cumulative poison—it is distributed in the blood within hours of exposure to mercury vapor and is concentrated in the kidneys. Higher exposures lead to kidney damage and respiratory failure. Mercury and mercury compounds do not biodegrade. Microorganisms in soil and water convert mercury to methyl- and dimethylmercury, which are more toxic than elemental mercury and bioacummulate in the food chain.

Cleaning Up Mercury Spills

- If mercury is spilled or a thermometer breaks, immediately open the windows and doors to provide maximum ventilation.
- Do not use a vacuum cleaner or a broom to clean up a spill. The vacuum will disperse mercury into the air and a broom will break the mercury into smaller droplets and spread them.
- Avoid contaminating shoes or other items in the area of the spill. Put plastic bags over your shoes.
- Wear chemical-resistant gloves. Collect visible drops of mercury with a medicine dropper or Beral-type pipet. Transfer the mercury to a seamless polyethylene bag or bottle.
- Mercury droplets will cling to vertical surfaces and on the underside of bench tops or shelves. Use a flashlight to locate small beads of mercury on surfaces or in cracks and crevices.
- Lightly cover the area with zinc powder; the resulting zinc amalgam is easily collected. (Do not use sulfur—it forms a surface film and leaves the mercury underneath exposed.)
- The Mercon™ Mercury Spill Control Kit is an effective mercury suppressant and decontaminant. It contains a spray to suppress mercury vapor, a sponge to pick up mercury droplets, chemical wipes to decontaminate the spill site and a waste container. See page 607 for a detailed explanation.
- Broken mercury thermometers in an oven can flood the lab with dangerous mercury vapor. Immediately open all windows and place the appliance in the hood or take it outside to drive off residual mercury.

Replacing Mercury Thermometers

See pages 195–196 for a complete listing of our digital and spirit-filled thermometers to meet all of your lab needs!

Methyl Ethyl Ketone *continued*

Shelf Life: Good if stored safely.
Soluble: Alcohol and ether.
Color and Odor: Colorless liquid with nail polish remover odor.
CAS No. 78-93-3

Methyl Orange

dye/indicator
pH 3.0 red to 4.4 yellow
$C_{14}H_{15}N_3O_3SNa$ **M0076** 25 g **$13.15**
F.W. 328.33

★ **HAZARD ALERT:** Highly toxic by ingestion. LD_{50} 60 mg/kg.
Storage: Organic #9. Store in a locked poisons cabinet.
Disposal: #26a
Shelf Life: Indefinite
Soluble: Best in hot water; partially in alcohol.
Color and Odor: Brown/orange solid with laundry soap odor.
CAS No. 547-58-0
C.I. #13025

Methyl Orange Indicator Solution

0.1%, aqueous
M0078 500 mL **$10.10**

★ **HAZARD ALERT:** Toxic by ingestion.
Storage: Organic #9
Disposal: #26b
Shelf Life: Fair
Color and Odor: Red/orange, odorless liquid.

4-Methyl-2-Pentanone

see Methyl Isobutyl Ketone

2-Methyl-1-Propanol

see Isobutyl Alcohol

2-Methyl-2-Propanol

see tert-Butyl Alcohol

Methyl Red

indicator, sodium salt
pH 4.4 red to 6.2 yellow
$C_{15}H_{14}N_3O_2Na$ **M0081** 10 g **$12.65**
F.W. 291.28

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Alcohol, ether, water and acetic acid. Color of solution fades quickly because of reduction.
Color and Odor: Brown/orange, odorless solid.
CAS No. 845-10-3

Methyl Red Indicator Solution

0.02%, aqueous
M0085 100 mL **$ 9.60**
M0086 500 mL **15.95**

Storage: Organic #9
Disposal: #26b
Shelf Life: Fair to poor (color fades because of reduction).
Color and Odor: Red, odorless liquid.

5-Methyl Resorcinol

see Orcinol

Methylene Blue

biological stain
$C_{16}H_{18}ClN_3S \cdot 3H_2O$ **M0072** 25 g **$18.45**
F.W. 373.90

★ **HAZARD ALERT:** Slightly toxic. LD_{50} 1180 mg/kg.
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water, alcohol, and chloroform.

Continued on next column.

Methylene Blue *continued*

Color and Odor: Gray/green, odorless solid.
CAS No. 7220-79-3
C.I. #52015

Methylene Blue Solution, Aqueous

1%, aqueous
M0074 100 mL **$ 6.95**
M0075 500 mL **12.00**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Deep blue, odorless liquid.

Methylene Blue Solution, Loeffler's

Loeffler's bacterial stain
contains: methylene blue, potassium hydroxide, ethyl alcohol and water
M0095 500 mL **$17.90**

★ **HAZARD ALERT:** Contains ethyl alcohol; toxic by ingestion and inhalation; body tissue irritant.
Storage: Organic #9 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #10
Shelf Life: Indefinite
Color and Odor: Blue liquid with slight alcohol odor.

Methylene Chloride

dichloromethane
laboratory grade
CH_2Cl_2 **M0059** 500 mL **$14.43/1**
F.W. 84.94 **84.12/6**
(Packaged in PVC-coated bottles)

★ **HAZARD ALERT:** *Possible carcinogen.* Can be narcotic in high concentrations. Slightly toxic. LD_{50} 1600 mg/kg. TLV 25 ppm.
Storage: Organic #4
Disposal: #27j. U-Listed (U080); purchase small amounts for effective inventory control.
Shelf Life: Volatile liquid; keep tightly capped.
Soluble: Alcohol; slightly in water.
Color and Odor: Colorless liquid with an ethyl ether odor.
CAS No. 75-09-2

Milk of Magnesia

see Magnesium Hydroxide Solution

Mineral Oil

light **M0064** 500 mL **$10.85**
laboratory grade **M0065** 4 liters **61.75**

Storage: Organic #3
Disposal: #18b
Shelf Life: Indefinite
Soluble: Many common organic solvents; insoluble in water and acids.
Color and Odor: Colorless, odorless liquid.
CAS No. 8042-47-5
Technical Note: Mineral oil is a safer alternative to halogenated solvents in halogen extraction experiments.

Mohr's Salt

see Ferrous Ammonium Sulfate

Emergencies and Panic

"Do not panic!" That's easy to say but hard to do during an emergency. A good policy to prepare for emergencies is to simulate the event and practice what should be done. If you have never used a hand-held fire extinguisher in an emergency, is the time to learn when a fire erupts? Certainly not! Practice and planning will help eliminate panic.

Molasses

pure, dark — M0068 — 300 mL — $9.10

Storage: With nonhazardous miscellaneous organic material.
Disposal: #26b
Shelf Life: Good.
Soluble: Water, alcohol.
Color and Odor: Dark brown liquid with brown sugar odor.
Note: Not for human consumption.

Mold Inhibitor

see Propionic Acid

Molecular Sieves

see Ion Exchange Resin

Molybdic Acid

see Ammonium Molybdate

Mounting Medium

CytoSeal

Low viscosity — M0194* — 4 oz. — $34.00

★ **HAZARD ALERT:** Contains toluene. Moderately toxic by ingestion and inhalation.
Storage: Organic #4
Disposal: #18b
Shelf Life: Indefinite
Soluble: Insoluble in water, soluble in toluene.
Color and Odor: Colorless liquid with slight toluene odor.
Technical Note: Low viscosity mounting media is an acrylic resin and will not crack or discolor with age. It is quick-drying and soluble in toluene and xylenes. Low viscosity media is suggested for use with cover glass.
*Special package containing a twist-open dropper cap.

Mueller-Hinton Agar

bacteriological culture media

M0203 — 100 g — $44.50

Storage: With culture media.
Disposal: #26a
Shelf Life: Good, if kept dry.
Soluble: Water
Color and Odor: Tan or off-white, odorless solid.

Muriatic Acid

see Hydrochloric Acid

N

Nails

see Iron, Nails

Naphthalene

flake
$C_{10}H_8$ — N0001 — 500 g — $14.80
F.W. 128.17

★ **HAZARD ALERT:** *Possible carcinogen.* Moderately toxic by ingestion, inhalation, and skin contact; moderate fire hazard. LD_{50} 490 mg/kg. TLV 52 mg/m^3.
Storage: Organic #3
Disposal: #18b. U-Listed (U165); purchase small amounts for effective inventory control.
Shelf Life: Volatile flakes; keep tightly closed.
Soluble: Alcohol and ether; not water.
Color and Odor: Shiny white solid with moth ball odor.
CAS No. 91-20-3

Continued on next column.

Authorized Personnel Only

Chemical storeroom access should only be granted to authorized science teachers. Access should be denied to students, custodians, teachers from other departments and unauthorized administrators. Keep your chemical storeroom locked!

Naphthalene *continued*

Technical Note: When used to show states of matter by heating in a test tube, quantity should be small and heating gentle so that minimum vapor is generated. Use under a hood or in a well-ventilated room.
Safety Purchase Note: Safer alternative substances for melting point determination are cetyl alcohol, 1-octadecanol, palmitic acid, stearic acid, lauric acid or 4-(t-octyl) phenol.

1-Naphthol

α-naphthol
laboratory grade, powder
$C_{10}H_8O$ — N0033 — 25 g — $29.10
F.W. 144.17

★ **HAZARD ALERT:** Slightly toxic by ingestion, inhalation and skin absorption; severe body tissue irritant. LD_{50} 1870 mg/kg.
Storage: Organic #8
Disposal: #18b
Shelf Life: Indefinite; darkens on exposure to light; protect from light.
Soluble: Alcohol, ether, and benzene; slightly in water.
Color and Odor: Yellow/brown solid with slight phenol odor.
CAS No. 90-15-3

Nichrome, Wire

bare

16 gauge (134 ft/lb) — N0040 — 4 oz. — $21.85
18 gauge (218 ft/lb) — N0041 — 4 oz. — 22.25
22 gauge (545 ft/lb) — N0042 — 4 oz. — 25.85

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Silver, odorless solid.

Nickel

reagent grade, shot
Ni — N0004 — 100 g — $ 25.15
A.W. 58.69 — N0005 — 500 g — 106.80

★ **HAZARD ALERT:** *Possible carcinogen.*
Storage: Inorganic #1
Disposal: #27a
Shelf Life: Indefinite
Soluble: Resists solution.
Color and Odor: Silver, odorless solid.
CAS No. 7440-02-0

Nickel Chloride

nickel(II) chloride
reagent grade, crystal
$NiCl_2{\cdot}6H_2O$ — N0069 — 50 g — $ 11.35
F.W. 237.72 — N0007 — 100 g — 23.65

★ **HAZARD ALERT:** Nickel compounds are *known carcinogens* by inhalation of dust. Highly toxic by ingestion and inhalation; avoid dispersing this substance; dispense with care. Avoid dispersing, breathing, or inhaling nickel dust. Possible reproductive/fertility hazard. LD_{50} 105 mg/kg.
Storage: Inorganic #2 in a locked poisons cabinet.
Disposal: #27f
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol, and ammonium hydroxide.
Color and Odor: Green, odorless solid.
CAS No. 7791-20-0

Nickel Nitrate

nickel(II) nitrate
crystal
$Ni(NO_3)_2{\cdot}6H_2O$
F.W. 290.82

Laboratory grade — N0090 — 100 g — $15.70
N0091 — 500 g — 38.30

NICKEL NITRATE continued on next page.

Nickel Nitrate *continued*

★ **HAZARD ALERT:** Nickel compounds are *known carcinogens*. Slightly toxic; avoid dispersing this substance; dispense with care; strong oxidant. Avoid dispersing, breathing, or inhaling nickel dust. Possible reproductive/fertility hazard. LD_{50} 1620 mg/kg.
Storage: Inorganic #3
Disposal: #27f
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol and ammonium hydroxide.
Color and Odor: Aqua, odorless solid.
CAS No. 13478-00-7

Nickel Sulfate

nickel(II) sulfate
crystal
$NiSO_4 \cdot 6H_2O$
F.W. 262.87

Reagent	**N0011**	100 g	**$19.50**
Laboratory grade	**N0013**	500 g	**$47.25**

★ **HAZARD ALERT:** Nickel compounds are *known carcinogens* by inhalation of dust. Moderately toxic by ingestion and inhalation; severe body tissue irritant; avoid dispersing this substance; dispense with care. Avoid dispersing, breathing, or inhaling nickel dust.
Storage: Inorganic #2
Disposal: #27f
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Light green, odorless solid.
CAS No. 10101-97-0

Ninhydrin

1, 2, 3-indantrione monohydrate
used in test for amino acids and proteins
laboratory grade, crystal
C_6H_4-1,2-$(CO)_2CO \cdot H_2O$ **N0015** 10 g **$18.75**
F.W. 195.15

★ **HAZARD ALERT:** Body tissue irritant.
Storage: Organic #2
Disposal: #18b
Shelf Life: Indefinite, but light sensitive. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Alcohol and water.
Color and Odor: White solid with fresh paint odor.
CAS No. 485-47-2
Technical Note: Use a 0.5% solution of ninhydrin in ethyl, isopropyl or butyl alcohol to test for proteins and amino acids.

Ninhydrin Solution

0.5% in butyl alcohol **N0023** 500 mL **$22.30**
reagent

★ **HAZARD ALERT:** Review the detailed hazard data provided for ninhydrin. The solution contains butanol, which is a flammable liquid. Severe body tissue irritant.
Storage: Organic #2 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Indefinite if stored safely.
Color and Odor: Amber liquid with butyl alcohol odor.

Nitric Acid

ACS reagent
15.8 Molar
assay 69.0 wt %
HNO_3
F.W. 63.01

N0043	100 mL	**$ 14.83**
N0016	500 mL	**24.71**
N0017	2.5 liters	**58.98**
N0055*	2.5 liters	**58.84/1**
		228.32/4

(Packaged in PVC-coated bottles)

★ **HAZARD ALERT:** Corrosive; strong oxidant; toxic by inhalation and

Continued on next column.

Nitric Acid *continued*

ingestion; avoid contact with acetic acid and readily oxidized substances. Concentrated nitric acid will attack and destroy metals and most plastics; never store concentrated nitric acid in a plastic bottle. TLV 5.2 mg/m^3.
Storage: In a separate, isolated portion of your acid cabinet. ***Never store with acetic acid.*** If an acid cabinet is not available, store in a Flinn *Saf-Cube*™.
Disposal: #24b
Shelf Life: When this substance is stored for a long period, it gradually destroys the cap. *Do not interchange another cap except one designated by its color code (red).* Shelf life of nitric acid is good except for this cap problem. Product may turn yellow due to the release of nitrogen dioxide on exposure to light. This yellow color does not affect the product's usefulness in the school lab.
Soluble: Miscible with water; considerable heat is released.
Color and Odor: Colorless liquid with a suffocating, unique odor.
CAS No. 7697-37-2
Safety Purchase Suggestion: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of nitric acid and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.
*Nitric acid is exactly as described under catalog number N0017 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are safely retained in a PVC outer envelope. *Plas-Pak*™ is a safer package for science teachers.

Nitric Acid Solution

8 Molar	**N0047**	500 mL	**$27.30**
6 Molar	**N0048**	500 mL	**16.95**
3 Molar	**N0049**	500 mL	**15.30**
1 Molar	**N0050**	500 mL	**10.80**
0.1 Molar	**N0052**	500 mL	**9.60**

★ **HAZARD ALERT:** Corrosive; strong oxidizing solution; avoid contact with acetic acid and readily-oxidized substances.
Storage: In a separate, isolated portion of your dedicated acid cabinet. Never store near acetic acid.
Disposal: #24b
Shelf Life: Good
Color and Odor: Colorless liquid with slight nitric acid odor.

Nitrogen Gas

Refillable cylinder **LB1075** 4 cu. ft. (112 liters) **$394.80**

Storage: In an area dedicated to bottled gases and away from any source of heat or flame.
Disposal: Completely empty lecture bottle, then follow #26a.
Shelf Life: Indefinite if stored safely.
Soluble: Slightly in water and alcohol.
Color and Odor: Colorless, odorless.
CAS No. 7727-37-9

para-Nitrophenol

4-nitrophenol, indicator
pH 5.6 colorless to 7.6 yellow
$O_2NC_6H_4OH$ **N0073** 25 g **$13.75**
F.W. 139.11

★ **HAZARD ALERT:** Highly toxic by ingestion, inhalation and skin absorption; body tissue irritant. LD_{50} 202 mg/kg.
Storage: Organic #8
Disposal: #18b. U-Listed (U170); purchase small amounts for effective inventory control.

PARA-NITROPHENOL continued on next page.

Nickel and Nickel Compounds—Carcinogens as Dust or Fumes

Nickel is classified as a possible carcinogen, and nickel compounds are classified as known carcinogens by IARC (International Agency for Research on Cancer). The danger is breathing or inhaling solid dust from these substances. Practice strict hygiene—avoid dispersing dust or fumes. Work with solutions whenever possible to avoid this hazard.

para-Nitrophenol *continued*

Shelf Life: Good
Soluble: Hot water, alcohol, and ether.
Color and Odor: Yellowish, odorless solid.
CAS No. 100-02-7

Nucleic Acids

see Deoxyribonucleic Acid and Ribonucleic Acid

Nutrient Agar

bacteriological media	**N0092**	23 g	**$ 14.01**
	N0019	100 g	**47.80**
	N0020	500 g	**139.00**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26a
Shelf Life: Must be kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Buff solid with strong, putrid odor.
Technical Note: N0092 is a premeasured amount of nutrient agar to make 1 liter of nutrient agar culture medium.

Nutrient Agar, Culture Tubes

prepared media in tubes

	N0064	pkg./ 6 tubes	**$19.67**

For storage, disposal, etc., see Nutrient Agar, N0019.
Color and Odor: Buff solid with strong, putrid odor.

Nutrient Broth

bacteriological media	**N0021**	100 g	**$40.00**

Storage: Miscellaneous, nonhazardous organic material.
Disposal: #26a
Shelf Life: Must be kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Buff solid with strong, putrid odor.
Technical Note: Best choice for growing cultures in liquid media. 8 g size is perfect to make one liter of broth.

O

Octadecanoic Acid

see Stearic Acid

1-Octanol

caprylic or n-octyl alcohol
$CH_3(CH_2)_7OH$
F.W. 130.23

	Q0018	100 mL	**$16.00**
	Q0014	500 mL	**41.05**

★ **HAZARD ALERT:** Body tissue irritant; slightly toxic. LD_{50} (mouse) 1790 mg/kg.
Storage: Organic #2
Disposal: #18b
Shelf Life: Indefinite
Soluble: Miscible with alcohol, chloroform, and mineral oil; immiscible with water and glycerin.
Color and Odor: Colorless liquid with strong floral odor.
CAS No. 111-87-5
Technical Note: The designation capryl alcohol is frequently used for both 1-octanol and 2-octanol. We've elected to designate the normal primary alcohol as 1-octanol.

Chemistry Is *Doing*

I hear, and I forget.
I see, and I remember.
I do, and I understand.

Help keep chemistry a "doing" science. Do it safely and resist efforts to make chemistry a survey course.

4-tert-Octylphenol

TOP
laboratory grade, powder
$C_8H_{17}C_6H_4OH$
F.W. 206.33

	Q0032	500 g	**$140.74**

★ **HAZARD ALERT:** Irritating to body tissue; slightly toxic by ingestion. LD_{50} (mouse) 3210 mg/kg.
Storage: Organic #8
Disposal: #24a
Shelf Life: Indefinite
Soluble: Alcohol, xylenes, and acetone.
Color and Odor: White solid with a sweet moth ball odor.
CAS No. 140-66-9
Technical Note: A safer alternative for melting point determination: melting point is 79–82 °C.

Oils

see individual listings (olive, paraffin, etc.)

Olive Oil

laboratory grade

	Q0004	200 mL	**$17.90**

Storage: Organic #3
Disposal: #26a
Shelf Life: Indefinite if kept tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Carbon disulfide, chloroform and ether; slightly in alcohol.
Color and Odor: Yellow liquid with a slightly pleasant odor.
CAS No. 8001-25-0
Technical Note: Not for human consumption.

Orange III

see Methyl Orange

Ortho Phosphoric Acid

see Phosphoric Acid

Oxalic Acid

crystal
$H_2C_2O_4 \cdot 2H_2O$
F.W. 126.07

Reagent	**Q0005**	100 g	**$12.30**
	Q0007	500 g	**34.80**
Laboratory grade	**Q0006**	500 g	**$17.05**

★ **HAZARD ALERT:** Skin and eye irritant; moderately toxic by ingestion. LD_{50} 375 mg/kg. TLV 1 mg/m^3.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Water and many common organic solvents.
Color and Odor: White, odorless solid.
CAS No. 6153-56-6

Oxygen Gas

Lecture bottle	**LB1025**	2 cu. ft. (56 liters)	**$296.05**
Refillable cylinder	**LB1080**	3.4 cu. ft. (95 liters)	**$435.00**

★ **HAZARD ALERT:** Fire risk.
Storage: In an area dedicated to bottled gases; store away from any source of heat or flame.
Disposal: Completely empty lecture bottle, then follow #26a.
Shelf Life: Indefinite if stored safely.
Soluble: Slightly soluble in water and alcohol.
Color and Odor: Colorless, odorless.
CAS No. 7782-44-7
Technical Note: Oxygen can be generated by using 30% hydrogen peroxide (H_2O_2). It is vital that you give 30% H_2O_2 your highest level of safety consciousness; it is a very hazardous substance.
Set up the apparatus to create a gas generator. A 250-mL flask, a two-hole rubber stopper, a delivery tube and a dropping funnel will be required. A

OXYGEN GAS continued on next page.

Oxygen Gas *continued*

drying tube containing anhydrous calcium chloride (Flinn C0016 or C0017) or Drierite® (Flinn D0011 or D0012) will be required since the O_2 will have an undesirably high water content. Place two grams of manganese dioxide (Flinn M0025) in the flask. Now dilute 50 mL of 30% H_2O_2 to 100 mL using distilled water. Add H_2O_2 dropwise through the dropping funnel into the flask. This process will generate about 6 liters of oxygen. ***Do not use potassium chlorate to generate oxygen.***

P

Palmitic Acid
hexadecanoic acid
laboratory grade, powder
$CH_3(CH_2)_{14}CO_2H$ **P0129** 100 g **$24.70**
F.W. 256.43
Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Hot alcohol; not water.
Color and Odor: White solid with waxlike odor.
CAS No. 57-10-3
Technical Note: Melting point 61–64 °C.

para-Dichlorobenzene
see page 54

Paraffin Oil
see Mineral Oil

Paraffin, Wax
laboratory grade
P0003 1 lb **$11.45**
Storage: Organic #3
Disposal: #26a
Shelf Life: Indefinite
Soluble: Warm alcohol, chloroform, petroleum ether, olive oil and other organic solvents.
Color and Odor: Waxy white, odorless solid.
CAS No. 8002-74-2

Pectinase
enzyme
powder obtained from *Aspergillus niger*
P0285 5 g **$46.95**
Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite, when refrigerated; hygroscopic.
Soluble: Water
Color and Odor: Light tan solid with strong, sweet odor.
CAS No. 9032-75-1

Pentane
laboratory grade
$CH_3(CH_2)_3CH_3$ **P0213** 100 mL **$11.20**
F.W. 72.15
★ **HAZARD ALERT:** Flammable liquid; narcotic in high concentrations. Toxic by ingestion and inhalation. LD_{50} 400 mg/kg. TLV 1770 mg/m^3.
Storage: Organic #3 in an approved flammables cabinet.
Disposal: #18b
Shelf Life: Indefinite
Soluble: Miscible with alcohol and many other organic solvents.
Color and Odor: Colorless liquid with a gasoline odor.
CAS No. 109-66-0

1-Pentanol
see n-Amyl Alcohol

Pentyl Alcohol
see n-Amyl Alcohol

tert-Pentyl Alcohol
2-methyl-2-pentanol, tert-amyl alcohol
reagent grade, 99%
$CH_3CH_2C(CH_3)_2OH$ **P0286** 500 mL **$55.85**
F.W. 88.15
★ **HAZARD ALERT:** Flammable liquid and vapor; dangerous fire risk. Moderately toxic by ingestion and inhalation; respiratory tract irritant. Use only in a hood or well-ventilated area. LD_{50} 1000 mg/kg.
Storage: Organic #2 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Fair; volatile liquid. Store in a cool, dry place.
Soluble: Ethyl alcohol and ether; slightly soluble in water.
Color and Odor: Clear, colorless liquid with pungent, unpleasant odor.
CAS No. 75-85-4

Pepsin
enzyme
laboratory grade, powder
Activity: 1:3000 **P0006** 25 g **$13.55**
P0007 100 g **45.75**
Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: Buff solid with sour malt odor.
CAS No. 9001-75-6
Technical Note: Use a 0.5% solution for protein digestion.

Petroleum Ether
ligroine
Reagent **P0014** 500 mL **$ 16.45**
P0015 4 liters **77.15/1 299.44/4**
Laboratory grade **P0275** 500 mL **$16.60**
★ **HAZARD ALERT:** Flammable liquid; dangerous fire risk.
Storage: Organic #3 in a dedicated flammables cabinet. If a flammables cabinet is not available store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Indefinite if stored safely.
Soluble: Miscible with many organic solvents; insoluble in water.
Color and Odor: Colorless liquid with natural gas-like odor.
CAS No. 8032-32-4
Technical Note: Technically the name petroleum ether is a misnomer. In the chemical sense it is not an ether, but consists chiefly of low boiling fractions (B.P. 30–60 °C) of petroleum, mostly pentanes and hexanes. Names like benzin and naphtha are synonymous to petroleum ether, which is not a peroxidizable substance like ethyl ether.

1,10-Phenanthroline
o-phenanthroline, monohydrate
reagent grade, granular
$C_{12}H_8N_2 \cdot H_2O$ **P0155** 5 g **$39.60**
F.W. 198.21
★ **HAZARD ALERT:** Highly toxic by ingestion; LD_{50} 132 mg/kg.
Storage: Organic #2
Disposal: #5
Shelf Life: Poor; hygroscopic.
Soluble: Alcohol; slightly in water.
Color and Odor: White, odorless solid.

1,10-PHENANTHROLINE continued on next page.

Chemical Odors
Many chemicals, particularly organic chemicals, have a characteristic odor. Odor information has been added to each of our chemical listings. Practical and brief odor identification terms have been used to keep it simple. Chemical odor and chemical color are unique pieces of information provided only by Flinn Scientific.

1,10-Phenanthroline *continued*

CAS No. 5144-89-8

Technical Note: Forms a complex with iron(II) or ferrous ions called ferroin, which is used as an indicator in redox systems.

Phenol Solution

5%, aqueous	**P0103**	500 mL	**$23.00**

★ **HAZARD ALERT:** Moderately toxic by ingestion, inhalation, and skin absorption; avoid skin contact.
Storage: Organic #8
Disposal: #24a
Shelf Life: Good
Color and Odor: Colorless liquid with slight disinfectant odor.

Phenol Red

indicator, sodium salt
pH 6.8 yellow to 8.4 red
reagent
$C_{19}H_{13}NaO_5S$
F.W. 376.36

	P0188	5 g	**$17.45**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Red, odorless solid.
CAS No. 34487-61-1

Phenol Red Indicator Solution

0.02%, aqueous

	P0100	100 mL	**$ 6.10**
	P0101	500 mL	**13.40**

Storage: Organic #9
Disposal: #26b
Shelf Life: Good
Color and Odor: Red, odorless liquid.

Phenolphthalein

indicator, powder
pH 8.2 colorless to 10.0 pink
$C_{20}H_{14}O_4$
F.W. 318.31

Reagent	**P0017**	25 g	**$ 10.35**
	P0018	100 g	**18.50**
Laboratory grade	**P0276**	100 g	**$15.85**

. **HAZARD ALERT:** *Possible carcinogen.* Phenolphthalein is listed as a suspected reproductive toxin by the state of CA (Proposition 65). Possible reproductive/fertility hazard.
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Alcohol and alkalies; insoluble in water.
Color and Odor: White, odorless solid.
CAS No. 77-09-8

Phenolphthalein Indicator Solution

Alcoholic			
1%	**P0019**	100 mL	**$6.66**
	P0020	500 mL	**8.80**
0.5%	**P0115**	100 mL	**$6.17**
	P0116	500 mL	**9.46**

★ **HAZARD ALERT:** Alcohol solution; flammable liquid; fire risk; skin, eyes, and respiratory irritant. Possible reproductive/fertility hazard.
Storage: Organic #9 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a
Shelf Life: Indefinite
Color and Odor: Colorless liquid with alcohol odor.

Phenyl Salicylate

salol
laboratory grade, crystal
2-HOC_6H_4-1-$CO_2C_6H_5$
F.W. 214.22

	P0021	100 g	**$16.95**
	P0022	500 g	**49.10**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} (mouse) 3000 mg/kg.
Storage: Organic #3
Disposal: #18b
Shelf Life: Indefinite
Soluble: Slightly in water; most common organic solvents.
Color and Odor: White solid with disinfectant odor.
CAS No. 118-55-8
Technical Note: Melting point 44–46 °C.

o-Phosphoric Acid

orthophosphoric acid
14.8 Molar
reagent
H_3PO_4
F.W. 98.00

	P0201	100 mL	**$16.65**
	P0023	500 mL	**40.70**
	P0024	2.5 liters	**135.00**
	P0181*	2.5 liters	**105.60**
		(Packaged in PVC-coated bottle)	

. **HAZARD ALERT:** Skin and eye irritant; slightly toxic by ingestion and inhalation; corrosive; burns tissue. LD_{50} 1530 mg/kg. TLV 1 mg/m^3.
Storage: Inorganic #9 in a dedicated acid cabinet. If one is not available, store in a Flinn *Saf-Cube*™.
Disposal: #24b
Shelf Life: Good if stored safely.
Cap Safety Color Code: White
Soluble: Water (heat generated) and alcohol.
Color and Odor: Colorless, odorless liquid.
CAS No. 7664-38-2
Safety Purchase Suggestion: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of phosphoric acid and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.
*Phosphoric acid is exactly as described under catalog number P0024 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are safely retained in a PVC outer envelope. *Plas-Pak*™ is a safer package for science teachers.

Phosphorus, Red

Red phosphorus is designated a List I chemical by the Drug Enforcement Agency (DEA) and is no longer available for sale. List I chemicals are defined as chemicals that are used in and important to the manufacture of controlled substances.

Plaster of Paris

see Calcium Sulfate

Platinum Wire

99.7% pure
Pt
A.W. 195.09
Supplied in one inch or multiples of one-inch lengths. If you order two inches, the piece will be two inches long, etc.

Catalog No.	B & S Gauge	Diameter (inch)	Weight (g/ft)	Price/Inch
P0145	36	0.005	0.083	**$12.83**
P0146	32	0.008	0.212	**15.65**
P0147	30	0.010	0.331	**23.04**
P0148	28	0.013	0.560	**30.25**
P0149	26	0.016	0.848	**33.00**
P0150	24	0.020	1.320	**69.48**
P0151	22	0.025	2.070	**61.50**

Storage: Inorganic #1
Disposal: #27a
Shelf Life: Indefinite
Color and Odor: Metallic gray, odorless solid.
CAS No. 7440-06-4

Polyacrylamide

see Water Marbles, pages 240 and 302
see Ghost Crystals, page 301

Polyethylene Oxide

see Super-Duper Polymer Gel, page 301

PolySnow™

"instant snow powder"
sodium polyacrylate

P0284	100 g	**$17.50**

Storage: Organic #3
Disposal: #26a
Shelf Life: Good, if kept dry.
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 9033-79-8
Technical Note: Adding 150 mL of DI water to 3 g of PolySnow produces over 300 mL of "snow." More absorbent than traditional sodium polyacrylate.

Polyurethane Foam System

A package which consists of two viscous liquids. When these substances are mixed, a rigid foam is produced. The volume of foam produced is 20–30 times larger than the original mixture. Liquid "A" is a polyether polyol. Liquid "B" is a polyfunctional isocyanate. Two pound set.

C0335	500 mL set	**$ 39.15**
C0442	4 L set	**297.35**

★ **HAZARD ALERT:** Solution "A" contains a polyether polyol, a tertiary amine and a silicone surfactant. Provide adequate ventilation and wear protective clothing. Solution "B" contains a polyfunctional diisocyanate. Provide adequate ventilation and avoid any body contact. Wear chemical splash goggles, chemical gloves, apron and mix under a hood or with adequate ventilation.

Storage: Liquid "A" Organic #2
Liquid "B" Organic #5
Disposal: Mix, form foam then #26a.
Shelf Life: Do not store longer than three years.
Soluble: Acetone and some other organic solvents.
Color and Odor: Solution A: Yellow/amber liquid, rubberlike odor.
Solution B: Brown/amber, odorless liquid.



Polyurethane Foam System C0335, etc.

Polyvinyl Alcohol

laboratory grade, granular
$[CH_2CH(OH)]_n$

P0154	500 g	**$32.70**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water

Continued on next column.

Polyvinyl Alcohol *continued*

Color and Odor: Off-white, odorless solid.
CAS No. 9002-89-5
Technical Note: If you are buying polyvinyl alcohol to prepare a polymer (like the toy "slime"), also consider guar gum as a substitute. See separate catalog listing.

Polyvinyl Alcohol Solution

4%, aqueous

P0209	500 mL	**$11.47**
P0210	1 liter	**20.55**
P0211	4 liters	**59.75**

Storage: In a tightly capped bottle. This substance will act as a growth media and should be kept cool.
Disposal: #26b
Shelf Life: Poor unless kept cool and uncontaminated.
Color and Odor: Cloudy, odorless solid.
Technical Note: Mix with saturated sodium borate solution to prepare a polymer ("slime").

Polyvinyl Alcohol/Sodium Borate "Slime Kit"

see pages 301–302 for several slime preparation kits

Potash

see Potassium Carbonate

Potassium

laboratory grade
K
A.W. 39.10

P0204	Bottle of 5 small pieces for demonstration (Packaged under mineral oil inside a plastic bottle. The bottle is contained within a metal can for storage protection.)	**$37.00**

★ **HAZARD ALERT:** Extremely *dangerous* in contact with moisture and water; releases hydrogen with sufficient heat to cause ignition or explosion; may ignite spontaneously in air or oxygen; can cause *severe* skin or eye burns. Shipped under dry oil (no water) and that is the way it ***must*** be stored. *Keep away from water and handle with* ***dry*** *utensils.*

★ **SPECIAL HAZARD ALERT:** Peroxide coatings are well known to develop on the exterior surface of potassium metal. The peroxide coating consists of potassium superoxide (KO_2) and potassium peroxide (K_2O_2). Potassium superoxide is yellow and reacts explosively with the light oil in which the product is stored when the metal is cut into small pieces. Do not use any potassium that is old or yellow! ***If you have a choice as to which alkali metal you use, sodium metal is a better choice since, upon aging, it does not develop peroxides.***
Storage: Inorganic #1 under dry oil in a Flinn *Saf-Stor*™ Can.
Disposal: #3
Shelf Life: Poor; see Special Hazard Alert above.
Soluble: Do not attempt to place into solution.
Color and Odor: As new metal, silvery; as old metal, gray to white to off-white; odorless.
CAS No. 7440-09-7

Potassium Acid Phthalate

see Potassium Hydrogen Phthalate

Potassium Aluminum Sulfate

see Aluminum Potassium Sulfate

Potassium Bicarbonate

potassium hydrogen carbonate
reagent grade, crystal
$KHCO_3$
F.W. 100.12

P0033	500 g	**$19.60**

Storage: Inorganic #4

POTASSIUM BICARBONATE continued on next page.

What To Do the First Day of Lab?

Start the year with safety as your #1 goal. Before starting your first lab, take time to discuss the rules of the lab and the student safety contract and administer a safety exam. If you don't have a safety contract, contact us and we will send you a copy of our free Flinn Safety Contract. Let your students know how important safety is to you and to their success in lab.

Potassium Bicarbonate *continued*

Disposal: #26a
Shelf Life: Poor; hygroscopic.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 298-14-6

Potassium Biphthalate

see Potassium Hydrogen Phthalate

Potassium Bisulfate

potassium hydrogen sulfate
reagent grade, crystal

$KHSO_4$	**P0134**	100 g	**$18.00**
F.W. 136.17			

★ **HAZARD ALERT:** Slightly toxic by ingestion; severe body tissue irritant. LD_{50} 2340 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; decomposes in alcohol.
Color and Odor: White solid with peanut brittle odor.
CAS No. 7646-93-7

Potassium Bitartrate

potassium hydrogen tartrate
laboratory grade, powder

$KHC_4H_4O_6$	**P0135**	100 g	**$12.00**
F.W. 188.18			

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Boiling water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 868-14-4

Potassium Bromate

reagent grade, crystal

$KBrO_3$	**P0136**	100 g	**$19.80**
F.W. 167.02			

★ **HAZARD ALERT:** *Possible carcinogen according to IARC.* Fire risk in contact with organic material; strong irritant; oxidizer; moderately toxic. LD_{50} 157 mg/kg.
Storage: Inorganic #6
Disposal: #12a
Shelf Life: Indefinite
Soluble: Boiling water.
Color and Odor: White solid with slight bromine odor.
CAS No. 7758-01-2

Potassium Bromide

reagent grade, crystal

KBr	**P0137**	100 g	**$10.70**
F.W. 119.02	**P0037**	500 g	**30.75**

★ **HAZARD ALERT:** Slightly toxic by ingestion; severe body tissue irritant. LD_{50} 3070 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Somewhat hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7758-02-3

Potassium Carbonate

potash, anhydrous
laboratory grade, granular

K_2CO_3	**P0038**	500 g	**$19.20**
F.W. 138.21			

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant. LD_{50} 1870 mg/kg.
Storage: Inorganic #4
Disposal: #26a

POTASSIUM CARBONATE continued on next page.

Flinn's Chemventory™

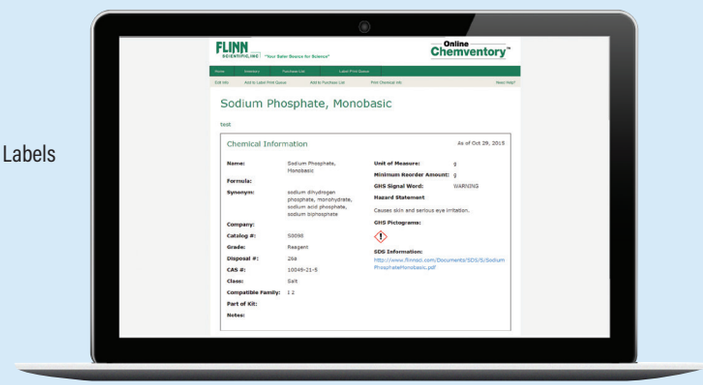
Chemical Inventory Management System

SEE PAGE 574 FOR DETAILS!

The Flinn Chemventory™ is a cloud-based laboratory chemical inventory system that allows multiple users access to the database from multiple locations and multiple devices! Maintaining an accurate laboratory chemical inventory has never been easier, more flexible and more convenient.

The Flinn Chemventory™ program features:

- Secure Cloud-Based Service
- Easily Add All Your Flinn Chemicals
- Multiple Users
- Print, Email and Export Your Inventory List
- Link Databases
- GHS Hazard Information Included
- Safety Data Sheets
- Print Chemical and Solution Labels
- Import Data from Previous Chemventory Versions
- Create a Purchase List



Affordable and Convenient Price Options

A one-time purchase gets you 1, 3 or 5 years of access to build, view and update your chemical inventory database.

Flinn Chemventory™ is flexible enough to allow you to access your inventory information from multiple locations on multiple devices. Manage your chemical inventory safely and conveniently with Flinn's affordable Chemventory program!

Catalog No.	Description	Price/Each
SE2998	Flinn Chemventory™, 1-Year License	$ 99.00
SE2999	Flinn Chemventory™, 3-Year License	249.00
SE3000	Flinn Chemventory™, 5-Year License	349.00

Potassium Carbonate *continued*

Shelf Life: Hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 584-08-7

Potassium Carbonate

sesquihydrate
reagent grade, crystal

$K_2CO_3 \cdot 1.5H_2O$	**P0157**	100 g	**$17.05**
F.W. 165.24			

★ **HAZARD ALERT:** Body tissue irritant. LD_{50} 1870 mg/kg.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 6381-79-9

Potassium Chlorate

laboratory grade, powder

$KClO_3$	**P0040**	500 g	**$22.66**
F.W. 122.56	**P0041**	2 kg	**68.97**

★ **HAZARD ALERT:** Strong oxidizer; slightly toxic; irritant. LD_{50} 1870 mg/kg. Extremely dangerous since the substance, if only slightly contaminated, will explode when exposed to moderate shock or when heated. Because this substance is so frequently a source of accidents on school premises we have elected to list some of the incompatible substances that should be avoided:

Ammonium Salts	Phosphorus	Carbon	
Sulfuric Acid	Combustible Material	Metal Powders	
Finely Divided Materials	Organic Materials	Sulfur	Sugar

★ **SPECIAL HAZARD ALERT:** Only pure manganese dioxide (manganese(IV) oxide) should be used with potassium chlorate for oxygen preparation. A safer method is the catalytic decomposition of hydrogen peroxide. You will find this method recited in detail under the oxygen gas listing in this Catalog/Reference Manual.
Storage: Inorganic #6
Disposal: #12a
Shelf Life: Indefinite if stored safely.
Soluble: Boiling water.
Color and Odor: White, odorless solid.
CAS No. 3811-04-9
Technical Note: Potassium Chlorate as an O_2 Source: Molar volume is frequently measured by generating O_2 using potassium chlorate and manganese dioxide. Molten $KClO_3$ is a powerful oxidizer of organic materials like the rubber in the stoppers used in the generating apparatus. Explosions can and do result. Please call or email us to obtain a free copy of Publication No. 1001, which describes a safe method involving the use of dry ice to measure molar volume.

Potassium Chloride

reagent grade, crystal

KCl	**P0183**	100 g	**$ 7.94**
F.W. 74.56	**P0042**	500 g	**13.11**
	P0043	2 kg	**45.59**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 2600 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; hygroscopic.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7447-40-7

Potassium Chloride Solution

(as KCl)

0.5 Molar	**P0236**	500 mL	**$9.35**
0.1 Molar	**P0160**	500 mL	**8.85**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Potassium Chromate

reagent grade, crystal

K_2CrO_4	**P0044**	100 g	**$16.00**
F.W. 194.21	**P0045**	500 g	**38.00**

★ **HAZARD ALERT:** *Known carcinogen.* Highly toxic; harmful to skin, eyes, and respiratory tract; corrosive action on skin and mucous membranes. Possible reproductive/fertility hazard. Chromates as a chemical family deserve special safety attention from science teachers. LD_{50} (mouse) 180 mg/kg.
Storage: Inorganic #8 in a Flinn *Chem-Saf*™ Bag inside a locked poisons cabinet.
Disposal: #12a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: Yellow, odorless solid.
CAS No. 7789-00-6

Potassium Chromate Solution

(as K_2CrO_4)

1 Molar	**P0161**	500 mL	**$16.50**

★ **HAZARD ALERT:** Moderately toxic by ingestion; may be corrosive to body tissue. Possible reproductive/fertility hazard.
Storage: Inorganic #8
Disposal: #12a
Shelf Life: Good
Color and Odor: Yellow, odorless liquid.

Potassium Dichromate

reagent grade, crystal **P0047** 100 g **$16.40**

$K_2Cr_2O_7$
F.W. 294.22

★ **HAZARD ALERT:** *Known carcinogen.* Strong oxidant; fire risk in contact with organic material; toxic by ingestion and inhalation; corrosive to body tissue. Possible reproductive/fertility hazard. LD_{50} 190 mg/kg.
Storage: Inorganic #8 in a Flinn *Chem-Saf*™ Bag inside a locked poisons cabinet.
Disposal: #12a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: Orange, odorless solid.
CAS No. 7778-50-9

Potassium Dihydrogen Phosphate

see Potassium Phosphate, Monobasic

Potassium Ferricyanide

potassium hexacyanoferrate(III)
reagent grade, crystal

$K_3Fe(CN)_6$	**P0050**	100 g	**$12.80**
F.W. 329.26	**P0051**	500 g	**40.05**

★ **HAZARD ALERT:** If heated or in contact with concentrated acids, poisonous fumes of hydrogen cyanide gas may evolve. Compound itself has slight toxicity. LD_{50} 1600 mg/kg.
Storage: Inorganic #7
Disposal: #14. P-Listed (P030); purchase small amount for effective inventory control.
Shelf Life: Fair, but light-sensitive. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: Orange, odorless solid.
CAS No. 13746-66-2

Goggle Use

When is it appropriate to wear goggles? Science teachers often respond by citing specific situations (e.g., when working with strong bases, when working with acids, when working with biuret). A good general rule would be... WORKING WITH CHEMICALS... ANY CHEMICALS... WEAR GOGGLES!

Wear chemical splash goggles whenever working with chemicals, glassware or heat.

Potassium Ferrocyanide

potassium hexacyanoferrate(II)
reagent grade, crystal
$K_4Fe(CN)_6 \cdot 3H_2O$ **P0053** 100 g **$19.45**
F.W. 422.41

★ **HAZARD ALERT:** Dangerous if heated or if in contact with concentrated acids since hydrogen cyanide gas may evolve. Slightly toxic by ingestion. LD_{50} 6400 mg/kg (for anhydrous salt).
Storage: Inorganic #7
Disposal: #14. P-Listed (P030); purchase small amount for effective inventory control.
Shelf Life: Fair to poor; effloresces on exposure to air; keep tightly capped and store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: Light yellow, odorless solid.
CAS No. 14459-95-1

Potassium Hexacyanoferrate(II)

see Potassium Ferrocyanide

Potassium Hexacyanoferrate(III)

see Potassium Ferricyanide

Potassium Hydrogen Carbonate

see Potassium Bicarbonate

Potassium Hydrogen Phosphate

see Potassium Phosphate, Dibasic

Potassium Hydrogen Phthalate

potassium acid phthalate
reagent grade, crystal
99.95–100.05% minimum
$KHC_8H_4O_4$ **P0056** 100 g **$17.43**
F.W. 204.23 **P0057** 500 g **46.91**

Storage: Inorganic #2
Disposal: #24a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 877-24-7
Technical Note: Primary standard for preparing volumetric alkali solutions. Also used as a buffering agent.

Potassium Hydrogen Sulfate

see Potassium Bisulfate

Potassium Hydrogen Tartrate

see Potassium Bitartrate

Potassium Hydroxide

KOH
F.W. 56.11
Reagent **P0058** 100 g **$10.75**
pellet **P0059** 500 g **25.05**
Laboratory grade **P0061** 500 g **$12.45**
flake **P0062** 2 kg **38.65**

★ **HAZARD ALERT:** Skin contact causes severe blisters; strongly corrosive as a solid and as a solution; very harmful if swallowed; extremely dangerous to eyes. LD_{50} 273 mg/kg. TLV-C 2 mg/m^3.
★ **SPECIAL HAZARD ALERT:** Wear appropriate face and body protection when making solutions; potassium hydroxide generates large amounts of heat while dissolving. You might consider immersing your solution-making vessel in an ice bath. The ice bath will better enable you to control the solution temperature. Stir continuously.
Storage: Inorganic #4
Continued on next column.

No Need to Repackage

Flinn sodium is packaged ready to use and ready to store. Five small pieces of sodium (0.3–0.5 g each), perfect for demonstrations, are packaged under mineral oil in a plastic bottle. The bottle is in a plastic bag within a metal can for safer storage. Count on Flinn for the safest package.



Potassium Hydroxide *continued*

Disposal: #10
Shelf Life: Fair; absorbs water and carbon dioxide.
Soluble: Water, alcohol and glycerin.
Color and Odor: White, odorless solid.
CAS No. 1310-58-3
Technical Note: Reagent potassium hydroxide contains 10–15% water.

Potassium Iodate

powder
KIO_3
F.W. 214.01
Reagent **P0063** 25 g **$ 10.97**
P0064 100 g **32.33**
P0065 500 g **114.50**
Laboratory grade **P0277** 100 g **$28.45**

★ **HAZARD ALERT:** Oxidizer; moderately toxic; tissue irritant. LD_{50} 531 mg/kg.
Storage: Inorganic #6
Disposal: #12a
Shelf Life: Indefinite
Soluble: Water; dilute sulfuric acid; not alcohol.
Color and Odor: White solid with strong iodine odor.
CAS No. 7758-05-6

Potassium Iodate Solution

(as KIO_3)
0.2 Molar **P0168** 500 mL **$11.75**
0.1 Molar **P0169** 500 mL **10.25**

For storage, disposal, etc., see Potassium Iodate Solution.
Color and Odor: Colorless, odorless liquid.

Potassium

crystal
KI
F.W. 166.01
Reagent **P0066** 25 g **$ 16.25**
P0067 100 g **39.15**
P0184 500 g **135.96/1**
789.84/6
Laboratory grade **P0278** 100 g **$ 38.00**
P0279 500 g **145.00**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; moisture- and light-sensitive.
Soluble: Water, alcohol, acetone, and glycerin.
Color and Odor: White, odorless solid.
CAS No. 7681-11-0

Potassium Iodide Solution

(as KI)
1 Molar **P0170** 500 mL **$39.20**
0.5 Molar **P0171** 500 mL **23.83**
0.2 Molar **I0026** 500 mL **17.25**
0.1 Molar **P0172** 500 mL **12.93**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good, if stored properly in a cool, dark place; protect from light and heat.
Color and Odor: Colorless, but darkens on exposure to light, slight iodine odor.

Potassium Nitrate

saltpeter
KNO_3
F.W. 101.11
Reagent **P0070** 100 g **$ 11.00**
crystal **P0071** 500 g **19.55**
Laboratory grade **P0073** 500 g **$ 10.95**
granular **P0074** 2 kg **34.60**

★ **HAZARD ALERT:** Strong oxidant; fire and explosion risk when heated or in contact with organic material; skin irritant. LD_{50} 3750 mg/kg.
Storage: Inorganic #3
Disposal: #26b

POTASSIUM NITRATE continued on next page.

Potassium Nitrate *continued*

Shelf Life: Good; slightly hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, glycerin, slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7757-79-1

Potassium Nitrate Solution

(as KNO_3)

0.5 Molar	**P0173**	500 mL	**$12.10**

Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Potassium Nitrite

crystal
KNO_2
F.W. 85.11

Reagent	**P0108**	100 g	**$30.10**
Laboratory grade	**P0280**	100 g	**$24.45**

★ **HAZARD ALERT:** Strong oxidant; fire and explosion risk when heated or in contact with organic material; skin irritant; highly toxic. LD_{50} 200 mg/kg.
Storage: Inorganic #3
Disposal: #12b
Shelf Life: Fair; hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: Very light yellow, odorless solid.
CAS No. 7758-09-0

Potassium Oxalate

laboratory grade, crystal
$K_2C_2O_4 \cdot H_2O$ **P0075** 500 g **$25.45**
F.W. 184.24

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Efflorescent in warm, dry air; keep tightly capped; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Off-white, odorless solid.
CAS No. 6487-48-5

Potassium Permanganate

reagent grade, crystal

$KMnO_4$	**P0077**	100 g	**$ 10.50**
F.W. 158.04	**P0078**	500 g	**23.95**

★ **HAZARD ALERT:** Powerful oxidizing agent; may react violently with easily oxidized substances and can explode on sudden heating in a closed container; common cause of eye accidents; *wear face protection.* Strong skin irritant; slightly toxic by ingestion. LD_{50} 1090 mg/kg.
Storage: Inorganic #8
Disposal: #12a
Shelf Life: Indefinite
Soluble: Water, alcohol, and methyl alcohol; decomposes in water.
Color and Odor: Gray/black, odorless solid.
CAS No. 7722-64-7

Potassium Permanganate Solution

(as $KMnO_4$)

0.2 Molar	**P0239**	500 mL	**$8.95**
0.1 Molar	**P0175**	500 mL	**10.25**

★ **HAZARD ALERT:** Solution may be a skin irritant.
Storage: Inorganic #8
Disposal: #12a
Shelf Life: Fair to poor.
Color and Odor: Dark purple, odorless liquid.

Potassium Phosphate, Monobasic

reagent grade, crystal

KH_2PO_4	**P0141**	100 g	**$16.20**
F.W. 136.09	**P0081**	500 g	**33.05**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; hygroscopic.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7778-77-0

Potassium Phosphate, Tribasic

reagent grade, powder
$K_3PO_4 \cdot nH_2O$ **P0083** 100 g **$29.45**
F.W. 212.27
(as K_3PO_4)

★ **HAZARD ALERT:** Slightly toxic; severe body tissue irritant. LD_{50} 1450 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor unless stored under dry conditions; hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water—giving a strongly basic solution; insoluble in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7778-53-2

Potassium Sodium Tartrate

Rochelle salt
reagent grade, crystal

$KNaC_4H_4O_6 \cdot 4H_2O$	**P0084**	100 g	**$13.90**
F.W. 282.23	**P0085**	500 g	**27.85**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; efflorescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 6381-59-5

Potassium Sulfate

K_2SO_4
F.W. 174.27

Reagent	**P0086**	500 g	**$30.45**
crystal			
Laboratory grade	**P0087**	100 g	**$ 10.45**
powder	**P0088**	500 g	**21.75**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7778-80-5

Potassium Thiocyanate

crystal
KSCN
F.W. 97.18

Reagent	**P0225**	50 g	**$12.35**
	P0089	100 g	**17.15**
	P0090	500 g	**53.90**
Laboratory grade	**P0281**	100 g	**$14.85**

★ **HAZARD ALERT:** Moderately toxic by ingestion; emits toxic fumes of cyanide if strongly heated or in contact with concentrated acids. Decomposes to NO and HCN in the presence of dilute nitric acid. LD_{50} 854 mg/kg.
Storage: Inorganic #7
Disposal: #26a
Shelf Life: Substance deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol, and acetone.
Color and Odor: White, odorless solid.
CAS No. 333-20-0

What Does LD_{50} Mean?

LD_{50} (lethal dose, 50% kill) is the dose that, when administered to test animals, kills half of them. The LD_{50} is expressed in milligrams (mg) of substance per kilogram (kg) of animal body mass and the method by which the toxicant was administered (e.g., oral, intravenous). Inhalation toxicity data are reported as LC_{50}, the lethal concentration, in ppm/hr. For more information, review the article on toxicity on page 594.

Potassium Thiocyanate Solution
(as KSCN)

1 Molar	**P0226**	500 mL	**$12.05**
0.1 Molar	**P0178**	500 mL	**10.95**

For hazard alert, storage, disposal, etc., see Potassium Thiocyanate, P0225.
Color and Odor: Colorless, odorless liquid.

Potato Dextrose Agar
bacteriological media

	P0098	100 g	**$ 42.00**
	P0099	500 g	**145.69**

Storage: Miscellaneous, nonhazardous organic material.
Disposal: #26a
Shelf Life: Good if kept dry.
Soluble: Water
Color and Odor: Buff solid with sour mash odor.

Potato Starch
see Starch, Potato

1-Propanol
see n-Propyl Alcohol under Propyl

2-Propanol
see Isopropyl Alcohol

Propionic Acid
propanoic acid, mold inhibitor
laboratory grade
CH_3CH_2COOH **P0091** 500 mL **$23.90**
F.W. 74.08

★ **HAZARD ALERT:** Flammable liquid; flash point 54 °C (130 °F); liquid burns skin and eyes. LD_{50} 2600 mg/kg. TLV 30 mg/m^3.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Water, alcohol, and chloroform.
Color and Odor: Clear liquid with rancid vinegarlike odor.
CAS No. 79-09-4
Technical Note: Add 1 mL per liter of culture media for mold inhibition.

n-Propyl Alcohol
1-propanol
reagent grade

$CH_3CH_2CH_2OH$	**P0228**	100 mL	**$ 11.20**
F.W. 60.10	**P0092**	500 mL	**15.55**

★ **HAZARD ALERT:** Flammable liquid; dangerous fire risk; harmful to eyes and respiratory tract. LD_{50} 1870 mg/kg. TLV 492 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Indefinite if stored safely.
Soluble: Water and alcohol.
Color and Odor: Colorless liquid with alcohol odor.
CAS No. 71-23-8

Q

Quicklime
see Calcium Oxide

Quieting Solution
see Polyvinyl Alcohol, 10% or Methyl Cellulose, 3%

What To Do in an Emergency?
More than 95% of the science teachers we talk to tell us their school has no emergency action plan for the science department. Don't wait for the administrators to act. You get this much-needed action started. You need a fire plan, you need an eye injury plan, you need a burn plan, you need an acid contact plan... don't wait for the event to happen. This is high priority stuff!

R

Rennin
rennet, cheese-making enzyme; see chymosin

Resazurin Solution
1%, aqueous **R0013*** 20 mL **$10.30**
biological stain/indicator
pH 3.8 orange to 6.5 violet
$C_{12}H_6NO_4Na$
F.W. 251.18
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in water; soluble in dilute alkali.
Color: Blue/black
*Special, unique dropping bottle package called a Flinn *E-Z Drop*™.

Resin, Ion Exchange
see Ion Exchange Resin

Rhodizonic Acid, Disodium Salt
see Sodium Rhodizonate

Ribonucleic Acid
ribose nucleic acid, RNA
from yeast **N0018** 25 g **$123.28**
Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 63231-63-0

RNA
see Ribonucleic Acid

Rochelle Salt
see Potassium Sodium Tartrate

Rubbing Alcohol
see Isopropyl Alcohol, 70%

S

Safranin Staining Solution
1%, aqueous
S0178 500 mL **$30.70**
Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Red, odorless liquid.

Safranin Staining Solution
Gram counter stain
0.25%, alcoholic **S0169** 500 mL **$16.45**
★ **HAZARD ALERT:** 40% alcohol based solution; vapors may be flammable.
Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite if stored safely.
Color and Odor: Red liquid with alcohol odor.

Sal Ammoniac
see Ammonium Chloride

Salicylic Acid
laboratory grade, crystal

$2\text{-}HOC_6H_4COOH$	**S0001**	100 g	**$ 10.15**
F.W. 138.13	**S0002**	500 g	**26.30**

★ **HAZARD ALERT:** Moderately toxic by ingestion; LD_{50} (mouse) 480 mg/kg.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Slightly in water; many organic solvents.
Color and Odor: White, odorless solid.
CAS No. 69-72-7

Saltpeter
see Potassium Nitrate

Sand

fine, white	**S0003**	500 g	**$ 7.10**
	S0004	2 kg	**11.26**
	AP6462	50 lbs	**73.15**
fine, black	**S0449**	500 g	**$8.91**

Storage: Miscellaneous nonhazardous inorganic material.
Color and Odor: White-gray/black, odorless solid.
CAS No. 14808-60-7
Technical Note: White sand is perfect for stream tables. Black sand is used for Earth Science heating of landforms demonstrations.

Sandpaper
fine
9" x 11" sheets **S0165** pkg./4 **$10.60**
Storage: Miscellaneous nonhazardous inorganic material.

Sebacoyl Chloride/Hexane Solution
4 mL of sebacoyl chloride in 100 mL of hexane for nylon polymer experiment or demonstration
S0260 100 mL **$23.30**
★ **HAZARD ALERT:** Flammable liquid; dangerous fire risk.
Storage: Organic #3 in a dedicated flammables cabinet.
Disposal: #18b
Shelf Life: Indefinite
Color and Odor: Colorless liquid with suffocating acid odor.
Technical Note: To prepare nylon you will also need hexamethylene diamine/sodium hydroxide solution.

Seliwanoff Reagent
test solution for distinguishing glucose vs. fructose
Contains 0.1%
resorcinol in 3M HCl **S0453** 100 mL **$9.70**
. **HAZARD ALERT:** Corrosive liquids.
Storage: Inorganic #9 in a dedicated acid cabinet
Disposal: #24b
Shelf Life: Fair

Silica Gel
for chromatography

35–60 Mesh	**S0408**	100 g	**$48.45**
100–200 Mesh	**S0412**	100 g	**30.05**
200–425 Mesh	**S0410**	100 g	**28.25**

For storage, disposal, etc., see Silica Gel, S0212.
Technical Note: As mesh size goes up, particle size decreases (e.g., 200 mesh are finer particles than 35 mesh).

Silicon
laboratory grade
Si
A.W. 28.09

Powder	**S0012**	500 g	**$41.02**
Lumps	**S0342**	100 g	**$13.05**
	S0013	500 g	**33.46**

★ **HAZARD ALERT:** Flammable in powder form. LD_{50} 3160 mg/kg. TLV 10 mg/m^3.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Mixture of nitric and hydrofluoric acid and alkalies.
Color and Odor: Gray, odorless solid.
CAS No. 7440-21-3

Silicone Oil
polymethylsiloxane
excellent heat transfer fluid for use in hot oil baths or melting point Thiele tubes
S0451 250 mL **$22.45**
Storage: Inorganic miscellaneous.
Disposal: #26a
Shelf Life: Indefinite
Soluble: Insoluble in water; soluble in hydrocarbons.
Continued on next column.

Silicone Oil *continued*

Color and Odor: Colorless, odorless.
CAS No. 63148-62-9
Technical Note: Greater working temperature and higher flashpoint than mineral oil. Less tendency to discolor or degrade upon heating than vegetable oil. Reusable almost indefinitely if uncontaminated. 250-mL size will fill five Thiele tubes.

Silver, Foil
0.005" x 2"
reagent grade, Ag **S0270** 5 g **$57.50**
A.W. 107.87 **S0014** 10 g **103.05**
Storage: Inorganic #1
Disposal: #27a
Shelf Life: Indefinite
Soluble: Nitric and hot sulfuric acids.
Color and Odor: Silver, odorless solid.
CAS No. 7440-22-4

Silver, Shot
reagent grade **S0270** 5 g **$ 57.50**
S0016 10 g **109.70**
For storage, disposal, etc., see Silver, Foil, S0270.

Silver Acetate
reagent grade, powder
CH_3CO_2Ag **S0019** 25 g **$183.00**
F.W. 166.93
Storage: Inorganic #2
Disposal: #11
Shelf Life: Indefinite but light-sensitive.
Soluble: Hot water and nitric acid.
Color and Odor: Brown/gray/white solid with slight vinegar odor.
CAS No. 563-63-3

Silver Chloride
reagent grade, powder
AgCl **S0273** 25 g **$115.45**
F.W. 143.34
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite but light-sensitive.
Soluble: Insoluble in water. Soluble in concentrated ammonia or sodium thiosulfate solution.
Color and Odor: Brown/gray/white solid with slight chlorine odor.
CAS No. 7783-90-6

Silver Nitrate
crystal
$AgNO_3$
F.W. 169.87

Reagent	**S0274**	5 g	**$ 22.30**
	S0025	25 g	**92.35**
	S0026	100 g	**334.75**
	S0027	500 g	**1570.75/1**
			9136.92/6
Laboratory grade	**S0433**	25 g	**$ 105.00**
	S0434	100 g	**329.60**

SILVER NITRATE continued on next page.

Reduce Fire Risk
1. Store chemicals in chemically compatible families.
2. Buy and store the minimum quantity of flammables.
3. Store flammables in dedicated flammables cabinets.
4. Provide good ventilation in chemical stores areas.
5. Use water baths, heating mantles and hot plates rather than Bunsen burners or alcohol burners, if possible.
6. Buy and store flammables in metal packages and plastic or PVC-coated bottles rather than glass.
7. Dispose of waste solvents responsibly.

Silver Nitrate *continued*

★ **HAZARD ALERT:** Corrosive; causes burns; avoid contact with eyes and skin; will stain skin and clothing; highly toxic. LD_{50} 1173 mg/kg.
Storage: Inorganic #3 in a Flinn *Chem-Saf*™ Bag inside a locked poisons cabinet.
Disposal: #11
Shelf Life: Indefinite but light-sensitive.
Soluble: Water; hot alcohol.
Color and Odor: White solid with faint nitric acid odor.
CAS No. 7761-88-8
Technical Note: Forms permanent brown/black stains on skin. Silver nitrate stains on clothing can almost always be removed by the use of Spray 'N Wash®, which is obtainable in the laundry products section of your local grocery store. To remove silver nitrate stains on skin, glassware, or lab equipment use the gentle but effective Erada-Stain® cream (Catalog No. AP7330).

Silver Nitrate, Gramolpak

(as $AgNO_3$)

1 Molar	**S0382***	pkg.	**$53.25**
0.1 Molar	**S0405***	pkg.	**16.35**

For hazard alert, storage, disposal, etc., see Silver Nitrate, S0274.
*Gramolpak™ is a unique package that makes 100 mL with distilled water.

Silver Nitrate Solution

(as $AgNO_3$)

1 Molar	**S0304**	25 mL	**$ 24.59**
	S0172	500 mL	**277.00**
0.5 Molar	**S0261**	100 mL	**$ 45.37**
	S0262	500 mL	**161.95**
0.2 Molar	**S0263**	100 mL	**$24.06**
	S0265	500 mL	**73.87**
0.1 Molar	**S0305**	100 mL	**$50.00**
	S0147	500 mL	**56.60**

For hazard alert, storage, disposal, etc., see Silver Nitrate, S0274.
Color and Odor: Colorless, odorless liquid.

Silver Oxide

laboratory grade, powder

Ag_2O	**S0028**	10 g	**$44.91**
F.W. 231.76	**S0029**	25 g	**109.15**

★ **HAZARD ALERT:** Slightly toxic; fire risk in contact with organic material or ammonia. LD_{50} 2820 mg/kg.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite but light-sensitive.
Soluble: Ammonium hydroxide, nitric acid sodium thiosulfate solution; slightly in water; insoluble in alcohol.
Color and Odor: Gray/black, odorless solid.
CAS No. 20667-12-3
Technical Note: See Flinn disposal procedure #11 for an inexpensive route to prepare silver oxide from silver wastes.

Silver Sulfate

reagent grade, powder

Ag_2SO_4	**S0031**	25 g	**$90.10**
F.W. 311.83			

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite but light-sensitive.

Continued on next column.

E-Z Drop™ Bottle

Flinn's E-Z Drop™ bottles are great for storing and dispensing indicator solutions.

Flinn always provides safe and easy-to-use packaging.



Silver Sulfate *continued*

Soluble: Ammonium hydroxide, nitric acid, sulfuric acid, and hot water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 10294-26-5

Slaked Lime

see Calcium Hydroxide

Soap

see Cleaners

Soda Ash

see Sodium Carbonate Anhydrous

Sodium

reagent grade, lumps
Na
A.W. 22.9896

S0329*	5 pieces	**$24.72**
S0450*	15 pieces	**29.00**
S0232	25 g	**26.90**
S0034	100 g	**69.30**
S0035	250 g	**96.65**

(All sizes packaged under mineral oil in plastic bottles, and then in a metal can for safer storage.)

★ **HAZARD ALERT:** A flammable, corrosive solid; dangerous when exposed to heat or flame; dangerous by reaction with moist air, water or any oxidizer. Spontaneously flammable when heated in air; reacts violently with water, producing very dangerous hydrogen gas and a solution of corrosive sodium hydroxide.
Storage: Inorganic #1 under dry mineral oil and inside a Flinn *Saf-Stor*™ Can. Sodium metal must always be stored under dry mineral oil to prevent contact with moist air.
Disposal: #3
Shelf Life: Good, if stored safely.
Color and Odor: New material: metallic gray. Old material: white gray. Metal itself is odorless but is usually stored under an oil or kerosene, either of which may have an odor.
CAS No. 7440-23-5
*These two packages contain small, precut pieces of sodium for demonstrations.
Technical Note: As you handle sodium be particularly attentive to the use of ***dry*** utensils and an entirely dry work surface. Use all appropriate personal safety apparel (e.g., gloves, apron, face shield). Sodium would be the better choice to demonstrate the characteristics of an alkali metal than potassium. Potassium may develop potentially explosive peroxides.

Sodium Acetate

acetic acid, sodium salt, trihydrate
reagent grade, crystal

$NaC_2H_3O_2 \cdot 3H_2O$	**S0036**	100 g	**$ 9.33**
F.W. 136.08	**S0037**	500 g	**20.00**

★ **HAZARD ALERT:** Skin, eye and respiratory irritant. LD_{50} 3530 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance efflorescent.
Soluble: Water; slightly in alcohol.
Color and Odor: White solid with faint vinegar odor.
CAS No. 6131-90-4

Sodium Acetate

anhydrous
laboratory grade, powder

CH_3CO_2Na	**S0344**	100 g	**$ 9.75**
F.W. 82.03	**S0038**	500 g	**16.85**

For hazard alert, storage, disposal, etc., see Sodium Acetate, S0036.
CAS No. 127-09-3

Sodium Acid Phosphate

see Sodium Phosphate, Monobasic

Sodium Alginate

algin; alginic acid, sodium salt
laboratory grade

$(C_6H_7O_6Na)_n$	**S0445**	25 g	**$17.60**

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water

SODIUM ALGINATE continued on next page.

Sodium Alginate *continued*

Color and Odor: Tan, odorless solid.
CAS No. 9005-38-3

Sodium Bicarbonate

sodium hydrogen carbonate, baking soda
powder
$NaHCO_3$
F.W. 84.01

Reagent	**S0042**	500 g	**$10.86**
Laboratory grade	**S0043**	500 g	**$ 8.69**
	S0044	2 kg	**18.20**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 4220 mg/kg.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Stable under dry storage conditions; slowly decomposes in moist air; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 144-55-8

Sodium Bicarbonate Solution

0.5 Molar
(as $NaHCO_3$) **S0268** 500 mL **$8.55**

For storage, disposal, etc.,
see Sodium Bicarbonate Solution, S0267.

Sodium Biphosphate

see Sodium Phosphate, monobasic

Sodium Bismuthate

laboratory grade, powder
$NaBiO_3$ **S0045** 10 g **$56.00**
F.W. 279.97

★ **HAZARD ALERT:** Oxidizer; body tissue irritant; highly toxic. LD_{50} 420 mg/kg.
Storage: Inorganic #7
Disposal: #26a
Shelf Life: Somewhat hygroscopic; slowly decomposes on storage. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Decomposes in hot water and acids; insoluble in cold water.
Color and Odor: Yellow, odorless solid.
CAS No. 12232-99-4

Sodium Bisulfate

sodium hydrogen sulfate
reagent grade, crystal
$NaHSO_4 \cdot H_2O$ **S0214** 100 g **$17.05**
F.W. 138.08

★ **HAZARD ALERT:** Body tissue irritant; moderately toxic.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Hygroscopic; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 10034-88-5

Sodium Bisulfite

sodium hydrogen sulfite
reagent grade, granular
$NaHSO_3$ **S0047** 500 g **$12.60**
F.W. 104.07

★ **HAZARD ALERT:** Severe irritant to skin and tissue as an aqueous solution; slightly toxic. LD_{50} 2000 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Substance very hygroscopic; keep tightly capped and in a cool location; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: White solid with faint sulfur odor.
CAS No. 7631-90-5
Technical Note: Sodium bisulfite is a mixture of sodium bisulfite and sodium metabisulfite, depending on the amount of hydration that has occurred.

Continued on next column.

Sodium Borate

borax, sodium tetraborate
laboratory grade, powder
$Na_2B_4O_7 \cdot 10H_2O$ **S0435** 500 g **$11.70**
F.W. 381.42

★ **HAZARD ALERT:** Slightly toxic by ingestion. Possible teratogen. Possible reproductive/fertility hazard. LD_{50} 2660 mg/kg.
Storage: Inorganic #8
Disposal: #26a
Shelf Life: Material efflorescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and glycerin; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 1303-96-4

Sodium Borate Solution

4%, aqueous
(as $Na_2B_4O_7 \cdot 10H_2O$) **S0363** 500 mL **$ 7.75**
S0364 1 liter **13.60**

★ **HAZARD ALERT:** Possible teratogen. Possible reproductive/fertility hazard.
Storage: Inorganic #8
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Sodium Bromide

reagent grade, granular
NaBr **S0215** 100 g **$11.10**
F.W. 102.90 **S0050** 500 g **26.55**

★ **HAZARD ALERT:** Slightly toxic by ingestion or inhalation. LD_{50} 3500 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Product absorbs water from air; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7647-15-6

Sodium Carbonate

soda ash, anhydrous
granular
Na_2CO_3
F.W. 105.99

Reagent	**S0051**	500 g	**$13.15**
Laboratory grade	**S0052**	500 g	**$ 10.25**
	S0053	2 kg	**16.40**

★ **HAZARD ALERT:** May be a skin irritant. LD_{50} 4090 mg/kg.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Hygroscopic; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, glycerin; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 497-19-8

Sodium Carbonate

monohydrate
reagent grade, crystal
$Na_2CO_3 \cdot H_2O$ **S0054** 500 g **$11.85**
F.W. 124.00 **S0055** 2 kg **41.75**

For hazard alert, storage, disposal, etc., see Sodium Carbonate, S0051.
CAS No. 5968-11-6

Goggle Sanitizing

You may be lucky enough to afford an ultraviolet sanitizing cabinet. If not, Lysol® kills gram positive and negative bacteria, including pseudomonas, staphylococcus, streptococcus, lipophillic viruses like the influenza virus A-2, herpes simplex, vaccinia and adeno type 2. Lysol is a concentrate. Dilute the Lysol in a full bucket of deionized water, immerse the goggles, and allow them to air dry.

Sodium Carbonate Solution

(as Na_2CO_3)

0.1 Molar	**S0235**	500 mL	**$7.75**

Storage: Inorganic #4
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Sodium Chlorate

$NaClO_3$
F.W. 106.45

Reagent	**S0058**	500 g	**$33.25**
granular			
Laboratory grade	**S0059**	500 g	**$15.75**
crystal			

★ **HAZARD ALERT:** Dangerous fire risk; strong oxidant; contact with organic material may cause fire; slightly toxic. LD_{50} 1200 mg/kg.
Storage: Inorganic #6
Disposal: #12a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 7775-09-9

Sodium Chloride

crystal
NaCl
F.W. 58.45

Reagent	**S0061**	500 g	**$ 9.75**
	S0062	2 kg	**25.05**
Laboratory grade	**S0063**	500 g	**$ 6.40**
	S0064	2 kg	**11.20**
	S0311	12 kg	**44.60**
Laboratory grade	**S0065**	1 kg	**$10.50**
rock salt, coarse			

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 3000 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Somewhat hygroscopic; keep tightly closed.
Soluble: Water and slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7647-14-5

Sodium Chloride Solution

(as NaCl)

Saturated	**S0236**	500 mL	**$9.60**
approx. 190 g/500 mL			
1 Molar	**S0347**	500 mL	**$8.30**
0.1 Molar	**S0237**	500 mL	**$7.85**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Sodium Citrate

citric acid, trisodium salt
laboratory grade, granular

$Na_3C_6H_5O_7 \cdot 2H_2O$	**S0068**	500 g	**$16.10**
F.W. 294.10			

Storage: Inorganic #2

Continued on next column.

Hazard Definitions

Carcinogen: Any substance that causes the development of cancerous growths in living tissue.

Mutagen: Any substance able to induce mutations in DNA and living cells.

Teratogen: Any substance that causes growth abnormalities in embryos, genetic modifications in cells, etc.

Allergen: Any substance that produces an allergic reaction.

Sodium Citrate *continued*

Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 6132-04-3

Sodium Dihydrogen Citrate

crystalline powder
citric acid, monosodium salt
sodium citrate, monobasic

$NaC_6H_7O_7$	**S0455**	25 g	**$12.60**
F.W. 214.11			

★ **HAZARD ALERT:** May be irritating to body tissue.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 18996-35-5

Sodium Dihydrogen Phosphate

see Sodium Phosphate, Monobasic

Sodium Dodecyl Sulfate

see Dodecyl Sulfate, Sodium Salt

Sodium Ethanoate

see Sodium Acetate

Sodium Fluoride

laboratory grade, powder

NaF	**S0316**	100 g	**$12.75**
F.W. 41.99			

★ **HAZARD ALERT:** Highly toxic by ingestion and inhalation; strong skin irritant. LD_{50} 52 mg/kg.
Storage: Inorganic #2 in a Flinn *Chem-Saf*™ Bag inside a locked poisons cabinet.
Disposal: #6
Shelf Life: Indefinite
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7681-49-4

Sodium Hexametaphosphate

Calgon®, sodium polyphosphate
laboratory grade

$(NaPO_3)_n$	**S0431**	500 g	**$25.70**
F.W. $(100.98)_n$			

★ **HAZARD ALERT:** Skin, eye, and respiratory irritant.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair; slightly hygroscopic.
Soluble: Soluble in water.
Color and Odor: White, odorless solid.
CAS No. 10124-56-8
Technical Note: Use in place of Calgon for water softening activities.

Sodium Hydrogen Carbonate

see Sodium Bicarbonate

Sodium Hydrogen Citrate

crystalline powder
citric acid, disodium salt
sodium citrate, dibasic

$Na_2C_6H_6O_7 \cdot 1.5H_2O$	**S0456**	25 g	**$14.60**
F.W. 263.11			

★ **HAZARD ALERT:** May be irritating to body tissue.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 6132-05-4

Sodium Hydrogen Phosphate

see Sodium Phosphate, Dibasic

Sodium Hydrogen Sulfate

see Sodium Bisulfate

Sodium Hydroxide

caustic soda, soda lye
NaOH
F.W. 40.00

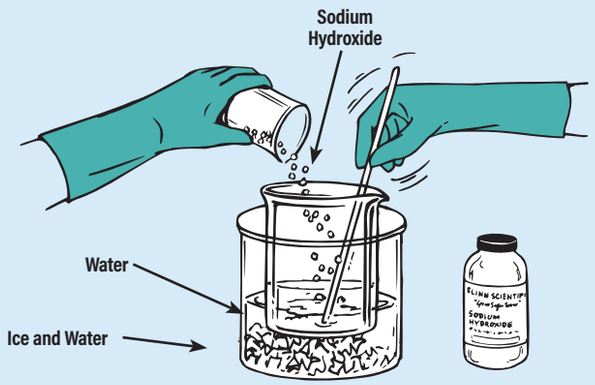
Reagent	**S0074**	100 g	**$ 10.69**
pellet	**S0075**	500 g	**20.40**
	S0076	2 kg	**65.90/1 255.60/4**
Laboratory grade	**S0279**	500 g	**$ 10.38**
flake	**S0077**	2 kg	**24.00**

★ **HAZARD ALERT:** Corrosive solid; skin burns are possible; large amounts of heat evolve when added to water; very dangerous to eyes; wear face and eye protection when using this substance. Wear gloves. TLV 2 mg/m^3.
Storage: Inorganic #4
Disposal: #10
Shelf Life: Good; keep tightly closed.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 1310-73-2

Sodium Hydroxide and Heat

Preparing Sodium Hydroxide Solution?

A large amount of heat is released when sodium hydroxide dissolves in water. The temperature of the solution may increase very rapidly. In fact, the temperature may rise so fast that the solution will boil and possibly spatter a hot, caustic solution. Immerse the beaker or flask in an ice water bath to control the solution temperature. Add ingredients slowly while stirring continuously. Use only borosilicate glassware, and make sure that there are no scratches, chips or breaks.



Sodium Hydroxide, Gramolpak

(as NaOH)

1 Molar	**S0394***	pkg. (Makes 1 L)	**$10.00**

For hazard alert, storage, disposal, etc., see Sodium Hydroxide, S0074.
*Gramolpak™ is a unique package that makes a known solution with distilled water.

Sodium Hydroxide Solution

50%

(as NaOH) approx. 19 M	**S0078**	500 mL	**$22.65**

★ **HAZARD ALERT:** Corrosive liquid; skin burns are possible; very dangerous to eyes; wear gloves.
Storage: Inorganic #4
Disposal: #10
Shelf Life: Good if kept tightly closed.
Color and Odor: Colorless, odorless liquid.

Sodium Hydroxide Solution

(as NaOH)

6 Molar	**S0242**	500 mL	**$12.36**
3 Molar	**S0447**	500 mL	**10.50**
1 Molar	**S0148**	500 mL	**8.30**
0.5 Molar	**S0243**	500 mL	**8.51**
0.2 Molar	**S0244**	500 mL	**8.02**
0.1 Molar	**S0149**	500 mL	**7.62**

For hazard alert, storage, disposal, etc., see Sodium Hydroxide Solution, 50%, S0078.

Sodium Hypochlorite Solution

bleach, 5% available chlorine
NaOCl
F.W. 74.44

S0080	1 liter	**$12.30**
S0081	3.78 liters	**20.85**

★ **HAZARD ALERT:** Corrosive liquid; causes skin burns; reacts with acid to evolve chlorine gas; evolves chlorine when heated; moderately toxic by ingestion and inhalation; avoid contact with organic material.
Storage: Inorganic #6
Disposal: #26b
Shelf Life: Fair; decomposes upon exposure to heat or light. Store in a cool, dry place.
Color and Odor: Faint yellow liquid; odor like chlorine or bleach.
CAS No. 7681-52-9 (for pure NaOCl)
Technical Note: Flinn sodium hypochlorite solution contains 5–5½% w/v sodium hypochlorite. Solution is approximately 0.7 M.

Sodium Hyposulfite

see Sodium Thiosulfate

Sodium Iodate

laboratory grade, powder
$NaIO_3$
F.W. 197.90

S0082	100 g	**$43.85**

★ **HAZARD ALERT:** Oxidant; fire risk in contact with organic material; slightly toxic by ingestion.
Storage: Inorganic #6
Disposal: #12a
Shelf Life: Deliquescent; changes color on exposure to light; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and acetone; not alcohol.
Color and Odor: White solid with faint iodine odor.
CAS No. 7681-55-2

Sodium Iodide

granular
NaI
F.W. 149.92

Reagent	**S0083**	25 g	**$15.45**
	S0084	100 g	**40.68**
Laboratory grade	**S0436**	100 g	**$ 38.00**
	S0437	500 g	**160.26**

★ **HAZARD ALERT:** Slightly toxic. LD_{50} 4340 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Deliquescent; changes color on exposure to light; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol, and glycerin.
Color and Odor: White, odorless solid.
CAS No. 7681-82-5

Sodium Iodide Solution

(as NaI)

0.5 Molar	**S0369**	500 mL	**$27.40**
0.1 Molar	**S0245**	500 mL	**10.50**

SODIUM IODIDE SOLUTION continued on next page.

Dry Sand—A Chemist's Good Friend

Dry sand is a good fire extinguisher, especially for use with flammable metals like sodium. Dry, clean sand also can be used to dike and absorb a hazardous material spill. Sand provides necessary traction in a treacherous floor situation. See to it that dry, clean sand is available in your laboratory and chemical storeroom.

Sodium Iodide Solution *continued*

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good, if kept tightly closed.
Color and Odor: Colorless, odorless liquid.

Sodium Lauryl Sulfate

see Dodecyl Sulfate, Sodium Salt

Sodium Metabisulfite

sodium pyrosulfite
reagent grade, granular

$Na_2S_2O_5$	**S0317**	100 g	**$ 9.45**
F.W. 190.11	**S0087**	500 g	**17.95**

★ **HAZARD ALERT:** Skin and tissue irritant; moderately toxic by ingestion. LD_{50} 1131 mg/kg.
Storage: Inorganic #2
Disposal: #12b
Shelf Life: Poor; moisture-sensitive.
Soluble: Water; slightly in alcohol.
Color and Odor: White solid with a sulfur odor.
CAS No. 7681-57-4

Sodium Monohydrogen Phosphate

see Sodium Phosphate, Dibasic

Sodium Nitrate

$NaNO_3$
F.W. 84.99

Reagent	**S0281**	100 g	**$ 10.25**
crystal	**S0088**	500 g	**25.90**
Laboratory grade	**S0090**	500 g	**$12.30**
granular			

★ **HAZARD ALERT:** Strong oxidizer; avoid friction or shock—explosions have occurred; moderately toxic by ingestion. LD_{50} 1267 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7631-99-4

Sodium Nitroferricyanide

sodium nitroprusside
for detection of the amino acid cysteine
reagent grade, crystal

$Na_2Fe(CN)_5NO \cdot 2H_2O$	**S0221**	25 g	**$63.04**
F.W. 297.91			

★ **HAZARD ALERT:** Highly toxic by ingestion and inhalation.
Storage: Inorganic #7
Disposal: #14. P-Listed (P030); purchase small amounts for effective inventory control.
Shelf Life: Poor; hygroscopic.
Soluble: Water; slightly in alcohol.
Color and Odor: Red/purple, odorless solid.
CAS No. 13755-38-9

Hood Storage of Chemicals

Reasons not to use a hood for chemical storage:

1. Hoods do not provide a secure storage space.
2. Labels may be damaged beyond recognition due to constant exposure to a corrosive environment.
3. The presence of hazardous materials stored under a hood would seriously complicate a hood fire.
4. Storing chemicals in the hood reduces available work space.
5. Many fume motor/blower sets are not designed for continuous, 24-hour operation.

Sodium Oxalate

powder
$Na_2C_2O_4$
F.W. 134.00

Reagent	**S0094**	100 g	**$20.00**
	S0095	500 g	**62.00**
Laboratory grade	**S0438**	100 g	**$17.70**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant. LD_{50} (mouse) 5094 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; hygroscopic.
Color and Odor: White, odorless solid.
CAS No. 62-76-0

Sodium Phosphate, Monobasic

sodium dihydrogen phosphate
reagent grade, crystal

$NaH_2PO_4 \cdot H_2O$	**S0097**	100 g	**$12.45**
F.W. 137.99	**S0098**	500 g	**40.00**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Slightly hygroscopic.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 10049-21-5

Sodium Phosphate (Monobasic) Solution

0.1 Molar

(as $NaH_2PO_4 \cdot H_2O$)	**S0371**	500 mL	**$8.70**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Sodium Phosphate, Dibasic

disodium hydrogen phosphate, heptahydrate
reagent grade, granular

$Na_2HPO_4 \cdot 7H_2O$	**S0099**	500 g	**$28.05**
F.W. 268.07			

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Hot water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7782-85-6

Sodium Phosphate, Dibasic

disodium hydrogen phosphate, anhydrous
reagent grade, powder

Na_2HPO_4	**S0223**	100 g	**$12.70**
F.W. 141.96			

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Hygroscopic; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Hot water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7558-79-4

Sodium Phosphate, Dibasic, Solution

(as $Na_2HPO_4 \cdot 7H_2O$)

1.0 Molar	**S0350**	500 mL	**$11.95**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite.
Color and Odor: Colorless, odorless liquid.

Sodium Phosphate, Tribasic

TSP, trisodium phosphate
laboratory grade, granular

$Na_3PO_4 \cdot 12H_2O$	**S0101**	500 g	**$16.75**
F.W. 380.12			

SODIUM PHOSPHATE, TRIBASIC continued on next page.

Sodium Phosphate, Tribasic *continued*

★ **HAZARD ALERT:** Slightly toxic by ingestion; severe body tissue irritant.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 10101-89-0
Technical Note: Excellent cleaner for washing wood acid cabinets.

Sodium Phosphate, Tribasic, Solution

0.1 Molar
(Na_3PO_4•$12H_2O$) **S0250** 500 mL **$8.85**

For hazard alert, storage, etc., see Sodium Phosphate, Tribasic, S0101.
Disposal: #26b
Color and Odor: Colorless, odorless liquid.

Sodium Polyacrylate

powder **W0013** 100 g **$12.38**
W0014 500 g **32.91**

Storage: Organic #3
Disposal: #26a
Shelf Life: Good if kept dry.
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 9003-04-7
Technical Note: Sodium polyacrylate is a super absorbent that will absorb about 800 times its weight in distilled water.

Sodium Potassium Tartrate

see Potassium Sodium Tartrate

Sodium Rhodizonate

rhodizonic acid, disodium salt
$C_6O_6Na_2$ **S0448** 1 g **$13.25**
F.W. 214.06

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Gray, odorless solid.
CAS No. 523-21-7
Technical Note: Use a 0.2% aqueous solution as a lead testing reagent. Solution must be made fresh.

Sodium Silicate Solution

water glass
laboratory grade **S0102** 500 mL **$ 8.05**
S0103 4 liters **31.15**

★ **HAZARD ALERT:** Body tissue irritant.
Storage: Inorganic #4
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.
Technical Note: This solution is 37–40% sodium silicate, (40–42 °Be, approx. density 1.40). It is prepared using a high-temperature, high-pressure process and cannot be made in lab.

Sodium Sulfate

Glauber's salt, decahydrate
reagent grade, crystal
Na_2SO_4•$10H_2O$ **S0225** 100 g **$13.65**
F.W. 322.19 **S0104** 500 g **46.05**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Substance loses water of hydration at 100 °C; indefinite.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7727-73-3

Sodium Sulfate

anhydrous
Na_2SO_4
F.W. 142.02
Reagent **S0105** 500 g **$17.05**
granular
Laboratory grade **S0107** 500 g **$ 8.40**
powder **S0108** 2 kg **21.55**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7757-82-6

Sodium Sulfide

chunk
Na_2S•$9H_2O$
F.W. 240.18
Reagent **S0109** 100 g **$25.44**
S0110 500 g **54.30**
Laboratory grade **S0439** 100 g **$17.25**

★ **HAZARD ALERT:** Toxic by ingestion and skin absorption; corrosive to skin and eyes. LD_{50} (for anhydrous salt) 208 mg/kg.
Storage: Inorganic #5
Disposal: #23
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Soluble: Water; slightly in alcohol.
Color and Odor: Colorless solid with rotten egg odor.
CAS No. 1313-84-4
Technical Note: Readily absorbs water from air. May appear as a slurry, especially under hot, humid conditions.

Sodium Sulfite

anhydrous
laboratory grade, granular
Na_2SO_3 **S0111** 500 g **$13.70**
F.W. 126.05

★ **HAZARD ALERT:** Slightly toxic; possible body tissue irritant. LD_{50} 3560 mg/kg.
Storage: Inorganic #2
Disposal: #12b
Shelf Life: Moisture-sensitive.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7757-83-7

Sodium Sulfite Solution

1 Molar
(as Na_2SO_3) **S0253** 500 mL **$10.25**

Storage: Inorganic #2
Disposal: #12b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Sodium Tetraborate

see Sodium Borate

Sodium Thiocyanate

laboratory grade, crystal
NaSCN **S0113** 100 g **$18.30**
F.W. 81.08

★ **HAZARD ALERT:** Moderately toxic. LD_{50} 764 mg/kg.
Storage: Inorganic #7
Disposal: #26a
Shelf Life: Hygroscopic and affected by light; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 540-72-7

Sodium Thiosulfate

hypo, pentahydrate
crystal
$Na_2S_2O_3 \cdot 5H_2O$
F.W. 248.19

Reagent	**S0114**	500 g	**$11.70**
	S0115	2 kg	**44.85**
Laboratory grade	**S0116**	1 kg	**$14.05**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant. LD_{50} 2000 mg/kg.
Storage: Inorganic #2
Disposal: #12b
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 10102-17-7

Sodium Thiosulfate

anhydrous
reagent grade, granular
$Na_2S_2O_3$ **S0322** 100 g **$ 10.70**
F.W. 158.11 **S0117** 500 g **18.35**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant.
Storage: Inorganic #2
Disposal: #12b
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7772-98-7

Sodium Thiosulfate Solution

0.1 Molar
(as $Na_2S_2O_3$) **S0150** 500 mL **$8.60**

Storage: Inorganic #2
Disposal: #12b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Stains

see individual listings, e.g., Crystal Violet, Methylene Blue, etc.

Stannic...Stannous...

see Tin(IV) and Tin(II)

Starch, Corn

laboratory grade, powder

	S0124	500 g	**$12.00**
	S0282	2 kg	**31.40**

Storage: Organic miscellaneous
Disposal: #26a
Shelf Life: Indefinite if kept dry.
Soluble: Water
Color and Odor: White, odorless solid.

Starch, Potato

powder

ACS Reagent	**S0122**	100 g	**$21.15**
starch soluble for iodometry	**S0123**	500 g	**66.25**
Laboratory grade	**S0125**	500 g	**$17.05**

Storage: Organic miscellaneous
Disposal: #26a
Shelf Life: Indefinite if kept dry.
Soluble: Water
Color and Odor: White, odorless solid.

What Does *Moderately Toxic* Mean?

Moderately toxic materials may be described as harmful if swallowed. They have Oral-Rat LD_{50} values between 300–2000 mg/kg or Inhalation-Rat LC_{50} of 220–2200 ppm/hr. To avoid chemical contact, immediately clean up all spills and never eat or drink in the lab. Rely on Flinn to help you understand chemical hazards and how they can affect you.

Starch, Spray

S0302 20 oz. can **$8.60**

Storage: Miscellaneous nonhazardous organic material.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: White, odorless spray.
Technical Note: Starch solution as an indicator for iodine can easily be made using spray starch. Generously spray the starch into the desired quantity of water and stir. Prepare as needed since starch solutions have a poor shelf life.

Starch Solution

0.5%, aqueous **S0151** 500 mL **$11.55**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26b
Shelf Life: Poor; deteriorates over time depending on storage conditions.
Color and Odor: Colorless, odorless liquid.

Stearic Acid

octadecanoic acid
powder
$CH_3(CH_2)_{16}COOH$
F.W. 284.49

Reagent	**S0336**	500 g	**$19.90**
Laboratory grade	**S0126**	500 g	**$22.00**

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Many organic solvents; not water.
Color and Odor: Off-white solid with faint wax odor.
CAS No. 57-11-4
Technical Note: Laboratory grade stearic acid is actually 50% stearic acid and 45% palmitic acid; melting point is 55–56 °C. Reagent grade is >95% stearic acid: melting point is 67–69 °C. The reagent grade is a better choice for melting point labs.

Steel, Shot

S0127 500 g **$10.50**

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Insoluble in chemicals commonly found on school premises.
Color and Odor: Gray, odorless solid.
Technical Note: Steel shot are irregularly shaped steel pieces, not small, evenly sized spheres.

Steel, Wool

size 00, 16 pads **S0128** 300 g **$10.20**

★ **HAZARD ALERT:** Steel wool is a flammable solid. Avoid contact with flames and electricity. Steel wool may spontaneously ignite upon contact with the leads on a typical dry-cell battery.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite; will quickly oxidize if stored in a corrosive environment.
Soluble: Easily in common mineral acids.
Color and Odor: Gray, odorless solid.
Technical Note: To remove protective coating, soak steel wool in acetone for a few minutes.

Strontium Chloride

crystal
$SrCl_2 \cdot 6H_2O$
F.W. 266.64

Reagent	**S0129**	100 g	**$12.84**
	S0130	500 g	**36.42**
Laboratory grade	**S0440**	100 g	**$10.97**
	S0441	500 g	**31.94**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 2250 mg/kg (for anhydrous salt).
Storage: Inorganic #2
Disposal: #26a

STRONTIUM CHLORIDE continued on next page.

Strontium Chloride *continued*

Shelf Life: Fair to poor; effloresces in air; deliquesces in moist air; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 10025-70-4

Strontium Chloride Solution

(as $SrCl_2 \cdot 6H_2O$)

1 Molar	**S0358**	500 mL	**$19.35**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good, if stored properly.
Color and Odor: Colorless, odorless liquid.

Strontium Nitrate

crystal
$Sr(NO_3)_2$
F.W. 211.63

Reagent	**S0131**	100 g	**$14.30**
Laboratory grade	**S0442**	100 g	**$12.80**
	S0443	500 g	**27.85**

★ **HAZARD ALERT:** Strong oxidant; fire risk in contact with organic material; slightly toxic. Possible body tissue irritant. LD_{50} 2750 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water; slightly in absolute alcohol.
Color and Odor: White, odorlesss solid.
CAS No. 10042-76-9

Strontium Nitrate Solution

(as $Sr(NO_3)_2$)

1 Molar	**S0359**	500 mL	**$16.65**
0.1 Molar			

★ **HAZARD ALERT:** Possible body tissue irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Succinic Acid

butanedioic acid
laboratory grade, powder

$(CH_2COOH)_2$	**S0133**	100 g	**$21.10**

F.W. 118.09

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 2260 mg/kg.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Alcohol; slightly in water.
Color and Odor: White, odorless solid.
CAS No. 110-15-6

Sucrose

crystal
$C_{12}H_{22}O_{11}$
F.W. 342.31

Reagent	**S0134**	500 g	**$18.65**
	S0283	2 kg	**51.00**
Laboratory grade	**S0135**	1 kg	**$14.80**
cane sugar, white	**S0136**	2 kg	**21.95**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White solid with malt odor.
CAS No. 57-50-1
Technical Note: Not for human consumption.

Sudan III Solution

0.01%, alcoholic staining solution

	S0159	100 mL	**$9.39**

★ **HAZARD ALERT:** Alcohol-based solution; flammable liquid; toxic by ingestion and inhalation.
Storage: Organic #9 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a
Shelf Life: Good if stored safely.
Color and Odor: Red liquid with alcohol odor.

Sudan IV Solution

0.01%, alcoholic staining solution

	S0160	100 mL	**$11.15**

★ **HAZARD ALERT:** Alcohol-based solution; flammable liquid; moderately toxic.
Storage: Organic #9 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Good if stored safely.
Color and Odor: Red liquid with alcohol odor.

Sugar, White Cane

see Sucrose

Sulfur, Flowers

laboratory grade, powder
sublimed

S	**S0138**	500 g	**$12.50**

A.W. 32.066

★ **HAZARD ALERT:** This finely divided form of sulfur can be a moderate fire or explosion risk. Sulfur has low toxicity. When sulfur is burned, toxic sulfur dioxide is produced. May be a skin irritant.
Storage: Inorganic #10
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in alcohol and other organic solvents; insoluble in water.
Color and Odor: Yellow solid with faint rotten egg odor.
CAS No. 7704-34-9

Sulfur, Roll

laboratory grade, flake

S	**S0140**	500 g	**$9.60**

A.W. 32.066

★ **HAZARD ALERT:** Dust or finely divided material in the container can be a moderate fire risk. When sulfur is burned, toxic sulfur dioxide is produced. Sulfur has low toxicity. May be a skin irritant.
Storage: Inorganic #10
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in alcohol and other organic solvents; insoluble in water.
Color and Odor: Yellow solid with faint rotten eggs odor.
CAS No. 7704-34-9

Sulfur, Precipitated

lac sulfur
laboratory grade, powder

S	**S0142**	500 g	**$13.50**

A.W. 32.066

SULFUR, PRECIPITATED continued on next page.

Hazardous Shipping Fee

Certain items sold by Flinn are classified as hazardous materials by the U.S. Department of Transportation and therefore require special handling to ensure safe transport. A flat fee of $32 per order is added to cover these handling requirements and such items can only be shipped to schools, museums and science centers.

Sulfur, Precipitated *continued*

★ **HAZARD ALERT:** This finely divided form of sulfur can be a moderate fire or explosion risk. Sulfur has low toxicity. When sulfur is burned, toxic sulfur dioxide is produced. May be a skin irritant.
Storage: Inorganic #10
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in alcohol and other organic solvents; insoluble in water.
Color and Odor: Yellow solid with faint rotten egg odor.
CAS No. 7704-34-9

Sulfur Hexafluoride Gas

lecture bottle	**LB1030**	0.5 lb (37 liters)	**$428.40**

★ **HAZARD ALERT:** May react violently with organometallics and chemically-active metals.
Storage: In an area dedicated to bottled gases.
Disposal: Completely empty lecture bottle in a well-operating fume hood, then follow #26a.
Shelf Life: Indefinite; if stored safely.
Soluble: Alcohol; slightly in water.
Color and Odor: Colorless, odorless.
CAS No. 2551-62-4

Sulfuric Acid

18 Molar

ACS, reagent	**S0228**	100 mL	**$ 10.41**
H_2SO_4	**S0143**	500 mL	**39.00**
F.W. 98.08	**S0144**	2.5 liters	**45.55**
	S0145*	2.5 liters	**51.95/1 201.44/4**

(*Packaged in PVC-coated bottle)

★ **HAZARD ALERT:** *Severely corrosive* to eyes, skin and other tissue; considerable heat of dilution with water; mixing with water may cause spraying and spattering. Solutions might best be made by immersing the mixing vessel in an ice bath. Even very dilute solutions are harmful to eyes and skin. ***Always add the acid to water, never the reverse;*** extremely hazardous in contact with finely divided materials, carbides, chlorates, nitrates, and other combustible materials. TLV 1 mg/m^3. LD_{50} 2140 mg/kg.
Storage: Inorganic #9 in a dedicated acid cabinet and away from any source of water; if an acid cabinet is not available, store in a Flinn *Saf-Cube*™.
Disposal: #24b
Shelf Life: Good, but only if stored away from water and under safe conditions. Sulfuric acid has an affinity to water—abstracting it from the air and from organic substances, hence it chars wood, sugar, etc. If sulfuric acid has turned dark brown on your shelf its purity would be in question.
Soluble: Water, evolving very considerable heat. Use an ice bath.
Color and Odor: Colorless liquid with sulfurous odor.
CAS No. 7664-93-9
Cap Safety Color Code: Yellow
Technical Note: Spilled sulfuric acid presents a very slippery floor problem. We hope you understand why it is essential to maintain a bucket of dry sand in the area where sulfuric acid is stored.
Safety Purchase Suggestion: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of sulfuric acid and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.
*Sulfuric acid is exactly as described under catalog number S0144 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are safely retained in a PVC outer envelope. The PVC-coated bottle is a safer package for science teachers.

Goggle Use

When is it appropriate to wear goggles? Science teachers often respond by citing specific situations (e.g., when working with strong bases, when working with acids, when working with biuret). A good general rule would be... WORKING WITH CHEMICALS... ANY CHEMICALS... WEAR GOGGLES!

Wear chemical splash goggles whenever working with chemicals, glassware or heat.

Sulfuric Acid Solution

(as H_2SO_4)

12.5 Molar	**S0380**	500 mL	**$18.45**
	S0406	1 liter	**31.50**
9 Molar	**S0414**	1 liter	**$29.60**
6 Molar	**S0415**	500 mL	**$16.80**
	S0416	1 liter	**26.70**
3 Molar	**S0417**	500 mL	**$11.90**
	S0418	1 liter	**21.75**
2 Molar	**S0205**	1 liter	**$17.10**
1 Molar	**S0202**	500 mL	**$11.60**
	S0203	1 liter	**15.70**
0.1 Molar	**S0420**	1 liter	**$12.80**

★ **HAZARD ALERT:** Treat all sulfuric acid solutions with the same caution you would have for concentrated sulfuric acid. For example, the pH of 0.05 M sulfuric acid solution is 1.2.
Storage: Inorganic #9; preferably in a dedicated acid cabinet.
Disposal: #24b
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Colorless, odorless liquid.

T

Tes-Tape

see Glucose Test Strips

Test Papers (litmus, etc.)

see page 193

Thermit™

black	**T0007**	500 g	**$17.45**

★ **HAZARD ALERT:** When ignited, produces an extremely hot (>2000 °C) reaction mixture that will throw sparks 10–15 feet and is difficult to stop. Wear face, hand, and eye protection and use a safety shield when performing demonstration.
Storage: Inorganic #4 inside a Flinn *Saf-Stor*™ Can and then in a dedicated flammables cabinet.
Disposal: #26a
Shelf Life: Good if stored safely.
Color and Odor: White/gray/black, odorless solid.
CAS No. 69012-31-3
Technical Note: Thermit is a mixture of ferric oxide and very fine aluminum powder. The thermite reaction requires a temperature of almost 1200 °C for ignition, and is best performed using specially designed igniting sticks (see next listing, T0086).

Thermite Igniting Sticks

	T0086	pkg./10	**$52.35**

★ **HAZARD ALERT:** Thermite igniting sticks are a fire hazard when exposed to a flame or temperatures above 500 °F. Contact us for a technical data sheet relating to their use.
Storage: Inorganic #1 in a dedicated flammables cabinet.
Disposal: #26a
Shelf Life: Indefinite if kept dry.
Color and Odor: Silver gray metal on a copper stick, odorless.
Safety Purchase Suggestion: These igniting sticks are the easiest and safest method for starting thermite reactions. Please consider using them instead of magnesium metal ribbon or other chemical igniters.

Thymol Blue

indicator, sodium salt
pH 1.2 red to 2.8 yellow and 8.0 yellow to 9.2 blue
reagent grade, crystal

$C_{27}H_{29}NaO_5S$	**T0025**	1 g	**$13.25**
F.W. 488.58			

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Alcohol and water.
Color and Odor: Black, odorless solid.
CAS No. 62625-21-2

Thymol Blue Indicator Solution

0.04%, aqueous

	T0045	100 mL	$10.70

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Dark blue, odorless liquid.

Thymolphthalein

indicator
pH 9.3 colorless to 10.5 blue
reagent grade, powder

$C_{28}H_{30}O_4$	T0073	5 g	$17.85
F.W. 430.52			

Storage: Organic #9
Disposal: #18b
Shelf Life: Indefinite
Soluble: Alcohol and acetone; not water.
Color and Odor: White, odorless solid.
CAS No. 125-20-2

Thymolphthalein Indicator Solution

0.04%, alcoholic

	T0080	500 mL	$19.30

★ **HAZARD ALERT:** Alcohol solution; flammable liquid.
For storage, disposal, etc., see Thymolphthalein, T0073.
Color and Odor: Colorless liquid with alcohol odor.

Tin

granular
20 mesh
Sn
A.W. 118.69

Reagent	T0013	100 g	$ 37.29
	T0063	500 g	132.89
Laboratory grade	T0090	100 g	$31.60

Storage: Inorganic #1
Disposal: #27a
Shelf Life: Indefinite
Soluble: Not water; acids and hot potassium hydroxide solution.
Color and Odor: Shiny gray, odorless solid.
CAS No. 7440-31-5

Tin, Foil

0.0015 thick x 12" wide	T0064	100 g	$ 37.29
Sn	T0017	500 g	117.25

For storage, disposal, etc., see Tin, granular, T0013.

Tin, Mossy

Sn	T0014	100 g	$ 30.13
	T0015	500 g	132.75

For storage, disposal, etc., see Tin, granular, T0013.

Tin, Sheet

Sn, 1/32" thick	T0089	12" x 4", approx. 125 g	$40.85
	T0088	12" x 12", approx. 500 g	103.12

For storage, disposal, etc., see Tin, granular, T0013.

Tin, Shot

Sn	T0057	25 g	$17.98
	T0016	100 g	38.52

For storage, disposal, etc., see Tin, granular, T0013.

Tin, Strips

Sn, 1/32" thick

6" long x 1/2" wide	T0087	pkg./6	$13.97

For storage, disposal, etc., see Tin, granular, T0013.

Tin(II)...Stannous... Tin compounds in which the tin has an ionic charge or oxidation number of two.

Tin(II) Chloride

stannous chloride
laboratory grade, crystal

$SnCl_2 \cdot 2H_2O$	S0120	100 g	$23.10
F.W. 225.65			

★ **HAZARD ALERT:** Moderately toxic; skin irritant; corrosive. LD_{50} 700 mg/kg.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Poor; absorbs oxygen from air and converts into an insoluble oxychloride; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag. Moisture-sensitive.
Soluble: Water, alkalies, tartaric acid and alcohol.
Color and Odor: White solid with slight chlorine odor.
CAS No. 10025-69-1

Tin(II) Chloride Solution

1 Molar

(as $SnCl_2 \cdot 2H_2O$ in HCl)	S0354	500 mL	$22.80

★ **HAZARD ALERT:** Corrosive to body tissue; moderately toxic by ingestion.
Storage: Inorganic #2
Disposal: #24b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Toluene

toluol
reagent grade

$C_6H_5CH_3$	T0019	500 mL	$ 11.25
F.W. 92.14	T0061	1 liter	21.65/1
			125.94/6

★ **HAZARD ALERT:** Moderately toxic by ingestion, inhalation, and skin absorption; flammable liquid; dangerous fire risk. Possible skin irritant. Possible reproductive/fertility hazard. LD_{50} 636 mg/kg. TLV 377 mg/m^3.
Storage: Organic #3 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b. U-Listed (U220); purchase small amounts for effective inventory control.
Shelf Life: Good if stored safely.
Soluble: Alcohol; not water.
Color and Odor: Colorless liquid with a benzenelike odor.
CAS No. 108-88-3

TOP

see 4-tert-Octylphenol

1,2,3-Triketohydrindene Hydrate

see Ninhydrin

Tris-Acetate Buffer

TAE buffer
pH 7.8 buffer for DNA or RNA electrophoresis
50X buffer concentrate
100 mL of concentrate is enough to make
5 L of buffer solution

	FB0325	100 mL	$27.26

Cleaning and Scratching Glassware

Scratches are a real enemy of glass. Why? A scratch causes a stress point in the glass around which a break will occur. Have you ever watched glass being cut? The first thing done is to scratch or scribe the glass. Pressure is placed on the scratched line, and a clean break occurs. If you can clean glassware without using wire brushes that may scratch—great. The sooner dirty labware is washed, the easier it is to clean.

U

Universal Indicator Solution

pH range 4–10
color indicator chart is attached to the bottle

U0009*	35 mL	**$ 7.79**
U0001	100 mL	**10.72**
U0002	500 mL	**17.25**
U0011	1000 mL	**31.28**

★ **HAZARD ALERT:** Alcohol-based solution; flammable liquid.
Storage: Organic #9 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Dark green liquid with slight alcohol odor.
*Special, unique dropping bottle package called a Flinn *E-Z Drop*™.

Universal Indicator, Red Cabbage Extract

pH range 2–11
Powdered cabbage extract. Will make gallons of red cabbage indicator solution.

U0014 10 g **$16.30**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite, if stored in a cool, dry area.
Soluble: Water
Color and Odor: Dark maroon solid with cabbage odor.
Technical Note: Prepare a 0.2% solution to use as an indicator.

Rainbow Acid Universal Indicator, pH 1–7 U0012



Universal Indicator Solution, Rainbow Acid

pH range 1–7
color indicator chart attached to the bottle

U0012 100 mL **$11.05**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Dark green liquid.
Technical Note: Rainbow spectrum of colors observed for pH values from 1–7. Excellent indicator to test acidity levels of common household substances.

Urea

laboratory grade, beads
NH_2CONH_2 **U0003** 500 g **$11.60**
F.W. 60.06

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 57-13-6

Universal Indicator Combination Kit

FLINN EXCLUSIVE

Two great indicators, one low price!

Contains one bottle (100 mL) each of the standard universal indicator solution (pH 4–10) and the rainbow acid universal indicator (pH 1–7). Combination kit offers great versatility for identifying the pH range and acid–base properties of common household substances.

AP7149 2 x 100 mL **$19.28**

V

Vanillin

Reagent
4-Hydroxy-3-methoxybenzaldehyde
$C_8H_8O_3$ **V0007** 100 g **$37.20**
F.W. 152.15

★ **HAZARD ALERT:** Body tissue irritant
Storage: Organic #3
Disposal: #2
Shelf Life: Excellent, if stored safely.
Soluble: ethanol, diethyl ether, acetone
Color and Odor: Light yellow to white solid with a vanilla odor.
CAS No. 121-33-5

Vegetable Dyes

see Food Coloring Dyes and FD&C Food Dyes

Vermiculite

see Super Sorb® on page 584

Vinegar

Cider	**V0002**	3.78 liters	**$11.26**
White	**V0005**	3.78 liters	**$12.30**

Storage: Organic #1
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Brown or clear liquid with acetic acid odor.
CAS No. 64-19-7

W

Washing Soda

see Sodium Carbonate

Water

Deionized	**W0007**	4 liters	**$11.37**
Distilled	**W0001**	4 liters	**11.33**

Storage: Miscellaneous nonhazardous material.
Disposal: #26b
Shelf Life: Indefinite if kept tightly closed. If your distilled water is stored for a long period, it will gradually become acidic, due to the presence of dissolved CO_2. Boiling the water before use will drive off and eliminate the dissolved CO_2.
Color and Odor: Colorless, odorless liquid.
CAS No. 7732-18-5

Water Glass

see Sodium Silicate Solution

Waterlock®

see Sodium Polyacrylate

Waxes

see individual listings (Paraffin, etc.)

X

Xylenes

reagent grade
$C_6H_4(CH_3)_2$ **X0001** 500 mL **$14.05**
F.W. 106.17

★ **HAZARD ALERT:** Flammable liquid; moderate fire risk; slightly toxic by ingestion and inhalation. Avoid skin contact. LD_{50} 4300 mg/kg. TLV 434 mg/m^3.
Storage: Organic #3 in a dedicated flammables cabinet. If one is not available, then store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b. U-Listed (U239); purchase small amounts for effective inventory control.
Shelf Life: Good if kept tightly closed and stored safely.
Soluble: Alcohol; not water.
Color and Odor: Colorless liquid with airplane glue odor.
CAS No. 1330-20-7

Y

Yeast

Baker's
viable — **Y0008** — pkg./3 — **$11.10**
three 7 g packets

Brewer's — **Y0002** — 500 g — **$24.00**
powder, inactive

Storage: Miscellaneous, nonhazardous organic material.
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Brown solid with malt odor.

Z

Zinc, Dust

laboratory grade
Zn — **Z0005** — 500 g — **$27.81**
A.W. 65.37

★ **HAZARD ALERT:** Zinc dust can be a dangerous fire risk; may form explosive mixture with air. If allowed to get damp in a confined bottle, heat will be generated and the mixture may even ignite; cases are known where bottles have exploded under pressure. ***Keep this product dry!***
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Good if kept dry. Store in a Flinn *Chem-Saf*™ Bag to ensure it is kept dry.
Soluble: Acids and alkalies; not water.
Color and Odor: Light gray, odorless solid.
CAS No. 7440-66-6

Zinc, Foil

0.010" x 10" x 36" — **Z0008** — ea. roll — **$33.65**
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.



Forms of Zinc
1. Mossy
2. Foil
3. Pieces
4. Granular
5. Dust
6. Strips
7. Shot

Zinc, Granular

reagent grade, 20–30 mesh
Zn — **Z0028** — 100 g — **$17.54**
A.W. 65.37 — **Z0002** — 500 g — **57.68**

★ **HAZARD ALERT:** Zinc metal dust could be flammable; dust may be present at the bottom of your bottle of this form of zinc.
★ **SPECIAL HAZARD ALERT:** Granular zinc is often used. See in a classic lab experiment to turn copper pennies into "silver" and then "gold". See the Gold Rush Chemical Demonstration Kit on page 237. Do *not* use sodium hydroxide in this reaction—the leftover basic zinc residue is a fire hazard. Call or write us to obtain a complimentary copy of a revised procedure for this demonstration using granular zinc and zinc chloride. Visit flinnsci.com to access publication No. 10991, Turning Copper Pennies into "silver" and "gold!"
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Acids and alkalies; not water.
Color and Odor: White/gray, odorless solid.
CAS No. 7440-66-6

Zinc, Mossy

laboratory grade
Zn — **Z0003** — 500 g — **$29.95**
Z0004 — 2 kg — **78.28**

★ **HAZARD ALERT:** Zinc metal dust could be flammable; dust may be present at the bottom of your bottle of this form of zinc.
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.
Technical Note: Due to the high purity of this zinc, it will not sufficiently produce hydrogen gas when introduced to an acid. The reaction can be catalyzed with a few mL of 0.5 M copper sulfate.

Zinc, Pieces

1" long
convenient for use with Kipp generator
Z0020 — 100 g — **$15.47**
Z0007 — 500 g — **42.65**
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.

Zinc, Sheet

1/32" thick — **Z0039** — 6" x 12", approx. 273 g — **$17.65**
Z0009 — 12" x 12", approx. 546 g — **33.07**
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.

Zinc, Shot

reagent grade — **Z0021** — 100 g — **$20.34**
Z0017 — 500 g — **35.53**
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.

Zinc, Strips

0.010" thick — **Z0024** — pkg./10 — **$12.36**
5" long x ½" wide
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.

Zinc Acetate

laboratory grade, crystal
$(CH_3CO_2)_2Zn \cdot 2H_2O$ — **Z0010** — 500 g — **$24.00**
F.W. 219.50

★ **HAZARD ALERT:** Possible body tissue irritant. Moderately toxic by ingestion. LD_{50} 794 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Good if kept tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White solid with faint acetic acid odor.
CAS No. 5970-45-6

Zinc Chloride

reagent, granular
$ZnCl_2$ — **Z0022** — 100 g — **$ 10.40**
F.W. 136.29 — **Z0011** — 500 g — **14.75**

★ **HAZARD ALERT:** Both solid and solutions are severe skin irritants; moderately toxic. LD_{50} 350 mg/kg. TLV 1 mg/m^3 as fume.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Substance deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 7646-85-7

In-service Topics

A school district or science department may be seeking good topics for in-service sessions. We suggest two topics:

1. Have a lawyer, experienced in tort law, address your group about your legal responsibilities.
2. Invite the local fire department to teach science instructors how to use a fire extinguisher and employ evacuation techniques.

Zinc Chloride Solution

(as $ZnCl_2$)

1 Molar	**Z0040**	500 mL	**$17.54**

★ **HAZARD ALERT:** Both solid and solutions are severe skin irritants.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Zinc Nitrate

flake
$Zn(NO_3)_2 \cdot 6H_2O$
F.W. 297.49

Reagent	**Z0029**	100 g	**$13.10**
	Z0012	500 g	**27.70**
Laboratory grade	**Z0042**	100 g	**$12.60**
	Z0043	500 g	**18.40**

★ **HAZARD ALERT:** Slightly toxic; severe body tissue irritant; strong oxidant; fire risk. LD_{50} 1190 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 10196-18-6

Zinc Nitrate Solution

(as $Zn(NO_3)_2 \cdot 6H_2O$)

1 Molar	**Z0030**	500 mL	**$10.35**
0.1 Molar	**Z0026**	500 mL	**9.65**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Zinc Oxide

laboratory grade, powder
ZnO **Z0013** 500 g **$25.70**
F.W. 81.38

★ **HAZARD ALERT:** If heated, fumes could be severely toxic; may react vigorously with some forms of rubber at elevated temperatures. TLV 5 mg/m^3 as fume.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Acids and alkalies; not water and alcohol.
Color and Odor: Off-white, odorless solid.
CAS No. 131 4-13-2

Zinc Sulfate

granular
$ZnSO_4 \cdot 7H_2O$
F.W. 287.56

Reagent	**Z0023**	100 g	**$ 10.90**
	Z0014	500 g	**22.00**
Laboratory grade	**Z0044**	500 g	**$12.85**

★ **HAZARD ALERT:** Skin and mucous membrane irritant; slightly toxic. LD_{50} 1260 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Effloresces in dry air; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7446-20-0

Zinc Sulfate Solution

1 Molar
(as $ZnSO_4 \cdot 7H_2O$) **Z0031** 500 mL **$10.30**

★ **HAZARD ALERT:** May cause skin and eye irritation.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Zinc Sulfide

phosphorescent
laboratory grade, powder
ZnS **Z0041** 100 g **$44.00**
F.W. 97.45

★ **HAZARD ALERT:** Contact with acid liberates toxic and flammable hydrogen sulfide gas.
Storage: Inorganic #5
Disposal: #26a
Shelf Life: Poor; moisture-sensitive.
Soluble: Acids; not water.
Color and Odor: Yellow, odorless solid.
CAS No. 1314-98-3
Technical Note: Not all zinc sulfide is phosphorecent. Flinn's zinc sulfide is specially formulated to give phosphorescence—guaranteed.

How Much Can You Stand?

Various concentrations of chemicals are encountered in a "typical" school science laboratory atmosphere. Knowing what concentrations create unhealthy effects is not an easy task. An effort has been made to quantify exposure levels based on extensive experience and data. These levels are called Threshold Limit Values (TLVs). Please review the section of this catalog dedicated to TLVs on page 592.



Chemventory™

LEARN ABOUT THE ENHANCED CHEMVENTORY

SEE PAGE 574 FOR DETAILS!

Chemicals

Flinn Scientific is the leading chemical supplier to science educators across North America. **Find the chemicals you need for your academic chemistry labs and classroom activities.**

32 Flinn Chemicals

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29 Should I Purchase This Chemical?



How to Use the Catalog/Reference Manual **Chemicals Section**

Product Name, Quality, Concentration, etc.:

The full chemical name is shown. An alternate name is sometimes shown. A chemical formula is provided as well as the formula weight. The purity grade is included.

Reagent: Highest purity available—conforms to specifications established by the chemical industry or American Chemical Society. Each batch undergoes an extensive analysis to determine its purity and level of impurities. Use for AP® labs and qualitative and quantitative analyses. Guaranteed to give the best results in your lab.

Laboratory Grade: High purity chemicals that meet industry standards. Well suited for most general experiments and demonstrations.

Hazard Alert:

Hazard data is provided to alert the science teacher to the hazardous character of each chemical.

Storage Number:

Number refers to the compatible chemical family in which this item should be stored. A detailed table of these families and even their most compatible shelf order is found in the Safety Reference section of this catalog.

Disposal Number:

Suggested disposal techniques for small, laboratory quantities of chemicals are provided in the back of this *Flinn Scientific Catalog/Reference Manual*. The number shown in the chemical listing refers you to a specific and suggested disposal method for that particular product.

Shelf Life:

Through a detailed literature and reference book search, we have attempted to provide a general statement about the anticipated shelf life expectancy of laboratory chemicals in a school setting. Since conditions vary from school building to school building, our shelf life designations are estimates only.

Definition of terms used to describe shelf life—

Excellent: The substance should have a long, useful life under varied storage conditions.

Good: If stored under reasonable conditions of temperature and humidity (25 °C at 50% or less relative humidity), the substance should have a long, useful life.

Fair: If stored under reasonable conditions, the product's useful life may be three years or fewer.

Poor: Substance does not store well under reasonable conditions.

Indefinite: A term used frequently to communicate that the substance has no fixed or definable life expectancy.

Deliquescent: Substances that tend to absorb atmospheric water and become liquids.

Efflorescent: Combined water molecules lost by hydrates when exposed to air, which can possibly result in partial decomposition.

Hygroscopic: A substance that absorbs moisture from the air.

Soluble:

The extent to which a substance would lose its form and become molecularly or ionically dispersed in a solvent to become a solution. Limited space prevents us from listing every possible solvent.

Color and Odor:

Meaningful terminology is used to characterize color and odor. This information is provided as a chemical identity tool. For a complete chart of chemical color/odor identification and mystery substance identification procedures, please contact us.

Hydrochloric Acid

12 Molar

ACS reagent
37 wt %
(sp. gr. = 1.19 at 20 °C)
HCl
F.W. 36.46

H0031	100 mL	**$ 10.47**
H0004	500 mL	**21.63**
H0005	2.5 liters	**37.60**
H0006*	2.5 liters	**53.00/1**
		310.20/6

(Packaged in PVC-coated bottle)

★ **HAZARD ALERT:** Highly toxic by ingestion or inhalation; severely corrosive to skin and eyes.

Storage: Inorganic #9 in a dedicated acid cabinet. If one is not available, store in a Flinn *Saf-Cube*™. See special storage tip under full listing on page 56–57.

Cap Safety Color Code: Blue

Disposal: #24b

Shelf Life: Good if stored safely.

Soluble: Water

Color and Odor: Colorless liquid with very strong chlorine odor.

CAS No. 7647-01-0

Incompatability: Avoid storing hydrochloric acid anywhere in the vicinity of formaldehyde. A ***potent carcinogen,*** chloromethoxychloromethane, is formed when hydrochloric acid and formaldehyde react in air. This serious potential problem further emphasizes the need to store hydrochloric acid in a dedicated acid cabinet.

Safety Purchase Suggestion: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of hydrochloric acid and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.

*Hydrochloric acid is exactly as described under Catalog Number H0005 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are safely retained in a PVC outer envelope. The PVC-coated bottle is a safer package for science teachers.

CAS Number:

CAS means Chemical Abstract Service. Think of this number as an identification number—unique to each substance. A more detailed explanation of CAS numbers is found on page 25 of this catalog.

Safety Purchase Suggestion:

If, in our opinion, you should exercise special caution in acquiring a substance, we alert you to that need.

Technical Note:

We have used this to provide technical information; uses, solution preparation, contents or product descriptions.

Catalog Number, Unit of Measure and Price:

Each product has been assigned a catalog number. The unit of measure is almost always specified in metric terms.

Should I Purchase **This Chemical?**

6

Does your school or district prohibit the use of certain chemicals in your science laboratory? This is a growing problem! Banning chemicals from the school science laboratory without giving thought to how often the chemical is used or its educational value and hazard level is similar to banning a textbook from the classroom. Teaching professionals must have available to them every teaching tool possible to educate our nation's young people. Flinn Scientific has adopted the philosophy that:

"Chemicals in any form can be safely stored, handled or used if the physical, chemical and hazardous properties are fully understood and the necessary precautions, including the use of proper safeguards and personal protective equipment, are observed."

Important Questions to Ask Before Purchasing a Chemical

1 What is the relative hazard level of the chemical?

Is the chemical reactive to water or air? Is it corrosive, flammable or hazardous by inhalation? Is the chemical irritating to body tissue or carcinogenic? In other words, how can this chemical hurt me?

2 How often is the chemical used in laboratory experiments and/or demonstrations?

Is the chemical commonly used in a high school setting?

3 What is the educational value of using the chemical?

What specific topic or lesson does the chemical help teach or illustrate? If the chemical is commonly used in other laboratory activities, you can generally say it has educational value. If the chemical is infrequently used and extremely hazardous, then we suggest you review the specific laboratory activity to judge its educational value for yourself. Further investigation may identify a less hazardous substitute. Only you, the teaching professional, can ultimately decide the chemical's educational value.

4 Have I used this substance before?

Am I familiar with the use of the chemical? Have I tried the experiment before? Do I feel comfortable using this chemical?

Remember, try all experiments and demonstrations first before using them in the classroom.

5 Is my laboratory facility equipped for the safe use of this chemical?

Do I have the correct type and size of fire extinguisher? Do I have an eyewash? Is my room properly ventilated?

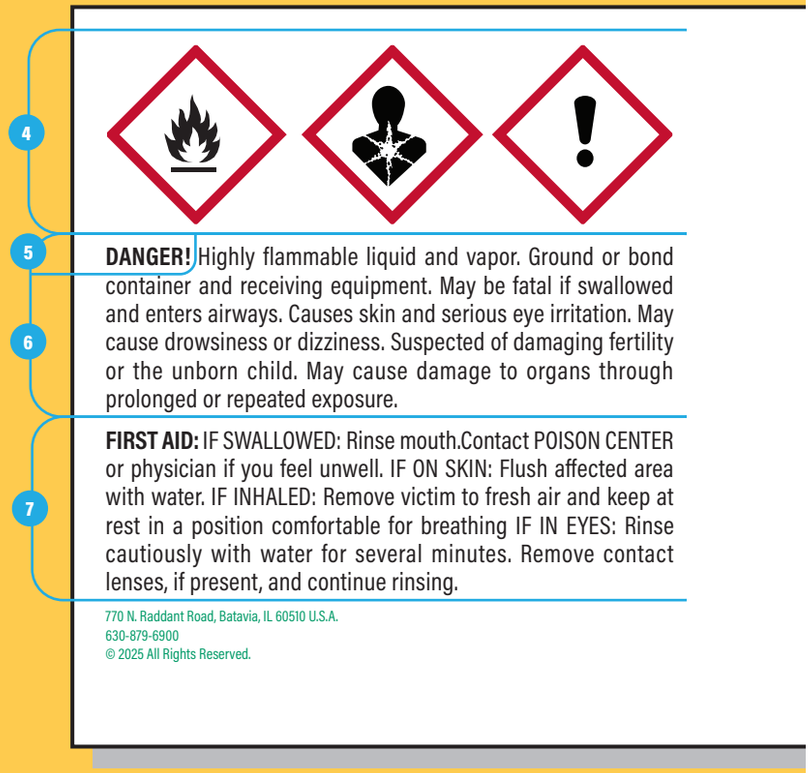
6 How will I dispose of this chemical?

Will this chemical require special disposal procedures? Does my school have a waste disposal program in place? Will the chemical have to be disposed of properly by a licensed hazardous waste disposal company?

If you have trouble answering one or more of these six questions, call us. Our technical staff will be more than happy to give you expert advice! Call us at 800-452-1261.

THE FLINN CHEMICAL SAFETY LABEL **SOLVES CHEMICAL PROBLEMS**

The Flinn chemical safety label has been specifically designed to fit the needs of the middle and high school science teacher. How should I properly store my chemicals? What safety aids should be available to me when using the chemical? How toxic is toxic? What is the shelf life of the chemical? How do I safely dispose of the chemical? Is the chemical hazardous? These questions and many more are answered by the Flinn chemical safety label.



1 Product Name, Quality, Concentration, etc.

Full chemical name is shown and sometimes a common alternative name. The chemical formula and formula weight is immediately below the name. The quality of the substance (e.g., reagent, laboratory grade) is clearly indicated. See page 22 of this catalog for quality or grade explanations.

2 Hazard Alert

Hazard and safety precaution information is provided to alert the science teacher to the hazardous character of each chemical. This information is helpful when storing, dispensing or using the product.

3 Large Hazard Warning

A large, brief and specific hazard warning is shown. Many substances have multiple hazard characteristics (e.g., corrosive and inhalation irritant). This single line and dominant warning restates the most hazardous nature of the substance.

4 Hazard Pictograms

Graphical pictures with characteristic symbols to convey specific hazard information. There are eight pictograms. See page 702 for more information about pictograms.

5 Signal Word

Indicates the relative severity of a hazard and alerts the reader to potential hazards. The GHS signal words are "Danger" or "Warning," with "Danger" being the more severe.

6 Warning Information

This section contains Hazard and Precautionary Statements. Hazard Statements are assigned based on a hazard class and category to describe the hazards of a product. Precautionary statements describe recommended measures that should be taken to minimize or prevent adverse effects from exposure to a hazardous product.

7 First Aid

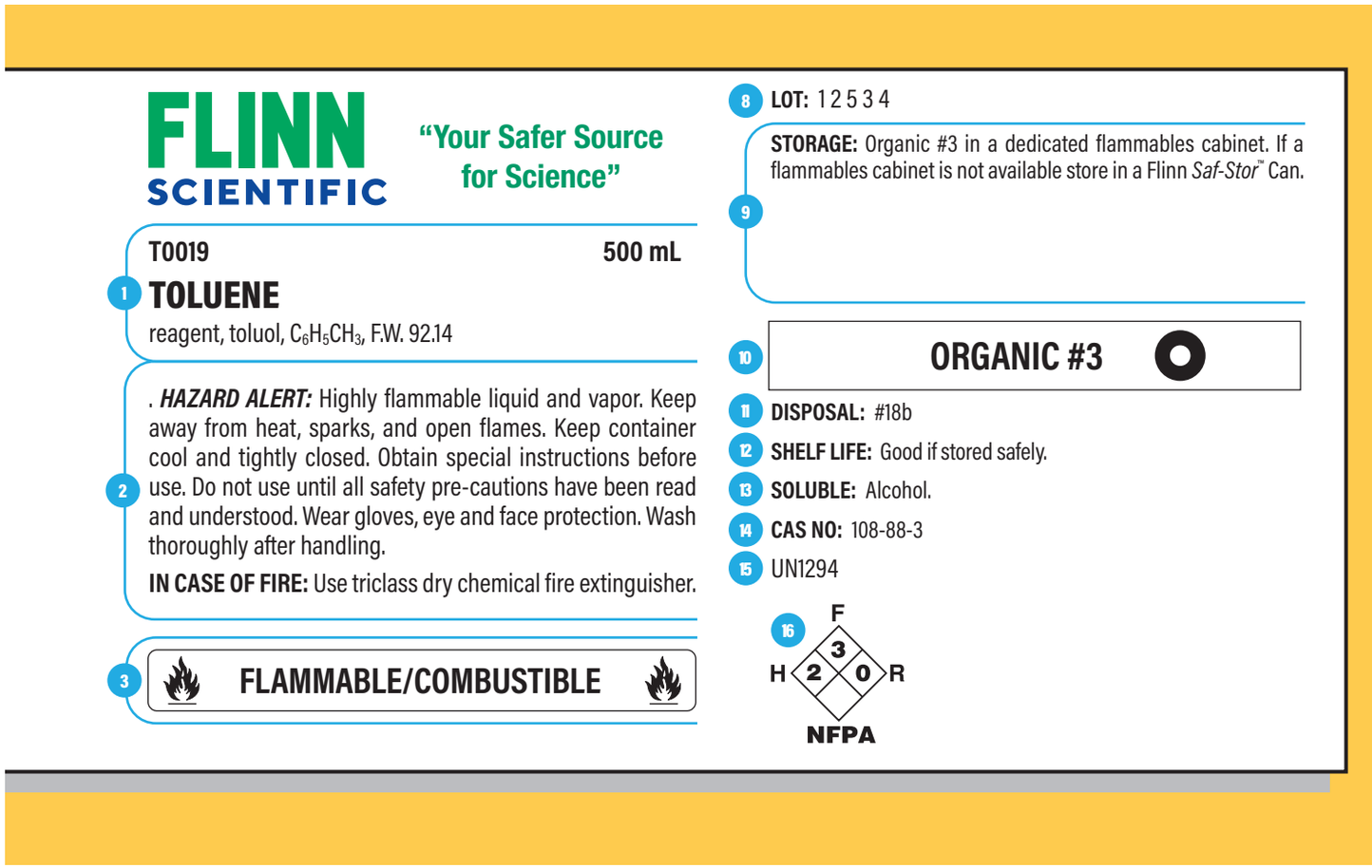
We have provided basic first aid recommendations, but always seek professional medical assistance whenever injury takes place in the laboratory.

8 Lot Number

The fingerprint of the chemical you have purchased. A series of numbers that identifies for Flinn Scientific what the chemical is, how it was packaged, when it was packaged, who the chemical manufacturer is, etc. Lot numbers are a very important part of any chemical label!

9 Flinn Storage Method/Number

Number refers to the compatible chemical family in which this item should be stored. For example: Inorganic #9 refers to the family that includes all inorganic acids except for nitric acid. A detailed table of these families and even their most compatible shelf order are found on pages 721–725 of this *Flinn Scientific Catalog/Reference Manual.*



10 Storage Method/Number, Enlarged

The Flinn compatible family storage number is enlarged so you can easily locate it and return the chemical container to its proper storage location.

11 Suggested Disposal Method

Suggested disposal techniques for small, laboratory quantities of chemicals are provided in this *Flinn Scientific Catalog/Reference Manual* on pages 736–753. The number shown in the chemical listing refers you to a specific and suggested disposal method for that particular product.

12 Shelf Life

A general statement about anticipated shelf life. Since conditions vary widely, the statement is general and should be accepted in that context. The shelf life data are based on exhaustive literature searches.

13 Soluble

In what solvent(s) is this substance soluble? We have listed the common solvents. Limited space may, in a few cases, prevent us from listing all of the possible solvents.

14 Chemical Abstract Service (CAS) Registry Number

CAS means Chemical Abstract Service. The CAS is operated by the American Chemical Society (ACS), a society of professional chemists. The CAS maintains resource information on thousands of chemicals. The CAS number is the single identifying number for each specific substance.

15 UN Number

The UN (United Nations) number is a worldwide identifying number for a substance in commerce or transport. This number is meaningful to shippers and hazardous material handlers.

16 NFPA Code

To protect the professional firefighter, NFPA (National Fire Protection Association) has established a numerical code that rates chemicals *under fire conditions* in four categories: health, flammability, reactivity and unusual reactivity. Within each category, a system has been established with five numerical ratings (0–4). Number 4 is a severe hazard and number 0 is no special hazard. This rating system is on our label because a few state laws require it. Unfortunately, the NFPA numerical ratings exist for a very limited number of chemicals, and the numbers represent hazard *under fire conditions* as opposed to normal laboratory use. This *under fire conditions* rating system tends to distort hazard characteristics. We urge teachers to depend more on the hazard warnings, pictograms and signal words shown elsewhere on each label.

A

Acetaminophen

laboratory grade, powder
$CH_3CONHC_6H_4OH$
F.W. 151.16

A0309	25 g	$12.25

★ **HAZARD ALERT:** Harmful if swallowed. Irritating to skin, eyes and mucous membranes. Possible sensitizer. LD_{50} 1944 mg/kg.
Storage: Organic #2 in a poison cabinet.
Disposal: #26a
Shelf Life: Indefinite, if stored properly.
Soluble: Soluble in ethyl alcohol, acetone, ethyl acetate; not water.
Color and Odor: White, odorless solid.
CAS No. 103-90-2

Acetanilide

laboratory grade, flake
$CH_3CONHC_6H_5$
F.W. 135.17

A0004	100 g	$42.30

★ **HAZARD ALERT:** Body tissue irritant; moderately toxic by ingestion. LD_{50} 800 mg/kg.
Storage: Organic #2
Disposal: #20
Shelf Life: Indefinite
Soluble: Hot water; alcohol and other organic solvents.
Color and Odor: White flake, odorless.
CAS No. 103-84-4
Technical Note: Not for human consumption.

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Acetic Acid

glacial acetic acid, ethanoic acid
CH_3CO_2H
F.W. 60.05

17.4 Molar	A0177	100 mL	$11.50
ACS reagent	A0005	500 mL	21.20
	A0006	2.5 liters	52.55
	A0007*	2.5 liters	53.60

(*Packaged in PVC-coated bottle)

★ **HAZARD ALERT:** Corrosive to skin and tissue; moderate fire risk (flash point: 39 °C); moderately toxic by ingestion and inhalation. LD_{50} 3310 mg/kg. TLV 25 mg/m^3.
Storage: Organic #1 inside a dedicated acid cabinet. *Store away from nitric acid.* If acid cabinet is not available store in Flinn *Saf-Cube*™. Acetic acid crystallizes at 16.6 °C. Room temperature is normally about 25 °C. So, a 10-degree reduction from room temperature will cause the material to crystallize. Return the substance to a warm environment and it will return to a liquid state. Such a freezing/defrosting process does not alter the nature of the substance.

Continued on next column.

Our Philosophy

Flinn Scientific believes that "Chemicals in any form can be safely stored and handled if the physical, chemical and hazardous properties are fully understood and the necessary precautions, including the use of proper safeguards and personal protective equipment, are observed."

Acetic Acid *continued*

Disposal: #24a
Shelf Life: Indefinite if stored properly. Cap safety color code: Brown.
Soluble: Miscible with water, alcohol, glycerol and ether. Insoluble in carbon disulfide.
Color and Odor: Colorless liquid with pungent vinegar odor.
CAS No. 64-19-7
Safety Purchase Suggestion: Buy and store only small quantities. Please consider buying PVC (polyvinyl chloride)–coated acid bottle—Flinn *Plas-Pak*™.
*Acetic acid is exactly as described under catalog number A0006 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are retained in a PVC outer envelope. The PVC-coated bottle is a safer package for science teachers.

Acetic Acid Solution

6 Molar	A0186	500 mL	$12.45
(pH 1.7)	A0187	1 liter	18.25
1 Molar	A0095	1 liter	12.60
(pH 2.4)			
0.1 Molar	A0096	1 liter	12.35
(pH 2.9)			

★ **HAZARD ALERT:** Corrosive liquid.
Storage: Organic #1
Disposal: #24a
Shelf Life: Good; store in a dedicated acid cabinet.
Color and Odor: Colorless liquid with strong vinegar odor.
Technical Note: 6 Molar is 36–37% by weight acetic acid.

Acetic Acid

4–8%
see Vinegar

Acetic Anhydride

$(CH_3CO)_2O$
F.W. 102.09

Reagent	A0156	100 mL	$11.40
	A0008	500 mL	24.85
Laboratory grade	A0305	500 mL	$18.90

★ **HAZARD ALERT:** Strongly irritating and corrosive; moderate fire risk (flash point 49 °C); causes severe eye damage; wear eye protection; have access to eyewash. Vapors are strongly irritating; open and dispense in a hood. Reacts (sometimes delayed) violently with water. Moderately toxic by ingestion and inhalation. LD_{50} 1780 mg/kg. TLV 24 mg/m^3.
Storage: Organic #1 inside a dedicated acid cabinet. If one is not available store in a Flinn *Saf-Cube*™.
Disposal: #24a
Shelf Life: Good if stored safely.
Soluble: Slowly soluble in H_2O forming acetic acid; forms ethyl acetate in solution with alcohol.
Color and Odor: Colorless liquid with strong vinegar odor.
CAS No. 108-24-7

Acetone

reagent grade
CH_3COCH_3
F.W. 58.08

A0009	500 mL	$	9.80
A0010	4 liters		44.30/1
			171.92/4
A0081	20 liters		163.80

★ **HAZARD ALERT:** Dangerous fire risk; flammable; slightly toxic by ingestion and inhalation. LD_{50} 5800 mg/kg. PEL: 2400 mg/m^3
Storage: Organic #4 inside a dedicated flammables cabinet. If one is not available store in a Flinn *Saf-Stor*™ Can. Avoid contact with strong oxidizing agents or with halogenated compounds. Avoid buying 20-liter containers unless you have approved flammable storage area or cabinet.
Disposal: #18a. U-Listed (U002); purchase small amounts for effective inventory control.
Shelf Life: Good if stored safely.

ACETONE continued on next page.

Acetone *continued*

Soluble: Miscible with water, alcohol, and many organic solvents.
Color and Odor: Colorless liquid with a sweet, fingernail polish remover odor.
CAS No. 67-64-1

Acetylsalicylic Acid

aspirin
laboratory grade, granular
$2\text{-}CH_3CO_2C_6H_4CO_2H$ **A0158** 100 g **$11.95**
F.W. 180.16

★ **HAZARD ALERT:** An allergen; may cause bleeding after ingestion; 10-gram dose may be fatal. LD_{50} 200 mg/kg. TLV 5 mg/m^3.
Storage: Organic #1 in a poison cabinet.
Disposal: #26a
Shelf Life: Poor unless stored in dry environment. Store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol, chloroform and ether.
Color and Odor: White solid. When fresh—odorless; as it ages—vinegarlike.
CAS No. 50-78-2
Safety Note: Not for human consumption.
Technical Note: See aspirin for aspirin tablets.

Acetylsalicylic Acid

in aspirin tablet form
see Aspirin, Tablets

Acid Potassium Phthalate

see Potassium Hydrogen Phthalate

Adenosine Triphosphate, Disodium Salt

ATP
powder
$C_{10}H_{14}N_5O_{13}P_3Na_2 \cdot 3H_2O$ **A0083** 1 g **$31.60**
F.W. 605.19

Storage: Organic #2
Disposal: #26a
Shelf Life: Good; store in freezer.
Soluble: Water; insoluble in most organic solvents.
Color and Odor: White, odorless powder.
CAS No. 51963-61-2

Adipoyl Chloride/Hexane Solution

0.25 Molar **A0185** 100 mL **$24.45**
(4.6 grams adipoyl chloride
in 100 mL hexane)

★ **HAZARD ALERT:** Flammable liquid; corrosive; stench.
Storage: Organic #3 in a dedicated flammables cabinet.
Disposal: #18b
Shelf Life: Fair
Color and Odor: Colorless liquid with hexanelike odor.
Technical Note: To prepare nylon, you will need a second solution, hexamethylenediamine/sodium hydroxide solution (see page 60).

Agar

base media for bacteriological cultures

Laboratory grade	**A0256**	25 g	**$ 11.10**
100 mesh, granular	**A0012**	100 g	**22.87**
	A0013	500 g	**83.43**
Bacteriological grade	**A0084**	100 g	**$23.81**
powder	**A0085**	500 g	**72.60**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Slowly soluble in hot water.
Color and Odor: Buff, odorless solid.
CAS No. 9002-18-0
Technical Note: Nutrients must be added to agar for microbial growth. See tables of culture media and ingredients on page 53.

Agarose

low EEO, < 0.15	**A0132**	10 g	**$29.14**
electrophoresis grade	**A0307**	25 g	**78.30**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26a
Shelf Life: Good, if kept dry.
Soluble: Soluble in boiling water.
Color and Odor: Buff, odorless solid.
CAS No. 9012-36-6

Albumin, Egg

protein, laboratory grade, fine powder

Egg albumin	**A0258**	25 g	**$ 10.80**
	A0014	100 g	**18.25**

Storage: Organic #2
Disposal: #26a
Shelf Life: Fair to poor; altered by heat and moisture; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water.
Color and Odor: Light yellow solid with slightly musty odor.
CAS No. 9006-59-1

Alcohols

see individual alphabetical listings; e.g., Ethyl Alcohol

Alcohol, Burner Fuel

see Ethyl Alcohol, burner fuel

Alconox®

see Cleaner, Alconox®

Alkaline Potassium Iodide

see Winkler's Solution #2

Alka-Seltzer®

tablets **A0111** pkg./24 **$13.40**

Special Note: For laboratory use only; not for human consumption.

Alum

see Aluminum Potassium Sulfate

Aluminum, Foil

Al
A.W. 26.98

Household type	**A0019**	each roll	**$3.70**
0.0007" thick			
12" wide x 25' long roll			
Heavy-Duty type	**A0020**	each roll	**$9.60**
0.0015" thick			
18" wide x 25' long roll			

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Shiny, silverlike, odorless solid.
CAS No. 7429-90-5

Diluting an Acid

When diluting an acid, always add the acid (slowly) to the water and never the reverse. Otherwise, severe spattering may occur. Always add acid to water.

Aluminum, Granular

5 mesh and finer

A0022	100 g	$ 11.15
A0223	500 g	28.10

For storage, disposal, etc., see Aluminum, Foil, A0019.

Aluminum, Powder

100 mesh

A0021	100 g	$17.60
A0222	500 g	42.85

★ **HAZARD ALERT:** Fine metal powders form an explosive mixture with air. TLV 15 mg/m^3 as dust.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Light gray, odorless solid.
CAS No. 7429-90-5
Incompatibility: Strong oxidizing agents, metal oxides, sulfur, halogens, ammonium nitrate, carbon dioxide, alcohols and silver nitrate.

Aluminum, Sheet

each piece 12" x 12"

#22 Gauge 0.025" thick	A0017	Weight: approx. 200 grams	$21.05
#30 Gauge 0.010" thick	A0018	Weight: approx. 100 grams	$19.15

For storage, disposal, etc., see Aluminum, Foil, A0019.

Aluminum, Shot

2–5 mesh

A0262	100 g	$ 9.80
A0023	500 g	19.05

For storage, disposal, etc., see Aluminum, Foil, A0019.

Aluminum, Strips

0.010" thick
each strip 6" x ½"

A0178	pkg./10	$7.50

For storage, disposal, etc., see Aluminum, Foil, A0019.

Aluminum, Wire

16 gauge
approx. 0.94 ft/g

A0175	100 g	$17.10
A0121	500 g	37.55

For storage, disposal, etc., see Aluminum, Foil, A0019.

Aluminum Chloride

crystal
$AlCl_3 \cdot 6H_2O$
F.W. 241.43

Reagent	A0225	100 g	$21.00
	A0026	500 g	78.00
Laboratory grade	A0179	500 g	$89.00

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant. LD_{50} 3311 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 7784-13-6

Aluminum Chloride

reagent, anhydrous
$AlCl_3$
F.W. 133.35

A0139	100 g	$35.50

★ **HAZARD ALERT:** Reacts very violently with water; corrosive to all body tissue. LD_{50} 3450 mg/kg.
Storage: Inorganic #9 in a dedicated acid cabinet inside a Flinn *Chem-Saf* ™ Bag.
Disposal: #1b. ***Treat this material carefully.***

Continued on next column.



Aluminum Chloride *continued*

Shelf Life: Poor; constantly evolves hydrochloric acid. Do not store in a warm, humid environment.
Soluble: Water; reacts violently with water.
Color and Odor: Light yellow solid with strong hydrochloric acid odor.
CAS No. 7446-70-0
Incompatibility: Water
Safety Purchase Suggestion: Buy only a small quantity, but if you cannot provide safe, dry, cool storage, do not buy this item at all.

Aluminum Nitrate

reagent, crystal
$Al(NO_3)_3 \cdot 9H_2O$
F.W. 375.13

A0029	100 g	$ 10.60
A0030	500 g	24.95

★ **HAZARD ALERT:** Strong oxidizer; slightly toxic by ingestion. LD_{50} 3671 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Soluble: Soluble in cold water and alcohol; decomposes in hot water.
Color and Odor: White solid with very slight ammonia odor.
CAS No. 7784-27-2

Aluminum Nitrate Solution

0.1 Molar
(as $Al(NO_3)_3 \cdot 9H_2O$)

A0277	500 mL	$8.00

Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Aluminum Potassium Sulfate

alum, crystal
$AlK(SO_4)_2 \cdot 12H_2O$
F.W. 474.39

Reagent	A0032	500 g	$ 22.70
	A0033	2 kg	45.00
Laboratory grade	A0180	500 g	$10.90
	A0181	2 kg	32.30

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7784-24-9

Aluminum Sulfate

$Al_2(SO_4)_3 \cdot 18H_2O$
F.W. 666.42

Reagent	A0035	500 g	$20.40

crystal

★ **HAZARD ALERT:** Severe eye irritant.

ALUMINUM SULFATE continued on next page.

Aluminum Sulfate *continued*

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 17927-65-0
Technical Note: The laboratory grade is approximately $18H_2O$, contains about 0.3% iron, and is a tan or brown color.

Amino Acids
see individual listings

Amino Acid Collection
FLINN EXCLUSIVE

A complete "sampler" collection of the 20 naturally occuring amino acids—alanine, arginine, aspartic acid, asparagine, cysteine, glycine, glutamic acid, glutamine, histidine, isoleucine, leucine, methionine, lysine, phenylalanine, serine, threonine, tryptophan, tyrosine, valine and cystine. 1 g each. Useful for biochemistry activities, such as amino acid chromatography, acid–base studies, qualitative tests for proteins and amino acids. Perfect for cooperative class projects!

	AP7238	20 x 1 g	**$96.95**

5-Amino-2,3-Dihydro-1,4-Phthalazinedione
see Luminol

Ammonia, Concentrated
see Ammonium Hydroxide and Ammonium Hydroxide solutions

Ammonium Carbonate
reagent, lump
$(NH_4)_2CO_3$
F.W. 96.09

	A0226	100 g	**$12.80**
	A0043	500 g	**20.30**

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water (decomposes in hot water).
Color and Odor: White solid with strong ammonia odor.
CAS No. 506-87-6
Technical Note: Decomposes to ammonia and carbon dioxide at temperatures over 58 °C (136 °F).

Ammonium Chloride
sal ammoniac
granular
NH_4Cl
F.W. 53.49

Reagent	**A0266**	100 g	**$ 8.60**
	A0044	500 g	**14.60**
Laboratory grade	**A0045**	500 g	**$ 10.70**
	A0046	2 kg	**24.70**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 1650 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; hygroscopic; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water and glycerol; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 12125-02-9

Ammonium Chloride Solution
1 Molar
(as NH_4Cl)

	A0278	500 mL	**$7.40**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Ammonium Dichromate
reagent, crystal
$(NH_4)_2Cr_2O_7$
F.W. 252.06

	A0048	500 g	**$32.00**

★ **HAZARD ALERT:** *Known carcinogen.* Very strong oxidizing agent; dangerous fire risk; dusts and solutions are toxic; irritant to eyes and skin. Possible reproductive/fertility hazard.
Storage: Inorganic #8
Disposal: #12a
Shelf Life: Fair; decomposes with slight heating; keep away from all organic materials.
Soluble: Water and alcohol.
Color and Odor: Orange, odorless solid.
CAS No. 7789-09-5
Incompatibility: Reducing agents, such as powdered metals, form an explosive mixture with magnesium metal powder. Avoid contact with oxidizable (flammable) organic compounds.
★ **SPECIAL HAZARD ALERT:** The "volcano" experiment or demonstration is a popular use of ammonium dichromate. When heated to decomposition, ammonium dichromate produces nitrogen, water, and chromium(III) oxide. Chromium compounds are known carcinogens. Because of this risk, the "volcano" demonstration should be conducted under a well-ventilated hood or outdoors. This demonstration should never be done in a closed, poorly ventilated room. Strict hygiene should be observed before and after the combustion.

Ammonium Dihydrogen Phosphate
see Ammonium Phosphate, Monobasic

Ammonium Ferrous Sulfate
see Ferrous Ammonium Sulfate

Ammonium Hydroxide
14.8 Molar
ACS reagent
28–30% NH_3
NH_4OH
F.W. 35.05

	A0051	500 mL	**$16.20**
	A0052	2.5 liters	**32.10**
	A0227*	2.5 liters	**44.65**

(*Packaged in PVC-coated bottle)

★ **HAZARD ALERT:** Both liquid and vapor are extremely irritating—especially to eyes. Dispense in a hood and be sure an eyewash is accessible. Moderately toxic by ingestion and inhalation. Serious respiratory hazard. LD_{50} 350 mg/kg.
Storage: Inorganic #4 in a dedicated base cabinet. If one is not available store in a Flinn *Saf-Cube*™.
Disposal: #10
Shelf Life: Indefinite if stored safely.
Color and Odor: Colorless liquid with strong ammonia odor.
CAS No. 1336-21-6
Cap Color Code: Green
Safety Purchase Consideration: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of ammonium hydroxide and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.
*Ammonium hydroxide is exactly as described under catalog number A0052 but in a PVC-coated bottle. In the event of breakage, base and glass shards are safely retained in a PVC outer envelope. The PVC-coated bottle is a safer package for science teachers.

How Is Your Housekeeping?
OSHA standards state "all places of employment, passageways, storerooms and service rooms shall be kept clear and orderly and in sanitary condition." Common sense says good housekeeping is an attitude and the cornerstone of any good safety program. Safety inspectors check housecleaning practices first. A clean lab is a safer lab.

Ammonium Hydroxide Solution

(as NH_4OH)

6 Molar	**A0192**	500 mL	**$ 10.30**
3 Molar	**A0193**	500 mL	**8.95**
1 Molar	**A0097**	1 liter	**13.05**
0.1 Molar	**A0098**	1 liter	**13.55**

For hazard alert, storage, disposal, etc., see Ammonium Hydroxide, A0174.

Ammonium Metavanadate

reagent, powder

NH_4VO_3	**A0211**	25 g	**$25.02**
F.W. 116.99	**A0176**	100 g	**67.76**

★ **HAZARD ALERT:** Highly toxic; body tissue irritant; liberates poisonous ammonia gas if heated. LD_{50} 58.1 mg/kg.

Storage: Inorganic #8

Disposal: #27d. P-Listed (P119); purchase small amounts for effective inventory control.

Shelf Life: Indefinite

Soluble: Slightly in cold water.

Color and Odor: Light yellow, odorless solid.

CAS No. 7803-55-6

Ammonium Molybdate

ammonium molybdate (VI) tetrahydrate

crystal

$(NH_4)_6Mo_7O_{24} \cdot 4H_2O$

F.W. 1235.86

Reagent	**A0054**	100 g	**$44.80**
Laboratory grade	**A0306**	100 g	**40.00**

★ **HAZARD ALERT:** Skin and eye irritant; moderately toxic by ingestion. LD_{50} 333 mg/kg.

Storage: Inorganic #8

Disposal: #6

Shelf Life: Indefinite

Soluble: Water; not alcohol.

Color and Odor: White, odorless solid.

CAS No. 12054-85-2

Ammonium Nitrate

pearls

NH_4NO_3

F.W. 80.04

Reagent	**A0241**	100 g	**$ 9.71**
	A0055	500 g	**21.75**

Continued on next column.

Ammonium Nitrate *continued*

Laboratory grade	**A0056**	500 g	**$12.16**
	A0057	2 kg	**39.05**

★ **HAZARD ALERT:** Strong oxidizer; may explode if heated under confinement; may explode at temperatures greater than 210 °C; explodes more readily if contaminated with combustible material; slightly toxic by ingestion; body tissue irritant. LD_{50} 2217 mg/kg.

Storage: Inorganic #8 away from all combustibles. We recommend that this dangerous substance be kept in a Flinn *Saf-Stor*™ Can.

Disposal: #26b

Shelf Life: Poor; hygroscopic; store in a Flinn *Chem-Saf* ™ bag.

Soluble: Water, alcohol and alkalis.

Color and Odor: White, odorless solid.

CAS No. 6484-52-2

Safety Purchase Suggestion: Do not store large quantities.

Technical Note: The granular lab grade material is easier to work with than the crystalline reagent, which tends to clump together. The lab grade material gives excellent results in quantitative thermochemistry experiments.

Incompatibility: Acids, chlorates, combustible materials, flammable liquids, nitrites, sulfur, carbon, organic compounds and metals (especially finely divided metals).

Ammonium Oxalate

laboratory grade, crystal

$(NH_4)_2C_2O_4 \cdot H_2O$	**A0058**	100 g	**$18.50**
F.W. 142.11			

★ **HAZARD ALERT:** Moderately toxic by ingestion and inhalation; corrosive to body tissue.

Storage: Inorganic #2

Disposal: #26a

Shelf Life: Indefinite

Soluble: Water

Color and Odor: White, odorless solid.

CAS No. 6009-70-7

Ammonium Persulfate

ammonium peroxydisulfate

reagent, crystal

$(NH_4)_2S_2O_8$	**A0059**	500 g	**$22.15**
F.W. 228.21			

★ **HAZARD ALERT:** Oxidizer; fire risk in contact with organic substances. Corrosive; moderately toxic. LD_{50} 689 mg/kg.

Storage: Inorganic #6

AMMONIUM PERSULFATE continued on next page.

Flinn Bases
The Safer Choice

Ammonium hydroxide is an essential part of any chemical laboratory, but is also one of the more hazardous substances. Flinn makes it safer by providing PVC-coated bottles, Flinn *Saf-Cube*™ and premixed solutions.



Safer Bottles

For your safety, please order the 2.5 L ammonium hydroxide in the PVC-coated bottle (A0227)—these bottles are lifesavers!

▶ See free video at flinnsci.com.

Saf-Cube™

All 14.8 M ammonium hydroxide bottles are shipped in Flinn *Saf-Cubes*™ for your protection. Don't throw these valuable containers away. They make great storage containers if no acid cabinet is available.

Premixed Solutions

Consider buying Flinn premixed ammonium hydroxide solutions. They save time and are safer to store than concentrated bases. If you make your own solutions remember...

Always Add Base to Water!



Ammonium Persulfate *continued*

Disposal: #12a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 7727-54-0

Ammonium Phosphate, Monobasic

ammonium dihydrogen phosphate
crystal
$NH_4H_2PO_4$
F.W. 115.03

Laboratory grade	**A0060**	500 g	**$25.80**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in water.
Color and Odor: White, odorless solid.
CAS No. 7722-76-1

Ammonium Phosphate, Dibasic

diammonium hydrogen phosphate
reagent, crystal
$(NH_4)_2HPO_4$
F.W. 132.06

	A0061	500 g	**$24.18**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7783-28-0

Ammonium Sulfate

crystal
$(NH_4)_2SO_4$
F.W. 132.15

Reagent	**A0062**	500 g	**$16.35**
Laboratory grade	**A0168**	500 g	**$11.35**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 2840 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol or acetone.
Color and Odor: White, odorless solid.
CAS No. 7783-20-2

Ammonium Sulfide

light solution

Reagent	**A0063**	100 mL	**$43.75**

★ **HAZARD ALERT:** Contact with acids or acid fumes may liberate flammable and poisonous hydrogen sulfide gas. Strong skin and mucous membrane irritant; toxic by skin absorption; vapor harmful. Even low concentrations may cause headache and general discomfort.
Storage: Inorganic #5; keep tightly closed; yellow color intensifies as substance ages.
Disposal: #23
Shelf Life: Good if stored safely; store in a Flinn *Chem-Saf* ™ Bag and then inside a Flinn *Saf-Stor* ™ Can.
Soluble: Water, alcohol and alkalis.
Color and Odor: Yellow/red liquid with rotten egg odor.
CAS No. 12135-76-1 as ammonium sulfide
Technical Note: The true sulfide form is only stable at a very low temperature (i.e., 0 °C), and in the absence of water. The light solution (so-called "yellow") contains approximately 20% $(NH_4)_2S$ or 8% sulfur and 8% ammonia and is the common commercial solution.

Ammonium Thiocyanate

crystal
NH_4SCN
F.W. 76.13

Reagent	**A0066**	500 g	**$39.00**
	A0213	100 g	**12.20**
Laboratory grade	**A0148**	500 g	**$26.80**

★ **HAZARD ALERT:** Moderately toxic by ingestion. LD_{50} 750 mg/kg.
Storage: Inorganic #7
Disposal: #26a
Shelf Life: Poor; deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol, acetone, and ammonia.
Color and Odor: White or light pink, odorless solid.
CAS No. 1762-95-4
Incompatibility: Dangerous when heated to decomposition (170 °C) or in contact with acids—fumes containing toxic HCN may be produced.

Ammonium Vanadate

see Ammonium Metavanadate

Isoamyl Alcohol

see Isopentyl Alcohol

n-Amyl Alcohol

1-pentanol
reagent
$CH_3(CH_2)_4OH$
F.W. 88.15

	A0067	500 mL	**$20.00**

★ **HAZARD ALERT:** Moderate fire risk; slightly toxic by ingestion and inhalation; severe body tissue irritant.
Storage: Organic #2 in a dedicated flammables cabinet; if one is not available, store in a Flinn *Saf-Stor* ™ Can.
Disposal: #18b
Shelf Life: Good, if stored properly.
Soluble: Alcohol
Color and Odor: Colorless liquid with bananalike odor.
CAS No. 71-41-0
Incompatibility: Can react vigorously with oxidizing agents.

tert-Amyl Alcohol

see tert-Pentyl Alcohol

Amylase

enzyme, powder

	A0283	10 g	**$16.05**
	A0303	25 g	**23.35**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Tan solid with malty odor.

Are You Receiving Fresh Chemicals?

You're always guaranteed to receive high-quality chemicals from Flinn Scientific. Our very deliquescent materials are packaged in a PVC-coated bottle inside a Flinn *Chem-Saf*™ bag with a packet of desiccant to ensure freshness. Does your chemical supplier do this?



Antimony

Sb
A.W. 121.75

Lump	**A0110**	100 g	**$25.85**

Storage: Inorganic #1
Disposal: #27d
Shelf Life: Indefinite
Soluble: Insoluble in water.
Color and Odor: Gray, odorless solid.
CAS No. 7440-36-0
Incompatibility: The poisonous gas stibine may be formed by the action of acidic reducing agents on antimony and its compounds.

L-Arabinose

pectin sugar
$C_5H_{10}O_5$
F.W. 150.13

	A0301	25 g	**$162.30**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and glycerol; not in alcohol or ether.
Color and Odor: White, odorless solid.
CAS No. 87-72-9

L-Ascorbic Acid

vitamin C
reagent, powder
$C_6H_8O_6$
F.W. 176.13

	A0078	100 g	**$17.45**

Storage: Organic #1
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 50-81-7

Aspirin, Tablets

acetylsalicylic acid	**A0201**	bottle 100 tablets	**$13.56**

★ **HAZARD ALERT:** An allergen; may cause bleeding after ingestion; 10-gram dose may be fatal.
Storage: Organic miscellaneous
Disposal: #26a
Shelf Life: Poor unless stored under cool, dry conditions.
Color and Odor: White tablet with slight vinegar odor.
Safety Note: Not sold for human consumption.
Technical Note: See also acetylsalicylic acid.

ATP

see Adenosine Triphosphate Disodium Salt

Azure B

Methylene Blue contains a small amount of Azure B stain and can be substituted for many Azure B staining procedures.

Shelf Life of Chemicals

The safe shelf life of chemicals varies from product to product. Some, like potassium metal and ether, can become potentially more dangerous. Others may become less chemically active. If you sometimes wonder why an experiment did not work, the chemical could be the problem. Review the shelf life information provided in this Catalog/Reference Manual. Purchase particularly hazardous chemicals in small quantities so that they are completely used up in a short time—preferably in less than a year.

See free video about chemical shelf life at flinnsci.com.

B

Bacteriological Media

see table of culture media, page 53, and individual catalog listings

Baking Powder

Typical composition: sodium aluminum sulfate, calcium sulfate, calcium phosphate and cornstarch

	B0001	229 g	**$6.00**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Good if kept dry; store in Flinn *Chem-Saf* ™ Bag.
Soluble: Water
Color and Odor: White, odorless solid.
Safety Note: Not for human consumption.

Baking Soda

see Sodium Bicarbonate

Barfoed's Reagent

test for glucose
contains: copper(II) acetate, acetic acid and water

	B0061	100 mL	**$10.45**

★ **HAZARD ALERT:** Copper(II) acetate is moderately toxic.
Storage: Inorganic #2
Disposal: #24a
Shelf Life: Indefinite
Color and Odor: Light blue/green liquid with faint vinegar odor.

Barium Chloride

crystal
$BaCl_2 \cdot 2H_2O$
F.W. 244.28

Reagent	**B0004**	100 g	**$ 10.30**
	B0005	500 g	**21.25**
Laboratory grade	**B0170**	100 g	**$ 8.05**
	B0006	500 g	**15.20**

★ **HAZARD ALERT:** Highly toxic by ingestion; store in a Flinn *Chem-Saf* ™ Bag. LD_{50} (intraperitoneal mouse) 118 mg/kg.
Storage: Inorganic #2
Disposal: #27h
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 10326-27-9
Safety Purchase Suggestion: Buy and store only small quantities packaged in an unbreakable container.

Barium Chloride Solution

(as $BaCl_2 \cdot 2H_2O$)

1 Molar	**B0143**	500 mL	**$12.40**
0.1 Molar	**B0144**	500 mL	**$11.50**

★ **HAZARD ALERT:** Toxic by ingestion.
Storage: Inorganic #2
Disposal: #27h
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Barium Hydroxide

large crystal
$Ba(OH)_2 \cdot 8H_2O$
F.W. 315.50

Reagent	**B0009**	100 g	**$14.60**
	B0174	500 g	**32.67**
Laboratory grade	**B0155**	100 g	**$ 10.85**
	B0072	500 g	**21.37**

★ **HAZARD ALERT:** Toxic by ingestion.

BARIUM HYDROXIDE continued on next page.

Barium Hydroxide *continued*

Storage: Inorganic #4
Disposal: #27h
Shelf Life: Poor; absorbs carbon dioxide from the air; keep tightly closed in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol and ether.
Color and Odor: White, odorless solid.
CAS No. 12230-71-6

Barium Nitrate

crystal
$Ba(NO_3)_2$
F.W. 261.35

Reagent	**B0010**	100 g	**$ 10.40**
	B0011	500 g	**24.75**
Laboratory grade	**B0232**	500 g	**$15.20**

★ **HAZARD ALERT:** Strong oxidizer; potentially serious fire risk; may be harmful if swallowed. LD_{50} 355 mg/kg.
Storage: Inorganic #3
Disposal: #27h
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 10022-31-8

Barium Nitrate Solution

(as $Ba(NO_3)_2$)

0.1 Molar	**B0148**	500 mL	**$8.60**

★ **HAZARD ALERT:** Toxic by ingestion.
Storage: Inorganic #3
Disposal: #27h
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Benedict's Qualitative Solution

for analysis of reducing sugars
contains: sodium citrate, sodium carbonate and copper(II) sulfate

B0171	100 mL	**$ 5.65**
B0015	500 mL	**7.25**
B0016	1 liter	**10.85**
B0172	4 liters	**29.95**

★ **HAZARD ALERT:** Skin and eye irritant.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Light blue, odorless liquid.



Benedict's Qualitative Solution B0015

Benedict's Quantitative Solution

for quantitative sugar determinations
contains: sodium citrate, sodium carbonate, copper(II) sulfate, potassium thiocyanate, and potassium ferrocyanide

B0062	500 mL	**$14.80**

★ **HAZARD ALERT:** Moderately toxic; skin and eye irritant.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Light blue, odorless liquid.

Benzaldehyde

laboratory grade
C_6H_5CHO
F.W. 106.13

B0017	100 mL	**$27.20**

★ **HAZARD ALERT:** Reacts with strong oxidizers; slightly toxic by inhalation or ingestion; irritating vapor; combustible. LD_{50} 1300 mg/kg.
Storage: Organic #3
Disposal: #2
Shelf Life: Fair; oxidizes to benzoic acid; yellows on prolonged storage; protect from light; keep tightly closed in a Flinn *Chem-Saf*™ Bag.
Soluble: Miscible with alcohol, ether, and some volatile oils; slightly soluble in water.
Color and Odor: Colorless liquid with almond odor.
CAS No. 100-52-7
Incompatibility: Potassium permanganate, sodium peroxide and other oxidizing agents.

Benzene

reagent
C_6H_6
F.W. 78.11

B0018	500 mL	**$48.60**

★ **HAZARD ALERT:** *Known carcinogen;* strict observance of safety precautions must be practiced, i.e., use a hood, wear gloves, use eye or face protection. Flammable; dangerous fire risk; moderately toxic by ingestion, inhalation, and skin absorption. Possible reproductive/fertility hazard. LD_{50} 930 mg/kg. TLV 0.5 ppm TWA.
Storage: Organic #3 in a Flinn *Chem-Saf* ™ Bag and then inside a Flinn *Saf-Stor* ™ Can. If packaged in glass, the container must be protected against possible breakage.
Disposal: #18b. U-Listed (U019); purchase small amounts for effective inventory control.
Shelf Life: Good if stored safely.
Soluble: Miscible with alcohol, ether, acetone, carbon tetrachloride, carbon disulfide, and acetic acid. Slightly soluble in water.
Color and Odor: Colorless liquid with gasolinelike odor.
CAS No. 71-43-2
Incompatibility: Dangerous in contact with chlorine or oxidizing agents.
Technical Note: Avoid buying and storing this *known carcinogen* unless you employ strict hygiene practices. Consider substituting cyclohexane, toluene or xylenes.

A Strong Base and the Human Eye

A strong base like ammonium hydroxide is capable of rapid and extensive eye damage. In fact, tissue damage to the human eye may occur in just the first 30 seconds of exposure. The use of chemical splash goggles and prompt access to a functional eyewash are essential when ammonium hydroxide and other strong bases are used. If chemicals are to be used, chemical splash goggles must be worn!

Benzin
see Petroleum Ether

Benzoic Acid
laboratory grade, flake

C_6H_5COOH	**B0197**	100 g	**$14.60**
F.W. 122.12	**B0020**	500 g	**20.25**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant; combustible. LD_{50} 1700 mg/kg.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Alcohol, ether, chloroform, carbon disulfide, and carbon tetrachloride. Only slightly soluble in water.
Color and Odor: White solid with maple syrup odor.
CAS No. 65-85-0

Benzyl Alcohol

$C_6H_5CH_2OH$	**B0132**	100 mL	**$18.45**
F.W. 108.14			

★ **HAZARD ALERT:** Reacts ***violently*** with strong oxidants; body tissue irritant; slightly toxic by ingestion and inhalation; combustible; may form explosive peroxides on concentration. LD_{50} 1230 mg/kg.
Storage: Organic #2 inside a Flinn *Chem-Saf* ™ Can.
Disposal: #18b
Shelf Life: Good if stored safely and away from oxidants.
Soluble: Miscible with alcohol, ether and chloroform; slightly soluble in water.
Color and Odor: Colorless liquid with slight floral odor.
CAS No. 100-51-6

BHT
see 2,6-Di-t-Butyl-4-Methylphenol

Bial's Reagent
Test for pentoses
see page 619 for preparation

Bile Salts
sodium salts of glycocholic and taurocholic acids

powder	**B0038**	100 g	**$39.85**

Storage: Organic #1
Disposal: #26a
Shelf Life: Good, but only if kept dry.
Soluble: Water and alcohol.
Color and Odor: Yellow/brown solid with putrid beef odor.

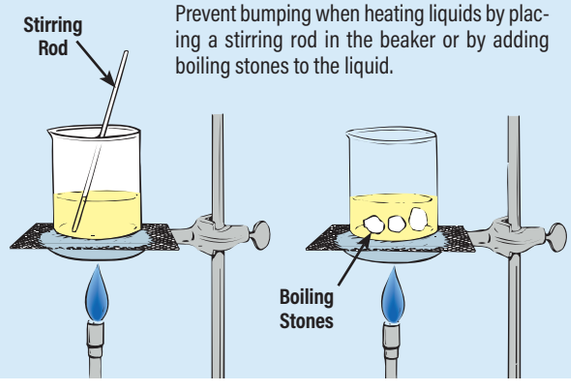
Biotechnology Chemicals
see page 462

Bismuth
Bi
A.W. 208.98

Lump	**B0048**	100 g	**$32.00**
Granular	**B0142**	100 g	**$135.80**

Continued on next column.

Heating a Liquid
Prevent bumping when heating liquids by placing a stirring rod in the beaker or by adding boiling stones to the liquid.



★ **HAZARD ALERT:** Flammable in finely divided form such as dust. Slightly toxic by inhalation or ingestion. LD_{50} 5000 mg/kg.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Nitric and hydrochloric acid.
Color and Odor: Metallic silver, odorless solid.
CAS No. 7440-69-9

Biuret Test Solution
Solution changes color from blue to purple in the presence of protein.
Contains: copper sulfate and 30% w/v aqueous sodium hydroxide.

B0050	100 mL	**$ 5.90**
B0051	500 mL	**9.50**
B0230	1000 mL	**15.55**

★ **HAZARD ALERT:** Corrosive liquid; especially dangerous to eyes.
Storage: Inorganic #4
Disposal: #10
Shelf Life: Good
Color and Odor: Royal blue, odorless liquid.

Biuret Quantitative Assay Solution
Assay solution for quantitative analysis of proteins.
Contains: copper(II) sulfate, potassium iodide and potassium sodium tartrate in 0.2 M NaOH

B0237	500 mL	**$10.50**

★ **HAZARD ALERT:** Irritating to skin and eyes.
Storage: Inorganic #4
Disposal: #10
Shelf Life: Fair
Color and Odor: Blue, odorless liquid.

Bleach
see Sodium Hypochlorite Solution

Bluing Solution, Flinn
for growing beautiful salt crystal gardens

B0235	500 mL	**$8.90**

Storage: Miscellaneous inorganic.
Disposal: #26b
Shelf Life: Indefinite
Soluble: Suspension in water.
Color and Odor: Blue, odorless liquid.

Bluing, Laundry

Mrs. Stewart's	**B0220**	8 oz.	**$10.05**

For hazard alert, storage, disposal, etc., see Bluing Solution, Flinn, B0235.

Boiling Stones

boiling chips	**B0136**	100 g	**$17.70**
4 mesh*	**B0079**	250 g	**32.80**

Storage: Miscellaneous inorganic.
Disposal: #26a
Color and Odor: Gray/white, odorless solid.
Technical Note: Prevents bumping. High purity alundum granules. Hard, porous surface; will not crumble or powder. Resists most chemicals except strong alkalies and concentrated sulfuric acid.
*approximately 7–9 mm

Borax
see Sodium Borate, Tetra

Borax Carmine
histological staining solution
This solution must be freshly prepared before use. See page 620 for preparation instructions.

Boric Acid

H_3BO_3
F.W. 61.83

Laboratory grade powder	**B0081**	500 g	**$12.90**

★ **HAZARD ALERT:** Slightly toxic by ingestion; irritant to skin in dry form. Possible reproductive/fertility hazard. LD_{50} 2660 mg/kg.
Storage: Inorganic #9
Disposal: #24b
Shelf Life: Indefinite
Soluble: Water, alcohol, and glycerol.
Color and Odor: White, odorless solid.
CAS No. 10043-35-3

Brass Sheet

each piece 12" x 12"

#30 gauge 0.010" thick	**B0027**	each	**$45.78**

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Brass, odorless solid.

Brass Shot

	B0234	100 g	**$17.60**

For storage, disposal, etc., see Brass Sheet, B0027.

Brass Strips

each strip 6" x ½" x 0.01"	**B0231**	pkg./6 strips	**$18.85**

For storage, disposal, etc., see Brass Sheet, B0027.



Brass Shot
B0234
Brass Strips
B0231

Brimstone

see Sulfur, Roll

Bromcresol Green

indicator, sodium salt
pH 3.8 yellow to 5.4 blue
reagent
$C_{21}H_{13}Br_4NaO_5S$
F.W. 720.02

	B0040	5 g	**$28.60**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Light brown, odorless solid.
CAS No. 62625-32-5

Bromcresol Green Indicator Solution

0.1%, alcoholic

	B0151	100 mL	**$7.80**

★ **HAZARD ALERT:** Flammable liquid. Contains ethyl alcohol; toxic by ingestion.
Storage: Organic #9 in a dedicated flammables cabinet.
Disposal: #26b

Continued on next column.

Bromcresol Green Indicator Solution *continued*

Shelf Life: Indefinite
Color and Odor: Dark green to blue liquid with alcohol-like odor.

Bromcresol Green Indicator Solution

0.04%, aqueous

	B0064	100 mL	**$7.85**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Dark green to blue, odorless liquid.

Bromine—Quietly Destructive

Bromine attacks metals. Bromine vapor leaves a container and slowly but surely destroys all nearby metal surfaces. Our heat-sealed, single-use ampule solves this bromine vapor problem. If you already have bromine in a capped bottle and want to minimize further damage, place the bottle in a plastic bag and seal it with a twist tie. Then place the bagged bromine bottle inside a paint can containing cat litter (see Flinn *Chem-Saf*™ Bags and *Saf-Stor*™ Cans on page 653). Replace the metal can about every 18–24 months.

Bromine

Br_2
F.W. 159.83

	B0149	3 x 1 g ampules	**$22.10**

Due to Flinn's unique safety packaging, truck shipment is no longer required. The total volume of bromine in these ampules is about 1 mL.

★ **HAZARD ALERT:** Highly toxic by inhalation and ingestion; severe skin irritant; very strong oxidizer; reacts violently with many organic compounds; very hazardous substance even in this small ampule. LD_{50} 2600 mg/kg. TLV 0.66 mg/m^3.
Storage: Inorganic #2. Store in ampule (before single use). Since the bromine is in a sealed, glass ampule it will not present a vapor problem.
Disposal: #12a
Shelf Life: As packaged, excellent. This is meant to be a one-time-use product.
Soluble: Most organic solvents; slightly in water.
Color and Odor: Dark red/brown with irritating, chlorinelike odor.
CAS No. 7726-95-6
Technical Note: Keep a supply of sodium thiosulfate solution (hypo) on hand as a neutralizer when working with bromine.

Bromine Water

	AP4502	kit	**$26.75**

Safely prepare fresh bromine water in any amount in less than five minutes with the Flinn Bromine Water Preparation Kit. Never again worry about the storage, handling, and use of elemental bromine. With this kit, you've eliminated the most corrosive chemical from your stockroom.
Kit contains all the ingredients and instructions to prepare 500 mL of fresh bromine water using a traditional redox reaction.

BROMINE WATER on next page.



Bromine Water Kit
AP4502

Bromine Water *continued*

★ **HAZARD ALERT:** Toxic by inhalation and ingestion; skin irritant.
Disposal: #12a
Shelf Life: Fair. Bromine vapors degrade bottle caps over time. To avoid corrosion of metals in storage area, always store in a Flinn *Saf-Stor*™ Can.
Color and Odor: Red/brown with irritating, chlorinelike odor.
Technical Note: Keep a supply of sodium thiosulfate solution (hypo) on hand as a neutralizer when working with bromine.

Simple and Safe Bromine Packaging

Elemental bromine is sold in a sealed 1-g ampule. The ampule is scored to allow the science instructor to easily break it into 50 mL of distilled water to prepare bromine water.



Bromobenzene

phenyl bromide
C_6H_5Br **B0138** 100 mL **$45.75**
F.W. 157.02

★ **HAZARD ALERT:** Moderate fire risk; skin irritant; slightly toxic by ingestion and inhalation. LD_{50} 2383 mg/kg.
Storage: Organic #4
Disposal: #4b
Shelf Life: Indefinite
Soluble: Miscible with most organic solvents; insoluble in water.
Color and Odor: Colorless liquid with moth ball odor.
CAS No. 108-86-1

1-Bromobutane

n-Butyl bromide
reagent grade, 99%
$CH_3CH_2CH_2CH_2Br$ **B0238** 100 mL **$20.75**
F.W. 137.03

★ **HAZARD ALERT:** Flammable liquid and vapor; dangerous fire risk. Irritating to eyes, skin and respiratory tissue; may cause serious eye irritation. Slightly toxic by ingestion. LD_{50} 2761 mg/kg.
Storage: Organic #4 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #4b
Shelf Life: Fair; volatile liquid. Store in a cool, dry place.
Soluble: Alcohol and ether; insoluble in water.
Color and Odor: Colorless to light brown liquid with characteristic odor.
CAS No. 109-65-9

Bromphenol Blue

indicator, sodium salt
pH 3.0 yellow to 4.6 purple
reagent, powder
$C_{19}H_8Br_4O_5SNa$ **B0044** 5 g **$21.80**
F.W. 691.97

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Dark green, odorless solid.
CAS No. 34725-61-6

Eliminate Mystery Substances at Their Source

Become a label fanatic! Eliminate future mystery substances by labeling all chemical solutions and preparations when they are made. Today's unlabeled bottle is tomorrow's mystery substance. See the Safety Reference section for chemical bottle labels, shelf storage labels and GHS pictogram stickers.

Bromphenol Blue Indicator Solution

0.04%, aqueous
B0065 100 mL **$7.70**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Dark purple, odorless liquid.

Bromthymol Blue

indicator, sodium salt
pH 6.0 yellow to 7.6 blue
powder
$C_{27}H_{27}Br_2O_5SNa$
F.W. 646.38
Reagent **B0046** 5 g **$24.10**
Laboratory grade **B0233** 5 g **13.65**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Blue-green, odorless solid.
CAS No. 34722-90-2

Bromthymol Blue Indicator Solution

0.04%, aqueous
B0173 100 mL **$ 4.33**
B0047 500 mL **8.62**
B0228 1000 mL **11.83**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Blue-green, odorless liquid.

Buffer Solutions

concentrated
pH accuracy ±0.02 at 25 °C.
pH 4.00 when 1 volume is diluted to 5 volumes
B0098 500 mL **$14.90**
pH 7.00 when 1 volume is diluted to 25 volumes
B0099 500 mL **21.05**
pH 10.00 when 1 volume is diluted to 10 volumes
B0100 500 mL **15.30**

★ **HAZARD ALERT:** Low and high pH concentrates (pH 4 and 10) should be treated as strongly acidic and alkaline solutions, respectively.
Storage: With Inorganic #2 family for convenience.
Disposal: #26b
Shelf Life: Much better than prepared buffers that are ready to use. Concentrates last longer and take up less shelf space.

Buffer Solutions

pH accuracy ±0.02 at 25 °C
500 mL bottle

Catalog No.	pH Value	Price
B0087	2.00	**$16.75**
B0088	3.00	**15.95**
B0089	4.00 (red)	**8.20**
B0090	5.00	**16.50**
B0091	6.00	**16.50**
B0092	7.00 (green)	**8.20**
B0093	8.00	**16.75**
B0094	9.00	**16.00**
B0095	10.00 (blue)	**8.45**
B0096	11.00	**16.50**
B0097	12.00	**16.70**

★ **HAZARD ALERT:** Buffers in low pH range are strongly acidic; those in high pH range are strongly alkaline.
Storage: Best and most conveniently stored together with proper recognition and precaution for their individual acid or alkaline nature. Keep bottles tightly closed.

BUFFER SOLUTIONS on next page.

Buffer Solutions *continued*

Disposal: #26b
Shelf Life: Ready-to-use Buffer Solutions' shelf life varies depending on pH value—from good to poor. The higher the pH value, the shorter the shelf life. Storage conditions vary so widely that it isn't possible to be specific about shelf life. Concentrated buffers, buffer capsules and buffers in Chemvelopes® all have better long-term shelf life than standard buffers.
Technical Note: The pH 4, 7 and 10 buffer solutions are dyed for convenience to allow easy identification and prevent confusion. These three buffers are the standards used to calibrate pH meters.

Buffer Capsules

B0227 contains 11 capsules, one of each pH value, and is great for preparing solutions of pH 2–12 for pH indicators.



Buffer Capsules

pH accuracy ±0.02 at 25 °C
stable dry powder in capsules
quickly and completely soluble
each capsule makes 100 mL of buffer solution
10 capsules per vial

Catalog No.	pH Value	Price/Vial
B0101	2.00	**$11.85**
B0102	3.00	**12.25**
B0103	4.00	**11.90**
B0104	5.00	**12.25**
B0105	6.00	**12.25**
B0106	7.00	**11.90**
B0107	8.00	**12.25**
B0108	9.00	**12.25**
B0109	10.00	**11.90**
B0110	11.00	**11.85**
B0111	12.00	**12.25**
B0227*	2.00–12.00	**19.15**

*This special package contains 11 capsules, one of each pH value.
★ **HAZARD ALERT:** Low and high pH buffer solutions should be treated as strongly acidic and alkaline solutions, respectively.
Storage: Wherever convenient—no special storage requirements.
Disposal: #26a
Shelf Life: Indefinite; consume minimal shelf space and are very stable.

Buffer Envelopes

Chemvelopes®
each envelope makes 500 mL of buffer solution
5 envelopes of a single pH per carton
pH accuracy ±0.02 at 25 °C

Catalog No.	pH Value	Price/Carton
B0112	2.00	**$18.43**
B0113	3.00	**18.80**
B0114	4.00	**18.15**
B0115	5.00	**18.43**
B0116	6.00	**18.43**
B0117	7.00	**18.80**
B0118	8.00	**18.80**
B0119	9.00	**18.80**
B0120	10.00	**18.80**
B0121	11.00	**18.20**
B0122	12.00	**18.80**
B0123*	2.00–11.00	**37.80**

*This special package contains 10 envelopes, one envelope of each pH value from 2 to 11.
★ **HAZARD ALERT:** Low and high pH buffer solutions should be treated as strongly acidic and alkaline solutions, respectively.
Storage: Wherever convenient—no special storage requirements.
Shelf Life: Excellent; very stable and convenient to store.
Technical Note: Aluminum foil, polyethylene, and paper protective envelopes. Envelopes keep buffers dry and free-flowing. Each envelope makes 500 mL when added to distilled water. Included in the package is a 7-mL dispensing vial of a buffer preservative. The preservative contains an effective antifungal, antibacterial agent. In addition, the preservative is a universal indicator that tints neutral solutions green, acid solutions orange-red, and basic solutions blue.

Buffer Solution Preservative

Colorless	**B0175**	60 mL	**$19.50**
Indicating	**B0176**	60 mL	**22.00**

Technical Note: Buffer solutions, particularly basic pH buffers, tend to act as a media for fungus and bacteria growth. This buffer preservative contains a highly effective anti-fungal, anti-bacterial agent to provide long-term protection for buffer solutions and does not affect pH value. The preservative is available in two forms:
- preservative only (colorless) (B0175)
- preservative with indicator (B0176)

If the preservative with indicator is used, the buffer will be tinted green for neutral solutions, orange-red for acid solutions and blue for basic solutions. Please specify whether you want clear, non-indicating preservative or the preservative with indicator. Three drops of preservative provides ample protection and, in the case of the indicating preservative, a distinct tint for 100 mL of buffer solution.

HOW TO

Understand Buffer Solutions and pH

What is pH?

The pH scale represents the acidity or alkalinity of an aqueous solution. pH is defined as the negative logarithm of the hydrogen ion concentration of a solution. $pH = -\log[H^+]$.

Absolutely pure water is the standard used in determining pH value. Since pH measurements depend on the chemical properties of water, the pH scale is not accurate for nonaqueous solutions. The pH scale was established with a range of 0 to 14 pH units. The low end of the scale is acid, the high end alkaline, with pH 7.00 at the mid-point as neutral.

Each unit on the pH scale represents a tenfold difference in acidity level. For example, pH 4 is ten times as acidic as pH 5. A pH 3 solution has ten times the acidity level of a pH 4 solution and 100 times the acidity level of a pH 5 solution.

What is a buffer?

A buffer is a chemical substance that resists changes in pH upon the addition of excess strong acid or strong base.

A buffer solution contains both a weak acid and its conjugate weak base. The weak acid component neutralizes any excess strong base added to the solution while the weak base component neutralizes any excess strong acid that may be added. As a result, a buffer solution maintains a constant hydrogen ion concentration despite the addition of relatively large quantities of acid or base.

Science teachers should know that water (distilled or deionized) has no "buffer effect." In fact, the use of "dip and read" test papers will quickly influence the pH of the pure water. Almost always, the test paper used in such water will read pH 5.00 after the paper has been dipped in the water even though the actual pH of the water may be entirely different. In this example, the test paper itself has had an effect on the pH value of the water. Good quality water is not a substitute for a buffer.

What are pH test papers?

pH papers are made with special indicator dyes that react (change color) at specific pH values. Two pH units is the useful limit for most indicators and indicator papers. No further perceptible color change will occur regardless of a further pH change in the solution being tested. For example, using a test paper with a pH range of 6.00 to 8.00, a reading can be successfully taken if the pH falls between the aforementioned points. If the pH is actually below 6.00 or higher than 8.00, the test paper cannot detect that change and will simply change color to one extreme or the other of its 2.00 pH unit range.

pH papers may not be reliable in aqueous solutions containing proteins or alkaloids (e.g., nitrogen-based substances of plant origin like nicotine).



Buffer Solutions
B0089, B0092, B0095

Burner Fuel
see Ethyl Alcohol (burner fuel)

Butanoic Acid
see Butyric Acid

2-Butanone
see Methyl Ethyl Ketone

n-Butyl Alcohol
1-butanol
reagent

$CH_3(CH_2)_2CH_2OH$	**B0177**	100 mL	**$ 10.85**
F.W. 74.12	**B0032**	500 mL	**14.85**

★ **HAZARD ALERT:** Moderate fire risk; moderately toxic by ingestion and inhalation; eye irritant; absorbed by skin. LD_{50} 790 mg/kg. TLV 152 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet; if one is not available, store in a Flinn *Saf-Stor* ™ Can.
Disposal: #18b. U-Listed (U031); purchase small amounts for effective inventory control.
Shelf Life: Fair; substance may oxidize.
Soluble: Miscible with alcohol and ether; soluble with water.
Color and Odor: Colorless liquid with strong wine odor.
CAS No. 71-36-3

tert-Butyl Alcohol
2-methyl-2-propanol
laboratory grade

$(CH_3)_3COH$	**B0055**	500 mL	**$16.25/1**
F.W. 74.12			**94.68/6**

★ **HAZARD ALERT:** Moderate fire risk; slightly toxic by ingestion and inhalation; eye irritant; absorbed by skin. LD_{50} 2743 mg/kg. TLV 303 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet; if one is not available store in a Flinn *Saf-Stor* ™ Can.
Disposal: #26b
Shelf Life: Fair
Soluble: Miscible with alcohol and ether; soluble in water.
Color and Odor: Colorless liquid with camphor odor.
CAS No. 75-65-0
Technical Note: Melting point is 25 °C; this substance may be a solid at room temperature.

n-Butyl Bromide
see 1-Bromobutane

sec-Butyl Bromide
see 2-Bromobutane

Butyric Acid
butanoic acid
laboratory grade

$CH_3CH_2CH_2COOH$	**B0139**	100 mL	**$23.10**
F.W. 88.11	**B0035**	500 mL	**49.45**

(All above packaged in PVC-coated bottles)

Continued on next column.

Butyric Acid *continued*

★ **HAZARD ALERT:** Obnoxious odor; stench agent; strong irritant to skin and eyes; flammable liquid; moderately toxic by ingestion and skin absorption. LD_{50} 2000 mg/kg.
Storage: Organic #1 inside a Flinn *Chem-Saf* ™ Bag and then inside Flinn *Saf-Stor* ™ Can.
Disposal: #24a
Shelf Life: Indefinite if stored properly.
Soluble: Water; miscible with alcohol and ether.
Color and Odor: Colorless liquid with penetrating, obnoxious vomit odor.
CAS No. 107-92-6
Special Precaution: Remove cap slowly and vent the container under a hood. This is particularly important if the butyric acid is at or above room temperature.

C

Cadmium Chloride
reagent, crystal

$CdCl_2 \cdot 2½H_2O$	**C0193**	25 g	**$28.60**
F.W. 228.34			

★ **HAZARD ALERT:** *Known carcinogen;* dust inhalation especially toxic. LD_{50} 88 mg/kg.
Storage: Inorganic #2 in a Flinn *Chem-Saf* ™ Bag in a poisons cabinet.
Disposal: #27f
Shelf Life: Indefinite
Soluble: Water and acetone.
Color and Odor: White, odorless solid.
CAS No. 7790-78-5
Safety Purchase Suggestion: Avoid this substance on school premises. If you do use it, practice strict hygiene.

Cadmium Nitrate
reagent, crystal

$Cd(NO_3)_2 \cdot 4H_2O$	**C0003**	100 g	**$70.35**
F.W. 308.49			

★ **HAZARD ALERT:** *Known carcinogen;* moderately toxic by inhalation and ingestion; strong oxidizer; fire and explosion risk. Possible reproductive/fertility hazard. LD_{50} 300 mg/kg.
Storage: Inorganic #3 in a Flinn *Chem-Saf* ™ Bag.
Disposal: #27f
Shelf Life: Indefinite
Soluble: Water, ammonia and alcohol.
Color and Odor: White solid with slight nitric acid odor.
CAS No. 10022-68-1
Safety Purchase Suggestion: Avoid this substance on school premises. If you do use it, practice strict hygiene.

Caffeine
alkaloid
laboratory grade, powder

$C_8H_{10}N_4O_2$	**C0344**	25 g	**$12.40**
F.W. 194.20			

★ **HAZARD ALERT:** *Very toxic;* as little as 65 mg can be life-threatening. LD_{50} 192 mg/kg.
Storage: Organic #2
Disposal: #5
Shelf Life: Fair to poor; may lose water (effloresce) and decompose in air. Store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Chloroform; partially in water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 58-08-2
Safety Purchase Suggestion: Avoid this substance on school premises. If you do use it, practice strict hygiene.

Calcium

reagent grade, turnings	C0345	10 g	$ 8.43
Ca	C0007	25 g	13.45
A.W. 40.08	C0008	100 g	29.87
	C0009	500 g	78.90

★ **HAZARD ALERT:** Contact with water or moisture evolves flammable hydrogen. Flammable in finely divided form. Avoid contact with oxidizers; skin irritant.

Storage: Inorganic #1 in a Flinn *Chem-Saf* ™ Bag and then inside a Flinn *Saf-Stor* ™ Can.
Disposal: #3
Shelf Life: Good; but only if stored under airtight conditions.
Soluble: In acid; decomposes in water.
Color and Odor: Gray/black, odorless solid.
CAS No. 7440-70-2

Calcium Acetate

calcium ethanoate
laboratory grade, powder

$Ca(C_2H_3O_2)_2 \cdot H_2O$	C0262	100 g	$ 8.95
F.W. 176.19	C0010	500 g	17.85

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; hygroscopic.
Soluble: Water; slightly in alcohol.
Color and Odor: White solid with slight vinegar odor.
CAS No. 62-54-4

Calcium Carbide

laboratory grade, lump

CaC_2	C0346	100 g	$12.60
F.W. 64.10	C0011	500 g	18.10

★ **HAZARD ALERT:** Exposure to water or moisture evolves flammable acetylene gas; corrosive to eyes and skin. 500 grams of calcium carbide will yield approximately 150 liters of flammable acetylene.

Storage: Inorganic #5 in a Flinn *Saf-Stor* ™ Can.
Disposal: #25
Shelf Life: Good if stored under dry conditions.
Soluble: Decomposes in water.
Color and Odor: Gray/black solid with garliclike odor.
CAS No. 75-20-7
Incompatibility: Water, dilute acids, halogens, silver nitrate, copper compounds, and heavy metals.

Calcium Carbonate

powder
F.W. 100.09

Laboratory grade	C0347	100 g	$ 9.10
$CaCO_3$ precipitated	C0012	500 g	14.15
Natural chalk	C0013	500 g	$13.10
ground limestone			

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Excellent
Soluble: Slightly in water; in acids with evolution of carbon dioxide.
Color and Odor: White, odorless solid.
CAS No. 471-34-1
Technical Note: Laboratory grade $CaCO_3$ is precipitated $CaCO_3$ with a purity of 98–99%. Natural chalk is ground limestone, 96% purity.

Calcium Carbonate

for generating carbon dioxide
see Marble Chips

Calcium Chloride

dihydrate
$CaCl_2 \cdot 2H_2O$
F.W. 147.02

Reagent	C0196	100 g	$ 10.62
powder	C0015	500 g	25.40
Laboratory grade	C0018	500 g	$ 7.88
flake	C0019	2 kg	20.26

★ **HAZARD ALERT:** Slightly toxic by ingestion.

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; deliquescent; keep bottle tightly closed and store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 10035-04-8

Calcium Chloride

anhydrous
4–8 mesh granules

$CaCl_2$	C0016	500 g	$ 9.40
F.W. 110.99	C0017	2 kg	22.50

★ **HAZARD ALERT:** Toxic by ingestion. LD_{50} 1000 mg/kg.
For storage, disposal, etc., see Calcium Chloride, C0018.
CAS No. 10043-52-4
Technical Note: An effective drying agent for desiccators and drying tubes.

Calcium Chloride

for drying, see Drierite®.

Calcium Chloride Solution

(as $CaCl_2 \cdot 2H_2O$)

1 Molar	C0233	500 mL	$11.50
0.1 Molar	C0234	500 mL	7.35

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Calcium Ethanoate

see Calcium Acetate

Calcium Hydroxide

powder
$Ca(OH)_2$
F.W. 74.10

Laboratory grade	C0022	500 g	$11.35

★ **HAZARD ALERT:** Skin irritant; avoid dust inhalation. TLV 5 mg/m^3.

Storage: Inorganic #4
Disposal: #10
Shelf Life: Fair to poor; absorbs carbon dioxide from air; keep tightly closed; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Slightly in water; soluble in glycerol or acids; insoluble in alcohol.
Color and Odor: Gray/white, odorless solid.
CAS No. 1305-62-0

Calcium Hydroxide Solution (Saturated)

see Limewater Solution

Compatible Chemical Families

Storing chemicals in alphabetical order can result in incompatible neighbors. For example, barium peroxide and benzaldehyde react violently together and should not be stored near each other. Chemicals should be stored in compatible chemical families. See pages 726–730 for details on the Flinn Suggested Chemical Storage Pattern.

Calcium Nitrate

crystal
$Ca(NO_3)_2 \cdot 4H_2O$
F.W. 236.16

Reagent	**C0025**	100 g	**$11.10**
	C0026	500 g	**21.20**
Laboratory grade*	**C0350**	100 g	**$ 9.35**
	C0166	500 g	**15.50**

★ **HAZARD ALERT:** Strong oxidizer; potential fire risk in contact with organic material; may explode if shocked or heated. Slightly toxic. LD_{50} 3900 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Fair to poor; deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol and acetone.
Color and Odor: Colorless, odorless solid.
CAS No. 13477-34-4
*Laboratory grade may only be a 2–3 hydrate.

Calcium Nitrate Solution

(as $Ca(NO_3)_2 \cdot 4H_2O$)

0.5 Molar	**C0235**	500 mL	**$10.55**
0.1 Molar	**C0236**	500 mL	**9.10**

Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

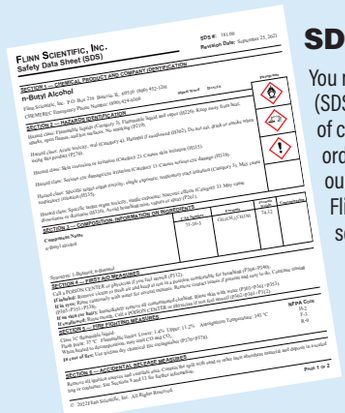
Calcium Oxide

CaO
F.W. 56.08

Reagent	**C0027**	500 g	**$21.55**
powder			
Laboratory grade	**C0028**	500 g	**$11.30**
lump	**C0029**	2 kg	**29.25**

★ **HAZARD ALERT:** Corrosive; dangerous in contact with organic material; exposure to water or moisture evolves heat. A lump of calcium oxide may disintegrate violently when water is added. Wear eye protection when handling this substance. TLV 2 mg/m³.
Storage: Inorganic #4.
Disposal: #10
Shelf Life: Fair to poor; protect from moisture; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Acid; reacts with water to form calcium hydroxide and evolves heat.
Color and Odor: Off-white, odorless solid.
CAS No. 1305-78-8
★ **SPECIAL HAZARD ALERT:** Avoiding moisture contact is important in storing this substance. Science teachers frequently report cracked glass bottles. We suggest high humidity exposure may have resulted in the generation of sufficient heat to crack or break the glass bottle. Flinn's product is

Continued on next column.



SDS Library

You need up-to-date Safety Data Sheets (SDSs) to safely use, store or dispose of chemicals. With your first chemical order of the year, you can find all of our SDSs at flinnsci.com. Count on Flinn as your safer source for science supplies.

Calcium Oxide *continued*

not packaged in glass; however, that does not negate the need to keep this substance dry. We package this substance in a plastic bottle. The bottle is in a plastic bag and contained within the bag is a desiccant to reduce or absorb moisture. Continue to store this material under similar conditions. Buy only small quantities of this substance.

Calcium Sulfate

reagent, powder
dihydrate
$CaSO_4 \cdot 2H_2O$ **C0198** 100 g **$15.30**
F.W. 172.17 **C0031** 500 g **30.65**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in water.
Color and Odor: White, odorless solid.
CAS No. 10101-41-4

Calcium Sulfate

plaster of paris
hemihydrate
$CaSO_4 \cdot ½H_2O$ **C0033** 2 kg **$19.65**
F.W. 145.15

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor unless kept dry; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Slightly in water.
Color and Odor: Off-white, odorless solid.
CAS No. 10034-76-1

Calcium Sulfate

for drying—see Drierite®

Calgon®

see Sodium Hexametaphosphate

Camphor

laboratory grade
$C_{10}H_{16}O$ **C0354** 25 g **$11.00**
F.W. 152.25

★ **HAZARD ALERT:** If heated, flammable and explosive vapors evolve; moderately toxic. LD_{50} (mouse) 1310 mg/kg. TLV 12 mg/m³.
Storage: Organic #4
Disposal: #18b
Shelf Life: Indefinite
Color and Odor: White solid with penetrating, aromatic chest rub odor.
CAS No. 76-22-2

Candles

Birthday type	**C0226**	pkg./24	**$2.16**
2½" x ¼"			
Color Flame	**AP7770**	pkg./12	**$5.35**
2¼" x ⅜"			
White	**C0229**	pkg./20	**$26.55**
5" x 1¼"			
plumber's candles			
Paraffin Candles	**AP4835**	pkg./10	**$9.00**
1.9 cm x 13 cm			

Storage: Miscellaneous nonhazardous organic materials.
Disposal: #26a
Shelf Life: Indefinite
Candle Use Suggestion: Mount candles on 3" x 5" cards to prevent students from using the lab bench top or expensive wire gauze squares for catching the melting wax. The cards make good drip catchers.

Carbolic Acid

see Phenol

Carbon

see Charcoal and Graphite listings

Carbon Rod

for use as inert electrodes in electrochemical cells — **C0410** — pkg./6 — **$13.60**

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Good
Color and Odor: Black, odorless solid.
CAS No. 7782-42-5

Carbon Dioxide Gas

Lecture bottle — **LB1005** — 0.5 lb (approximately 125 liters) — **$273.20**

Refillable cylinder — **LB1060** — 1.0 lb (approximately 210 liters) — **$449.25**

★ **HAZARD ALERT:** In solid form (solidified carbon dioxide—commonly known as dry ice) is very damaging to skin and eyes.
Storage: A cabinet dedicated to bottled gas storage.
Disposal: Completely empty lecture bottle in an operating fume hood then follow #26a.
Shelf Life: Indefinite
Soluble: Slightly soluble in water, hydrocarbons, and most organic solvents.
Color and Odor: Colorless, odorless solid.
CAS No. 124-38-9

Carbon Dioxide Gas Preparation: CO_2 gas can be produced from dry ice. One to two pounds of dry ice should provide sufficient gas for 40–50 students. You will have to set up a generator apparatus that will enable you to heat the dry ice by placing chunks in a water bath. The evolution of gas is not sufficient unless warmed by water. Your delivery tube (from the generator) should be rather long to allow the gas to reach room temperature. A drying tube will also have to be part of the apparatus to remove moisture.
Some teachers set up a CO_2 generator using a flask (about 250 mL size) into which is placed a long-stem funnel and delivery tube. Using about 25 grams of calcium carbonate (Flinn Catalog Nos. C0347, C0012 and C0013) and 6 Molar hydrochloric acid (Flinn Catalog No. H0033) will produce approximately 6 liters of CO_2 at room temperature and atmospheric pressure. A drying tube should be a part of the generation apparatus.

Catalase

from bovine liver oxidizing enzyme — **C0359** — 1 g — **$44.30**

Storage: Organic #1
Disposal: #26a
Shelf Life: Poor; keep refrigerated.
Color and Odor: Brown/gray, odorless solid.
CAS No. 9001-05-2

Technical Note: This enzyme is used to decompose hydrogen peroxide. Units of activity are shown on the bottle label and vary from lot to lot. Currently our label shows 3800 units per milligram solid. We also provide a technical data sheet to help you prepare catalase solutions. Catalase solution must always be very fresh. Even a solution that is just a few hours old will render poor results.
▶ See free How To video at flinnsci.com.

Caustic Potash

see Potassium Hydroxide

Caustic Soda

see Sodium Hydroxide

Cellulase

enzyme complex that degrades cellulose fine powder — **C0172** — 25 g — **$47.20**

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Buff liquid with ginger odor.
CAS No. 9012-54-8

Cerium(IV) Ammonium Nitrate

ceric ammonium nitrate reagent
$(NH_4)_2Ce(NO_3)_6$ — **C0287** — 25 g — **$29.95**
F.W. 548.23

★ **HAZARD ALERT:** Strong oxidizer; avoid contact with organic material; dangerous fire risk; skin irritant.
Storage: Inorganic #3
Disposal: #27f
Shelf Life: Good
Soluble: Water and alcohol.
Color and Odor: Orange/red solid with slight nitric acid odor.
CAS No. 16774-21-3

Cesium Chloride

laboratory grade, crystal
CsCl — **C0417** — 25 g — **$55.10**
F.W. 168.36

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 2600 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Somewhat hygroscopic, keep tightly closed.
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 7647-17-8

Technical Note: Produces a brilliant violet color in flame tests.

Chalk

see Calcium Carbonate

Charcoal, Granular

Coconut activated 6–12 mesh — **C0048** — 500 g — **$31.25**

★ **HAZARD ALERT:** Flammable solid.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag in a Flinn *Saf-Stor*™ Can.
Color and Odor: Gray/black, odorless solid.
CAS No. 7440-44-0

Technical Note: Activated charcoal is specially treated to increase internal surface area for high absorptivity.

Charcoal, Powder

activated charcoal powder — **C0047** — 500 g — **$35.95**

★ **HAZARD ALERT:** Flammable solid.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag in a Flinn *Saf-Stor*™ Can.
Color and Odor: Black, odorless solid.

Chlorine Water

saturated — **C0055** — 500 mL (Packaged in PVC-coated bottles) — **$13.50**

★ **HAZARD ALERT:** Toxic by ingestion or inhalation; strong, pungent odor;

CHLORINE WATER continued on next page.

Good-Bye to Chlorine and Bromine Water

Disposing of these two solutions is easy. How? Shake the contents of the bottle well. Unscrew the bottle cap and place the bottle under your efficiently operating fume hood. Both chlorine and bromine will vaporize and leave the bottle. Every now and then put the cap back on, shake the bottle, and again remove the cap. It does not take long for all the halogen to evaporate. You will be left with a bottle of water, which can be poured down the drain. How can you tell when all the halogen is gone? The odor is gone!

Chlorine Water *continued*

avoid contact with organic materials and powdered metals. TLV 1.5 mg/m^3 as elemental chlorine.

Storage: Inorganic #2

Disposal: Allow the chlorine water to stand in an open container ***under a hood*** in a well-ventilated, protected area. The chlorine will slowly leave the water and the container. The remaining water (now effectively de-gassed) can be put down the drain.

Shelf Life: Whether you buy ready-made chlorine water or make your own (see recipes below) the shelf life of our product or yours would be poor—perhaps six months at best.

Color and Odor: Pale yellow liquid with a pungent odor like a swimming pool.

CAS No. for chlorine gas is 7782-50-5

Safety Purchase Suggestion: Prepare this solution as you need it rather than buy it.

Chloroform

reagent

$CHCl_3$	**C0056**	500 mL	**$24.00**
F.W. 119.38			

★ **HAZARD ALERT:** *Possible carcinogen*. Prolonged inhalation may be fatal; toxic and narcotic by inhalation; ingestion may be fatal. Store in a Flinn *Saf-Stor*™ Can. Possible reproductive/fertility hazard. LD_{50} 695 mg/kg. TLV 49 mg/m^3.

Storage: Organic #4

Disposal: #27j

Shelf Life: Good if stored properly; keep from sources of light.

Soluble: Slightly in water; miscible with alcohol, ether, benzene, carbon disulfide, carbon tetrachloride.

Color and Odor: Clear liquid with a sweet anesthesia odor.

CAS No. 67-66-3

Incompatibility: Oxidizing agents, alkalis and alkali metals.

Chromatography Solvent

for paper and plant chromatography
contains 20% acetone and 80% petroleum ether

C0422	500 mL	**$18.88**

★ **HAZARD ALERT:** Mildly toxic by ingestion, inhalation and skin absorption. Irritating to body tissues.

Storage: Organic #4

Disposal: #18b

Shelf Life: Good

Color and Odor: Colorless liquid with natural gas-like odor.

Chromium

laboratory grade, chunk

Cr	**C0058**	100 g	**$26.35**
A.W. 52.0			

★ **HAZARD ALERT:** Highly toxic as dust or fumes. TLV 0.5 mg/m^3 as dust or fume.

Continued on next column.

Chromium *continued*

Storage: Inorganic #1

Disposal: #27f

Shelf Life: Indefinite

Soluble: Acids (except nitric); strong alkalis; insoluble in water.

Color and Odor: Gray, odorless solid.

CAS No. 7440-47-3

Chromium Nitrate

chromium(III) nitrate
reagent, crystal

$Cr(NO_3)_3 \cdot 9H_2O$	**C0061**	100 g	**$19.55**
F.W. 400.18			

★ **HAZARD ALERT:** Strong oxidizer; avoid contact with organic materials; slightly toxic by ingestion. LD_{50} 3250 mg/kg.

Storage: Inorganic #3

Disposal: #27f

Shelf Life: Good.

Soluble: Water and alcohol.

Color and Odor: Metallic gray/black, odorless solid.

CAS No. 7789-02-8

Chymosin

natural enzyme coagulant
for cheese-making

powder	**C0419**	5 g	**$14.35**

Storage: Miscellaneous, nonhazardous organic material.

Disposal: #26a

Shelf Life: Good if stored properly. Store in a cool (<10 °C) and dry place in a closed container.

Soluble: Water

Color and Odor: Buff solid with malty odor.

Technical Note: Used for cheese-making demonstrations and experiments. Prepare solutions fresh: dissolve 0.3 g chymosin in 100 mL of bottled water. Use two drops of solution per 10-mL sample size of milk. Optimum temperature for enzyme activity is 40 °C. Two grams of C0419 should be enough to coagulate more than 100 L of milk!

trans-Cinnamic Acid

3-phenyl-2-propenoic acid,(E)
reagent

$C_9H_8O_2$	**C0401**	500 g	**$123.00**
F.W. 148.159			

★ **HAZARD ALERT:** Causes skin and serious eye irritation. May cause respiratory irritation.

Storage: Organic #1

Disposal: #26a

Shelf Life: Good

Soluble: Very soluble in ethanol; soluble in diethyl ether, acetone and benzene.

Color and Odor: Tan, odorless.

CAS No. 140-10-3

HOW TO

Prepare Saturated Chlorine Water Solution

There are three common methods for preparing saturated chlorine water solution. Carry out all reactions and work with the chlorine water under a fume hood.

1. Very slowly bubble chlorine gas from a chlorine gas cylinder or lecture bottle into the required quantity of distilled water. Perform this process only under a fume hood.
2. Set up a chlorine gas generator using common lab glassware, equipment and chemicals. You will need a long-stem funnel and a delivery tube assembled into a two-hole stopper that will fit into a 250-mL Erlenmeyer or flat bottom flask. Place approximately 10 grams of manganese dioxide (MnO_2) (Flinn Catalog numbers M0023, M0025) into the flask. Now slowly add approximately 40 mL of hydrochloric acid (Flinn Catalog numbers H0031, H0004, H0005, H0006) and warm very slightly. Bubble the gas that is produced into a flask containing distilled water. This process should produce about one liter of chlorine water and must be performed under a fume hood.
3. Mix 100 mL of commercial bleach (like Clorox®) with 25 mL of 6 M hydrochloric acid (Flinn Catalog number H0033) and then dilute to one liter with distilled water. The solution will have a characteristic yellow-green or light green color. Do not immediately cover the container in which the solution is prepared as a great deal of chlorine is formed. Allow the solution to stand for a short period until it is stable. If the bleach is very fresh, it may take days before the solution stops bubbling. Only when the bubbling stops should you cap the bottle or container. You can be sure such a solution is saturated. If, at some later time, you are not sure it is still saturated, then either make fresh solution or add some bleach to your old solution. The wise option would be to make a fresh solution.

Safety Suggestion: Prepare the option you select only under a fume hood. Package only in glass containers with a cap that has a plastic cap liner.

Label the material as follows: *Solution causes severe burns. Avoid contact with skin, eyes or clothing. Avoid breathing vapors. Do not pipet by mouth. Wash areas of contact with copious quantities of water.*

Citric Acid

monohydrate
reagent, crystal
$C_6H_8O_7 \cdot H_2O$ F.W. 210.15

C0231	100 g	$ 8.75
C0065	500 g	23.50

★ **HAZARD ALERT:** Severe eye irritant. Slightly toxic by ingestion. LD_{50} 3000 mg/kg.
Storage: Organic #1
Disposal: #26a
Shelf Life: Substance efflorescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol, and ether.
Color and Odor: White, odorless solid.
CAS No. 5949-29-1

Citric Acid

anhydrous
laboratory grade, powder
$C_6H_8O_7$ F.W. 192.13

C0135	100 g	$15.58
C0136	500 g	16.34

For hazard alert, storage, disposal, etc., see Citric Acid, C0231.
Color and Odor: White, odorless solid.
CAS No. 77-92-9

Citric Acid, Trisodium Salt

see Sodium Citrate

Cleaner, Alconox®

powder
general purpose laboratory detergent

A0126	4 lb.	$ 65.00
A0127	25 lb.	312.75

Storage: Washing area.
Disposal: Dilute and place down the drain.
Shelf Life: Indefinite if kept dry.
Soluble: Water
Color and Odor: White solid with slight chlorine odor.

Cleaner, Dishwashing

household liquid dishwashing detergent — C0241 — 22 oz. dispenser bottle — $11.50

Storage: In washing area.
Disposal: Dilute with water and place down the drain.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: May vary.

Cleaner, Erada-Stain® Cream

Removes chemical, biological and silver nitrate stains from hands, glassware, and lab equipment. Biodegradable.

AP7330	6 oz.	$31.71

Storage: Washing area.
Disposal: #26a.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Pink cream with pleasant odor.



Cleaners
A0126, etc.

Cleaner, Liqui-Nox®

General purpose liquid laboratory detergent
phosphate free

L0045	1 qt.	$ 30.85
L0046	1 gal.	108.45

Storage: Washing area.
Disposal: Dilute with water and place down the drain.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Yellow, odorless liquid.

FLINNSCI.COM
VISIT US ONLINE

Cleaner, Simple Green®

general purpose liquid cleaner, phosphate-free, biodegradable; degreaser — C0405 — 32 oz. — $13.15

Storage: Washing area.
Disposal: Dilute with water and place down the drain.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Clear green liquid with sassafras odor.

Cobalt

laboratory grade, piece
Co A.W. 58.93

C0067	25 g	$44.00

★ **HAZARD ALERT:** *Possible carcinogen* as fume or dust. TLV 0.01 mg/m^3 as dust or fume. LD_{50} 6171 mg/kg.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Nitric acid.
Color and Odor: Silver/brown, odorless solid.
CAS No. 7440-48-4

Cobalt Chloride

cobalt(II) chloride
crystal
$CoCl_2 \cdot 6H_2O$
F.W. 237.95

Reagent	C0225	25 g	$12.98
	C0069	100 g	28.57
	C0070	500 g	103.90

COBALT CHLORIDE continued on next page.

Hazardous Shipping Fees

Certain items sold by Flinn are classified as hazardous materials by the U.S. Department of Transportation and therefore require special handling to ensure safe transport. A flat fee of $32 per order is added to cover these handling requirements and such items can only be shipped to schools, museums and science centers.

Cobalt Chloride *continued*

★ **HAZARD ALERT:** *Possible carcinogen* as fume or dust. Moderately toxic by ingestion; causes blood damage. Practice strict hygiene in the use of this substance. Possible reproductive/fertility hazard. LD_{50} 766 mg/kg.
Storage: Inorganic #2
Disposal: #27f
Shelf Life: Hygroscopic; keep tightly closed. Good if stored properly.
Soluble: Water, alcohol, and acetone.
Color and Odor: Red/violet, odorless solid.
CAS No. 7791-13-1

Cobalt Chloride Solution

0.1 Molar
(as $CoCl_2 \cdot 6H_2O$) **C0242** 500 mL **$8.75**

For hazard alert, storage, disposal, etc., see Cobalt Chloride, C0225.
Color and Odor: Pink, odorless liquid.

Cobalt Chloride, Test Paper

see Test Papers on page 193

Cobalt Nitrate

cobalt(II) nitrate
crystal
$Co(NO_3)_2 \cdot 6H_2O$
F.W. 291.05

Reagent	**C0071**	100 g	**$24.35**
	C0072	500 g	**74.30**
Laboratory grade	**C0412**	100 g	**24.50**
	C0413	500 g	**74.80**

★ **HAZARD ALERT:** Oxidizer; fire risk in contact with organic material; moderately toxic; *possible carcinogen.* Possible reproductive/fertility hazard. LD_{50} 691 mg/kg.
Storage: Inorganic #3
Disposal: #27f
Shelf Life: Poor; substance deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol, and most organic solvents.
Color and Odor: Brown/orange, odorless solid.
CAS No. 10026-22-9

Congo Red

biological stain/indicator
pH 3.0 blue to 5.0 red
$C_{32}H_{22}N_6Na_2O_6S_2$ **C0120** 10 g **$14.70**
F.W. 696.67

★ **HAZARD ALERT:** Possible reproductive/fertility hazard.
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Dark brown, odorless solid.
CAS No. 573-58-0
C.I. #22120

Congo Red Indicator Solution

0.1%, aqueous
C0128 500 mL **$15.05**

★ **HAZARD ALERT:** Possible reproductive/fertility hazard.
Storage: Organic #9

Continued on next column.

Total Lifetime Cost of a Chemical

Administrators who purchase low-priced chemicals may not appreciate the true "lifetime cost" of a chemical. The lifetime cost includes not only the cost to purchase the chemical, but also the cost of storage and disposal. Cheap chemicals are typically lower quality and packaged in inferior containers. This greatly increases the amount of chemicals needing expensive disposal. Save money by relying on Flinn to provide smaller quantities of higher quality chemicals in date-labeled packages.

Congo Red Indicator Solution *continued*

Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Orange/red, odorless liquid.

Copper, Foil

Cu **C0137** 100 g **$15.43**
A.W. 63.55 (100 g = approx. 1 sq. foot)
0.005" thick **C0138** 500 g **65.23**
(500 g = approx. 55" long x 12" wide)

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Copper, odorless solid.
CAS No. 7440-50-8

Copper, Granular

20 mesh and smaller **C0081** 100 g **$14.18**
C0082 500 g **50.90**

For storage, disposal, etc., see Copper, Foil, C0137.

Copper, Powder

C0086 100 g **$15.87**
C0087 500 g **63.89**

★ **HAZARD ALERT:** Metals, in fine powder form, always present a serious fire and explosion risk. TLV 1 mg/m^3 as dust or fume.
For storage, disposal, etc., see Copper, Foil, C0137.

Copper, Sheet

#22 gauge **C0369** **$30.82**
0.025" thick Each piece 6" x 12"
Weight: approx. 223 grams
C0079 **50.00**
Each piece 12" x 12"
Weight: approx. 445 grams
#30 gauge **C0370** **$24.04**
0.010" thick Each piece 6" x 12"
Weight: approx. 125 grams
C0080 **33.01**
Each piece 12" x 12"
Weight: approx. 210 grams

For storage, disposal, etc., see Copper, Foil, C0137.

Copper, Shot

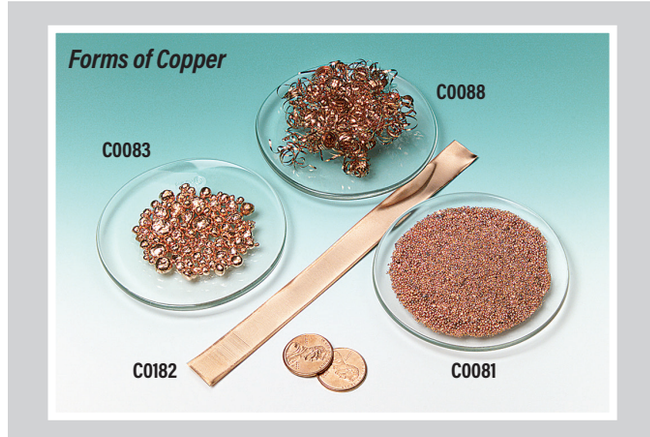
3–14 mesh **C0083** 100 g **$ 13.58**
C0084 500 g **47.40**

For storage, disposal, etc., see Copper, Foil, C0137.

Copper, Strips

1.2 x 15 cm **C0182** pkg./6 strips **$14.28**

For storage, disposal, etc., see Copper, Foil, C0137.



Copper, Turnings, Light

1–2 mm width

	C0088	100 g	$18.93
	C0089	500 g	53.50

For storage, disposal, etc., see Copper, Foil, C0137.

Copper, Wire, Bare

16 gauge 1.3 mm thick (128 ft/lb)	C0146	4 oz.	$ 10.43
	C0147	1 pound	26.73
18 gauge 1.0 mm thick (203 ft/lb)	C0148	4 oz.	$ 10.30
	C0149	1 pound	26.60
22 gauge 0.6 mm thick (516 ft/lb)	C0150	4 oz.	$ 10.61
	C0151	1 pound	31.94

For storage, disposal, etc., see Copper, Foil, C0137.

Copper(I)...Cuprous... Copper compounds in which the copper has an ionic charge or oxidation number of one.

Copper(I) Chloride

cuprous chloride, anhydrous
powder
CuCl
F.W. 98.99

Laboratory grade	C0112	100 g	$15.45
	C0134	500 g	46.05

★ **HAZARD ALERT:** Toxic; eye, skin and respiratory tract irritant. LD_{50} 140 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair; changes on exposure to air and light. Store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Acids, ammonia and ether; slightly in water; insoluble in alcohol and acetone.
Color and Odor: Pea green, odorless solid.
CAS No. 7758-89-6

Copper(II)...Cupric... Copper compounds in which the copper has an ionic charge or oxidation number of two.

Copper(II) Acetate

cupric acetate
laboratory grade, crystal
$(CH_3CO_2)_2Cu \cdot H_2O$ C0093 100 g $25.25
F.W. 199.65

★ **HAZARD ALERT:** Moderately toxic. LD_{50} 710 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water, alcohol, and ether.
Color and Odor: Blue/green, odorless solid.
CAS No. 6046-93-1

Copper(II) Bromide

cupric bromide
laboratory grade, crystal
$CuBr_2$ C0094 100 g $32.00
F.W. 223.37

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water, alcohol and acetone.
Color and Odor: Grayish black solid with a brominelike odor.
CAS No. 7789-45-9

Copper(II) Carbonate

cupric carbonate
laboratory grade, powder
$Cu_2(OH)_2CO_3$ C0211 100 g $14.60
F.W. 221.11 C0095 500 g 39.83

★ **HAZARD ALERT:** Slightly toxic by ingestion and inhalation. LD_{50} 1350 mg/kg.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Acids; not in water.
Color and Odor: Light blue/green, odorless solid.
CAS No. 12069-69-1

Copper(II) Chloride

cupric chloride, dihydrate
crystal
$CuCl_2 \cdot 2H_2O$
F.W. 170.49

Reagent	C0096	100 g	$15.98
	C0097	500 g	42.00
Laboratory grade	C0281	100 g	$ 11.28
	C0161	500 g	25.25
	C0162	2 kg	96.70

★ **HAZARD ALERT:** Highly toxic by ingestion and inhalation. LD_{50} 140 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; substance deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water and alcohol.
Color and Odor: Light blue/green, odorless solid.
CAS No. 10125-13-0

Copper(II) Chloride

cupric chloride, anhydrous
laboratory grade, powder
$CuCl_2$ C0227 100 g $25.60
F.W. 134.45

For hazard alert, storage, disposal, etc., see Copper(II) Chloride, C0096.
Color and Odor: Light brown solid with slight vanilla odor.
CAS No. 7447-39-4

Copper(II) Chloride Solution

(as $CuCl_2 \cdot 2H_2O$)

0.5 Molar	C0381	500 mL	$12.00
0.1 Molar	C0382	500 mL	8.45

★ **HAZARD ALERT:** Toxic if ingested.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Light blue/green, odorless liquid.

Copper(II) Nitrate

cupric nitrate
crystal
$Cu(NO_3)_2 \cdot 3H_2O$
F.W. 241.60

Reagent	C0098	100 g	$17.52
	C0099	500 g	53.22

COPPER(II) NITRATE continued on next page.

Cans—Great Friends

Flinn Scientific packages calcium and other reactive metals in metal cans. Why? Because the package (i.e., the can) is the most protective container economically available to hold reactive substances. When you have to deal with chemicals that are unusually hazardous, consider using plastic bags and outer cans to provide additional protection for these "devils." Put your bottle into a bag and then into a can. See Flinn *Chem-Saf*™ Bags and *Saf-Stor*™ Cans on page 653.

Copper(II) Nitrate *continued*

Laboratory grade	**C0414**	100 g	**$18.24**
	C0415	500 g	**36.30**

★ **HAZARD ALERT:** Oxidizing material; dangerous in contact with organic material; moderately toxic. LD_{50} 940 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Poor; substance deliquescent; store in a Flinn *Chem-Saf* ™ Bag.
Soluble: Water and alcohol.
Color and Odor: Royal blue solid with slight nitric acid odor.
CAS No. 10031-43-3

Copper(II) Nitrate Solution

(as $Cu(NO_3)_2 \cdot 3H_2O$)

0.5 Molar	**C0244**	500 mL	**$10.40**
0.1 Molar	**C0245**	500 mL	**7.55**

★ **HAZARD ALERT:** Skin and eye irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Blue, odorless liquid.

Copper(II) Oxide

cupric oxide
reagent
CuO
F.W. 79.54

Powder	**C0100**	100 g	**$14.25**

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Acids; only with difficulty in water.
Color and Odor: Gray/black, odorless solid.
CAS No. 1317-38-0

Copper(II) Sulfate

cupric sulfate, pentahydrate
$CuSO_4 \cdot 5H_2O$
F.W. 249.69

Reagent	**C0102**	100 g	**$12.17**
crystal, fine	**C0103**	500 g	**23.73**
	C0104	2 kg	**91.47**
Laboratory grade	**C0105**	500 g	**$15.15**
crystal, medium	**C0106**	2 kg	**41.95**
Approx. ¼" to ½" dia.			
Laboratory grade	**C0373**	500 g	**$17.72**
crystal, large	**C0374**	2 kg	**43.12**
Approx. ½" to ¾" dia.			

Continued on next column.

Copper(II) Sulfate *continued*

Laboratory grade	**C0110**	500 g	**$14.25**
powder	**C0111**	2 kg	**43.19**

★ **HAZARD ALERT:** Skin and eye irritant; toxic by ingestion. LD_{50} 300 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair, slowly effloresces in the air.
Soluble: Water and methyl alcohol; slightly in ethyl alcohol and glycerol.
Color and Odor: Blue/white, odorless solid.
CAS No. 7758-99-8
Technical Note: Laboratory grade copper(II) sulfate pentahydrate powder contains up to 0.7% of an insoluble anticaking agent, magnesium carbonate. This additive is very effective in preventing clumping and hardening of the chemical and makes the powder free-flowing. If a transparent solution is needed, filter the mixture before use or add a small amount of 1 M hydrochloric acid.



Forms of Copper(II) Sulfate

Copper(II) Sulfate

cupric sulfate, anhydrous
reagent, powder
$CuSO_4$
F.W. 159.61

	C0107	100 g	**$22.36**
	C0108	500 g	**58.84**

For hazard alert, storage, disposal, etc., see Copper(II) Sulfate, C0102.
Color and Odor: Off-white, odorless solid.
CAS No. 7758-98-7

How To Read a GHS Label, Poster

FLINN EXCLUSIVE

Pictograms, signal words and hazard codes, oh my! This exclusive Flinn poster is a quick and easy reference for your chemical storeroom to help you remember and understand the changes made to chemical labels as a result of the Globally Harmonized System updates. With this reference, you will be able to identify where to look on the label to find key information, such as hazard alerts, precautionary statements and more. Includes a description of each pictogram with its respective hazards. The "right to know" has become "the right to understand!" 24" x 36".

Catalog No.	Description	Price/Each
AP7650	How To Read a GHS Label, Poster	**$19.90**



Copper(II) Sulfate Solution

(as $CuSO_4 \cdot 5H_2O$)

1 Molar	**C0246**	500 mL	**$10.75**
0.1 Molar	**C0247**	500 mL	**8.60**

★ **HAZARD ALERT:** Slightly toxic by ingestion.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Blue/green, odorless liquid.

Copper(II) Sulfate Stock Solution

20%
for preparing any strength of solution for determining specific gravity of blood and plasma
specific gravity: 1.100 20/20 °C

C0156 500 mL **$17.95**

★ **HAZARD ALERT:** Slightly toxic by ingestion.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Blue, odorless liquid.

Copper(II) Sulfate Electrolyte Solution

contains cupric sulfate and sulfuric acid

C0249 500 mL **$11.40**

★ **HAZARD ALERT:** Toxic; corrosive; acid solution.
Storage: Inorganic #2
Disposal: #24b
Shelf Life: Good
Color and Odor: Blue, odorless liquid.
Technical Note: Suitable for copper electroplating experiments and demonstrations.

Corn Oil

C0090 473 mL **$10.75**

Storage: Organic #3
Disposal: #26a
Shelf Life: Indefinite
Soluble: Organic solvents; slightly in alcohol; not water.
Color and Odor: Amber, odorless liquid.
CAS No. 8001-30-7

Corn Syrup

dextrose syrup **C0091** 16 oz. **$8.05**

Storage: Organic #2
Disposal: #26b
Shelf Life: Fair to good.
Soluble: Water; slightly in alcohol.
Color and Odor: Colorless, odorless liquid.
CAS No. 8029-43-4

Cotton

See page 100

Craftcast

see Polyurethane Foam System

Cream of Tartar

see Potassium Bitartrate

Crystal Violet

gentian violet
indicator/biological stain
pH 0.0 yellow to 1.8 violet-blue
reagent
$C_{25}H_{30}ClN_3$ **C0125** 10 g **$12.90**
F.W. 408.00

★ **HAZARD ALERT:** Moderately toxic by ingestion; body tissue irritant. LD_{50} 420 mg/kg.
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite

Continued on next column.

Crystal Violet *continued*

Soluble: Water and alcohol.
Color and Odor: Pea green solid with musty odor.
CAS No. 548-62-9
C.I. #42555

Crystal Violet Solutions

1%, Alcoholic	**C0133**	500 mL	**$17.60**
Hucker formula	**C0189**	500 mL	**$28.85**

for Gram staining

★ **HAZARD ALERT:** Flammable liquid.
Storage: Organic #9 in a dedicated flammables cabinet; if one is not available store in a Flinn *Saf-Stor*™ Can.
Disposal: #26b
Shelf Life: Good, if stored safely.
Color and Odor: Blue/violet liquid with alcohol odor.
Technical Note: Hucker formula contains crystal violet, ammonium oxalate and ethyl alcohol and is commonly used for Gram staining procedures.

Culture Media

These substances are also listed individually and in alphabetical order throughout the chemical section of this Catalog/Reference Manual.

Agar, Bacteriological	**A0084**	100 g	**$23.81**
	A0085	500 g	**72.60**
Dextrose Agar	**D0049**	100 g	**$89.00**
EMB Agar	**E0021**	100 g	**$63.95**
MacConkey Agar	**M0209**	100 g	**$56.80**
Mueller Hinton Agar	**M0203**	100 g	**$44.50**
Nutrient Agar	**N0019**	100 g	**$ 47.80**
	N0020	500 g	**139.00**
Nutrient Broth	**N0021**	100 g	**$40.00**
Potato Dextrose Agar	**P0098**	100 g	**$ 42.00**
	P0099	500 g	**145.69**

Culture Media Ingredients

Agar	**A0256**	25 g	**$ 11.10**
	A0012	100 g	**22.87**
	A0013	500 g	**83.43**
Bile Salts	**B0038**	100 g	**$39.85**
Gelatin	**G0004**	500 g	**$25.85**
Pepsin	**P0006**	25 g	**$13.55**
	P0007	100 g	**45.75**

Culture Media, Prepared

see page 474 for a complete listing of all prepared culture media

Cupric...Cuprous...

see Copper(II) and Copper(I)

Cyclohexane

laboratory grade
C_6H_{12} **C0113** 500 mL **$14.10/1**
F.W. 84.16 **82.50/6**

★ **HAZARD ALERT:** Dangerous fire risk; flammable liquid; slightly toxic by ingestion, inhalation and skin contact. TLV 1030 mg/m^3.
Storage: Organic #3 inside a dedicated flammables cabinet. If one is not available, store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Disposal: #18b. U-Listed (U056); purchase small amounts for effective inventory control.
Shelf Life: Indefinite if stored safely.
Soluble: Many organic solvents; insoluble in water.
Color and Odor: Colorless liquid with a rubber cement odor.
CAS No. 110-82-7

Cyclohexanol

laboratory grade
$C_6H_{11}OH$ **C0190** 500 mL **$61.45**
F.W. 100.16

★ **HAZARD ALERT:** Combustible; may form explosive peroxides. Do not distill to dryness. Slightly toxic by ingestion, inhalation, and skin absorption. LD_{50} 1400 mg/kg. TLV 206 mg/m^3.

Storage: Organic #2 away from any oxidizers.
Disposal: #18b
Shelf Life: Fair to poor; substance hygroscopic. Store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can. Avoid prolonged storage.
Soluble: Slightly in water; miscible with many organic solvents.
Color and Odor: Colorless with a camphorlike odor.
CAS No. 108-93-0
Technical Note: Melting point is 23–25 °C; this substance may be a solid at room temperature (68 ºF/20 ºC).

Cyclohexanone

cyclohexyl ketone
ACS Reagent, 99.8%
$C_6H_{10}O$ **C0289** 500 mL **$38.00**
F.W. 98.14

★ **HAZARD ALERT:** *Possible mutagen;* suspected of causing genetic defects. Use only in a hood or well-ventilated area. Moderate fire risk; flammable liquid and vapor. Moderately toxic by ingestion, inhalation and skin absorption; causes skin and serious eye irritation. LD_{50} 1620 µL/kg.

Storage: Organic #4 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b. U-Listed (U057); purchase small amounts for effective inventory control.
Shelf Life: Fair; store in a cool, dry place.
Soluble: Alcohol, ether and common organic solvents; partially soluble in water.
Color and Odor: Colorless, oily liquid with peppermint and acetone odor.
CAS No. 108-94-1
Technical Note: Reacts with hydrogen peroxide and nitric acid to form explosive peroxides.

Cyclohexene

laboratory grade
C_6H_{10} **C0141** 500 mL **$67.00**
F.W. 82.15

★ **HAZARD ALERT:** Flammable liquid; dangerous fire risk. Slightly toxic by ingestion and inhalation. May form explosive peroxides; do not distill to dryness. Strong, offensive odor. LD_{50} 1920 mg/kg. TLV 1010 mg/m^3.

Storage: Organic #3 in a dedicated flammables cabinet. If a flammables cabinet is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Poor. Substance may form explosive peroxides; avoid prolonged storage.
Soluble: Alcohol; not water.
Color and Odor: Colorless liquid with paint thinner odor.
CAS No. 110-83-8

D

Decanedioyl Chloride

see Sebacoyl Chloride

Alcohols and Explosions

Reports suggest that secondary alcohols, such as sec-butyl alcohol and isopropyl alcohol, can develop explosive organic peroxides. Organic peroxides are unlikely to be a problem if the alcohols are fresh. Solution: Always know the age of your chemicals (Flinn chemical labels are dated), and use only fresh materials. Also, do not distill any alcohols to dryness since this will concentrate any explosive peroxides that may have formed.

Dehydrating Agents

see Calcium Chloride, Drierite®, etc.

Deionized Water

see Water, Deionized

Desiccants

see Calcium Chloride, Drierite®, etc.

Detergents

see Cleaners

Dextrose

glucose, anhydrous
reagent, granular
$C_6H_{12}O_6$ **D0002** 500 g **$11.30**
F.W. 180.16 **D0015** 2 kg **34.25**

Storage: Organic #2
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 492-62-6

Dextrose

glucose, monohydrate
laboratory grade, powder
$C_6H_{12}O_6 \cdot H_2O$
F.W. 198.18 **D0005** 500 g **$11.30**

Storage: Organic #2
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 5996-10-1

Dextrose Agar

bacteriological culture media
D0049 100 g **$89.00**

Storage: With culture media.
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Buff solid with dry dog food odor.

Dextrose Solutions

see Glucose Solutions

2,6-Di-t-Butyl-4-Methylphenol

BHT, butylated hydroxytoluene
laboratory grade, crystals
$((CH_3)_3C)_2CH_3C_6H_2OH$ **D0058** 500 g **$34.70**
F.W. 220.36

★ **HAZARD ALERT:** Moderately toxic by ingestion and inhalation. Body tissue irritant. LD_{50} 890 mg/kg.

Storage: Organic #8
Disposal: #24a
Shelf Life: Good; reacts with oxygen; limit exposure to air.
Soluble: Alcohol, xylenes, and acetone.
Color and Odor: White, odorless solid.
CAS No. 128-37-0
Technical Note: A safer alternative for melting point determination: melting point is 69–71 °C.

para-Dichlorobenzene

1,4-dichlorobenzene
laboratory grade, crystal
$C_6H_4Cl_2$ **D0007** 500 g **$62.50**
F.W. 147.01
M.P. 53 °C

★ **HAZARD ALERT:** *Possible carcinogen.* Severe irritant to eyes, skin, and respiratory tract. Moderately toxic by ingestion. LD_{50} 500 mg/kg. The threshold

PARA-DICHLOROBENZENE continued on next page.

para-Dichlorobenzene *continued*

limit value (TLV) for this substance is 60 mg/m^3 in air. Provide a high degree of ventilation.
Storage: Organic #4
Disposal: #4b. U-Listed (U072); purchase small amounts for effective inventory control.
Shelf Life: Fair to poor; substance volatile; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Insoluble in water; soluble in many organic solvents.
Color and Odor: White solid with moth ball odor.
CAS No. 106-46-7
Safety Purchase Suggestion: Cetyl alcohol, stearic acid and t-octyl phenol are safer alternatives for melting point determinations. A safer alternative for enthalpy of fusion experiments might be acetamide.

DNA Samples for Electrophoresis

See page 512 for predigested, ready-to-run DNA samples for electrophoresis.

2,6-Dichloroindophenol, Sodium Salt

2,6-dichlorophenol indophenol
DPIP, DCIP or DCPIP
reagent, powder

$NaOC_6H_4N=C_6H_2(Cl_2):O$	**D0009**	1 g	**$12.80**
F.W. 290.09	**D0026**	5 g	**38.30**

Storage: Organic #8
Disposal: #5
Shelf Life: Poor, substance is hygroscopic; may contain up to 2 moles water of hydration.
Soluble: Water and alcohol.
Color and Odor: Dark green solid with throat lozenge odor.
CAS No. 620-45-1
Technical Note: Use a 0.025% solution for Vitamin C determination. Solution is blue in base, changes to red in acid. Solutions of this indicator have a poor shelf life; make fresh solution for best results.

2,4-Dichlorophenoxyacetic Acid

2,4-D; an auxin

$C_8H_6Cl_2O_3$	**D0056**	100 g	**$81.14**

★ **HAZARD ALERT:** Toxic by ingestion; severe eye irritant. LD_{50} 375 mg/kg
Storage: Organic #1
Disposal: #4c
Shelf Life: Indefinite
Soluble: Slightly soluble in water, soluble in alcohol.
Color and Odor: Buff/tan, odorless solid.
CAS No. 94-75-7
Technical Note: Use a 0.01–5.0 mg/L solution as a plant growth regulator.

2,4-Dinitrophenylhydrazine

2,4-DNPH
stabilized with 30–35% water

$2,4\text{-}(NO_2)_2C_6H_4NHNH_2$	**D0061**	100 g	**$211.60**
F.W. 198.14			

★ **HAZARD ALERT:** Flammable; toxic by ingestion. LD_{50} >500 mg/kg.
Storage: Organic #2
Disposal: #5
Shelf Life: Good, if stored safely.
Soluble: Slightly soluble in water and alcohol; soluble in dilute inorganic acids.
Color and Odor: Moist, reddish-orange solid; odorless.
CAS No. 119-26-6
Technical Note: Contains 30–35% water as a stabilizer. Dry solid is shock-sensitive. Used to test for and identify carbonyl compounds.

Disinfectant

see Lysol®

Distilled Water

see Water, Distilled

DNA

see Deoxyribonucleic Acid

Dodecanoic Acid

see Lauric Acid

Dodecyl Alcohol

lauryl alcohol, 1-dodecanol
laboratory grade, crystal

$CH_3(CH_2)_{11}OH$	**D0035**	100 g	**$33.35**
F.W. 186.34			

Storage: Organic #2
Disposal: #18b
Shelf Life: Indefinite
Soluble: Alcohol
Color and Odor: White solid with floral odor.
CAS No. 112-53-8
Technical Note: Melting point is 24 °C; material may be a liquid or fused solid.

Dodecyl Sulfate, Sodium Salt

sodium lauryl sulfate, sodium dodecyl sulfate, SDS
laboratory grade, powder

$CH_3(CH_2)_{11}OSO_3Na$	**D0024**	100 g	**$21.35**
F.W. 288.38			

★ **HAZARD ALERT:** Harmful if swallowed. Causes skin and serious eye irritation. May cause respiratory irritation. LD_{50} 1288 mg/kg.
Storage: Inorganic #2 or Organic #4.
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 151-21-3
Technical Note: Suitable for electrophoresis as an anionic detergent to denature proteins.

DPIP

see Dichloroindophenol

Drierite®

calcium sulfate, anhydrous
moisture absorbent, 8 mesh

Non-indicating white	**D0011**	454 g	**$25.80**
Indicating blue, changes to pink when saturated	**D0012**	454 g	**$43.50**

★ **HAZARD ALERT:** Possible allergen. Respiratory irritant.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Not meant to be put in solution.
Color and Odor: White or blue, odorless solid.
CAS No. 7778-18-9

Dyes

see Food Coloring Dyes

Purchase Suggestion

If you use a lot of gases, consider our refillable gas cylinders. They provide more gas, eliminate disposal problems and save you money.

See page 157 of this catalog/reference manual for more information.



E

EBT
see Eriochrome Black T

EDTA
see Ethylenediaminetetraacetic Acid

Electrophoresis Chemicals
see page 448

EMB Agar
eosin methylene blue
bacteriological culture media
powder **E0021** 100 g **$63.95**

Storage: With other culture media.
Disposal: #26a
Shelf Life: Very hygroscopic; keep dry; shelf life good if kept dry. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Pink/violet solid with malt odor.

Enviro-Bond™ 403
oil absorbing material
E0058 100 g **$13.50**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26a
Shelf Life: Indefinite
Soluble: Insoluble
Color and Odor: White, odorless solid.
Technical Note: Use with Marvel Mystery Oil (AP8927) to simulate an oil spill cleanup; please see page 301.

Epsom Salts
see Magnesium Sulfate

Eriochrome Black T
EBT, biological stain/indicator
E0024 25 g **$15.90**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Hot water; moderately soluble in alcohol.
Color and Odor: Black solid with new rubber odor.
CAS No. 1787-61-7
C.I. #14645
Technical Note: Prepare fresh 0.5 or 1% EBT solutions in ethyl alcohol for use as a metal ion (calcium and magnesium) indicator.

Ethanol
see Ethyl Alcohol

Ether, Ethyl
diethyl ether
contains peroxide inhibitor
$C_2H_5OC_2H_5$
F.W. 74.12

ACS Reagent	**E0048**	100 mL	**$ 32.00**
anhydrous	**E0001**	500 mL	**34.05/1**
			199.02/6

Continued on next column.

Heavy Metals
Heavy metals, including cadmium and cadmium compounds, are most dangerous if inhaled as a fume or fine dust. Water soluble compounds of heavy metals are also toxic, but inhalation and ingestion are extremely unlikely. If the cadmium you intend to use will not generate a dust that can be inhaled, prudent practice suggests that it is not necessary to ban the material. Many heavy metals serve useful purposes in everyday life. Know the substance, how it can hurt you and how it can be properly disposed of.

Ether, Ethyl *continued*

Laboratory grade	**E0003**	100 mL	**$35.00**
anesthesia		(All above package sizes packaged in PVC-coated bottles)	

★ **HAZARD ALERT:** ***Severe fire and explosion hazard;*** may form explosive peroxides; vapor harmful, use only under a hood or in a well-ventilated area. TLV 1210 mg/m^3. LD_{50} 1215 mg/kg.
Storage: Organic #4 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can. ***Never store this substance in an ordinary household refrigerator.*** Avoid storing longer than 3–6 months. Buy and store only small quantities. Abide by label expiration date.
Disposal: #15. U-Listed (U117); purchase small amounts for effective inventory control.
Shelf Life: Poor; avoid prolonged storage.
Soluble: Slightly in water; soluble in many common organic solvents.
Color and Odor: Colorless liquid with an aromatic, sweet, not unpleasant odor.
CAS No. 60-29-7
Safety Purchase Suggestion: Consider using an alternative, less hazardous substitute such as Flinn *Lull-A-Fly*™ to anesthetize *Drosophila*. *Lull-A-Fly* contains no ether.

Ether, Petroleum
see Petroleum Ether

Ethyl Acetate
reagent grade

$CH_3COOC_2H_5$	**E0005**	500 mL	**$13.90**
F.W. 88.11	**E0006**	4 liters	**73.00**

★ **HAZARD ALERT:** Dangerous fire hazard and explosion risk; irritating to skin and eyes; slightly toxic by inhalation, ingestion and skin absorption. LD_{50} 5620 mg/kg. TLV 1440 mg/m^3.
Storage: Organic #3 in a dedicated flammables cabinet. If one is not available then store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a. U-Listed (U012); purchase small amounts for effective inventory control.
Shelf Life: Good if stored safely.
Soluble: Slightly in water; soluble in many organic solvents.
Color and Odor: Colorless liquid with stronger and more pungent odor than acetone.
CAS No. 141-78-6
Technical Note for Biology Teachers: This substance has been suggested for use in insect morgues in lieu of other, more hazardous substances.

Ethyl Alcohol
absolute
not denatured
This is the alcohol that humans can consume. A federal and local license is required to sell such consumable alcohol. We do not have such a license and do not want to get one. If you need alcohol that contains no denaturant, go to your local liquor store and buy grain alcohol. It may be sold under another name, but what you are seeking is 100% pure grain alcohol. Store in a poison cabinet.

Ethyl Alcohol
reagent alcohol, anhydrous
specially denatured formulation 3A
plus 5% isopropyl alcohol

C_2H_5OH	**E0007**	500 mL	**$10.75**
F.W. 46.07	**E0008**	4 liters	**38.40**

★ **HAZARD ALERT:** Dangerous fire risk; flammable; addition of denaturant makes the product poisonous—it cannot be made non-poisonous. TLV 1880 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet. If a flammables cabinet is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #26b
Shelf Life: Excellent if stored safely.
Soluble: Miscible with water and many organic solvents.
Color and Odor: Colorless liquid with alcohol odor.
CAS No. 64-17-5

ETHYL ALCOHOL continued on next page.

Ethyl Alcohol *continued*

Safety Purchase Suggestion: Do not buy large quantities or large package sizes of ethyl alcohol unless you have safe and fire-resistant storage facilities on your school premises.

Ethyl Alcohol

anhydrous, ethanol
denatured with isopropyl alcohol and methanol
C_2H_5OH F.W. 46.07

E0012	500 mL	**$ 10.41**
E0013	4 liters	**37.74**

For hazard alert, storage, disposal, etc., see Ethyl Alcohol, E0007.
Color and Odor: Colorless liquid with alcohol odor.

Ethyl Alcohol

95% ethanol
denatured with isopropyl alcohol and methanol
C_2H_5OH F.W. 46.07

E0009	500 mL	**$ 8.27**
E0010	4 liters	**35.00/1 135.68/4**
E0011	20 liters	**157.60**

For hazard alert, storage, disposal, etc., see Ethyl Alcohol, E0007.
Color and Odor: Colorless liquid with alcohol odor.

Ethyl Alcohol

70% in water
denatured ethyl alcohol and water

E0030	500 mL	**$ 10.80**
E0031	4 liters	**29.25**

★ **HAZARD ALERT:** Toxic by ingestion.
Storage: Organic #2
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water and many common organic solvents.
Color and Odor: Colorless liquid with alcohol odor.

Organic Solvents for GC Analysis

Nine solvents—two alcohols, three esters, and four ketones—25 mL each, to do all of the experiments in the Vernier Mini GC lab manual! Solvents within each functional group class differ in the number of carbon atoms (CH_2 groups), giving rise to a progressive trend in boiling point and excellent separation by gas chromatography. Convenient set of solvents may also be used for boiling point or fractional distillation labs, qualitative analysis of organic functional groups, and identification of unknowns. Solvents include: methyl alcohol, ethyl alcohol, acetone, methyl ethyl ketone, methyl isobutyl ketone, 2-pentanone, ethyl acetate, propyl acetate, and butyl acetate. Requires a fume hood or well-ventilated area.

Catalog No.	Description	Price/Each
AP7480	Organic Solvents for GC Analysis	**$66.20**

Ethyl Alcohol (Burner Fuel, Safety)

Denatured ethyl alcohol with added sodium salt.
The added presence of the sodium causes the flame to be more visible, thus reducing the potential for accidental burns.

E0025	4 liters	**$40.40**

★ **HAZARD ALERT:** Dangerous fire risk; addition of denaturant makes the product poisonous—it cannot be made nonpoisonous.
Storage: Organic #2 in a dedicated flammables cabinet. If a flammables cabinet is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #26b
Shelf Life: Excellent if stored safely.
Soluble: Miscible with water and many organic solvents.
Color and Odor: Colorless liquid with alcohol odor.

Continued on next column.

Ethyl Alcohol (Burner Fuel, Safety) *continued*

Safety Purchase Suggestion: Do not buy large quantities or large package sizes of ethyl alcohol unless you have safe and fire-resistant storage facilities on your school premises.
Technical Note: *Never allow the use of duplicator fluid* for fueling alcohol burners. The products of combustion from duplicator fluids are extremely hazardous to your health and the health of your students.
Safer Alternative for Alcohol Burners: Consider acquiring portable gas burners that operate from small bottles of gas; see page 124. We suggest these portable gas burners are safer than alcohol burners. Yes, such burners are expensive, but if you calculate the real cost over the life of the burners, it may easily be equal to alcohol burners. A hot plate or these suggested gas burners are safer than alcohol burners.

Ethylenediaminetetraacetic Acid

EDTA
reagent, powder
$C_{10}H_{16}N_2O_8$ F.W. 292.25

E0017	100 g	**$19.20**

★ **HAZARD ALERT:** Toxic by ingestion.
Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in water; insoluble in most common organic solvents.
Color and Odor: White, odorless solid.
CAS No. 60-00-4

Ethylenediaminetetraacetic Acid, Disodium Salt

EDTA, disodium salt, dihydrate
reagent, powder
$C_{10}H_{14}N_2Na_2O_8 \cdot 2H_2O$ F.W. 372.25

E0019	100 g	**$20.00**

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; insoluble in most common organic solvents.
Color and Odor: White, odorless solid.
CAS No. 6381-92-6
Technical Note: The disodium salt is most convenient for the preparation of solutions for hard water analysis and is the most commonly used reagent. A 0.01 M disodium EDTA solution works well in this regard.

EDTA Solution

0.1 Molar
contains EDTA, disodium salt

E0059	500 mL	**$7.35**

Storage: Organic #1
Disposal: #26b
Shelf Life: Indefinite
Soluble: Aqueous solution; immiscible with nonpolar organic solvents.
Color and Odor: Colorless, odorless liquid.
Technical Note: Commonly used for hard water analysis and water softening experiments.

Ethylene Glycol

laboratory grade
$HOCH_2CH_2OH$ F.W. 62.07

E0020	500 mL	**$10.85**

★ **HAZARD ALERT:** Moderately toxic by ingestion, inhalation and skin absorption, but the ingestion of even small quantities can be lethal to some people. LD_{50} 4700 mg/kg. TLV 127 mg/m^3 as vapor and mist.
Storage: Organic #2
Disposal: #18b
Shelf Life: Substance is hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol, and acetone.
Color and Odor: Colorless liquid with auto anti-freeze odor.
CAS No. 107-21-1

Ethylenedinitrilotetraacetic Acid
see Ethylenediaminetetraacetic Acid

Ethyl Ether
see Ether, Ethyl

F

Ferric Ammonium Citrate
ammonium iron(III) citrate
(so called brown)
laboratory grade, powder

F0003 500 g **$47.50**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; substance deliquescent; affected by light; store in Flinn *Chem-Saf*™ Bag and then inside Flinn *Saf-Stor*™ Can.
Soluble: Water; not alcohol.
Color and Odor: Mustard, odorless solid.
CAS No. 1185-57-5

Ferric Ammonium Sulfate
ammonium iron(III) sulfate
reagent, crystal
$FeNH_4(SO_4)_2 \cdot 12H_2O$ **F0004** 100 g **$13.10**
F.W. 482.21

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance efflorescent; light sensitive; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: Light purple, odorless solid.
CAS No. 7783-83-7

Ferric(ous) Oxide
see Iron Oxide, Black

Ferric...Ferrous...
see Iron(III) and Iron(II)

Ferrofluid
See page 235

Ferrous Ammonium Sulfate
reagent grade, crystal
$Fe(NH_4)_2(SO_4)_2 \cdot 6H_2O$ **F0013** 100 g **$14.10**
F.W. 392.16 **F0014** 500 g **36.60**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 3250 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance deliquescent and affected by light; store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Soluble: Water; not alcohol.
Color and Odor: Light green, odorless solid.
CAS No. 7783-85-9

Foam
see Polyurethane Foam System

Food Coloring Dyes
Dye set **V0003** set **$7.75**
contains 0.25 oz. each of red, yellow, blue and green

Continued on next column.

Ethyl Ether
It's the end of the school year—have you checked the expiration date of your ethyl ether? We strongly recommend that ethyl ether not be stored for periods longer than 3 to 6 months. With age, ethyl ether may form explosive peroxides. If your ethyl ether is nearing its expiration date, dispose of it before leaving for the summer.

Food Coloring Dyes *continued*

Red food dye **V0006** 100 mL **$15.10**
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Various as above, odorless.

Food Dyes, FD&C
Set of seven
FD&C Red 3, Red 40, Yellow 5,
Yellow 6, Green 3, Blue 1 and Blue 2
AP7375 set **$48.95**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Varied colors; odorless.

Formalternate™, Concentrate
nonformaldehyde substitute
F0056* 500 mL **$25.20**

*Each 500 mL makes 5 liters of ready-to-use solution.
Storage: Organic #2
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Colorless odorless liquid.
Technical Note: Formalternate, F0056, can be used instead of formaldehyde for storage (not fixation) of biological specimens. F0056 is sold in concentrated form: Dilute 1 volume concentrate per 9 volumes water to make 10 volumes of solution. Complete use instructions are furnished. This solution is an alternative for formaldehyde for biological specimen storage only. It is not a chemical substitute.

Formic Acid
23 Molar **F0023** 500 mL **$29.95**
88% solution
ACS reagent
HCOOH
F.W. 46.03

★ **HAZARD ALERT:** Corrosive to skin and tissue; reacts violently with bases. Upon aging, decomposes to carbon monoxide and water thus creating potential explosive danger in a tightly sealed bottle. Explosions have occurred. Slightly toxic by ingestion and inhalation. LD_{50} 1100 mg/kg. TLV 9.4 mg/m^3.
Storage: Organic #1 in a dedicated acid cabinet; if one is not available store in a Flinn *Saf-Cube*™.
Disposal: #24a. U-Listed (U123); purchase small amounts for effective inventory control.
Shelf Life: Poor; research suggests it ages poorly and may be an explosion risk. Avoid extended storage.
Soluble: Water, alcohol, and ether.
Color and Odor: Colorless liquid with penetrating, strong vinegarlike odor.
CAS No. 64-18-6

Fructose
see Levulose

G

D-Galactose
anhydrous
$C_6H_{12}O_6$ **G0018** 100 g **$53.15**
F.W. 180.09

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Hot water and pyridine.
Color and Odor: White solid with malt odor.
CAS No. 59-23-4

Gallium
small pieces
Ga A.W. 69.72 **G0031** 2.5 g **$71.95**

Storage: Inorganic #1
Disposal: #27a
Shelf Life: Poor; moisture sensitive.
Soluble: Acid, alkali, and slightly in mercury.
Color and Odor: Silvery/white, odorless solid/liquid.
CAS No. 7440-55-3
Technical Note: Melting point is 29.8 °C; may be a liquid or fused solid.

Gases, Lecture Bottle
See individual listing in bottled gas section of Catalog and repeated under individual gas names (e.g., oxygen) in chemical listings.

Gelatin
laboratory grade, granular
medium Bloom **G0004** 500 g **$25.85**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Hot water; insoluble in most organic solvents.
Color and Odor: Buff solid with a faint, musty odor.
CAS No. 9000-70-8
Technical Note: Mix 25–30 g per liter of deionized water to make a firm gel.

Gelatin Capsules
see page 100

Gentian Violet
see Crystal Violet

Ghost Crystals
see page 301 in the Chemistry of Toys section

Gibberellic Acid
Gibberellin A_3
crystal
$C_{19}H_{22}O_6$ F.W. 346.41 **G0003** 1 g **$39.15**

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in water, methyl and ethyl alcohol and acetone; soluble in aqueous solution of sodium bicarbonate and sodium acetate.
Color and Odor: White, odorless solid.
CAS No. 77-06-5
Technical Note: See Technical Note under Gibberellic Acid, Potassium Salt for solution preparation instructions.

Glass Wool, Medium
G0023 454 g **$99.24**

★ **HAZARD ALERT:** Wear gloves when handling glass wool.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Insoluble except in hydrofluoric acid.

Glauber's Salt
see Sodium Sulfate

Glucose
For powder or granular material see Dextrose; for standard solutions of glucose see the glucose listings that follow this cross reference.

Glucose Solution
dextrose
standard solutions

1 mL = 10 mg	**G0024**	100 mL	**$10.95**
1 mL = 2 mg	**G0025**	100 mL	**11.35**
1 mL = 1 mg	**G0026**	100 mL	**11.35**

Continued on next column.

Glucose Solution *continued*

Storage: Organic #2
Disposal: #26b
Shelf Life: Poor; please acquire only small quantities since the shelf life is limited to one year once the bottle is opened.
Color and Odor: Colorless, odorless liquid.

Glucose-1-Phosphate, Disodium Salt
$C_6H_{11}Na_2O_9P \cdot 4H_2O$ F.W. 376.16 **G0005** 1 g **$59.00**

Storage: Organic #2
Disposal: #26a
Shelf Life: Good, if kept dry. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 56401-20-8

Glucose Test Strips
glucose test paper for urine sugar determination
package contains 100 test strips
T0004 1 pkg. **$25.49**

Storage: With test papers.
Disposal: #26a
Shelf Life: Indefinite

Glue, White
simple white glue
G0049 1 L **$15.35**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26a
Shelf Life: Fair
Soluble: Water
Color and Odor: White liquid with glue odor.

Glycerin
glycerol
$C_3H_5(OH)_3$
F.W. 92.10

ACS Reagent	**G0019**	100 mL	**$10.37**
for electrophoresis			
Laboratory grade	**G0007**	500 mL	**$14.46**
	G0008	4 liters	**97.48**

★ **HAZARD ALERT:** Some people are allergic to glycerin and may experience irritation to their skin and eyes. Contact with strong oxidants (chromium trioxide, potassium chlorate, potassium permanganate) may cause an explosion. LD_{50} 12600 mg/kg.
Storage: Organic #2
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water and alcohol; insoluble in some common organic solvents.
Color and Odor: Colorless, odorless liquid.
CAS No. 56-81-5

Glycerin Solution
15% v/v, aqueous solution
G0043 500 mL **$11.20**

For hazard alert, storage, disposal, etc., see Glycerin, G0007.

Glycerol
see Glycerin

Gram Iodine Solution
see Iodine Solution, Gram

What Does "Denatured" Mean When Describing Ethyl Alcohol?
A denaturant is added to ethyl alcohol to make it unfit for use as a beverage. Frequently, the denaturant added is methyl alcohol (wood alcohol), which is very toxic. Denatured alcohol is not subject to federal alcohol taxes for beverages. There are many formulations of denatured alcohol, but the goal is always the same—to make ethyl alcohol unfit for use as a beverage.

Graphite Powder

90–97% **G0010** 500 g **$32.00**

★ **HAZARD ALERT:** A fire risk as fine powder. TLV 2.5 mg/m^3.
Storage: Inorganic #4; store in a Flinn *Saf-Stor*™ Can.
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Gray/black, odorless solid.
CAS No. 7782-42-5

Guaiacol Solution, 0.2%

0.2% in isopropyl alcohol reducing agent for peroxidase enzyme activity studies forms orange product with hydrogen peroxide and peroxidase
G0054 100 mL **$10.45**

★ **HAZARD ALERT:** Flammable liquid, irritating to body tissues. Slightly toxic by ingestion and inhalation.
Storage: Organic #2 in a dedicated flammables cabinet. If a flammables cabinet is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a
Shelf Life: Good, if stored safely. Protect from heat and light.
Color and Odor: Colorless liquid, rubbing alcohol odor.

Guar Gum

laboratory grade, powder **G0040** 500 g **$31.45**
Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Buff solid with freshly cut grass odor.
CAS No. 39421-75-5
Technical Note: This material is most frequently used for preparing slime.

Gypsum

see Calcium Sulfate

H

Helium Gas

Lecture bottle	**LB1010**	2 cu. ft. (56 liters)	**$441.27**
Refillable cylinder	**LB1065**	3.6 cu. ft. (100 liters)	**$449.25**

★ **HAZARD ALERT:** Please do not allow students to inhale helium. Government health agencies and industrial safety representatives have taken strong stands against the practice of breathing helium to demonstrate the change in pitch that occurs when breathing a lighter-than-air gas. Breathing helium removes oxygen from the bloodstream, so it's not the same and actually worse than just "holding your breath."
Storage: In an area dedicated to bottled gases.
Disposal: Completely empty lecture bottle, then follow #26a.
Shelf Life: Indefinite
Soluble: Slightly in water; insoluble in alcohol.
Color and Odor: Colorless, odorless.
CAS No. 7440-59-7

n-Heptane

laboratory grade
C_7H_{16} **H0001** 500 mL **$41.00**
F.W. 100.21

★ **HAZARD ALERT:** Dangerous fire risk; flammable liquid; slightly toxic by inhalation. TLV 1640 mg/m^3.

Continued on next column.

Biological Chemicals

The catalase listing on this page is an example of how we provide more than just "bare bones" catalog copy that tells nothing about a substance except its name, package size and price. Flinn is the problem-solving supplier for biology teachers as well as chemistry teachers.

n-Hexane *continued*

Storage: Organic #3 in a dedicated flammables cabinet. If a flammables cabinet is not available, then store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Good if stored safely.
Soluble: Alcohol, ether, and chloroform; not water.
Color and Odor: Colorless liquid with paint thinner odor.
CAS No. 142-82-5

Hexamethylenediamine/Sodium Hydroxide Solution

for nylon demonstration
contains: hexamethylenediamine, 6 grams;
sodium hydroxide, 2 grams; distilled water, 100 mL;
red vegetable dye added to to give slight pink color.
H0032 100 mL **$8.75**

★ **HAZARD ALERT:** Slightly toxic by ingestion; corrosive to body tissue.
Storage: Organic #2
Disposal: #10
Shelf Life: Good
Color and Odor: Pink, odorless liquid.
Technical Note: You will need a second solution to prepare nylon. See sebacoyl chloride/hexane solution or adipoyl chloride/hexane solution for preparation of nylon.

n-Hexane

hexane
reagent grade, 95+%
$CH_3(CH_2)_4CH_3$ **H0058** 500 mL **$ 43.00/1**
F.W. 86.18 **250.26/6**

★ **HAZARD ALERT:** *Suspected teratogen.* Dangerous fire risk; highly flammable liquid and vapor. Causes skin irritation. Possible reproductive/fetility hazard. Narcotic at high concentrations; may cause drowsiness or dizziness; aspiration hazard if swallowed and enters airways. Chronic exposure to vapors may cause peripheral nervous system damage. Use only in a hood or well-ventilated area.
Storage: Organic #3 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Good if stored properly.
Soluble: Alcohol and ether; not miscible with water.
Color and Odor: Clear, colorless liquid with characteristic weak odor.
CAS No. 110-54-3
Technical Note: May cause damage to organs, including the reproductive system, through prolonged or repeated exposure. Do not breathe vapors, mist or spray. Use only in a hood or well-ventilated area.

Hexanes

mixture of n-hexane and other isomers
reagent grade
C_6H_{14} **H0046** 100 mL **$ 10.50**
F.W. 86.18 **H0002** 500 mL **15.70**
H0054 1 L **32.66**

★ **HAZARD ALERT:** Flammable liquid; dangerous fire risk; respiratory irritant. Possible reproductive/fetility hazard. TLV 176 mg/m^3.
Storage: Organic #3 in a dedicated flammables cabinet. If one is not available then store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Indefinite if stored safely.
Soluble: Acetone, alcohol, and ether; not water.
Color and Odor: Colorless liquid with paint thinner odor.
CAS No. 110-54-3

1,6-Hexanediamine

see Hexamethylenediamine

Hydrochloric Acid

12 Molar
ACS reagent
37 wt %
(sp. gr. = 1.19 at 20 °C)
HCl
F.W. 36.46

H0031	100 mL	**$ 10.47**
H0004	500 mL	**21.63**
H0005	2.5 liters	**37.60**
H0006*	2.5 liters	**53.00/1**
		310.20/6

(Packaged in PVC-coated bottle)

★ **HAZARD ALERT:** Highly toxic by ingestion or inhalation; severely corrosive to skin and eyes.

Storage: Inorganic #9 in a dedicated acid cabinet. If one is not available, store in a Flinn *Saf-Cube*™. See our special storage tip for additional information.

Cap Safety Color Code: Blue

Disposal: #24b

Shelf Life: Good if stored safely.

Soluble: Water

Color and Odor: Colorless liquid with very strong chlorine odor.

CAS No. 7647-01-0

Incompatability: Avoid storing hydrochloric acid anywhere in the vicinity of formaldehyde. A ***potent carcinogen,*** chloromethoxychloromethane, is formed when hydrochloric acid and formaldehyde react in air. This serious potential problem further emphasizes the need to store hydrochloric acid in a dedicated acid cabinet.

Safety Purchase Suggestion: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of hydrochloric acid and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.

*Hydrochloric acid is exactly as described under catalog number H0005 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are safely retained in a PVC outer envelope. The PVC-coated bottle is a safer package for science teachers.

SPECIAL STORAGE TIP: Hydrochloric acid fumes a lot—particularly when warm. These fumes are responsible for most of the corrosion damage in your acid storage area. To solve this problem, store hydrochloric acid bottle(s) in a tightly sealed plastic bag. ***Be sure*** to label the outside of the plastic bag since acid fumes will soon destroy the bottle label. Spray the label on the bottle with Krylon® plastic spray (AP1559, page 579) if you wish to preserve it.

Hydrochloric Acid, Gramolpak

(as HCl)

1 Molar	**H0039***	pkg.	**$17.10**
0.1 Molar	**H0042***	pkg.	**10.95**

For hazard alert, storage, disposal, etc., see Hydrochloric Acid, H0033.

*Gramolpak™ is a unique package that makes 1 liter with distilled water.



Hydrochloric Acid Solution

6 Molar	**H0033**	500 mL	**$ 10.87**
	H0056	1 L	**17.35**
3 Molar	**H0034**	500 mL	**10.80**
1 Molar	**H0013**	500 mL	**7.80**
	H0057	1 L	**12.90**
0.5 Molar	**H0035**	500 mL	**9.53**
0.25 Molar	**H0041**	500 mL	**9.29**
0.15 Molar	**H0036**	500 mL	**8.80**
0.1 Molar	**H0014**	500 mL	**8.33**

★ **HAZARD ALERT:** Toxic by ingestion or inhalation; severely corrosive to skin and eyes.

Storage: Inorganic #9 in a dedicated acid cabinet.

Disposal: #24b

Shelf Life: Good

Color and Odor: Colorless liquid with slight hydrochloric acid odor.

Hydrogen Gas

Lecture bottle	**LB1015**	2 cu. ft. (56 liters)	**$295.30**
Refillable cylinder	**LB1070**	3.6 cu. ft. (100 liters)	**$437.00**

★ **HAZARD ALERT:** Highly flammable gas; severe fire hazard.

Storage: In an area dedicated to bottled gases and *away from any source of heat or flame.*

Disposal: Completely empty lecture bottle in a good operating fume hood, then follow #26a.

Shelf Life: Indefinite if stored safely.

Soluble: Slightly in water, alcohol, and ether.

Color and Odor: Colorless, odorless.

CAS No. 1333-74-0

Hydrogen Peroxide

H_2O_2
F.W. 34.02

30% Reagent	**H0037**	100 mL	**$14.40**
(stabilized)	**H0008**	500 mL	**35.50**
6%	**H0028**	500 mL	**$ 10.55**
laboratory grade	**H0029**	3.8 liters	**29.90**
3%	**H0009**	473 mL	**$ 6.35**
laboratory grade	**H0038**	3.8 liters	**21.24**

★ **HAZARD ALERT:** 30% hydrogen peroxide requires special storage and handling procedures. It is a *very strong oxidizing agent* and *severely corrosive* to skin, eyes and respiratory tract. Many common substances, including iron and other transition metals, will catalyze the decomposition to produce copious amounts of oxygen gas and heat. The 30% solution is a dangerous fire and explosion risk—do not heat. Wear appropriate protective clothing. TLV 1.4 mg/m^3. Dilute 3% and 6% hydrogen peroxide solutions are weak oxidizers and skin and eye irritants.

Storage: Inorganic #6. We frequently find 30% hydrogen peroxide stored in school refrigerators. We do not recommend storing any laboratory chemicals in household-type refrigerators.

Disposal: #22a

Shelf Life: Fair to poor; when stored at room temperature, the substance decomposes at approximately 0.5% per year.

Soluble: Water and alcohol.

Color and Odor: Colorless, odorless liquid.

CAS No. 7722-84-1

Hydroxylamine Hydrochloride

laboratory grade, crystal
$H_2NOH \cdot HCl$ **H0019** 100 g **$19.80**
F.W. 69.50

★ **HAZARD ALERT:** Highly toxic by ingestion; strong tissue irritant. LD_{50} 141 mg/kg. Incompatible with sodium hydroxide and other strong bases; reacts to form hydroxylamine, which may explode when heated.

Storage: Organic #2

Disposal: #26a

Shelf Life: Slowly decomposes when moist. Keep cool and dry.

Soluble: Water; glycerol, and alcohol; insoluble in ether.

Color and Odor: White, odorless solid.

CAS No. 5470-11-1

How to Neutralize a Base Spill

The common answer is to use vinegar to neutralize a base spill. Don't do it. You will have to add gallons of vinegar, and this will only make the spill larger. Use anhydrous citric acid powder. It has three acid groups for neutralization, low toxicity and is easily poured onto a spill. Keep a supply of citric acid powder on hand any time you are working with bases. See page 578 for a complete listing of spill control materials.

I

Immersion Oil
R.I. 1.515, PCB free

Low viscosity	**I0051**	0.5 oz	**$13.50**
150 CS	**I0052**	1 oz	**21.00**
High viscosity	**I0054**	1 oz	**$78.00**
1250 CS			

Storage: Organic #3
Disposal: #18b
Shelf Life: Indefinite
Soluble: Insoluble in water.
Color and Odor: Colorless or slightly pale yellow, odorless oil.
Technical Note: Packaged in squeezable dropper-type bottles. Both oils meet or exceed DIN standards and are nondrying and nonhardening. Use low viscosity between the objective and slide; use high viscosity between the condenser and slide.

1,2,3-Indantrione Monohydrate
see Ninhydrin

Indicators
see individual listings or chart

Indigo Carmine
indicator and stain
pH 11.6 blue to 13.0 yellow
$C_{16}H_8N_2Na_2O_8S_2$ **I0022** 10 g **$15.70**
F.W. 466.37

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant. LD_{50} 2000 mg/kg.
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and slightly in alcohol.
Color and Odor: Violet, odorless solid.
CAS No. 860-22-0
C.I. #73015
Technical Note: To make a 0.25% solution, add 0.25 g of indigo carmine to 100 mL of 50% ethyl alcohol. Prepare fresh for use; solution does not store well. Color of the solution fades on standing.

Indole-3-Acetic Acid
reagent grade
$C_8H_6NCH_2COOH$ **I0002** 5 g **$48.80**
F.W. 175.19

Continued on next column.

Indole-3-Acetic Acid *continued*

Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Alcohol and ether; insoluble in water and chloroform.
Color and Odor: Light pink, odorless solid.
CAS No. 87-51-4
Technical Note: Use a 1.0–8.0 mg/L solution as a plant growth hormone.

Indophenol, Sodium Salt
see Dichloroindophenol, Sodium Salt

Ink, Black
can be used for chromatography
water soluble **I0028** 2-oz. bottle **$17.48**

Storage: Miscellaneous nonhazardous organic material.
Soluble: Water
Color and Odor: Black, odorless.

Instant Light
see Chemical Demonstration Kits, page 232

Iodine
resublimed
I_2
F.W. 253.81

Reagent	**I0006**	25 g	**$22.41**
crystals	**I0007**	100 g	**51.55**
Laboratory grade	**I0060**	100 g	**$46.35**
granules			

(All above sizes are packaged in wax-sealed, PVC-coated bottles)

★ **HAZARD ALERT:** Toxic by ingestion or inhalation. Reacts violently with reducing materials, sulfur, iron, alkali metals, metal powders and phosphorus. Irritates the skin; corrosive to eyes and respiratory tract. TLV 1.0 mg/m^3.
Storage: Inorganic #2
Disposal: #12a
Shelf Life: Fair; the substance sublimes. Reacts with and corrodes metal shelves or metal containers. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Many organic solvents; not water.
Color and Odor: Black/purple solid with unique, acrid odor.
CAS No. 7553-56-2
Technical Note: Iodine may be removed from clothing by washing the stain with a 10% solution of sodium thiosulfate and then rinsing with water.

Indicators, pH Ranges

Indicator	Flinn Catalog Nos.	pH Range	Color Change
Bromcresol Green	**B0040**	3.8–5.4	yellow to blue
Bromphenol Blue	**B0044**	3.0–4.6	yellow to purple
Bromthymol Blue	**B0046**	6.0–7.6	yellow to blue
Congo Red	**C0120**	3.0–5.0	blue to red
Crystal Violet	**C0125**	0–1.8	yellow to violet-blue
Indigo Carmine	**I0022**	11.6–13.0	blue to yellow
Malachite Green Oxalate	**M0129**	0.0–2.0 & 11.6–14.0	yellow to green blue-green to colorless
Methyl Orange	**M0076**	3.0–4.4	red to yellow
Methyl Red	**M0081**	4.4–6.2	red to yellow

Indicator	Flinn Catalog Nos.	pH Range	Color Change
p-Nitrophenol	**N0073**	5.6–7.6	colorless to yellow
Phenol Red	**P0188**	6.8–8.4	yellow to red
Phenolphthalein	**P0017, P0018, P0193, P0276**	8.2–10.0	colorless to pink
Thymol Blue	**T0025**	1.2–2.8 & 8.0–9.2	red to yellow yellow to blue
Thymolphthalein	**T0073**	9.3–10.5	colorless to blue
Universal Indicator	**U0001, U0002, U0009, U0011**	4–10	chart necessary
Universal Indicator, Rainbow Acid	**U0012**	1–7	chart necessary
Universal Indicator, Red Cabbage Extract	**U0014**	2–11	chart necessary

See individual indicator listings in alphabetical sequence in the chemical section of this catalog/reference manual. In many cases, the listing includes ready-made solutions of these indicators.

Iodine, Tincture

contains potassium iodide, iodine, water and ethyl alcohol

	I0009	100 mL	$ 9.40
	I0035	500 mL	25.15

(Both sizes packaged in PVC-coated bottles)

★ **HAZARD ALERT:** Contains ethyl alcohol; toxic by ingestion and inhalation; flammable liquid.
Storage: Inorganic #2, store as a flammable liquid.
Disposal: #12a
Shelf Life: Good, if stored safely.
Color and Odor: Brown/black liquid with iodine and alcohol odor.

Iodine Solution

iodine-iodide

0.1 Molar	I0039	500 mL	$19.56
0.05 Molar	I0048	100 mL	$ 10.23
	I0023	500 mL	17.15

★ **HAZARD ALERT:** Irritating to eyes and skin.
Storage: Inorganic #2
Disposal: #12a
Shelf Life: Fair to poor; store away from heat and direct light.
Color and Odor: Brown/red liquid with iodine odor.

Iodine–Potassium Iodide Solution

test solution for starch

	I0038	100 mL	$ 8.30
	I0027	500 mL	12.05

★ **HAZARD ALERT:** Irritating to eyes and skin.
Storage: Inorganic #2
Disposal: #12a
Shelf Life: Fair to poor; store away from heat and direct light.
Color and Odor: Amber liquid with slight iodine odor.
Technical Note: Turns purple in the presence of starch.

Iodine Solution, Gram

staining solution	G0036	100 mL	$7.65
iodine-iodide	G0009	500 mL	12.75

For hazard alert, storage, disposal, etc., see Iodine–Potassium Iodide Solution, I0038.
Color and Odor: Brown liquid with iodine odor.

Iodine Solution, Lugol's

Weigert's, vital stain solution

iodine-iodide	I0036	100 mL	$ 8.24
	I0010	500 mL	16.50

For hazard alert, storage, disposal, etc., see Iodine–Potassium Iodide Solution, I0038.
Color and Odor: Brown liquid with iodine odor.

Ion Exchange Resin

Ion Exchange Resin SBA	I0034	500 g	$196.24

strongly basic anion exchange resin, Dowex® 2-X8 20–50 mesh

Ion Exchange Resin SAC	I0043	100 g	$91.25

strongly acidic cation exchange resin, Dowex® 50X8 50–100 mesh

Storage: Miscellaneous organic.
Disposal: #26a
Shelf Life: Excellent
Color and Odor: Buff or brown, odorless solid.

Iron, Filings

fine, 65 mesh
Fe, A.W. 55.85

Pure iron	I0011	500 g	$ 9.70
	I0012	2 kg	29.50
Non-rusting alloy	I0059	500 g	$12.65

IODINE SOLUTION, GRAM continued on next page.

Iron, Filings *continued*

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Sulfuric, hydrochloric, and cold, dilute nitric acids.
Color and Odor: Gray/black, odorless solid.
CAS No. 7439-89-6
Technical Note: Pure iron filings quickly oxidize (rust) and can be messy. Flinn's iron alloy metal filings act just like iron filings for magnetism experiments, but resist oxidation. Use pure iron filings for iron sulfide or other chemistry experiments.

Iron, Galvanized

28 gauge, 2.5" square pieces

	I0064	pkg./5	$10.60

For storage, disposal, etc., see Iron, Sheet, I0015.

Iron, Nails

3" long, 10 penny nongalvanized steel	I0032	1 lb	$8.30

For storage, disposal, etc., see Iron, Sheet, I0015.

Iron, Powder

Laboratory grade	I0014	500 g	$17.50

★ **HAZARD ALERT:** Metals in fine powder form present a serious fire and explosion risk.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Good if kept dry and protected from fire. Store in a Flinn *Saf-Stor*™ Can.
Soluble: Sulfuric, hydrochloric and cold, dilute nitric acids.
Color and Odor: Gray, odorless solid.
CAS No. 7439-89-6

Iron, Sheet

mild steel

12" x 12" x 0.024", B&S gauge #24	I0015	each	$12.60

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Excellent
Color and Odor: Gray, odorless solid.

Iron, Strips

mild steel, 6" x ½" x 0.024"	I0058	pkg./10 strips	$9.35

For storage, disposal, etc., see Iron, Sheet, I0015.

Iron, Wire

wire, 18 gauge

1.2 mm diameter	I0050	25 g	$11.60
(100 cm = 8.8 g)	I0062	100 g	37.20

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Excellent
Color and Odor: Gray, odorless solid.
CAS No. 7439-89-6

Preparing an Iodine Solution?

Iodine crystals are not directly soluble in water, which is why most water-based iodine solutions call for potassium iodide as an ingredient. Iodine is soluble in potassium iodide solutions. As a general rule, start with approximately one-fourth of the final volume of water and add the required amount of potassium iodide. Once the potassium iodide has dissolved, add the iodine crystals. Stir until completely dissolved and bring the solution up to its final volume. Iodine solutions should be prepared under a fume hood.

Iron Oxide, Black

iron(II, III) oxide, ferric ferrous oxide, triiron tetraoxide, black iron oxide
laboratory grade, powder

Fe_3O_4	**F0012**	500 g	**$19.30**
F.W. 231.54			

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: In acids; not water.
Color and Odor: Black, odorless solid.
CAS No. 1317-61-9

Iron(II) Ammonium Sulfate

see Ferrous Ammonium Sulfate

Iron(II)...Ferrous... Iron compounds in which the iron has an ionic charge or oxidation number of two.

Iron(II) Chloride

ferrous chloride
reagent grade, crystal

$FeCl_2 \cdot 4H_2O$	**F0041**	25 g	**$14.95**
F.W. 198.81	**F0015**	100 g	**30.85**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; substance deliquescent and easily oxidized; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: Pea green solid with slight chlorine odor.
CAS No. 13478-10-9

Iron(II) Sulfate

ferrous sulfate
laboratory grade, granular

$FeSO_4 \cdot 7H_2O$	**F0016**	500 g	**$13.35**
F.W. 278.03			

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} (mouse) 1520 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance efflorescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: Light green, odorless solid.
CAS No. 7782-63-0

Iron(II) Sulfide

ferrous sulfide
laboratory grade, lump
H_2S generating

FeS	**F0042**	100 g	**$30.25**
F.W. 87.91			

★ **HAZARD ALERT:** Contact with acid liberates poisonous hydrogen sulfide gas; ***do not dispose of the product down a drain that might contain acid.*** Hydrogen sulfide gas is toxic and flammable.
Storage: Inorganic #5
Disposal: #26a

Continued on next column.

Before a Lab Even Starts

Many safety-conscious science teachers require students to pass a prelab quiz before starting any lab activity. The prelab quiz encourages students to understand laboratory and safety procedures before they even start. According to a recent teacher survey, the number-one reason for accidents in the science lab was "students' failure to carefully read and understand laboratory activity instructions." A prelab quiz may help solve this problem.

Shelf Life: Must be stored away from any source of moisture and away from any acid; store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Soluble: Acids; not water.
Color and Odor: Metallic gray, odorless solid.
CAS No. 1317-37-9

Iron(III)...Ferric... Iron compounds in which the iron has an ionic charge or oxidation number of three.

Iron(III) Ammonium Citrate

see Ferric Ammonium Citrate

Iron(III) Ammonium Sulfate

see Ferric Ammonium Sulfate

Iron(III) Chloride

ferric chloride
reagent, lump

$FeCl_3 \cdot 6H_2O$	**F0006**	100 g	**$12.45**
F.W. 270.32	**F0007**	500 g	**24.50**

★ **HAZARD ALERT:** Skin and tissue irritant; corrosive; slightly toxic by ingestion.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and other common organic solvents.
Color and Odor: Mustard solid with slight chlorine odor.
CAS No. 10025-77-1

Iron(III) Chloride Solution

(as $FeCl_3 \cdot 6H_2O$)

1.0 Molar	**F0069**	100 mL	**$ 10.55**
0.1 Molar	**F0045**	500 mL	**12.20**

★ **HAZARD ALERT:** May be skin and body tissue irritant.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Amber, odorless liquid.

Iron(III) Nitrate

ferric nitrate
reagent, crystal

$Fe(NO_3)_3 \cdot 9H_2O$	**F0008**	100 g	**$12.00**
F.W. 404.00	**F0009**	500 g	**22.10**

★ **HAZARD ALERT:** Strong oxidizer; skin and tissue irritant. LD_{50} 3250 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Fair to poor—deliquescent; Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: Light violet solid with slight nitric acid odor.
CAS No. 7782-61-8
Technical Note: Because of the poor shelf life of this chemical, we recommend purchasing prepared solutions whenever possible.

Iron(III) Nitrate Solution

(as $Fe(NO_3)_3 \cdot 9H_2O$)

0.2 Molar	**F0046**	500 mL	**$10.30**
0.1 Molar	**F0047**	500 mL	**9.35**

★ **HAZARD ALERT:** Skin and body tissue irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Amber, odorless liquid.

Iron(III) Nitrate Solution, Acidified

ferric nitrate plus nitric acid
for use in iron–thiocyanate complex ion equilibrium constant labs

0.2 Molar	**F0048**	500 mL	**$18.85**

★ **HAZARD ALERT:** Corrosive liquid; solution is 0.6 M in nitric acid.
Storage: Inorganic #3
Disposal: #24b
Shelf Life: Fair
Color and Odor: Very faint yellow to colorless; odorless.

Iron(III) Oxide

ferric oxide, hematite
reagent grade, powder

Fe_2O_3	**F0010**	500 g	**$22.85**
F.W. 159.69			

★ **HAZARD ALERT:** Skin, eye and respiratory irritant.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: In acids; not water.
Color and Odor: Rust, odorless solid.
CAS No. 1309-37-1
Technical Note: See Iron Oxide, Black, for the mixed iron(II, III) oxide, Fe_3O_4, also known as magnetite.

Iron(III) Sulfate

ferric sulfate
reagent grade, powder

$Fe_2(SO_4)_3 \cdot 7H_2O$	**F0031**	100 g	**$22.10**
F.W. 399.89 (as $Fe_2(SO_4)_3$)			

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; hygroscopic; keep tightly closed and protected from light; store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Soluble: Water
Color and Odor: Buff, odorless solid.
CAS No. 15244-10-7
Technical Note: Iron(III) sulfate has approximately 20% water content.

Isoamyl Alcohol

see Isopentyl Alcohol

Isobutyl Alcohol

2-methyl-1-propanol
reagent grade

$(CH_3)_2CHCH_2OH$	**I0017**	500 mL	**$20.05**
F.W. 74.12			

★ **HAZARD ALERT:** Flammable; slightly toxic; skin, eye, and respiratory irritant. LD_{50} 2460 mg/kg. TLV 152 mg/m^3.
Storage: Organic #2. Substance attacks plastic containers. Store in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b. U-Listed (U140); purchase small amounts for effective inventory control.
Shelf Life: Indefinite
Soluble: Alcohol and ether; partially in water.
Color and Odor: Colorless liquid with strong, alcohol-like odor.
CAS No. 78-83-1

Isopentyl Alcohol

isoamyl alcohol
reagent grade

$(CH_3)_2CHCH_2CH_2OH$	**I0031**	100 mL	**$19.05**
F.W. 88.15	**I0018**	500 mL	**44.80**

★ **HAZARD ALERT:** Slightly toxic by ingestion and inhalation; moderate fire risk; may form explosive peroxides, do not distill to dryness. LD_{50} 1300 mg/kg. TLV 361 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b

Continued on next column.

Isopentyl Alcohol *continued*

Shelf Life: Poor. May form explosive peroxides. Avoid prolonged storage.
Soluble: Slightly in water; miscible with alcohol and ether.
Color and Odor: Colorless liquid with strong, disagreeable, alcohol-like odor.
CAS No. 123-51-3

Isopropyl Alcohol

2-propanol, isopropanol
reagent grade, 99% purity

$(CH_3)_2CHOH$	**I0019**	500 mL	**$ 9.86**
F.W. 60.10	**I0020**	4 liters	**57.00/1**
			224.64/4

★ **HAZARD ALERT:** Flammable liquid; fire hazard; slightly toxic by ingestion and inhalation. LD_{50} 5045 mg/kg. TLV 983 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet. If a flammables cabinet is not available store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a
Shelf Life: Fair. May form explosive peroxides; avoid prolonged storage and do not distill to dryness. If in doubt about the age or condition of your isopropyl alcohol, do not use.
Soluble: Water, alcohol, and ether.
Color and Odor: Colorless liquid with rubbing alcohol odor.
CAS No. 67-63-0

Isopropyl Alcohol

70% rubbing alcohol	**I0021**	500 mL	**$ 10.10**
laboratory grade	**I0037**	4 liters	**52.50**

★ **HAZARD ALERT:** Moderate fire risk; flammable liquid; slightly toxic by ingestion and inhalation.
Storage: Organic #2 in a dedicated flammables cabinet. If a flammables cabinet is not available store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a
Shelf Life: Fair
Soluble: Water
Color and Odor: Colorless liquid with rubbing alcohol odor.

J

Janus Green B

biological stain (supravital stain)	**J0001**	5 g	**$44.80**

Storage: Organic #9
Disposal: #5
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Black/green, odorless solid.
CAS No. 2869-83-2
C.I. #11050

K

Kastle-Meyer Reagent

Used with hydrogen peroxide as a presumptive test for blood. Contains: ethyl alcohol, sodium hydroxide, phenolphthalein and zinc.

	AP7555	100 mL	**$13.25**

★ **HAZARD ALERT:** Alcohol solution; flammable liquid. Dilute sodium hydroxide is irritating to body tissues.
Storage: Organic #9
Disposal: #10
Shelf Life: Fair to poor.
Color and Odor: Pale gray, peach or yellow solution. Faint alcohol odor.

The Package Can Be Dangerous!

The low bid supplier may not always be the better choice. While you may save money on the front end, inappropriate packaging may cause special hazards. Always rely on Flinn for safe packaging and handling and disposal guidelines.

Kerosene
lamp oil
Odorless **K0002** 500 mL **$12.90**

★ **HAZARD ALERT:** Moderate fire risk; moderately toxic by ingestion, inhalation and skin absorption; skin and eye irritant. LD_{50} (rabbit) 2835 mg/kg.
Storage: Organic #3 preferably in a flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Excellent if stored safely.
Soluble: Many organic solvents.
Color and Odor: Liquid with slight oil odor.
CAS No. 8008-20-6

L

Laboratory Cleaners
see Cleaners

Lactose
laboratory grade, powder
$C_{12}H_{22}O_{11} \cdot H_2O$ **L0002** 500 g **$17.70**
F.W. 360.31
Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; insoluble or only slightly soluble in many organic solvents.
Color and Odor: White, odorless solid.
CAS No. 64044-51-5

Lampblack
see Charcoal

Lanolin
wool fat, anhydrous
laboratory grade **L0003** 500 g **$35.90**
Storage: Organic #3
Disposal: #26a
Shelf Life: Good if kept cool and dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Many organic solvents; insoluble in water.
Color and Odor: Yellowish solid with shoe polish odor.
CAS No. 8006-54-0

Latex
liquid, compounded **L0110** 1 liter **$33.20**

★ **HAZARD ALERT:** Possible allergen and skin irritant.
Storage: Organic #3
Disposal: #26b
Shelf Life: Fair; will turn pink if exposed to light.
Soluble: Most common organic solvents.
Color and Odor: White or light pink liquid; slight ammonia odor.
Technical Note: Compounded latex has additives that prevent discoloration, aging, and deterioration.

Laundry Bluing
see Bluing, Laundry

Hazardous Shipping Fee
Certain items sold by Flinn are classified as hazardous materials by the U.S.. Department of Transportation and therefore require special handling to ensure safe transport. A flat fee of $32 per order is added to cover these handling requirements and such items can only be shipped to schools, museums and science centers.

Lauric Acid
dodecanoic acid
laboratory grade, flake
$CH_3(CH_2)_{10}COOH$ **L0052** 100 g **$12.30**
F.W. 200.32 **L0044** 500 g **20.85**
M.P. 43–45 °C
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Insoluble in water; soluble in ether and benzene.
Color and Odor: White solid with candle wax odor.
CAS No. 143-07-7

Lauryl Alcohol
see Dodecyl Alcohol

Lead, Foil
Pb **L0109** 250 g **$34.85**
A.W. 207.19 (3" x 70")
0.006" thick

★ **HAZARD ALERT:** *Probable carcinogen.* Possible reproductive/fertility hazard.
Storage: Inorganic #1
Disposal: #27d
Shelf Life: Indefinite
Soluble: Dilute nitric acid; not water.
Color and Odor: Silvery/gray, odorless solid.
CAS No. 7439-92-1

Lead, Sheet
1/32" thick **L0072** 500 g **$23.45**
(6" x 14")

For hazard alert, storage, disposal, etc., see Lead, Foil, L0109.
Color and Odor: Gray, odorless solid.

Lead, Shot
Approx. 2 mm diam. **L0090** 250 g **$17.95**
L0008 500 g **24.35**

For hazard alert, storage, disposal, etc., see Lead, Foil, L0109.
Color and Odor: Gray, odorless solid.

Lead, Strips
15 x 1 cm, 0.8 mm thick
L0065 pkg./6 **$10.35**

For hazard alert, storage, disposal, etc., see Lead, Foil, L0109.
Color and Odor: Gray, odorless solid.

Lead Acetate
lead(II) acetate
laboratory grade, flake
$Pb(C_2H_3O_2)_2 \cdot 3H_2O$ **L0010** 500 g **$24.00**
F.W. 379.34

★ **HAZARD ALERT:** *Probable carcinogen;* eye, skin and respiratory irritant; slightly toxic. Possible reproductive/fertility hazard. *Avoid dispersing, breathing or inhaling dust.* LD_{50} 4665 mg/kg.
Storage: Inorganic #2
Disposal: #27f. U-Listed (U144); purchase small amounts for effective inventory control.
Shelf Life: Fair to poor; absorbs carbon dioxide when exposed to air, becoming insoluble in water. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, glycerin and slightly in alcohol.
Color and Odor: White solid with strong vinegar odor.
CAS No. 6080-56-4

Lead Chloride
lead(II) chloride
reagent, powder
$PbCl_2$ **L0011** 250 g **$28.20**
F.W. 278.12

★ **HAZARD ALERT:** *Probable carcinogen.* Moderately toxic by inhalation and ingestion. Possible reproductive/fertility hazard.

LEAD CHLORIDE continued on next page.

Lead Chloride *continued*

Storage: Inorganic #2 in a Flinn *Chem-Saf*™ Bag.
Disposal: #27f
Shelf Life: Indefinite
Soluble: Slightly in hot water; insoluble in cold water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 7758-95-4

Lead Nitrate

lead(II) nitrate
$Pb(NO_3)_2$
F.W. 331.20

Reagent	**L0014**	100 g	**$ 10.95**
crystal	**L0015**	500 g	**23.95**
Laboratory grade	**L0060**	500 g	**$21.20**

★ **HAZARD ALERT:** *Possible carcinogen.* Moderately toxic by inhalation and ingestion; strong oxidant; dangerous fire risk in contact with organic material; body tissue irritant. Possible reproductive/fertility hazard.
Storage: Inorganic #3
Disposal: #27f
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White solid with slight nitric acid odor.
CAS No. 10099-74-8

Lead Nitrate Solution

(as $Pb(NO_3)_2$)

1 Molar	**L0067**	500 mL	**$11.35**
0.5 Molar	**L0068**	500 mL	**10.85**
0.1 Molar	**L0069**	500 mL	**11.00**

For hazard alert, storage, disposal, etc., see Lead Nitrate, L0014.
Color and Odor: Clear, odorless liquid.

Lectin

mitosis activator (AP® Biology Investigation 7)
lyophilized powder extracted from red kidney beans

	L0114	10 mg	**$42.85**

★ **HAZARD ALERT:** Hemolytic; agglutinates human red blood cells. Use with appropriate personal protective equipment to limit exposure.
Storage: Organic miscellaneous.
Disposal: #26a
Shelf Life: Poor; keep frozen until use.
Soluble: Water
Color and Odor: White, odorless solid.
Technical Note: Typical concentration is 10 mg/200 mL. Refrigerate solution and use within one week.

Lemon Juice

	L0042	15 oz	**$8.95**

Storage: Organic #1
Disposal: #26b
Shelf Life: Limited; keep cool after opening.
Soluble: Water
Color and Odor: Yellow liquid with lemon odor.

Levulose

D-fructose
laboratory grade, crystal

$C_6H_{12}O_6$	**L0020**	100 g	**$ 10.35**
F.W. 180.16	**L0074**	500 g	**26.85**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water, alcohol, and ether.
Color and Odor: White, odorless solid.
CAS No. 57-48-7

Light Sticks

see pages 166, 301 and 384

Lime, Slaked

see Calcium Hydroxide

Limewater Solution

calcium hydroxide saturated solution

140 mg/100 mL	**L0021**	500 mL	**$ 6.15**
	L0022	4 liters	**13.45**

Storage: Inorganic #4
Disposal: #10
Shelf Life: Fair to poor; absorbs carbon dioxide from air. Keep your container tightly closed.
Color and Odor: Clear and colorless if left undisturbed, odorless.
Technical Note: Use for detecting carbon dioxide gas. The solution always contains some undissolved calcium hydroxide.

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Lipase

enzyme, powder **L0056** 25 g **$36.00**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Buff solid with decaying flesh odor.

Liqui-Nox®

see Cleaners

Lithium

sticks

Li	**L0057**	2.5 g	**$24.06**
A.W. 6.94	**L0024**	10 g	**45.60**

(Both sizes packaged under mineral oil in plastic bottles and then in a metal can for safer storage)

★ **HAZARD ALERT:** Dangerous; water-reactive; explosion risk; flammable solid. Use a Class D fire extinguisher or have a generous supply of dry sand to use as a fire extinguisher. Corrosive to skin, eyes and respiratory tract.
Storage: Inorganic #1 under dry kerosene or dry oil. Store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Disposal: #3
Shelf Life: Indefinite if stored safely. Do not store or use near water.
Soluble: In water and acids, releasing hydrogen gas.
Color and Odor: Silver/white, odorless solid.
CAS No. 7439-93-2

Lithium Carbonate

laboratory grade, powder

Li_2CO_3	**L0025**	100 g	**$26.00**
F.W. 73.89			

LITHIUM CARBONATE continued on next page.

Chemicals in Refrigerators

We commonly find flammables (like ether) and 30% hydrogen peroxide in school science department refrigerators. Found along with these items are lunches, apples and open cans of soda pop. Unless your school refrigerator is designed specifically for the storage of flammables, keep chemicals out of the refrigerator. Remember that sparking bimetallic switches activate both the refrigerator's compressor and internal light.

Lithium Carbonate *continued*

★ **HAZARD ALERT:** *Possible teratogen;* strong base when dissolved in water; substance is corrosive to eyes and respiratory tract. Possible reproductive/fertility hazard. Moderately toxic. LD_{50} 525 mg/kg.
Storage: Inorganic #4
Disposal: #10
Shelf Life: Poor; substance hygroscopic.
Soluble: Slightly in water; insoluble in alcohol; soluble in dilute acid.
Color and Odor: White, odorless solid.
CAS No. 554-13-2

Lithium Chloride

reagent grade, granular	**L0095**	50 g	**$15.03**
LiCl	**L0026**	100 g	**28.80**
F.W. 42.40	**L0075**	500 g	**102.00**

★ **HAZARD ALERT:** Moderately toxic by ingestion. LD_{50} 526 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance deliquescent; one of the most hygroscopic substances; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol.
Color and Odor: White, odorless solid.
CAS No. 7447-41-8

Lithium Chloride Solution

1 Molar

(as LiCl)	**L0096**	500 mL	**$9.00**

For storage, disposal, etc., see Lithium Chloride, L0095.
Color and Odor: Colorless, odorless liquid.

Lithium Nitrate

reagent grade, crystal			
$LiNO_3$	**L0097**	50 g	**$15.85**
F.W. 68.95	**L0027**	100 g	**25.15**

★ **HAZARD ALERT:** Strong oxidizer. Risk of explosion when heated with organic vapors. Body tissue irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Fair—deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 7790-69-4

Lithium Nitrate Solution

0.5 Molar

(as $LiNO_3$)	**L0071**	500 mL	**$11.90**

Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Lithium Sulfate

reagent grade, crystal			
$Li_2SO_4 \cdot H_2O$	**L0040**	100 g	**$46.55**
F.W. 127.96			

★ **HAZARD ALERT:** Slightly toxic. LD_{50} (for anhydrous salt) 613 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 10102-25-7

No Food in the Laboratory

There may be many food-grade items among the laboratory chemicals on the shelves in the chemical storeroom. Sugar, corn syrup and lemon juice are just a few examples. Each time one of these substances is used in the laboratory, take that occasion to reinforce the fact that in the lab setting, it is a chemical. Food is never consumed in a laboratory. Is it time to say goodbye to the coffee pot in the lab? You set the example!

Litmus Papers

see Test Papers, beginning on page 193

Litmus Solution

0.5% aqueous indicator solution	**L0028**	500 mL	**$17.15**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite if kept tightly closed. Store in a Flinn *Chem-Saf*™ Bag.
Color and Odor: Blue or amber liquid with cabbagelike odor.
Technical Note: Litmus solution may be either amber (pH <7) or blue (pH >7) depending on the pH of the solution.

Loeffler's Bacterial Stain

see Methylene Blue Solution, Loeffler's

Lugol's Iodine Solution

see Iodine Solution, Lugol's

Lull-A-Fly™

triethylamine with a scent added	**FB1438**	vial	**$13.65**

★ **HAZARD ALERT:** Flammable liquid; moderately toxic by ingestion and inhalation; use only in a *well-ventilated area*; corrosive to eyes or skin.
Storage: Organic #2
Disposal: #5
Shelf Life: Indefinite
Soluble: Alcohol and water.
Color and Odor: Colorless liquid with licorice odor.
Technical Note: The scent is added to reduce the undesirable ammonia odor. This substance does not act to anesthetize *Drosophila* as quickly or easily as ether. If the instructions are followed carefully, it is possible to perfect the anesthetic process. If you have tried other ether substitutes and did not like them, you will not like Lull-A-Fly™ since the material is the same (i.e., triethylamine). However, Lull-A-Fly is a much safer substance than ether.

Luminol

3-aminophthalhydrazide laboratory grade			
$C_8H_7N_3O_2$	**L0031**	1 g	**$11.71**
F.W. 177.17			

Storage: Organic #2
Disposal: #5
Shelf Life: Poor
Soluble: Alcohol
Color and Odor: Tan/yellow, odorless solid.
CAS No. 521-31-3
Technical Note: Reagent for detection of copper, iron, peroxides and cyanides. Oxidation results in a striking emission of light—chemiluminescence.

Exciting Chemiluminescence Activities

Flinn has exciting chemiluminescence demonstration kits. Each kit contains instructions, teacher notes and all the chemicals you need to perform the demonstration seven times. Look on page 231 for more information on these kits.



AP8983	Chemiluminescence Ammonia Fountain	**$55.80**
AP8627	Cool Light	**37.50**
AP8978	Energetic Light	**31.85**
AP8926	Fountain of Light	**50.25**
AP9118	Instant Light	**15.35**

Flinn Chemical Demonstration Kits are guaranteed to work and will save you time and money. Try one today!

Lycopodium
powder

Reagent	**L0033**	100 g	**$30.59**
Laboratory grade	**L0112**	100 g	**$28.40**
	L0113	500 g	**106.31**

★ **HAZARD ALERT:** Highly flammable powder. Possible allergen.
Storage: Organic #2 in a Flinn *Saf-Stor*™ Can.
Disposal: #26a
Shelf Life: Indefinite if stored properly.
Soluble: Generally insoluble in water and organic solvents.
Color and Odor: Yellow/white solid with fresh cut wood odor.

Lysol®
disinfectant **L0035** 12 oz **$10.80**

Storage: Miscellaneous organic.
Disposal: Dilute and place down the sink drain.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Brown/amber liquid with phenol odor.

M

MacConkey Agar
culture media
M0209 100 g **$56.80**

Storage: Miscellaneous, nonhazardous organic material.
Disposal: #26a
Shelf Life: Must be kept dry.
Soluble: Water
Color and Odor: Buff solid with strong, musty odor.
Technical Note: For the isolation of organisms capable of fermenting lactose. Mix 50 g of agar with 1000 mL of water. Bring to a boil and stir to dissolve completely. Sterilize at 121 °C at 15 lb of pressure for 15 minutes.

Magnesia
see Magnesium Oxide

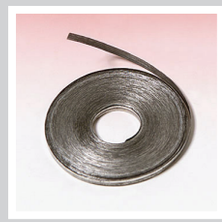
Magnesium Detection Reagent
qualitative
see 4-(p-Nitrophenylazo) resorcinol

Magnesium, Powder
laboratory grade
Mg **M0145** 25 g **$10.62**
A.W. 24.31

★ **HAZARD ALERT:** Powder form of this substance is a serious fire hazard; keep either dry sand or Flinn Class D Fire Extinguisher Powder available in case of a fire.
Storage: Inorganic #1 in a Flinn *Saf-Stor*™ Can.
Disposal: #26a
Shelf Life: Indefinite if stored safely.
Soluble: Acids; not water.
Color and Odor: Light gray, odorless solid.
CAS No. 7439-95-4

Magnesium, Ribbon
0.15 x 3.2 mm
Mg **M0001** 25 g (roll approx. 90 ft. long) **16.75**
A.W. 24.31

★ **HAZARD ALERT:** Flammable solid; burns with an intense flame; keep either dry sand or Flinn Class D Fire Extinguisher Powder available in case of a fire.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite if stored safely.
Soluble: Acids; not water.
Color and Odor: Silver/gray, odorless solid.
CAS No. 7439-95-4



Magnesium, Ribbon
M0139

Magnesium, Granules
reagent grade
Mg **M0212** 100 g **$21.24**
A.W. 24.31

★ **HAZARD ALERT:** Flammable solid; burns with intense flame.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite if stored safely.
Soluble: Acids; not water.
Color and Odor: Silver/gray, odorless solid.
CAS No. 7439-95-4

Magnesium Bromide
laboratory grade, crystal
$MgBr_2 \cdot 6H_2O$ **M0097** 100 g **$35.80**
F.W. 292.25

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; very deliquescent substance; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 13446-53-2

Magnesium Chloride
$MgCl_2 \cdot 6H_2O$
F.W. 203.33

Reagent	**M0146**	50 g	**$ 7.40**
crystal	**M0009**	100 g	**12.40**
	M0010	500 g	**22.90**
Laboratory grade	**M0011**	500 g	**$14.35**

flake

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White to slightly green, odorless solid.
CAS No. 7791-18-6
Technical Note: Loses H_2O, HCl and/or Cl_2 upon strong heating.

Magnesium Chloride Solution
(as $MgCl_2 \cdot 6H_2O$)

1.0 Molar	**M0164**	500 mL	**$18.75**
0.1 Molar	**M0121**	500 mL	**9.95**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

A Practical Goggle Policy
When the school owns the goggles, the school is responsible for their cleanliness. Schools invest in sterilizers, cleaning solutions and other means of ensuring sanitary goggles. Discuss with school administrators the practical aspects of the students each owning their own goggles. The students can purchase a pair of goggles from Flinn Scientific that can later be used later.

Magnesium Hydroxide

laboratory grade, powder
$Mg(OH)_2$ M0089 500 g $20.45
F.W. 58.34

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Dilute acids; solutions of ammonium salts; very slightly in water and alcohol.
Color and Odor: Gray/white, odorless solid.
CAS No. 1309-42-8

Magnesium Hydroxide Solution

saturated suspension of $Mg(OH)_2$ in water
M0122 500 mL $16.65

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Poor unless kept tightly closed; absorbs CO_2 from air.
Color and Odor: Milky white, odorless liquid.
Technical Note: This suspension contains approx. 300 g/L.

Magnesium Nitrate

crystal
$Mg(NO_3)_2 \cdot 6H_2O$
F.W. 256.43

Reagent	M0114	100 g	$ 10.25
	M0012	500 g	18.70
Laboratory grade	M0204	500 g	$15.65

★ **HAZARD ALERT:** Strong oxidant; fire and explosion risk in contact with organic material. Skin, eye, and respiratory tract irritant. LD_{50} 5440 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Fair to poor; substance deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: Color can vary from white to pale yellow, odorless solid.
CAS No. 13446-18-9

Magnesium Nitrate Solution

0.1 Molar
(as $Mg(NO_3)_2 \cdot 6H_2O$) M0123 500 mL $9.40

★ **HAZARD ALERT:** Skin and eye irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Magnesium Oxide

laboratory grade, powder
MgO M0013 100 g $12.65
F.W. 40.32 M0014 500 g 31.70

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Fair to poor; substance absorbs CO_2 and water from the air; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Slightly in water; soluble in acids and ammonium salt solutions.
Color and Odor: Off-white, odorless solid.
CAS No. 1309-48-4

How to Use a Fire Extinguisher

It seems so simple! Pull the pin, point the extinguisher nozzle, and press the lever that releases the extinguisher's contents. If you have never used a hand-held extinguisher, the time to learn is before an emergency occurs. Ask your local fire protection professionals for a lesson in fire extinguisher use. How to use a handheld extinguisher makes a great in-service session. Your local fire department will be glad to help.

Magnesium Sulfate

epsom salts, heptahydrate
crystal
$MgSO_4 \cdot 7H_2O$
F.W. 246.50

Reagent	M0016	100 g	$ 8.70
	M0017	500 g	28.85
Laboratory grade	M0018	500 g	$ 9.35
	M0019	2 kg	25.20

★ **HAZARD ALERT:** Irritates eyes and respiratory tract.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; substance hygroscopic.
Soluble: Water and glycerin; slightly in alcohol.
Color and Odor: Colorless, odorless solid.
CAS No. 10034-99-8

Magnesium Sulfate

anhydrous
laboratory grade, powder
$MgSO_4$ M0115 100 g $22.70
F.W. 120.39 M0020 500 g 40.35

For hazard alert, storage, disposal, etc., see Magnesium Sulfate, M0016.
Color and Odor: White, odorless solid.
CAS No. 7487-88-9

Magnesium Sulfate Solution

(as $MgSO_4 \cdot 7H_2O$)
0.5 Molar M0167 500 mL $13.70

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Malachite Green Oxalate

basic green 4
biological stain/indicator
pH 0.0 yellow to 2.0 green and
11.6 blue-green to 14.0 colorless M0129 10 g $17.15

★ **HAZARD ALERT:** Moderately toxic by ingestion. LD_{50} 275 mg/kg.
Storage: Organic #9
Disposal: #5
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Deep metallic green, odorless solid.
CAS No. 2437-29-8
C.I. #42000

Malachite Green Solution, 1%, Aqueous

1%, aqueous M0100 100 mL $14.70

Storage: Organic #9
Disposal: #26b
Shelf Life: Good if stored safely.
Color and Odor: Deep green, odorless solution.

Maleic Acid

butenedioic acid
powder
$HO_2CCH{=}CHCO_2H$ M0090 200 g $28.60
F.W. 116.07

★ **HAZARD ALERT:** Moderately toxic by ingestion; severe body tissue irritant. LD_{50} 708 mg/kg.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Water, alcohol, and acetone.
Color and Odor: White solid with faint tea odor.
CAS No. 110-16-7

Malonic Acid

propanedioic acid
crystal
$HO_2CCH_2CO_2H$ **M0091** 25 g **$13.35**
F.W. 104.06

★ **HAZARD ALERT:** Strong irritant; slightly toxic; when dissolved in water it is a strong acid; corrosive to eyes, skin and respiratory tract. Malonic acid has been used as a drug intermediate (precursor). This substance is regulated in some states like California. Check local regulations before purchasing. LD_{50} 1310 mg/kg.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White solid with faint beef bouillon odor.
CAS No. 141-82-2

Maltose

malt sugar
laboratory grade, powder
$C_{12}H_{22}O_{11}\cdot H_2O$ **M0021** 500 g **$24.35**
F.W. 360.32
Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; slightly in alcohol.
Color and Odor: Buff solid with fresh cut hay odor.
CAS No. 6363-53-7

Manganese

carbon free
chips
Mn **M0022** 500 g **$31.30**
A.W. 54.94

★ **HAZARD ALERT:** Irritant as a fume or dust; dust is flammable. TLV 0.2 mg/m^3 as dust.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Decomposes water; soluble in dilute acids.
Color and Odor: Gray/blue, odorless solid.
CAS No. 7439-96-5

Manganese Chloride

see Manganese(II) Chloride

Manganese Dioxide

manganese(IV) oxide
powder
MnO_2
F.W. 86.94

Reagent	**M0023**	100 g	**$18.20**
Laboratory grade	**M0205**	100 g	**$11.05**
	M0025	500 g	**10.85**

★ **HAZARD ALERT:** Body tissue irritant.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite if stored safely.
Soluble: Hydrochloric acid; insoluble in water.
Color and Odor: Gray, odorless solid.
CAS No. 1313-13-9

Manganese(II) Chloride

manganous chloride
reagent grade, crystal
$MnCl_2\cdot 4H_2O$ **M0027** 100 g **$12.90**
F.W. 197.91 **M0028** 500 g **40.15**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 1484 mg/kg.
Storage: Inorganic #2
Disposal: #27f

Continued on next column.

Manganese(II) Chloride *continued*

Shelf Life: Fair to poor; substance deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: Pink, odorless solid.
CAS No. 13446-34-9

Manganese(II) Nitrate Solution

manganous nitrate
45–50%, aqueous
$Mn(NO_3)_2$ **M0029** 500 mL **$31.95**
F.W. 178.94

★ **HAZARD ALERT:** Slightly toxic by ingestion; corrosive to body tissues.
Storage: Inorganic #3
Disposal: #27f
Shelf Life: Indefinite
Color and Odor: Pink liquid with faint nitric acid odor.
CAS No. 20694-39-7
Technical Note: Manganese(II) nitrate solution has a density of 1.53 g/mL and is between 3.9–4.3 M.

Manganese(II) Sulfate

manganous sulfate
powder
$MnSO_4\cdot H_2O$
F.W. 169.01

Reagent	**M0030**	100 g	**$14.80**
Laboratory grade	**M0206**	500 g	**$30.80**

★ **HAZARD ALERT:** Body tissue irritant.
Storage: Inorganic #2
Disposal: #27f
Shelf Life: Poor; substance hygroscopic.
Soluble: Water; not alcohol.
Color and Odor: Rose, odorless solid.
CAS No. 10034-96-5

Manganous Peroxide

see Manganese Dioxide

Marble Chips

limestone, calcium carbonate
for CO_2 generation **M0032** 500 g **$ 7.10**
M0033 2 kg **13.10**

Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: In acids with evolution of CO_2; slightly in water.
Color and Odor: Gray/white, odorless solid.
CAS No. 471-34-1

Marvel Mystery Oil

Synthetic petroleum-based product for environmental oil-spill simulations. See page 301.

Menthol

laboratory grade, crystal
$C_{10}H_{20}O$ **M0104** 100 g **$54.75**
F.W. 156.26

★ **HAZARD ALERT:** Slightly toxic by ingestion and inhalation; body tissue irritant; severe eye irritant. LD_{50} 3300 mg/kg.
Storage: Organic #2
Disposal: #18b
Shelf Life: Indefinite

MENTHOL continued on next page.

We Didn't Know About It Yesterday!

We have added the hazard alert about the peroxidizable character of some alcohols, such as 2-octanol, to our chemical listings. This development may not be new; however, one of the many benefits of the *Flinn Scientific Catalog/Reference Manual* is that it keeps science teachers up-to-date.

Menthol *continued*

Soluble: Alcohol, many organic solvents, and acetic acid.
Color and Odor: White/clear solid with peppermint odor.
CAS No. 2216-51-5

Metal Electrode Set

contains six strips (6" x ½", zinc 5" x ½")
one each of aluminum, brass,
copper, iron, lead and zinc metals

	AP4602	pkg.	**$11.70**

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Excellent

Methanol

see Methyl Alcohol

Methyl Alcohol

methanol, absolute (anhydrous)
CH_3OH
F.W. 32.04

Reagent	**M0054**	500 mL	**$ 8.62**
	M0055	4 liters	**30.64/1 118.92/4**
Laboratory grade	**M0207**	4 liters	**$31.39**

★ **HAZARD ALERT:** Flammable; dangerous fire risk; toxic by ingestion (ingestion of as little as 15 mL has caused blindness). TLV 262 mg/m^3. LD_{50} 5628 mg/kg.

★ **SPECIAL HAZARD ALERT:** Laboratory accidents involving methyl alcohol occur when vapor in the air ignites and travels back to the source, causing a flash fire. Always cap the bottle of methyl alcohol and remove it from the area prior to performing any demonstration involving open flames, sparks or heat. Use only a small amount and always perform demonstrations behind a safety shield. Please visit flinnsci.com to access publication No. 10497, *Methyl Alcohol Safety,* for more detailed safety information and instructions.

Storage: Organic #2 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.

Continued on next column.

Methyl Alcohol *continued*

Disposal: #18a. U-Listed (U154); purchase small amounts for effective inventory control.
Shelf Life: Good if stored safely.
Soluble: Miscible with water and alcohol.
Color and Odor: Colorless liquid with alcohol odor.
CAS No. 67-56-1

Safety Purchase Suggestion: Please consider the use of anhydrous ethyl alcohol (E0012, etc.) as a substitute. Ethyl alcohol is a good substitute for methyl alcohol for most laboratory experiments and as a burner fuel. Avoid purchasing 20-liter cans of this substance unless you have approved, dedicated flammables storage.

2-Methyl-2-Butanol

see tert-Pentyl Alcohol

3-Methyl-1-Butanol

see Isopentyl Alcohol

Methyl Cellulose Solution

3%, aqueous, quieting solution

	M0171	100 mL	**$10.55**

Storage: Organic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Cloudy/colorless, odorless liquid.

Methyl Ethyl Ketone

2-butanone
laboratory grade
$CH_3COC_2H_5$
F.W. 72.11

	M0060	500 mL	**$16.45**

★ **HAZARD ALERT:** Flammable, dangerous fire risk; narcotic by inhalation. LD_{50} 2737 mg/kg. TLV 590 mg/m^3.

Storage: Organic #4 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.

Disposal: #18b. U-Listed (U159); purchase small amounts for effective inventory control.

METHYL ETHYL KETONE continued on next page.

Mercury and Mercury Spills

For more than 40 years, Flinn Scientific has embraced the philosophy that chemicals can be safely used if the necessary safety precautions are thoroughly understood. Nevertheless, in July 2008, Illinois joined 15 other states that have banned the use of thermometers, barometers and other instruments containing mercury. At least 11 states also prohibit the use of elemental mercury in schools and hospitals. The laws limit the ability of manufacturers to sell mercury or mercury-added products. The purpose of laws banning the sale of mercury is to eliminate nonessential uses of mercury and reduce its environmental release. In response to these laws, Flinn Scientific has discontinued the sale of elemental mercury, mercury compounds and mercury thermometers.

Health and Environmental Effects of Mercury

Mercury is a volatile, highly toxic liquid and a serious environmental hazard. The vapor pressure of mercury at room temperature is more than 100 times greater than the permissible exposure limit for mercury in air (0.01 mg/m^3). The threat increases at higher temperatures. Exposure to mercury vapor occurs when mercury is spilled or products that contain mercury break. The high surface tension and low viscosity of liquid mercury are reflected in its common name, quicksilver. These properties cause mercury to break up into small droplets that are easily trapped or hidden. Small amounts of mercury are easy to overlook and add up over time. There have been reports of 15–20 pounds of spilled mercury found in labs! Inhalation and absorption of mercury leads to nervousness, insomnia, depression, headache, fatigue, tremors, muscle atrophy and cognitive decline. Mercury is a cumulative poison—it is distributed in the blood within hours of exposure to mercury vapor and is concentrated in the kidneys. Higher exposures lead to kidney damage and respiratory failure. Mercury and mercury compounds do not biodegrade. Microorganisms in soil and water convert mercury to methyl- and dimethylmercury, which are more toxic than elemental mercury and bioacummulate in the food chain.

Cleaning Up Mercury Spills

- If mercury is spilled or a thermometer breaks, immediately open the windows and doors to provide maximum ventilation.
- Do not use a vacuum cleaner or a broom to clean up a spill. The vacuum will disperse mercury into the air and a broom will break the mercury into smaller droplets and spread them.
- Avoid contaminating shoes or other items in the area of the spill. Put plastic bags over your shoes.
- Wear chemical-resistant gloves. Collect visible drops of mercury with a medicine dropper or Beral-type pipet. Transfer the mercury to a seamless polyethylene bag or bottle.
- Mercury droplets will cling to vertical surfaces and on the underside of bench tops or shelves. Use a flashlight to locate small beads of mercury on surfaces or in cracks and crevices.
- Lightly cover the area with zinc powder; the resulting zinc amalgam is easily collected. (Do not use sulfur—it forms a surface film and leaves the mercury underneath exposed.)
- The Mercon™ Mercury Spill Control Kit is an effective mercury suppressant and decontaminant. It contains a spray to suppress mercury vapor, a sponge to pick up mercury droplets, chemical wipes to decontaminate the spill site and a waste container. See page 607 for a detailed explanation.
- Broken mercury thermometers in an oven can flood the lab with dangerous mercury vapor. Immediately open all windows and place the appliance in the hood or take it outside to drive off residual mercury.

Replacing Mercury Thermometers

See pages 195–196 for a complete listing of our digital and spirit-filled thermometers to meet all of your lab needs!

Methyl Ethyl Ketone *continued*

Shelf Life: Good if stored safely.
Soluble: Alcohol and ether.
Color and Odor: Colorless liquid with nail polish remover odor.
CAS No. 78-93-3

Methyl Orange

dye/indicator
pH 3.0 red to 4.4 yellow
$C_{14}H_{15}N_3O_3SNa$ **M0076** 25 g **$13.15**
F.W. 328.33

★ **HAZARD ALERT:** Highly toxic by ingestion. LD_{50} 60 mg/kg.
Storage: Organic #9. Store in a locked poisons cabinet.
Disposal: #26a
Shelf Life: Indefinite
Soluble: Best in hot water; partially in alcohol.
Color and Odor: Brown/orange solid with laundry soap odor.
CAS No. 547-58-0
C.I. #13025

Methyl Orange Indicator Solution

0.1%, aqueous
M0078 500 mL **$10.10**

★ **HAZARD ALERT:** Toxic by ingestion.
Storage: Organic #9
Disposal: #26b
Shelf Life: Fair
Color and Odor: Red/orange, odorless liquid.

4-Methyl-2-Pentanone

see Methyl Isobutyl Ketone

2-Methyl-1-Propanol

see Isobutyl Alcohol

2-Methyl-2-Propanol

see tert-Butyl Alcohol

Methyl Red

indicator, sodium salt
pH 4.4 red to 6.2 yellow
$C_{15}H_{14}N_3O_2Na$ **M0081** 10 g **$12.65**
F.W. 291.28

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Alcohol, ether, water and acetic acid. Color of solution fades quickly because of reduction.
Color and Odor: Brown/orange, odorless solid.
CAS No. 845-10-3

Methyl Red Indicator Solution

0.02%, aqueous
M0085 100 mL **$ 9.60**
M0086 500 mL **15.95**

Storage: Organic #9
Disposal: #26b
Shelf Life: Fair to poor (color fades because of reduction).
Color and Odor: Red, odorless liquid.

5-Methyl Resorcinol

see Orcinol

Methylene Blue

biological stain
$C_{16}H_{18}ClN_3S \cdot 3H_2O$ **M0072** 25 g **$18.45**
F.W. 373.90

★ **HAZARD ALERT:** Slightly toxic. LD_{50} 1180 mg/kg.
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water, alcohol, and chloroform.

Continued on next column.

Methylene Blue *continued*

Color and Odor: Gray/green, odorless solid.
CAS No. 7220-79-3
C.I. #52015

Methylene Blue Solution, Aqueous

1%, aqueous
M0074 100 mL **$ 6.95**
M0075 500 mL **12.00**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Deep blue, odorless liquid.

Methylene Blue Solution, Loeffler's

Loeffler's bacterial stain
contains: methylene blue, potassium hydroxide, ethyl alcohol and water
M0095 500 mL **$17.90**

★ **HAZARD ALERT:** Contains ethyl alcohol; toxic by ingestion and inhalation; body tissue irritant.
Storage: Organic #9 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #10
Shelf Life: Indefinite
Color and Odor: Blue liquid with slight alcohol odor.

Methylene Chloride

dichloromethane
laboratory grade
CH_2Cl_2 **M0059** 500 mL **$14.43/1**
F.W. 84.94 **84.12/6**
(Packaged in PVC-coated bottles)

★ **HAZARD ALERT:** *Possible carcinogen.* Can be narcotic in high concentrations. Slightly toxic. LD_{50} 1600 mg/kg. TLV 25 ppm.
Storage: Organic #4
Disposal: #27j. U-Listed (U080); purchase small amounts for effective inventory control.
Shelf Life: Volatile liquid; keep tightly capped.
Soluble: Alcohol; slightly in water.
Color and Odor: Colorless liquid with an ethyl ether odor.
CAS No. 75-09-2

Milk of Magnesia

see Magnesium Hydroxide Solution

Mineral Oil

light **M0064** 500 mL **$10.85**
laboratory grade **M0065** 4 liters **61.75**

Storage: Organic #3
Disposal: #18b
Shelf Life: Indefinite
Soluble: Many common organic solvents; insoluble in water and acids.
Color and Odor: Colorless, odorless liquid.
CAS No. 8042-47-5
Technical Note: Mineral oil is a safer alternative to halogenated solvents in halogen extraction experiments.

Mohr's Salt

see Ferrous Ammonium Sulfate

Emergencies and Panic

"Do not panic!" That's easy to say but hard to do during an emergency. A good policy to prepare for emergencies is to simulate the event and practice what should be done. If you have never used a hand-held fire extinguisher in an emergency, is the time to learn when a fire erupts? Certainly not! Practice and planning will help eliminate panic.

Molasses

pure, dark — M0068 — 300 mL — $9.10

Storage: With nonhazardous miscellaneous organic material.
Disposal: #26b
Shelf Life: Good.
Soluble: Water, alcohol.
Color and Odor: Dark brown liquid with brown sugar odor.
Note: Not for human consumption.

Mold Inhibitor

see Propionic Acid

Molecular Sieves

see Ion Exchange Resin

Molybdic Acid

see Ammonium Molybdate

Mounting Medium

CytoSeal

Low viscosity — M0194* — 4 oz. — $34.00

★ **HAZARD ALERT:** Contains toluene. Moderately toxic by ingestion and inhalation.
Storage: Organic #4
Disposal: #18b
Shelf Life: Indefinite
Soluble: Insoluble in water, soluble in toluene.
Color and Odor: Colorless liquid with slight toluene odor.
Technical Note: Low viscosity mounting media is an acrylic resin and will not crack or discolor with age. It is quick-drying and soluble in toluene and xylenes. Low viscosity media is suggested for use with cover glass.
*Special package containing a twist-open dropper cap.

Mueller-Hinton Agar

bacteriological culture media

M0203 — 100 g — $44.50

Storage: With culture media.
Disposal: #26a
Shelf Life: Good, if kept dry.
Soluble: Water
Color and Odor: Tan or off-white, odorless solid.

Muriatic Acid

see Hydrochloric Acid

N

Nails

see Iron, Nails

Naphthalene

flake
$C_{10}H_8$ — N0001 — 500 g — $14.80
F.W. 128.17

★ **HAZARD ALERT:** *Possible carcinogen.* Moderately toxic by ingestion, inhalation, and skin contact; moderate fire hazard. LD_{50} 490 mg/kg. TLV 52 mg/m^3.
Storage: Organic #3
Disposal: #18b. U-Listed (U165); purchase small amounts for effective inventory control.
Shelf Life: Volatile flakes; keep tightly closed.
Soluble: Alcohol and ether; not water.
Color and Odor: Shiny white solid with moth ball odor.
CAS No. 91-20-3

Continued on next column.

Authorized Personnel Only

Chemical storeroom access should only be granted to authorized science teachers. Access should be denied to students, custodians, teachers from other departments and unauthorized administrators. Keep your chemical storeroom locked!

Naphthalene *continued*

Technical Note: When used to show states of matter by heating in a test tube, quantity should be small and heating gentle so that minimum vapor is generated. Use under a hood or in a well-ventilated room.
Safety Purchase Note: Safer alternative substances for melting point determination are cetyl alcohol, 1-octadecanol, palmitic acid, stearic acid, lauric acid or 4-(t-octyl) phenol.

1-Naphthol

α-naphthol
laboratory grade, powder
$C_{10}H_8O$ — N0033 — 25 g — $29.10
F.W. 144.17

★ **HAZARD ALERT:** Slightly toxic by ingestion, inhalation and skin absorption; severe body tissue irritant. LD_{50} 1870 mg/kg.
Storage: Organic #8
Disposal: #18b
Shelf Life: Indefinite; darkens on exposure to light; protect from light.
Soluble: Alcohol, ether, and benzene; slightly in water.
Color and Odor: Yellow/brown solid with slight phenol odor.
CAS No. 90-15-3

Nichrome, Wire

bare

16 gauge (134 ft/lb) — N0040 — 4 oz. — $21.85
18 gauge (218 ft/lb) — N0041 — 4 oz. — 22.25
22 gauge (545 ft/lb) — N0042 — 4 oz. — 25.85

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Color and Odor: Silver, odorless solid.

Nickel

reagent grade, shot
Ni — N0004 — 100 g — $ 25.15
A.W. 58.69 — N0005 — 500 g — 106.80

★ **HAZARD ALERT:** *Possible carcinogen.*
Storage: Inorganic #1
Disposal: #27a
Shelf Life: Indefinite
Soluble: Resists solution.
Color and Odor: Silver, odorless solid.
CAS No. 7440-02-0

Nickel Chloride

nickel(II) chloride
reagent grade, crystal
$NiCl_2{\cdot}6H_2O$ — N0069 — 50 g — $ 11.35
F.W. 237.72 — N0007 — 100 g — 23.65

★ **HAZARD ALERT:** Nickel compounds are *known carcinogens* by inhalation of dust. Highly toxic by ingestion and inhalation; avoid dispersing this substance; dispense with care. Avoid dispersing, breathing, or inhaling nickel dust. Possible reproductive/fertility hazard. LD_{50} 105 mg/kg.
Storage: Inorganic #2 in a locked poisons cabinet.
Disposal: #27f
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol, and ammonium hydroxide.
Color and Odor: Green, odorless solid.
CAS No. 7791-20-0

Nickel Nitrate

nickel(II) nitrate
crystal
$Ni(NO_3)_2{\cdot}6H_2O$
F.W. 290.82

Laboratory grade — N0090 — 100 g — $15.70
N0091 — 500 g — 38.30

NICKEL NITRATE continued on next page.

Nickel Nitrate *continued*

★ **HAZARD ALERT:** Nickel compounds are *known carcinogens*. Slightly toxic; avoid dispersing this substance; dispense with care; strong oxidant. Avoid dispersing, breathing, or inhaling nickel dust. Possible reproductive/fertility hazard. LD_{50} 1620 mg/kg.
Storage: Inorganic #3
Disposal: #27f
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol and ammonium hydroxide.
Color and Odor: Aqua, odorless solid.
CAS No. 13478-00-7

Nickel Sulfate

nickel(II) sulfate
crystal
$NiSO_4 \cdot 6H_2O$
F.W. 262.87

Reagent	**N0011**	100 g	**$19.50**
Laboratory grade	**N0013**	500 g	**$47.25**

★ **HAZARD ALERT:** Nickel compounds are *known carcinogens* by inhalation of dust. Moderately toxic by ingestion and inhalation; severe body tissue irritant; avoid dispersing this substance; dispense with care. Avoid dispersing, breathing, or inhaling nickel dust.
Storage: Inorganic #2
Disposal: #27f
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Light green, odorless solid.
CAS No. 10101-97-0

Ninhydrin

1, 2, 3-indantrione monohydrate
used in test for amino acids and proteins
laboratory grade, crystal
C_6H_4-1,2-$(CO)_2CO \cdot H_2O$ **N0015** 10 g **$18.75**
F.W. 195.15

★ **HAZARD ALERT:** Body tissue irritant.
Storage: Organic #2
Disposal: #18b
Shelf Life: Indefinite, but light sensitive. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Alcohol and water.
Color and Odor: White solid with fresh paint odor.
CAS No. 485-47-2
Technical Note: Use a 0.5% solution of ninhydrin in ethyl, isopropyl or butyl alcohol to test for proteins and amino acids.

Ninhydrin Solution

0.5% in butyl alcohol **N0023** 500 mL **$22.30**
reagent

★ **HAZARD ALERT:** Review the detailed hazard data provided for ninhydrin. The solution contains butanol, which is a flammable liquid. Severe body tissue irritant.
Storage: Organic #2 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Indefinite if stored safely.
Color and Odor: Amber liquid with butyl alcohol odor.

Nitric Acid

ACS reagent
15.8 Molar
assay 69.0 wt %
HNO_3
F.W. 63.01

N0043	100 mL	**$ 14.83**
N0016	500 mL	**24.71**
N0017	2.5 liters	**58.98**
N0055*	2.5 liters	**58.84/1**
		228.32/4

(Packaged in PVC-coated bottles)

★ **HAZARD ALERT:** Corrosive; strong oxidant; toxic by inhalation and

Continued on next column.

Nitric Acid *continued*

ingestion; avoid contact with acetic acid and readily oxidized substances. Concentrated nitric acid will attack and destroy metals and most plastics; never store concentrated nitric acid in a plastic bottle. TLV 5.2 mg/m^3.
Storage: In a separate, isolated portion of your acid cabinet. ***Never store with acetic acid.*** If an acid cabinet is not available, store in a Flinn *Saf-Cube*™.
Disposal: #24b
Shelf Life: When this substance is stored for a long period, it gradually destroys the cap. *Do not interchange another cap except one designated by its color code (red).* Shelf life of nitric acid is good except for this cap problem. Product may turn yellow due to the release of nitrogen dioxide on exposure to light. This yellow color does not affect the product's usefulness in the school lab.
Soluble: Miscible with water; considerable heat is released.
Color and Odor: Colorless liquid with a suffocating, unique odor.
CAS No. 7697-37-2
Safety Purchase Suggestion: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of nitric acid and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.
*Nitric acid is exactly as described under catalog number N0017 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are safely retained in a PVC outer envelope. *Plas-Pak*™ is a safer package for science teachers.

Nitric Acid Solution

8 Molar	**N0047**	500 mL	**$27.30**
6 Molar	**N0048**	500 mL	**16.95**
3 Molar	**N0049**	500 mL	**15.30**
1 Molar	**N0050**	500 mL	**10.80**
0.1 Molar	**N0052**	500 mL	**9.60**

★ **HAZARD ALERT:** Corrosive; strong oxidizing solution; avoid contact with acetic acid and readily-oxidized substances.
Storage: In a separate, isolated portion of your dedicated acid cabinet. Never store near acetic acid.
Disposal: #24b
Shelf Life: Good
Color and Odor: Colorless liquid with slight nitric acid odor.

Nitrogen Gas

Refillable cylinder **LB1075** 4 cu. ft. (112 liters) **$394.80**

Storage: In an area dedicated to bottled gases and away from any source of heat or flame.
Disposal: Completely empty lecture bottle, then follow #26a.
Shelf Life: Indefinite if stored safely.
Soluble: Slightly in water and alcohol.
Color and Odor: Colorless, odorless.
CAS No. 7727-37-9

para-Nitrophenol

4-nitrophenol, indicator
pH 5.6 colorless to 7.6 yellow
$O_2NC_6H_4OH$ **N0073** 25 g **$13.75**
F.W. 139.11

★ **HAZARD ALERT:** Highly toxic by ingestion, inhalation and skin absorption; body tissue irritant. LD_{50} 202 mg/kg.
Storage: Organic #8
Disposal: #18b. U-Listed (U170); purchase small amounts for effective inventory control.

PARA-NITROPHENOL continued on next page.

Nickel and Nickel Compounds—Carcinogens as Dust or Fumes

Nickel is classified as a possible carcinogen, and nickel compounds are classified as known carcinogens by IARC (International Agency for Research on Cancer). The danger is breathing or inhaling solid dust from these substances. Practice strict hygiene—avoid dispersing dust or fumes. Work with solutions whenever possible to avoid this hazard.

para-Nitrophenol *continued*

Shelf Life: Good
Soluble: Hot water, alcohol, and ether.
Color and Odor: Yellowish, odorless solid.
CAS No. 100-02-7

Nucleic Acids

see Deoxyribonucleic Acid and Ribonucleic Acid

Nutrient Agar

bacteriological media	**N0092**	23 g	**$ 14.01**
	N0019	100 g	**47.80**
	N0020	500 g	**139.00**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26a
Shelf Life: Must be kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Buff solid with strong, putrid odor.
Technical Note: N0092 is a premeasured amount of nutrient agar to make 1 liter of nutrient agar culture medium.

Nutrient Agar, Culture Tubes

prepared media in tubes

	N0064	pkg./ 6 tubes	**$19.67**

For storage, disposal, etc., see Nutrient Agar, N0019.
Color and Odor: Buff solid with strong, putrid odor.

Nutrient Broth

bacteriological media	**N0021**	100 g	**$40.00**

Storage: Miscellaneous, nonhazardous organic material.
Disposal: #26a
Shelf Life: Must be kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Buff solid with strong, putrid odor.
Technical Note: Best choice for growing cultures in liquid media. 8 g size is perfect to make one liter of broth.

O

Octadecanoic Acid

see Stearic Acid

1-Octanol

caprylic or n-octyl alcohol
$CH_3(CH_2)_7OH$
F.W. 130.23

	Q0018	100 mL	**$16.00**
	Q0014	500 mL	**41.05**

★ **HAZARD ALERT:** Body tissue irritant; slightly toxic. LD_{50} (mouse) 1790 mg/kg.
Storage: Organic #2
Disposal: #18b
Shelf Life: Indefinite
Soluble: Miscible with alcohol, chloroform, and mineral oil; immiscible with water and glycerin.
Color and Odor: Colorless liquid with strong floral odor.
CAS No. 111-87-5
Technical Note: The designation capryl alcohol is frequently used for both 1-octanol and 2-octanol. We've elected to designate the normal primary alcohol as 1-octanol.

Chemistry Is *Doing*

I hear, and I forget.
I see, and I remember.
I do, and I understand.

Help keep chemistry a "doing" science. Do it safely and resist efforts to make chemistry a survey course.

4-tert-Octylphenol

TOP
laboratory grade, powder
$C_8H_{17}C_6H_4OH$
F.W. 206.33

	Q0032	500 g	**$140.74**

★ **HAZARD ALERT:** Irritating to body tissue; slightly toxic by ingestion. LD_{50} (mouse) 3210 mg/kg.
Storage: Organic #8
Disposal: #24a
Shelf Life: Indefinite
Soluble: Alcohol, xylenes, and acetone.
Color and Odor: White solid with a sweet moth ball odor.
CAS No. 140-66-9
Technical Note: A safer alternative for melting point determination: melting point is 79–82 °C.

Oils

see individual listings (olive, paraffin, etc.)

Olive Oil

laboratory grade

	Q0004	200 mL	**$17.90**

Storage: Organic #3
Disposal: #26a
Shelf Life: Indefinite if kept tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Carbon disulfide, chloroform and ether; slightly in alcohol.
Color and Odor: Yellow liquid with a slightly pleasant odor.
CAS No. 8001-25-0
Technical Note: Not for human consumption.

Orange III

see Methyl Orange

Ortho Phosphoric Acid

see Phosphoric Acid

Oxalic Acid

crystal
$H_2C_2O_4 \cdot 2H_2O$
F.W. 126.07

Reagent	**Q0005**	100 g	**$12.30**
	Q0007	500 g	**34.80**
Laboratory grade	**Q0006**	500 g	**$17.05**

★ **HAZARD ALERT:** Skin and eye irritant; moderately toxic by ingestion. LD_{50} 375 mg/kg. TLV 1 mg/m^3.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Water and many common organic solvents.
Color and Odor: White, odorless solid.
CAS No. 6153-56-6

Oxygen Gas

Lecture bottle	**LB1025**	2 cu. ft. (56 liters)	**$296.05**
Refillable cylinder	**LB1080**	3.4 cu. ft. (95 liters)	**$435.00**

★ **HAZARD ALERT:** Fire risk.
Storage: In an area dedicated to bottled gases; store away from any source of heat or flame.
Disposal: Completely empty lecture bottle, then follow #26a.
Shelf Life: Indefinite if stored safely.
Soluble: Slightly soluble in water and alcohol.
Color and Odor: Colorless, odorless.
CAS No. 7782-44-7
Technical Note: Oxygen can be generated by using 30% hydrogen peroxide (H_2O_2). It is vital that you give 30% H_2O_2 your highest level of safety consciousness; it is a very hazardous substance.
Set up the apparatus to create a gas generator. A 250-mL flask, a two-hole rubber stopper, a delivery tube and a dropping funnel will be required. A

OXYGEN GAS continued on next page.

Oxygen Gas *continued*

drying tube containing anhydrous calcium chloride (Flinn C0016 or C0017) or Drierite® (Flinn D0011 or D0012) will be required since the O_2 will have an undesirably high water content. Place two grams of manganese dioxide (Flinn M0025) in the flask. Now dilute 50 mL of 30% H_2O_2 to 100 mL using distilled water. Add H_2O_2 dropwise through the dropping funnel into the flask. This process will generate about 6 liters of oxygen. ***Do not use potassium chlorate to generate oxygen.***

P

Palmitic Acid
hexadecanoic acid
laboratory grade, powder
$CH_3(CH_2)_{14}CO_2H$ **P0129** 100 g **$24.70**
F.W. 256.43
Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Hot alcohol; not water.
Color and Odor: White solid with waxlike odor.
CAS No. 57-10-3
Technical Note: Melting point 61–64 °C.

para-Dichlorobenzene
see page 54

Paraffin Oil
see Mineral Oil

Paraffin, Wax
laboratory grade
P0003 1 lb **$11.45**
Storage: Organic #3
Disposal: #26a
Shelf Life: Indefinite
Soluble: Warm alcohol, chloroform, petroleum ether, olive oil and other organic solvents.
Color and Odor: Waxy white, odorless solid.
CAS No. 8002-74-2

Pectinase
enzyme
powder obtained from *Aspergillus niger*
P0285 5 g **$46.95**
Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite, when refrigerated; hygroscopic.
Soluble: Water
Color and Odor: Light tan solid with strong, sweet odor.
CAS No. 9032-75-1

Pentane
laboratory grade
$CH_3(CH_2)_3CH_3$ **P0213** 100 mL **$11.20**
F.W. 72.15
★ **HAZARD ALERT:** Flammable liquid; narcotic in high concentrations. Toxic by ingestion and inhalation. LD_{50} 400 mg/kg. TLV 1770 mg/m^3.
Storage: Organic #3 in an approved flammables cabinet.
Disposal: #18b
Shelf Life: Indefinite
Soluble: Miscible with alcohol and many other organic solvents.
Color and Odor: Colorless liquid with a gasoline odor.
CAS No. 109-66-0

1-Pentanol
see n-Amyl Alcohol

Pentyl Alcohol
see n-Amyl Alcohol

tert-Pentyl Alcohol
2-methyl-2-pentanol, tert-amyl alcohol
reagent grade, 99%
$CH_3CH_2C(CH_3)_2OH$ **P0286** 500 mL **$55.85**
F.W. 88.15
★ **HAZARD ALERT:** Flammable liquid and vapor; dangerous fire risk. Moderately toxic by ingestion and inhalation; respiratory tract irritant. Use only in a hood or well-ventilated area. LD_{50} 1000 mg/kg.
Storage: Organic #2 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Fair; volatile liquid. Store in a cool, dry place.
Soluble: Ethyl alcohol and ether; slightly soluble in water.
Color and Odor: Clear, colorless liquid with pungent, unpleasant odor.
CAS No. 75-85-4

Pepsin
enzyme
laboratory grade, powder
Activity: 1:3000 **P0006** 25 g **$13.55**
P0007 100 g **45.75**
Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: Buff solid with sour malt odor.
CAS No. 9001-75-6
Technical Note: Use a 0.5% solution for protein digestion.

Petroleum Ether
ligroine
Reagent **P0014** 500 mL **$ 16.45**
P0015 4 liters **77.15/1 299.44/4**
Laboratory grade **P0275** 500 mL **$16.60**
★ **HAZARD ALERT:** Flammable liquid; dangerous fire risk.
Storage: Organic #3 in a dedicated flammables cabinet. If a flammables cabinet is not available store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Indefinite if stored safely.
Soluble: Miscible with many organic solvents; insoluble in water.
Color and Odor: Colorless liquid with natural gas-like odor.
CAS No. 8032-32-4
Technical Note: Technically the name petroleum ether is a misnomer. In the chemical sense it is not an ether, but consists chiefly of low boiling fractions (B.P. 30–60 °C) of petroleum, mostly pentanes and hexanes. Names like benzin and naphtha are synonymous to petroleum ether, which is not a peroxidizable substance like ethyl ether.

1,10-Phenanthroline
o-phenanthroline, monohydrate
reagent grade, granular
$C_{12}H_8N_2 \cdot H_2O$ **P0155** 5 g **$39.60**
F.W. 198.21
★ **HAZARD ALERT:** Highly toxic by ingestion; LD_{50} 132 mg/kg.
Storage: Organic #2
Disposal: #5
Shelf Life: Poor; hygroscopic.
Soluble: Alcohol; slightly in water.
Color and Odor: White, odorless solid.

1,10-PHENANTHROLINE continued on next page.

Chemical Odors
Many chemicals, particularly organic chemicals, have a characteristic odor. Odor information has been added to each of our chemical listings. Practical and brief odor identification terms have been used to keep it simple. Chemical odor and chemical color are unique pieces of information provided only by Flinn Scientific.

1,10-Phenanthroline *continued*

CAS No. 5144-89-8

Technical Note: Forms a complex with iron(II) or ferrous ions called ferroin, which is used as an indicator in redox systems.

Phenol Solution

5%, aqueous	**P0103**	500 mL	**$23.00**

★ **HAZARD ALERT:** Moderately toxic by ingestion, inhalation, and skin absorption; avoid skin contact.
Storage: Organic #8
Disposal: #24a
Shelf Life: Good
Color and Odor: Colorless liquid with slight disinfectant odor.

Phenol Red

indicator, sodium salt
pH 6.8 yellow to 8.4 red
reagent
$C_{19}H_{13}NaO_5S$
F.W. 376.36

	P0188	5 g	**$17.45**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Red, odorless solid.
CAS No. 34487-61-1

Phenol Red Indicator Solution

0.02%, aqueous

	P0100	100 mL	**$ 6.10**
	P0101	500 mL	**13.40**

Storage: Organic #9
Disposal: #26b
Shelf Life: Good
Color and Odor: Red, odorless liquid.

Phenolphthalein

indicator, powder
pH 8.2 colorless to 10.0 pink
$C_{20}H_{14}O_4$
F.W. 318.31

Reagent	**P0017**	25 g	**$ 10.35**
	P0018	100 g	**18.50**
Laboratory grade	**P0276**	100 g	**$15.85**

. **HAZARD ALERT:** *Possible carcinogen.* Phenolphthalein is listed as a suspected reproductive toxin by the state of CA (Proposition 65). Possible reproductive/fertility hazard.
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Alcohol and alkalies; insoluble in water.
Color and Odor: White, odorless solid.
CAS No. 77-09-8

Phenolphthalein Indicator Solution

Alcoholic			
1%	**P0019**	100 mL	**$6.66**
	P0020	500 mL	**8.80**
0.5%	**P0115**	100 mL	**$6.17**
	P0116	500 mL	**9.46**

★ **HAZARD ALERT:** Alcohol solution; flammable liquid; fire risk; skin, eyes, and respiratory irritant. Possible reproductive/fertility hazard.
Storage: Organic #9 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a
Shelf Life: Indefinite
Color and Odor: Colorless liquid with alcohol odor.

Phenyl Salicylate

salol
laboratory grade, crystal
2-HOC_6H_4-1-$CO_2C_6H_5$
F.W. 214.22

	P0021	100 g	**$16.95**
	P0022	500 g	**49.10**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} (mouse) 3000 mg/kg.
Storage: Organic #3
Disposal: #18b
Shelf Life: Indefinite
Soluble: Slightly in water; most common organic solvents.
Color and Odor: White solid with disinfectant odor.
CAS No. 118-55-8
Technical Note: Melting point 44–46 °C.

o-Phosphoric Acid

orthophosphoric acid
14.8 Molar
reagent
H_3PO_4
F.W. 98.00

	P0201	100 mL	**$16.65**
	P0023	500 mL	**40.70**
	P0024	2.5 liters	**135.00**
	P0181*	2.5 liters	**105.60**
		(Packaged in PVC-coated bottle)	

. **HAZARD ALERT:** Skin and eye irritant; slightly toxic by ingestion and inhalation; corrosive; burns tissue. LD_{50} 1530 mg/kg. TLV 1 mg/m^3.
Storage: Inorganic #9 in a dedicated acid cabinet. If one is not available, store in a Flinn *Saf-Cube*™.
Disposal: #24b
Shelf Life: Good if stored safely.
Cap Safety Color Code: White
Soluble: Water (heat generated) and alcohol.
Color and Odor: Colorless, odorless liquid.
CAS No. 7664-38-2
Safety Purchase Suggestion: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of phosphoric acid and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.
*Phosphoric acid is exactly as described under catalog number P0024 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are safely retained in a PVC outer envelope. *Plas-Pak*™ is a safer package for science teachers.

Phosphorus, Red

Red phosphorus is designated a List I chemical by the Drug Enforcement Agency (DEA) and is no longer available for sale. List I chemicals are defined as chemicals that are used in and important to the manufacture of controlled substances.

Plaster of Paris

see Calcium Sulfate

Platinum Wire

99.7% pure
Pt
A.W. 195.09
Supplied in one inch or multiples of one-inch lengths. If you order two inches, the piece will be two inches long, etc.

Catalog No.	B & S Gauge	Diameter (inch)	Weight (g/ft)	Price/Inch
P0145	36	0.005	0.083	**$12.83**
P0146	32	0.008	0.212	**15.65**
P0147	30	0.010	0.331	**23.04**
P0148	28	0.013	0.560	**30.25**
P0149	26	0.016	0.848	**33.00**
P0150	24	0.020	1.320	**69.48**
P0151	22	0.025	2.070	**61.50**

Storage: Inorganic #1
Disposal: #27a
Shelf Life: Indefinite
Color and Odor: Metallic gray, odorless solid.
CAS No. 7440-06-4

Polyacrylamide

see Water Marbles, pages 240 and 302
see Ghost Crystals, page 301

Polyethylene Oxide

see Super-Duper Polymer Gel, page 301

PolySnow™

"instant snow powder"
sodium polyacrylate

P0284	100 g	**$17.50**

Storage: Organic #3
Disposal: #26a
Shelf Life: Good, if kept dry.
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 9033-79-8
Technical Note: Adding 150 mL of DI water to 3 g of PolySnow produces over 300 mL of "snow." More absorbent than traditional sodium polyacrylate.

Polyurethane Foam System

A package which consists of two viscous liquids. When these substances are mixed, a rigid foam is produced. The volume of foam produced is 20–30 times larger than the original mixture. Liquid "A" is a polyether polyol. Liquid "B" is a polyfunctional isocyanate. Two pound set.

C0335	500 mL set	**$ 39.15**
C0442	4 L set	**297.35**

★ **HAZARD ALERT:** Solution "A" contains a polyether polyol, a tertiary amine and a silicone surfactant. Provide adequate ventilation and wear protective clothing. Solution "B" contains a polyfunctional diisocyanate. Provide adequate ventilation and avoid any body contact. Wear chemical splash goggles, chemical gloves, apron and mix under a hood or with adequate ventilation.

Storage: Liquid "A" Organic #2
Liquid "B" Organic #5
Disposal: Mix, form foam then #26a.
Shelf Life: Do not store longer than three years.
Soluble: Acetone and some other organic solvents.
Color and Odor: Solution A: Yellow/amber liquid, rubberlike odor.
Solution B: Brown/amber, odorless liquid.



Polyurethane Foam System C0335, etc.

Polyvinyl Alcohol

laboratory grade, granular
$[CH_2CH(OH)]_n$

P0154	500 g	**$32.70**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water

Continued on next column.

Polyvinyl Alcohol *continued*

Color and Odor: Off-white, odorless solid.
CAS No. 9002-89-5
Technical Note: If you are buying polyvinyl alcohol to prepare a polymer (like the toy "slime"), also consider guar gum as a substitute. See separate catalog listing.

Polyvinyl Alcohol Solution

4%, aqueous

P0209	500 mL	**$11.47**
P0210	1 liter	**20.55**
P0211	4 liters	**59.75**

Storage: In a tightly capped bottle. This substance will act as a growth media and should be kept cool.
Disposal: #26b
Shelf Life: Poor unless kept cool and uncontaminated.
Color and Odor: Cloudy, odorless solid.
Technical Note: Mix with saturated sodium borate solution to prepare a polymer ("slime").

Polyvinyl Alcohol/Sodium Borate "Slime Kit"

see pages 301–302 for several slime preparation kits

Potash

see Potassium Carbonate

Potassium

laboratory grade
K
A.W. 39.10

P0204	Bottle of 5 small pieces for demonstration (Packaged under mineral oil inside a plastic bottle. The bottle is contained within a metal can for storage protection.)	**$37.00**

★ **HAZARD ALERT:** Extremely *dangerous* in contact with moisture and water; releases hydrogen with sufficient heat to cause ignition or explosion; may ignite spontaneously in air or oxygen; can cause *severe* skin or eye burns. Shipped under dry oil (no water) and that is the way it ***must*** be stored. *Keep away from water and handle with* ***dry*** *utensils.*

★ **SPECIAL HAZARD ALERT:** Peroxide coatings are well known to develop on the exterior surface of potassium metal. The peroxide coating consists of potassium superoxide (KO_2) and potassium peroxide (K_2O_2). Potassium superoxide is yellow and reacts explosively with the light oil in which the product is stored when the metal is cut into small pieces. Do not use any potassium that is old or yellow! ***If you have a choice as to which alkali metal you use, sodium metal is a better choice since, upon aging, it does not develop peroxides.***
Storage: Inorganic #1 under dry oil in a Flinn *Saf-Stor*™ Can.
Disposal: #3
Shelf Life: Poor; see Special Hazard Alert above.
Soluble: Do not attempt to place into solution.
Color and Odor: As new metal, silvery; as old metal, gray to white to off-white; odorless.
CAS No. 7440-09-7

Potassium Acid Phthalate

see Potassium Hydrogen Phthalate

Potassium Aluminum Sulfate

see Aluminum Potassium Sulfate

Potassium Bicarbonate

potassium hydrogen carbonate
reagent grade, crystal
$KHCO_3$
F.W. 100.12

P0033	500 g	**$19.60**

Storage: Inorganic #4

POTASSIUM BICARBONATE continued on next page.

What To Do the First Day of Lab?

Start the year with safety as your #1 goal. Before starting your first lab, take time to discuss the rules of the lab and the student safety contract and administer a safety exam. If you don't have a safety contract, contact us and we will send you a copy of our free Flinn Safety Contract. Let your students know how important safety is to you and to their success in lab.

Potassium Bicarbonate *continued*

Disposal: #26a
Shelf Life: Poor; hygroscopic.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 298-14-6

Potassium Biphthalate

see Potassium Hydrogen Phthalate

Potassium Bisulfate

potassium hydrogen sulfate
reagent grade, crystal

$KHSO_4$	**P0134**	100 g	**$18.00**
F.W. 136.17			

★ **HAZARD ALERT:** Slightly toxic by ingestion; severe body tissue irritant. LD_{50} 2340 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; decomposes in alcohol.
Color and Odor: White solid with peanut brittle odor.
CAS No. 7646-93-7

Potassium Bitartrate

potassium hydrogen tartrate
laboratory grade, powder

$KHC_4H_4O_6$	**P0135**	100 g	**$12.00**
F.W. 188.18			

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Boiling water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 868-14-4

Potassium Bromate

reagent grade, crystal

$KBrO_3$	**P0136**	100 g	**$19.80**
F.W. 167.02			

★ **HAZARD ALERT:** *Possible carcinogen according to IARC.* Fire risk in contact with organic material; strong irritant; oxidizer; moderately toxic. LD_{50} 157 mg/kg.
Storage: Inorganic #6
Disposal: #12a
Shelf Life: Indefinite
Soluble: Boiling water.
Color and Odor: White solid with slight bromine odor.
CAS No. 7758-01-2

Potassium Bromide

reagent grade, crystal

KBr	**P0137**	100 g	**$10.70**
F.W. 119.02	**P0037**	500 g	**30.75**

★ **HAZARD ALERT:** Slightly toxic by ingestion; severe body tissue irritant. LD_{50} 3070 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Somewhat hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7758-02-3

Potassium Carbonate

potash, anhydrous
laboratory grade, granular

K_2CO_3	**P0038**	500 g	**$19.20**
F.W. 138.21			

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant. LD_{50} 1870 mg/kg.
Storage: Inorganic #4
Disposal: #26a

POTASSIUM CARBONATE continued on next page.

Flinn's Chemventory™

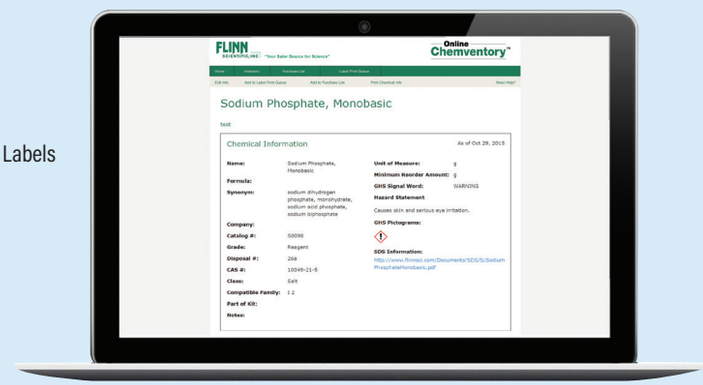
Chemical Inventory Management System

SEE PAGE 574 FOR DETAILS!

The Flinn Chemventory™ is a cloud-based laboratory chemical inventory system that allows multiple users access to the database from multiple locations and multiple devices! Maintaining an accurate laboratory chemical inventory has never been easier, more flexible and more convenient.

The Flinn Chemventory™ program features:

- Secure Cloud-Based Service
- Easily Add All Your Flinn Chemicals
- Multiple Users
- Print, Email and Export Your Inventory List
- Link Databases
- GHS Hazard Information Included
- Safety Data Sheets
- Print Chemical and Solution Labels
- Import Data from Previous Chemventory Versions
- Create a Purchase List



Affordable and Convenient Price Options

A one-time purchase gets you 1, 3 or 5 years of access to build, view and update your chemical inventory database.

Flinn Chemventory™ is flexible enough to allow you to access your inventory information from multiple locations on multiple devices. Manage your chemical inventory safely and conveniently with Flinn's affordable Chemventory program!

Catalog No.	Description	Price/Each
SE2998	Flinn Chemventory™, 1-Year License	$ 99.00
SE2999	Flinn Chemventory™, 3-Year License	249.00
SE3000	Flinn Chemventory™, 5-Year License	349.00

Potassium Carbonate *continued*

Shelf Life: Hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 584-08-7

Potassium Carbonate

sesquihydrate
reagent grade, crystal

$K_2CO_3 \cdot 1.5H_2O$	**P0157**	100 g	**$17.05**
F.W. 165.24			

★ **HAZARD ALERT:** Body tissue irritant. LD_{50} 1870 mg/kg.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 6381-79-9

Potassium Chlorate

laboratory grade, powder

$KClO_3$	**P0040**	500 g	**$22.66**
F.W. 122.56	**P0041**	2 kg	**68.97**

★ **HAZARD ALERT:** Strong oxidizer; slightly toxic; irritant. LD_{50} 1870 mg/kg. Extremely dangerous since the substance, if only slightly contaminated, will explode when exposed to moderate shock or when heated. Because this substance is so frequently a source of accidents on school premises we have elected to list some of the incompatible substances that should be avoided:

Ammonium Salts	Phosphorus	Carbon	
Sulfuric Acid	Combustible Material	Metal Powders	
Finely Divided Materials	Organic Materials	Sulfur	Sugar

★ **SPECIAL HAZARD ALERT:** Only pure manganese dioxide (manganese(IV) oxide) should be used with potassium chlorate for oxygen preparation. A safer method is the catalytic decomposition of hydrogen peroxide. You will find this method recited in detail under the oxygen gas listing in this Catalog/Reference Manual.
Storage: Inorganic #6
Disposal: #12a
Shelf Life: Indefinite if stored safely.
Soluble: Boiling water.
Color and Odor: White, odorless solid.
CAS No. 3811-04-9
Technical Note: Potassium Chlorate as an O_2 Source: Molar volume is frequently measured by generating O_2 using potassium chlorate and manganese dioxide. Molten $KClO_3$ is a powerful oxidizer of organic materials like the rubber in the stoppers used in the generating apparatus. Explosions can and do result. Please call or email us to obtain a free copy of Publication No. 1001, which describes a safe method involving the use of dry ice to measure molar volume.

Potassium Chloride

reagent grade, crystal

KCl	**P0183**	100 g	**$ 7.94**
F.W. 74.56	**P0042**	500 g	**13.11**
	P0043	2 kg	**45.59**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 2600 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; hygroscopic.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7447-40-7

Potassium Chloride Solution

(as KCl)

0.5 Molar	**P0236**	500 mL	**$9.35**
0.1 Molar	**P0160**	500 mL	**8.85**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Potassium Chromate

reagent grade, crystal

K_2CrO_4	**P0044**	100 g	**$16.00**
F.W. 194.21	**P0045**	500 g	**38.00**

★ **HAZARD ALERT:** *Known carcinogen.* Highly toxic; harmful to skin, eyes, and respiratory tract; corrosive action on skin and mucous membranes. Possible reproductive/fertility hazard. Chromates as a chemical family deserve special safety attention from science teachers. LD_{50} (mouse) 180 mg/kg.
Storage: Inorganic #8 in a Flinn *Chem-Saf*™ Bag inside a locked poisons cabinet.
Disposal: #12a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: Yellow, odorless solid.
CAS No. 7789-00-6

Potassium Chromate Solution

(as K_2CrO_4)

1 Molar	**P0161**	500 mL	**$16.50**

★ **HAZARD ALERT:** Moderately toxic by ingestion; may be corrosive to body tissue. Possible reproductive/fertility hazard.
Storage: Inorganic #8
Disposal: #12a
Shelf Life: Good
Color and Odor: Yellow, odorless liquid.

Potassium Dichromate

reagent grade, crystal **P0047** 100 g **$16.40**

$K_2Cr_2O_7$
F.W. 294.22

★ **HAZARD ALERT:** *Known carcinogen.* Strong oxidant; fire risk in contact with organic material; toxic by ingestion and inhalation; corrosive to body tissue. Possible reproductive/fertility hazard. LD_{50} 190 mg/kg.
Storage: Inorganic #8 in a Flinn *Chem-Saf*™ Bag inside a locked poisons cabinet.
Disposal: #12a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: Orange, odorless solid.
CAS No. 7778-50-9

Potassium Dihydrogen Phosphate

see Potassium Phosphate, Monobasic

Potassium Ferricyanide

potassium hexacyanoferrate(III)
reagent grade, crystal

$K_3Fe(CN)_6$	**P0050**	100 g	**$12.80**
F.W. 329.26	**P0051**	500 g	**40.05**

★ **HAZARD ALERT:** If heated or in contact with concentrated acids, poisonous fumes of hydrogen cyanide gas may evolve. Compound itself has slight toxicity. LD_{50} 1600 mg/kg.
Storage: Inorganic #7
Disposal: #14. P-Listed (P030); purchase small amount for effective inventory control.
Shelf Life: Fair, but light-sensitive. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: Orange, odorless solid.
CAS No. 13746-66-2

Goggle Use

When is it appropriate to wear goggles? Science teachers often respond by citing specific situations (e.g., when working with strong bases, when working with acids, when working with biuret). A good general rule would be... WORKING WITH CHEMICALS... ANY CHEMICALS... WEAR GOGGLES!

Wear chemical splash goggles whenever working with chemicals, glassware or heat.

Potassium Ferrocyanide

potassium hexacyanoferrate(II)
reagent grade, crystal
$K_4Fe(CN)_6 \cdot 3H_2O$ **P0053** 100 g **$19.45**
F.W. 422.41

★ **HAZARD ALERT:** Dangerous if heated or if in contact with concentrated acids since hydrogen cyanide gas may evolve. Slightly toxic by ingestion. LD_{50} 6400 mg/kg (for anhydrous salt).
Storage: Inorganic #7
Disposal: #14. P-Listed (P030); purchase small amount for effective inventory control.
Shelf Life: Fair to poor; effloresces on exposure to air; keep tightly capped and store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: Light yellow, odorless solid.
CAS No. 14459-95-1

Potassium Hexacyanoferrate(II)

see Potassium Ferrocyanide

Potassium Hexacyanoferrate(III)

see Potassium Ferricyanide

Potassium Hydrogen Carbonate

see Potassium Bicarbonate

Potassium Hydrogen Phosphate

see Potassium Phosphate, Dibasic

Potassium Hydrogen Phthalate

potassium acid phthalate
reagent grade, crystal
99.95–100.05% minimum
$KHC_8H_4O_4$ **P0056** 100 g **$17.43**
F.W. 204.23 **P0057** 500 g **46.91**

Storage: Inorganic #2
Disposal: #24a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 877-24-7
Technical Note: Primary standard for preparing volumetric alkali solutions. Also used as a buffering agent.

Potassium Hydrogen Sulfate

see Potassium Bisulfate

Potassium Hydrogen Tartrate

see Potassium Bitartrate

Potassium Hydroxide

KOH
F.W. 56.11
Reagent **P0058** 100 g **$10.75**
pellet **P0059** 500 g **25.05**
Laboratory grade **P0061** 500 g **$12.45**
flake **P0062** 2 kg **38.65**

★ **HAZARD ALERT:** Skin contact causes severe blisters; strongly corrosive as a solid and as a solution; very harmful if swallowed; extremely dangerous to eyes. LD_{50} 273 mg/kg. TLV-C 2 mg/m^3.
★ **SPECIAL HAZARD ALERT:** Wear appropriate face and body protection when making solutions; potassium hydroxide generates large amounts of heat while dissolving. You might consider immersing your solution-making vessel in an ice bath. The ice bath will better enable you to control the solution temperature. Stir continuously.
Storage: Inorganic #4
Continued on next column.

No Need to Repackage

Flinn sodium is packaged ready to use and ready to store. Five small pieces of sodium (0.3–0.5 g each), perfect for demonstrations, are packaged under mineral oil in a plastic bottle. The bottle is in a plastic bag within a metal can for safer storage. Count on Flinn for the safest package.



Potassium Hydroxide *continued*

Disposal: #10
Shelf Life: Fair; absorbs water and carbon dioxide.
Soluble: Water, alcohol and glycerin.
Color and Odor: White, odorless solid.
CAS No. 1310-58-3
Technical Note: Reagent potassium hydroxide contains 10–15% water.

Potassium Iodate

powder
KIO_3
F.W. 214.01
Reagent **P0063** 25 g **$ 10.97**
P0064 100 g **32.33**
P0065 500 g **114.50**
Laboratory grade **P0277** 100 g **$28.45**

★ **HAZARD ALERT:** Oxidizer; moderately toxic; tissue irritant. LD_{50} 531 mg/kg.
Storage: Inorganic #6
Disposal: #12a
Shelf Life: Indefinite
Soluble: Water; dilute sulfuric acid; not alcohol.
Color and Odor: White solid with strong iodine odor.
CAS No. 7758-05-6

Potassium Iodate Solution

(as KIO_3)
0.2 Molar **P0168** 500 mL **$11.75**
0.1 Molar **P0169** 500 mL **10.25**

For storage, disposal, etc., see Potassium Iodate Solution.
Color and Odor: Colorless, odorless liquid.

Potassium

crystal
KI
F.W. 166.01
Reagent **P0066** 25 g **$ 16.25**
P0067 100 g **39.15**
P0184 500 g **135.96/1**
789.84/6
Laboratory grade **P0278** 100 g **$ 38.00**
P0279 500 g **145.00**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; moisture- and light-sensitive.
Soluble: Water, alcohol, acetone, and glycerin.
Color and Odor: White, odorless solid.
CAS No. 7681-11-0

Potassium Iodide Solution

(as KI)
1 Molar **P0170** 500 mL **$39.20**
0.5 Molar **P0171** 500 mL **23.83**
0.2 Molar **I0026** 500 mL **17.25**
0.1 Molar **P0172** 500 mL **12.93**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good, if stored properly in a cool, dark place; protect from light and heat.
Color and Odor: Colorless, but darkens on exposure to light, slight iodine odor.

Potassium Nitrate

saltpeter
KNO_3
F.W. 101.11
Reagent **P0070** 100 g **$ 11.00**
crystal **P0071** 500 g **19.55**
Laboratory grade **P0073** 500 g **$ 10.95**
granular **P0074** 2 kg **34.60**

★ **HAZARD ALERT:** Strong oxidant; fire and explosion risk when heated or in contact with organic material; skin irritant. LD_{50} 3750 mg/kg.
Storage: Inorganic #3
Disposal: #26b

POTASSIUM NITRATE continued on next page.

Potassium Nitrate *continued*

Shelf Life: Good; slightly hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, glycerin, slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7757-79-1

Potassium Nitrate Solution

(as KNO_3)

0.5 Molar	**P0173**	500 mL	**$12.10**

Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Potassium Nitrite

crystal
KNO_2
F.W. 85.11

Reagent	**P0108**	100 g	**$30.10**
Laboratory grade	**P0280**	100 g	**$24.45**

★ **HAZARD ALERT:** Strong oxidant; fire and explosion risk when heated or in contact with organic material; skin irritant; highly toxic. LD_{50} 200 mg/kg.
Storage: Inorganic #3
Disposal: #12b
Shelf Life: Fair; hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: Very light yellow, odorless solid.
CAS No. 7758-09-0

Potassium Oxalate

laboratory grade, crystal
$K_2C_2O_4 \cdot H_2O$ **P0075** 500 g **$25.45**
F.W. 184.24

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Efflorescent in warm, dry air; keep tightly capped; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Off-white, odorless solid.
CAS No. 6487-48-5

Potassium Permanganate

reagent grade, crystal

$KMnO_4$	**P0077**	100 g	**$ 10.50**
F.W. 158.04	**P0078**	500 g	**23.95**

★ **HAZARD ALERT:** Powerful oxidizing agent; may react violently with easily oxidized substances and can explode on sudden heating in a closed container; common cause of eye accidents; *wear face protection.* Strong skin irritant; slightly toxic by ingestion. LD_{50} 1090 mg/kg.
Storage: Inorganic #8
Disposal: #12a
Shelf Life: Indefinite
Soluble: Water, alcohol, and methyl alcohol; decomposes in water.
Color and Odor: Gray/black, odorless solid.
CAS No. 7722-64-7

Potassium Permanganate Solution

(as $KMnO_4$)

0.2 Molar	**P0239**	500 mL	**$8.95**
0.1 Molar	**P0175**	500 mL	**10.25**

★ **HAZARD ALERT:** Solution may be a skin irritant.
Storage: Inorganic #8
Disposal: #12a
Shelf Life: Fair to poor.
Color and Odor: Dark purple, odorless liquid.

Potassium Phosphate, Monobasic

reagent grade, crystal

KH_2PO_4	**P0141**	100 g	**$16.20**
F.W. 136.09	**P0081**	500 g	**33.05**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; hygroscopic.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7778-77-0

Potassium Phosphate, Tribasic

reagent grade, powder
$K_3PO_4 \cdot nH_2O$ **P0083** 100 g **$29.45**
F.W. 212.27
(as K_3PO_4)

★ **HAZARD ALERT:** Slightly toxic; severe body tissue irritant. LD_{50} 1450 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor unless stored under dry conditions; hygroscopic; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water—giving a strongly basic solution; insoluble in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7778-53-2

Potassium Sodium Tartrate

Rochelle salt
reagent grade, crystal

$KNaC_4H_4O_6 \cdot 4H_2O$	**P0084**	100 g	**$13.90**
F.W. 282.23	**P0085**	500 g	**27.85**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; efflorescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 6381-59-5

Potassium Sulfate

K_2SO_4
F.W. 174.27

Reagent	**P0086**	500 g	**$30.45**
crystal			
Laboratory grade	**P0087**	100 g	**$ 10.45**
powder	**P0088**	500 g	**21.75**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7778-80-5

Potassium Thiocyanate

crystal
KSCN
F.W. 97.18

Reagent	**P0225**	50 g	**$12.35**
	P0089	100 g	**17.15**
	P0090	500 g	**53.90**
Laboratory grade	**P0281**	100 g	**$14.85**

★ **HAZARD ALERT:** Moderately toxic by ingestion; emits toxic fumes of cyanide if strongly heated or in contact with concentrated acids. Decomposes to NO and HCN in the presence of dilute nitric acid. LD_{50} 854 mg/kg.
Storage: Inorganic #7
Disposal: #26a
Shelf Life: Substance deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol, and acetone.
Color and Odor: White, odorless solid.
CAS No. 333-20-0

What Does LD_{50} Mean?

LD_{50} (lethal dose, 50% kill) is the dose that, when administered to test animals, kills half of them. The LD_{50} is expressed in milligrams (mg) of substance per kilogram (kg) of animal body mass and the method by which the toxicant was administered (e.g., oral, intravenous). Inhalation toxicity data are reported as LC_{50}, the lethal concentration, in ppm/hr. For more information, review the article on toxicity on page 594.

Potassium Thiocyanate Solution
(as KSCN)

1 Molar	**P0226**	500 mL	**$12.05**
0.1 Molar	**P0178**	500 mL	**10.95**

For hazard alert, storage, disposal, etc., see Potassium Thiocyanate, P0225.
Color and Odor: Colorless, odorless liquid.

Potato Dextrose Agar
bacteriological media

	P0098	100 g	**$ 42.00**
	P0099	500 g	**145.69**

Storage: Miscellaneous, nonhazardous organic material.
Disposal: #26a
Shelf Life: Good if kept dry.
Soluble: Water
Color and Odor: Buff solid with sour mash odor.

Potato Starch
see Starch, Potato

1-Propanol
see n-Propyl Alcohol under Propyl

2-Propanol
see Isopropyl Alcohol

Propionic Acid
propanoic acid, mold inhibitor
laboratory grade
CH_3CH_2COOH **P0091** 500 mL **$23.90**
F.W. 74.08

★ **HAZARD ALERT:** Flammable liquid; flash point 54 °C (130 °F); liquid burns skin and eyes. LD_{50} 2600 mg/kg. TLV 30 mg/m^3.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Water, alcohol, and chloroform.
Color and Odor: Clear liquid with rancid vinegarlike odor.
CAS No. 79-09-4
Technical Note: Add 1 mL per liter of culture media for mold inhibition.

n-Propyl Alcohol
1-propanol
reagent grade

$CH_3CH_2CH_2OH$	**P0228**	100 mL	**$ 11.20**
F.W. 60.10	**P0092**	500 mL	**15.55**

★ **HAZARD ALERT:** Flammable liquid; dangerous fire risk; harmful to eyes and respiratory tract. LD_{50} 1870 mg/kg. TLV 492 mg/m^3.
Storage: Organic #2 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Indefinite if stored safely.
Soluble: Water and alcohol.
Color and Odor: Colorless liquid with alcohol odor.
CAS No. 71-23-8

Q

Quicklime
see Calcium Oxide

Quieting Solution
see Polyvinyl Alcohol, 10% or Methyl Cellulose, 3%

What To Do in an Emergency?
More than 95% of the science teachers we talk to tell us their school has no emergency action plan for the science department. Don't wait for the administrators to act. You get this much-needed action started. You need a fire plan, you need an eye injury plan, you need a burn plan, you need an acid contact plan... don't wait for the event to happen. This is high priority stuff!

R

Rennin
rennet, cheese-making enzyme; see chymosin

Resazurin Solution
1%, aqueous **R0013*** 20 mL **$10.30**
biological stain/indicator
pH 3.8 orange to 6.5 violet
$C_{12}H_6NO_4Na$
F.W. 251.18
Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in water; soluble in dilute alkali.
Color: Blue/black
*Special, unique dropping bottle package called a Flinn *E-Z Drop*™.

Resin, Ion Exchange
see Ion Exchange Resin

Rhodizonic Acid, Disodium Salt
see Sodium Rhodizonate

Ribonucleic Acid
ribose nucleic acid, RNA
from yeast **N0018** 25 g **$123.28**
Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 63231-63-0

RNA
see Ribonucleic Acid

Rochelle Salt
see Potassium Sodium Tartrate

Rubbing Alcohol
see Isopropyl Alcohol, 70%

S

Safranin Staining Solution
1%, aqueous
S0178 500 mL **$30.70**
Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Red, odorless liquid.

Safranin Staining Solution
Gram counter stain
0.25%, alcoholic **S0169** 500 mL **$16.45**
★ **HAZARD ALERT:** 40% alcohol based solution; vapors may be flammable.
Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite if stored safely.
Color and Odor: Red liquid with alcohol odor.

Sal Ammoniac
see Ammonium Chloride

Salicylic Acid
laboratory grade, crystal

$2\text{-}HOC_6H_4COOH$	**S0001**	100 g	**$ 10.15**
F.W. 138.13	**S0002**	500 g	**26.30**

★ **HAZARD ALERT:** Moderately toxic by ingestion; LD_{50} (mouse) 480 mg/kg.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Slightly in water; many organic solvents.
Color and Odor: White, odorless solid.
CAS No. 69-72-7

Saltpeter
see Potassium Nitrate

Sand

fine, white	**S0003**	500 g	**$ 7.10**
	S0004	2 kg	**11.26**
	AP6462	50 lbs	**73.15**
fine, black	**S0449**	500 g	**$8.91**

Storage: Miscellaneous nonhazardous inorganic material.
Color and Odor: White-gray/black, odorless solid.
CAS No. 14808-60-7
Technical Note: White sand is perfect for stream tables. Black sand is used for Earth Science heating of landforms demonstrations.

Sandpaper
fine
9" x 11" sheets **S0165** pkg./4 **$10.60**
Storage: Miscellaneous nonhazardous inorganic material.

Sebacoyl Chloride/Hexane Solution
4 mL of sebacoyl chloride in 100 mL of hexane for nylon polymer experiment or demonstration
S0260 100 mL **$23.30**
★ **HAZARD ALERT:** Flammable liquid; dangerous fire risk.
Storage: Organic #3 in a dedicated flammables cabinet.
Disposal: #18b
Shelf Life: Indefinite
Color and Odor: Colorless liquid with suffocating acid odor.
Technical Note: To prepare nylon you will also need hexamethylene diamine/sodium hydroxide solution.

Seliwanoff Reagent
test solution for distinguishing glucose vs. fructose
Contains 0.1%
resorcinol in 3M HCl **S0453** 100 mL **$9.70**
. **HAZARD ALERT:** Corrosive liquids.
Storage: Inorganic #9 in a dedicated acid cabinet
Disposal: #24b
Shelf Life: Fair

Silica Gel
for chromatography

35–60 Mesh	**S0408**	100 g	**$48.45**
100–200 Mesh	**S0412**	100 g	**30.05**
200–425 Mesh	**S0410**	100 g	**28.25**

For storage, disposal, etc., see Silica Gel, S0212.
Technical Note: As mesh size goes up, particle size decreases (e.g., 200 mesh are finer particles than 35 mesh).

Silicon
laboratory grade
Si
A.W. 28.09

Powder	**S0012**	500 g	**$41.02**
Lumps	**S0342**	100 g	**$13.05**
	S0013	500 g	**33.46**

★ **HAZARD ALERT:** Flammable in powder form. LD_{50} 3160 mg/kg. TLV 10 mg/m^3.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Mixture of nitric and hydrofluoric acid and alkalies.
Color and Odor: Gray, odorless solid.
CAS No. 7440-21-3

Silicone Oil
polymethylsiloxane
excellent heat transfer fluid for use in hot oil baths or melting point Thiele tubes
S0451 250 mL **$22.45**
Storage: Inorganic miscellaneous.
Disposal: #26a
Shelf Life: Indefinite
Soluble: Insoluble in water; soluble in hydrocarbons.
Continued on next column.

Silicone Oil *continued*

Color and Odor: Colorless, odorless.
CAS No. 63148-62-9
Technical Note: Greater working temperature and higher flashpoint than mineral oil. Less tendency to discolor or degrade upon heating than vegetable oil. Reusable almost indefinitely if uncontaminated. 250-mL size will fill five Thiele tubes.

Silver, Foil
0.005" x 2"
reagent grade, Ag **S0270** 5 g **$57.50**
A.W. 107.87 **S0014** 10 g **103.05**
Storage: Inorganic #1
Disposal: #27a
Shelf Life: Indefinite
Soluble: Nitric and hot sulfuric acids.
Color and Odor: Silver, odorless solid.
CAS No. 7440-22-4

Silver, Shot
reagent grade **S0270** 5 g **$ 57.50**
S0016 10 g **109.70**
For storage, disposal, etc., see Silver, Foil, S0270.

Silver Acetate
reagent grade, powder
CH_3CO_2Ag **S0019** 25 g **$183.00**
F.W. 166.93
Storage: Inorganic #2
Disposal: #11
Shelf Life: Indefinite but light-sensitive.
Soluble: Hot water and nitric acid.
Color and Odor: Brown/gray/white solid with slight vinegar odor.
CAS No. 563-63-3

Silver Chloride
reagent grade, powder
AgCl **S0273** 25 g **$115.45**
F.W. 143.34
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite but light-sensitive.
Soluble: Insoluble in water. Soluble in concentrated ammonia or sodium thiosulfate solution.
Color and Odor: Brown/gray/white solid with slight chlorine odor.
CAS No. 7783-90-6

Silver Nitrate
crystal
$AgNO_3$
F.W. 169.87

Reagent	**S0274**	5 g	**$ 22.30**
	S0025	25 g	**92.35**
	S0026	100 g	**334.75**
	S0027	500 g	**1570.75/1**
			9136.92/6
Laboratory grade	**S0433**	25 g	**$ 105.00**
	S0434	100 g	**329.60**

SILVER NITRATE continued on next page.

Reduce Fire Risk
1. Store chemicals in chemically compatible families.
2. Buy and store the minimum quantity of flammables.
3. Store flammables in dedicated flammables cabinets.
4. Provide good ventilation in chemical stores areas.
5. Use water baths, heating mantles and hot plates rather than Bunsen burners or alcohol burners, if possible.
6. Buy and store flammables in metal packages and plastic or PVC-coated bottles rather than glass.
7. Dispose of waste solvents responsibly.

Silver Nitrate *continued*

★ **HAZARD ALERT:** Corrosive; causes burns; avoid contact with eyes and skin; will stain skin and clothing; highly toxic. LD_{50} 1173 mg/kg.
Storage: Inorganic #3 in a Flinn *Chem-Saf*™ Bag inside a locked poisons cabinet.
Disposal: #11
Shelf Life: Indefinite but light-sensitive.
Soluble: Water; hot alcohol.
Color and Odor: White solid with faint nitric acid odor.
CAS No. 7761-88-8
Technical Note: Forms permanent brown/black stains on skin. Silver nitrate stains on clothing can almost always be removed by the use of Spray 'N Wash®, which is obtainable in the laundry products section of your local grocery store. To remove silver nitrate stains on skin, glassware, or lab equipment use the gentle but effective Erada-Stain® cream (Catalog No. AP7330).

Silver Nitrate, Gramolpak

(as $AgNO_3$)

1 Molar	**S0382***	pkg.	**$53.25**
0.1 Molar	**S0405***	pkg.	**16.35**

For hazard alert, storage, disposal, etc., see Silver Nitrate, S0274.
*Gramolpak™ is a unique package that makes 100 mL with distilled water.

Silver Nitrate Solution

(as $AgNO_3$)

1 Molar	**S0304**	25 mL	**$ 24.59**
	S0172	500 mL	**277.00**
0.5 Molar	**S0261**	100 mL	**$ 45.37**
	S0262	500 mL	**161.95**
0.2 Molar	**S0263**	100 mL	**$24.06**
	S0265	500 mL	**73.87**
0.1 Molar	**S0305**	100 mL	**$50.00**
	S0147	500 mL	**56.60**

For hazard alert, storage, disposal, etc., see Silver Nitrate, S0274.
Color and Odor: Colorless, odorless liquid.

Silver Oxide

laboratory grade, powder

Ag_2O	**S0028**	10 g	**$44.91**
F.W. 231.76	**S0029**	25 g	**109.15**

★ **HAZARD ALERT:** Slightly toxic; fire risk in contact with organic material or ammonia. LD_{50} 2820 mg/kg.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite but light-sensitive.
Soluble: Ammonium hydroxide, nitric acid sodium thiosulfate solution; slightly in water; insoluble in alcohol.
Color and Odor: Gray/black, odorless solid.
CAS No. 20667-12-3
Technical Note: See Flinn disposal procedure #11 for an inexpensive route to prepare silver oxide from silver wastes.

Silver Sulfate

reagent grade, powder

Ag_2SO_4	**S0031**	25 g	**$90.10**
F.W. 311.83			

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite but light-sensitive.

Continued on next column.

E-Z Drop™ Bottle

Flinn's E-Z Drop™ bottles are great for storing and dispensing indicator solutions.

Flinn always provides safe and easy-to-use packaging.



Silver Sulfate *continued*

Soluble: Ammonium hydroxide, nitric acid, sulfuric acid, and hot water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 10294-26-5

Slaked Lime

see Calcium Hydroxide

Soap

see Cleaners

Soda Ash

see Sodium Carbonate Anhydrous

Sodium

reagent grade, lumps
Na
A.W. 22.9896

S0329*	5 pieces	**$24.72**
S0450*	15 pieces	**29.00**
S0232	25 g	**26.90**
S0034	100 g	**69.30**
S0035	250 g	**96.65**

(All sizes packaged under mineral oil in plastic bottles, and then in a metal can for safer storage.)

★ **HAZARD ALERT:** A flammable, corrosive solid; dangerous when exposed to heat or flame; dangerous by reaction with moist air, water or any oxidizer. Spontaneously flammable when heated in air; reacts violently with water, producing very dangerous hydrogen gas and a solution of corrosive sodium hydroxide.
Storage: Inorganic #1 under dry mineral oil and inside a Flinn *Saf-Stor*™ Can. Sodium metal must always be stored under dry mineral oil to prevent contact with moist air.
Disposal: #3
Shelf Life: Good, if stored safely.
Color and Odor: New material: metallic gray. Old material: white gray. Metal itself is odorless but is usually stored under an oil or kerosene, either of which may have an odor.
CAS No. 7440-23-5
*These two packages contain small, precut pieces of sodium for demonstrations.
Technical Note: As you handle sodium be particularly attentive to the use of ***dry*** utensils and an entirely dry work surface. Use all appropriate personal safety apparel (e.g., gloves, apron, face shield). Sodium would be the better choice to demonstrate the characteristics of an alkali metal than potassium. Potassium may develop potentially explosive peroxides.

Sodium Acetate

acetic acid, sodium salt, trihydrate
reagent grade, crystal

$NaC_2H_3O_2 \cdot 3H_2O$	**S0036**	100 g	**$ 9.33**
F.W. 136.08	**S0037**	500 g	**20.00**

★ **HAZARD ALERT:** Skin, eye and respiratory irritant. LD_{50} 3530 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair to poor; substance efflorescent.
Soluble: Water; slightly in alcohol.
Color and Odor: White solid with faint vinegar odor.
CAS No. 6131-90-4

Sodium Acetate

anhydrous
laboratory grade, powder

CH_3CO_2Na	**S0344**	100 g	**$ 9.75**
F.W. 82.03	**S0038**	500 g	**16.85**

For hazard alert, storage, disposal, etc., see Sodium Acetate, S0036.
CAS No. 127-09-3

Sodium Acid Phosphate

see Sodium Phosphate, Monobasic

Sodium Alginate

algin; alginic acid, sodium salt
laboratory grade

$(C_6H_7O_6Na)_n$	**S0445**	25 g	**$17.60**

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water

SODIUM ALGINATE continued on next page.

Sodium Alginate *continued*

Color and Odor: Tan, odorless solid.
CAS No. 9005-38-3

Sodium Bicarbonate

sodium hydrogen carbonate, baking soda
powder
$NaHCO_3$
F.W. 84.01

Reagent	**S0042**	500 g	**$10.86**
Laboratory grade	**S0043**	500 g	**$ 8.69**
	S0044	2 kg	**18.20**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 4220 mg/kg.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Stable under dry storage conditions; slowly decomposes in moist air; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 144-55-8

Sodium Bicarbonate Solution

0.5 Molar
(as $NaHCO_3$) **S0268** 500 mL **$8.55**

For storage, disposal, etc.,
see Sodium Bicarbonate Solution, S0267.

Sodium Biphosphate

see Sodium Phosphate, monobasic

Sodium Bismuthate

laboratory grade, powder
$NaBiO_3$ **S0045** 10 g **$56.00**
F.W. 279.97

★ **HAZARD ALERT:** Oxidizer; body tissue irritant; highly toxic. LD_{50} 420 mg/kg.
Storage: Inorganic #7
Disposal: #26a
Shelf Life: Somewhat hygroscopic; slowly decomposes on storage. Store in a Flinn *Chem-Saf*™ Bag.
Soluble: Decomposes in hot water and acids; insoluble in cold water.
Color and Odor: Yellow, odorless solid.
CAS No. 12232-99-4

Sodium Bisulfate

sodium hydrogen sulfate
reagent grade, crystal
$NaHSO_4 \cdot H_2O$ **S0214** 100 g **$17.05**
F.W. 138.08

★ **HAZARD ALERT:** Body tissue irritant; moderately toxic.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Hygroscopic; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 10034-88-5

Sodium Bisulfite

sodium hydrogen sulfite
reagent grade, granular
$NaHSO_3$ **S0047** 500 g **$12.60**
F.W. 104.07

★ **HAZARD ALERT:** Severe irritant to skin and tissue as an aqueous solution; slightly toxic. LD_{50} 2000 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Substance very hygroscopic; keep tightly capped and in a cool location; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: White solid with faint sulfur odor.
CAS No. 7631-90-5
Technical Note: Sodium bisulfite is a mixture of sodium bisulfite and sodium metabisulfite, depending on the amount of hydration that has occurred.

Continued on next column.

Sodium Borate

borax, sodium tetraborate
laboratory grade, powder
$Na_2B_4O_7 \cdot 10H_2O$ **S0435** 500 g **$11.70**
F.W. 381.42

★ **HAZARD ALERT:** Slightly toxic by ingestion. Possible teratogen. Possible reproductive/fertility hazard. LD_{50} 2660 mg/kg.
Storage: Inorganic #8
Disposal: #26a
Shelf Life: Material efflorescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and glycerin; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 1303-96-4

Sodium Borate Solution

4%, aqueous
(as $Na_2B_4O_7 \cdot 10H_2O$) **S0363** 500 mL **$ 7.75**
S0364 1 liter **13.60**

★ **HAZARD ALERT:** Possible teratogen. Possible reproductive/fertility hazard.
Storage: Inorganic #8
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Sodium Bromide

reagent grade, granular
NaBr **S0215** 100 g **$11.10**
F.W. 102.90 **S0050** 500 g **26.55**

★ **HAZARD ALERT:** Slightly toxic by ingestion or inhalation. LD_{50} 3500 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Product absorbs water from air; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7647-15-6

Sodium Carbonate

soda ash, anhydrous
granular
Na_2CO_3
F.W. 105.99

Reagent	**S0051**	500 g	**$13.15**
Laboratory grade	**S0052**	500 g	**$ 10.25**
	S0053	2 kg	**16.40**

★ **HAZARD ALERT:** May be a skin irritant. LD_{50} 4090 mg/kg.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Hygroscopic; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, glycerin; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 497-19-8

Sodium Carbonate

monohydrate
reagent grade, crystal
$Na_2CO_3 \cdot H_2O$ **S0054** 500 g **$11.85**
F.W. 124.00 **S0055** 2 kg **41.75**

For hazard alert, storage, disposal, etc., see Sodium Carbonate, S0051.
CAS No. 5968-11-6

Goggle Sanitizing

You may be lucky enough to afford an ultraviolet sanitizing cabinet. If not, Lysol® kills gram positive and negative bacteria, including pseudomonas, staphylococcus, streptococcus, lipophillic viruses like the influenza virus A-2, herpes simplex, vaccinia and adeno type 2. Lysol is a concentrate. Dilute the Lysol in a full bucket of deionized water, immerse the goggles, and allow them to air dry.

Sodium Carbonate Solution

(as Na_2CO_3)

0.1 Molar	**S0235**	500 mL	**$7.75**

Storage: Inorganic #4
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Sodium Chlorate

$NaClO_3$
F.W. 106.45

Reagent	**S0058**	500 g	**$33.25**
granular			
Laboratory grade	**S0059**	500 g	**$15.75**
crystal			

★ **HAZARD ALERT:** Dangerous fire risk; strong oxidant; contact with organic material may cause fire; slightly toxic. LD_{50} 1200 mg/kg.
Storage: Inorganic #6
Disposal: #12a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 7775-09-9

Sodium Chloride

crystal
NaCl
F.W. 58.45

Reagent	**S0061**	500 g	**$ 9.75**
	S0062	2 kg	**25.05**
Laboratory grade	**S0063**	500 g	**$ 6.40**
	S0064	2 kg	**11.20**
	S0311	12 kg	**44.60**
Laboratory grade	**S0065**	1 kg	**$10.50**
rock salt, coarse			

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 3000 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Somewhat hygroscopic; keep tightly closed.
Soluble: Water and slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7647-14-5

Sodium Chloride Solution

(as NaCl)

Saturated	**S0236**	500 mL	**$9.60**
approx. 190 g/500 mL			
1 Molar	**S0347**	500 mL	**$8.30**
0.1 Molar	**S0237**	500 mL	**$7.85**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Sodium Citrate

citric acid, trisodium salt
laboratory grade, granular

$Na_3C_6H_5O_7 \cdot 2H_2O$	**S0068**	500 g	**$16.10**
F.W. 294.10			

Storage: Inorganic #2

Continued on next column.

Hazard Definitions

Carcinogen: Any substance that causes the development of cancerous growths in living tissue.

Mutagen: Any substance able to induce mutations in DNA and living cells.

Teratogen: Any substance that causes growth abnormalities in embryos, genetic modifications in cells, etc.

Allergen: Any substance that produces an allergic reaction.

Sodium Citrate *continued*

Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 6132-04-3

Sodium Dihydrogen Citrate

crystalline powder
citric acid, monosodium salt
sodium citrate, monobasic

$NaC_6H_7O_7$	**S0455**	25 g	**$12.60**
F.W. 214.11			

★ **HAZARD ALERT:** May be irritating to body tissue.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 18996-35-5

Sodium Dihydrogen Phosphate

see Sodium Phosphate, Monobasic

Sodium Dodecyl Sulfate

see Dodecyl Sulfate, Sodium Salt

Sodium Ethanoate

see Sodium Acetate

Sodium Fluoride

laboratory grade, powder

NaF	**S0316**	100 g	**$12.75**
F.W. 41.99			

★ **HAZARD ALERT:** Highly toxic by ingestion and inhalation; strong skin irritant. LD_{50} 52 mg/kg.
Storage: Inorganic #2 in a Flinn *Chem-Saf*™ Bag inside a locked poisons cabinet.
Disposal: #6
Shelf Life: Indefinite
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7681-49-4

Sodium Hexametaphosphate

Calgon®, sodium polyphosphate
laboratory grade

$(NaPO_3)_n$	**S0431**	500 g	**$25.70**
F.W. $(100.98)_n$			

★ **HAZARD ALERT:** Skin, eye, and respiratory irritant.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Fair; slightly hygroscopic.
Soluble: Soluble in water.
Color and Odor: White, odorless solid.
CAS No. 10124-56-8
Technical Note: Use in place of Calgon for water softening activities.

Sodium Hydrogen Carbonate

see Sodium Bicarbonate

Sodium Hydrogen Citrate

crystalline powder
citric acid, disodium salt
sodium citrate, dibasic

$Na_2C_6H_6O_7 \cdot 1.5H_2O$	**S0456**	25 g	**$14.60**
F.W. 263.11			

★ **HAZARD ALERT:** May be irritating to body tissue.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 6132-05-4

Sodium Hydrogen Phosphate

see Sodium Phosphate, Dibasic

Sodium Hydrogen Sulfate

see Sodium Bisulfate

Sodium Hydroxide

caustic soda, soda lye
NaOH
F.W. 40.00

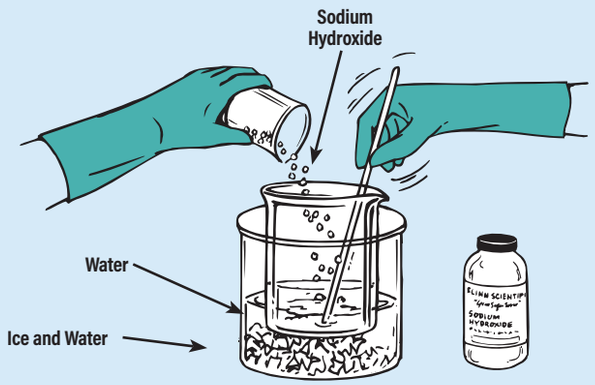
Reagent	**S0074**	100 g	**$ 10.69**
pellet	**S0075**	500 g	**20.40**
	S0076	2 kg	**65.90/1 255.60/4**
Laboratory grade	**S0279**	500 g	**$ 10.38**
flake	**S0077**	2 kg	**24.00**

★ **HAZARD ALERT:** Corrosive solid; skin burns are possible; large amounts of heat evolve when added to water; very dangerous to eyes; wear face and eye protection when using this substance. Wear gloves. TLV 2 mg/m^3.
Storage: Inorganic #4
Disposal: #10
Shelf Life: Good; keep tightly closed.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 1310-73-2

Sodium Hydroxide and Heat

Preparing Sodium Hydroxide Solution?

A large amount of heat is released when sodium hydroxide dissolves in water. The temperature of the solution may increase very rapidly. In fact, the temperature may rise so fast that the solution will boil and possibly spatter a hot, caustic solution. Immerse the beaker or flask in an ice water bath to control the solution temperature. Add ingredients slowly while stirring continuously. Use only borosilicate glassware, and make sure that there are no scratches, chips or breaks.



Sodium Hydroxide, Gramolpak

(as NaOH)

1 Molar	**S0394***	pkg. (Makes 1 L)	**$10.00**

For hazard alert, storage, disposal, etc., see Sodium Hydroxide, S0074.
*Gramolpak™ is a unique package that makes a known solution with distilled water.

Sodium Hydroxide Solution

50%

(as NaOH) approx. 19 M	**S0078**	500 mL	**$22.65**

★ **HAZARD ALERT:** Corrosive liquid; skin burns are possible; very dangerous to eyes; wear gloves.
Storage: Inorganic #4
Disposal: #10
Shelf Life: Good if kept tightly closed.
Color and Odor: Colorless, odorless liquid.

Sodium Hydroxide Solution

(as NaOH)

6 Molar	**S0242**	500 mL	**$12.36**
3 Molar	**S0447**	500 mL	**10.50**
1 Molar	**S0148**	500 mL	**8.30**
0.5 Molar	**S0243**	500 mL	**8.51**
0.2 Molar	**S0244**	500 mL	**8.02**
0.1 Molar	**S0149**	500 mL	**7.62**

For hazard alert, storage, disposal, etc., see Sodium Hydroxide Solution, 50%, S0078.

Sodium Hypochlorite Solution

bleach, 5% available chlorine
NaOCl
F.W. 74.44

S0080	1 liter	**$12.30**
S0081	3.78 liters	**20.85**

★ **HAZARD ALERT:** Corrosive liquid; causes skin burns; reacts with acid to evolve chlorine gas; evolves chlorine when heated; moderately toxic by ingestion and inhalation; avoid contact with organic material.
Storage: Inorganic #6
Disposal: #26b
Shelf Life: Fair; decomposes upon exposure to heat or light. Store in a cool, dry place.
Color and Odor: Faint yellow liquid; odor like chlorine or bleach.
CAS No. 7681-52-9 (for pure NaOCl)
Technical Note: Flinn sodium hypochlorite solution contains 5–5½% w/v sodium hypochlorite. Solution is approximately 0.7 M.

Sodium Hyposulfite

see Sodium Thiosulfate

Sodium Iodate

laboratory grade, powder
$NaIO_3$
F.W. 197.90

S0082	100 g	**$43.85**

★ **HAZARD ALERT:** Oxidant; fire risk in contact with organic material; slightly toxic by ingestion.
Storage: Inorganic #6
Disposal: #12a
Shelf Life: Deliquescent; changes color on exposure to light; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and acetone; not alcohol.
Color and Odor: White solid with faint iodine odor.
CAS No. 7681-55-2

Sodium Iodide

granular
NaI
F.W. 149.92

Reagent	**S0083**	25 g	**$15.45**
	S0084	100 g	**40.68**
Laboratory grade	**S0436**	100 g	**$ 38.00**
	S0437	500 g	**160.26**

★ **HAZARD ALERT:** Slightly toxic. LD_{50} 4340 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Deliquescent; changes color on exposure to light; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water, alcohol, and glycerin.
Color and Odor: White, odorless solid.
CAS No. 7681-82-5

Sodium Iodide Solution

(as NaI)

0.5 Molar	**S0369**	500 mL	**$27.40**
0.1 Molar	**S0245**	500 mL	**10.50**

SODIUM IODIDE SOLUTION continued on next page.

Dry Sand—A Chemist's Good Friend

Dry sand is a good fire extinguisher, especially for use with flammable metals like sodium. Dry, clean sand also can be used to dike and absorb a hazardous material spill. Sand provides necessary traction in a treacherous floor situation. See to it that dry, clean sand is available in your laboratory and chemical storeroom.

Sodium Iodide Solution *continued*

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good, if kept tightly closed.
Color and Odor: Colorless, odorless liquid.

Sodium Lauryl Sulfate

see Dodecyl Sulfate, Sodium Salt

Sodium Metabisulfite

sodium pyrosulfite
reagent grade, granular

$Na_2S_2O_5$	**S0317**	100 g	**$ 9.45**
F.W. 190.11	**S0087**	500 g	**17.95**

★ **HAZARD ALERT:** Skin and tissue irritant; moderately toxic by ingestion. LD_{50} 1131 mg/kg.
Storage: Inorganic #2
Disposal: #12b
Shelf Life: Poor; moisture-sensitive.
Soluble: Water; slightly in alcohol.
Color and Odor: White solid with a sulfur odor.
CAS No. 7681-57-4

Sodium Monohydrogen Phosphate

see Sodium Phosphate, Dibasic

Sodium Nitrate

$NaNO_3$
F.W. 84.99

Reagent	**S0281**	100 g	**$ 10.25**
crystal	**S0088**	500 g	**25.90**
Laboratory grade	**S0090**	500 g	**$12.30**
granular			

★ **HAZARD ALERT:** Strong oxidizer; avoid friction or shock—explosions have occurred; moderately toxic by ingestion. LD_{50} 1267 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water; slightly in alcohol.
Color and Odor: White, odorless solid.
CAS No. 7631-99-4

Sodium Nitroferricyanide

sodium nitroprusside
for detection of the amino acid cysteine
reagent grade, crystal

$Na_2Fe(CN)_5NO \cdot 2H_2O$	**S0221**	25 g	**$63.04**
F.W. 297.91			

★ **HAZARD ALERT:** Highly toxic by ingestion and inhalation.
Storage: Inorganic #7
Disposal: #14. P-Listed (P030); purchase small amounts for effective inventory control.
Shelf Life: Poor; hygroscopic.
Soluble: Water; slightly in alcohol.
Color and Odor: Red/purple, odorless solid.
CAS No. 13755-38-9

Hood Storage of Chemicals

Reasons not to use a hood for chemical storage:

1. Hoods do not provide a secure storage space.
2. Labels may be damaged beyond recognition due to constant exposure to a corrosive environment.
3. The presence of hazardous materials stored under a hood would seriously complicate a hood fire.
4. Storing chemicals in the hood reduces available work space.
5. Many fume motor/blower sets are not designed for continuous, 24-hour operation.

Sodium Oxalate

powder
$Na_2C_2O_4$
F.W. 134.00

Reagent	**S0094**	100 g	**$20.00**
	S0095	500 g	**62.00**
Laboratory grade	**S0438**	100 g	**$17.70**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant. LD_{50} (mouse) 5094 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Poor; hygroscopic.
Color and Odor: White, odorless solid.
CAS No. 62-76-0

Sodium Phosphate, Monobasic

sodium dihydrogen phosphate
reagent grade, crystal

$NaH_2PO_4 \cdot H_2O$	**S0097**	100 g	**$12.45**
F.W. 137.99	**S0098**	500 g	**40.00**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Slightly hygroscopic.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 10049-21-5

Sodium Phosphate (Monobasic) Solution

0.1 Molar

(as $NaH_2PO_4 \cdot H_2O$)	**S0371**	500 mL	**$8.70**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Sodium Phosphate, Dibasic

disodium hydrogen phosphate, heptahydrate
reagent grade, granular

$Na_2HPO_4 \cdot 7H_2O$	**S0099**	500 g	**$28.05**
F.W. 268.07			

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Hot water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7782-85-6

Sodium Phosphate, Dibasic

disodium hydrogen phosphate, anhydrous
reagent grade, powder

Na_2HPO_4	**S0223**	100 g	**$12.70**
F.W. 141.96			

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Hygroscopic; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Hot water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7558-79-4

Sodium Phosphate, Dibasic, Solution

(as $Na_2HPO_4 \cdot 7H_2O$)

1.0 Molar	**S0350**	500 mL	**$11.95**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite.
Color and Odor: Colorless, odorless liquid.

Sodium Phosphate, Tribasic

TSP, trisodium phosphate
laboratory grade, granular

$Na_3PO_4 \cdot 12H_2O$	**S0101**	500 g	**$16.75**
F.W. 380.12			

SODIUM PHOSPHATE, TRIBASIC continued on next page.

Sodium Phosphate, Tribasic *continued*

★ **HAZARD ALERT:** Slightly toxic by ingestion; severe body tissue irritant.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 10101-89-0
Technical Note: Excellent cleaner for washing wood acid cabinets.

Sodium Phosphate, Tribasic, Solution

0.1 Molar
(Na_3PO_4•$12H_2O$) **S0250** 500 mL **$8.85**

For hazard alert, storage, etc., see Sodium Phosphate, Tribasic, S0101.
Disposal: #26b
Color and Odor: Colorless, odorless liquid.

Sodium Polyacrylate

powder **W0013** 100 g **$12.38**
W0014 500 g **32.91**

Storage: Organic #3
Disposal: #26a
Shelf Life: Good if kept dry.
Soluble: Water
Color and Odor: White, odorless solid.
CAS No. 9003-04-7
Technical Note: Sodium polyacrylate is a super absorbent that will absorb about 800 times its weight in distilled water.

Sodium Potassium Tartrate

see Potassium Sodium Tartrate

Sodium Rhodizonate

rhodizonic acid, disodium salt
$C_6O_6Na_2$ **S0448** 1 g **$13.25**
F.W. 214.06

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Gray, odorless solid.
CAS No. 523-21-7
Technical Note: Use a 0.2% aqueous solution as a lead testing reagent. Solution must be made fresh.

Sodium Silicate Solution

water glass
laboratory grade **S0102** 500 mL **$ 8.05**
S0103 4 liters **31.15**

★ **HAZARD ALERT:** Body tissue irritant.
Storage: Inorganic #4
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.
Technical Note: This solution is 37–40% sodium silicate, (40–42 °Be, approx. density 1.40). It is prepared using a high-temperature, high-pressure process and cannot be made in lab.

Sodium Sulfate

Glauber's salt, decahydrate
reagent grade, crystal
Na_2SO_4•$10H_2O$ **S0225** 100 g **$13.65**
F.W. 322.19 **S0104** 500 g **46.05**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Substance loses water of hydration at 100 °C; indefinite.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7727-73-3

Sodium Sulfate

anhydrous
Na_2SO_4
F.W. 142.02
Reagent **S0105** 500 g **$17.05**
granular
Laboratory grade **S0107** 500 g **$ 8.40**
powder **S0108** 2 kg **21.55**

Storage: Inorganic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7757-82-6

Sodium Sulfide

chunk
Na_2S•$9H_2O$
F.W. 240.18
Reagent **S0109** 100 g **$25.44**
S0110 500 g **54.30**
Laboratory grade **S0439** 100 g **$17.25**

★ **HAZARD ALERT:** Toxic by ingestion and skin absorption; corrosive to skin and eyes. LD_{50} (for anhydrous salt) 208 mg/kg.
Storage: Inorganic #5
Disposal: #23
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag and then inside a Flinn *Saf-Stor*™ Can.
Soluble: Water; slightly in alcohol.
Color and Odor: Colorless solid with rotten egg odor.
CAS No. 1313-84-4
Technical Note: Readily absorbs water from air. May appear as a slurry, especially under hot, humid conditions.

Sodium Sulfite

anhydrous
laboratory grade, granular
Na_2SO_3 **S0111** 500 g **$13.70**
F.W. 126.05

★ **HAZARD ALERT:** Slightly toxic; possible body tissue irritant. LD_{50} 3560 mg/kg.
Storage: Inorganic #2
Disposal: #12b
Shelf Life: Moisture-sensitive.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7757-83-7

Sodium Sulfite Solution

1 Molar
(as Na_2SO_3) **S0253** 500 mL **$10.25**

Storage: Inorganic #2
Disposal: #12b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Sodium Tetraborate

see Sodium Borate

Sodium Thiocyanate

laboratory grade, crystal
NaSCN **S0113** 100 g **$18.30**
F.W. 81.08

★ **HAZARD ALERT:** Moderately toxic. LD_{50} 764 mg/kg.
Storage: Inorganic #7
Disposal: #26a
Shelf Life: Hygroscopic and affected by light; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 540-72-7

Sodium Thiosulfate

hypo, pentahydrate
crystal
$Na_2S_2O_3 \cdot 5H_2O$
F.W. 248.19

Reagent	**S0114**	500 g	**$11.70**
	S0115	2 kg	**44.85**
Laboratory grade	**S0116**	1 kg	**$14.05**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant. LD_{50} 2000 mg/kg.
Storage: Inorganic #2
Disposal: #12b
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 10102-17-7

Sodium Thiosulfate

anhydrous
reagent grade, granular
$Na_2S_2O_3$ **S0322** 100 g **$ 10.70**
F.W. 158.11 **S0117** 500 g **18.35**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant.
Storage: Inorganic #2
Disposal: #12b
Shelf Life: Deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7772-98-7

Sodium Thiosulfate Solution

0.1 Molar
(as $Na_2S_2O_3$) **S0150** 500 mL **$8.60**

Storage: Inorganic #2
Disposal: #12b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Stains

see individual listings, e.g., Crystal Violet, Methylene Blue, etc.

Stannic...Stannous...

see Tin(IV) and Tin(II)

Starch, Corn

laboratory grade, powder

	S0124	500 g	**$12.00**
	S0282	2 kg	**31.40**

Storage: Organic miscellaneous
Disposal: #26a
Shelf Life: Indefinite if kept dry.
Soluble: Water
Color and Odor: White, odorless solid.

Starch, Potato

powder

ACS Reagent	**S0122**	100 g	**$21.15**
starch soluble for iodometry	**S0123**	500 g	**66.25**
Laboratory grade	**S0125**	500 g	**$17.05**

Storage: Organic miscellaneous
Disposal: #26a
Shelf Life: Indefinite if kept dry.
Soluble: Water
Color and Odor: White, odorless solid.

What Does *Moderately Toxic* Mean?

Moderately toxic materials may be described as harmful if swallowed. They have Oral-Rat LD_{50} values between 300–2000 mg/kg or Inhalation-Rat LC_{50} of 220–2200 ppm/hr. To avoid chemical contact, immediately clean up all spills and never eat or drink in the lab. Rely on Flinn to help you understand chemical hazards and how they can affect you.

Starch, Spray

S0302 20 oz. can **$8.60**

Storage: Miscellaneous nonhazardous organic material.
Shelf Life: Indefinite
Soluble: Water
Color and Odor: White, odorless spray.
Technical Note: Starch solution as an indicator for iodine can easily be made using spray starch. Generously spray the starch into the desired quantity of water and stir. Prepare as needed since starch solutions have a poor shelf life.

Starch Solution

0.5%, aqueous **S0151** 500 mL **$11.55**

Storage: Miscellaneous nonhazardous organic material.
Disposal: #26b
Shelf Life: Poor; deteriorates over time depending on storage conditions.
Color and Odor: Colorless, odorless liquid.

Stearic Acid

octadecanoic acid
powder
$CH_3(CH_2)_{16}COOH$
F.W. 284.49

Reagent	**S0336**	500 g	**$19.90**
Laboratory grade	**S0126**	500 g	**$22.00**

Storage: Organic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Many organic solvents; not water.
Color and Odor: Off-white solid with faint wax odor.
CAS No. 57-11-4
Technical Note: Laboratory grade stearic acid is actually 50% stearic acid and 45% palmitic acid; melting point is 55–56 °C. Reagent grade is >95% stearic acid: melting point is 67–69 °C. The reagent grade is a better choice for melting point labs.

Steel, Shot

S0127 500 g **$10.50**

Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Insoluble in chemicals commonly found on school premises.
Color and Odor: Gray, odorless solid.
Technical Note: Steel shot are irregularly shaped steel pieces, not small, evenly sized spheres.

Steel, Wool

size 00, 16 pads **S0128** 300 g **$10.20**

★ **HAZARD ALERT:** Steel wool is a flammable solid. Avoid contact with flames and electricity. Steel wool may spontaneously ignite upon contact with the leads on a typical dry-cell battery.
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite; will quickly oxidize if stored in a corrosive environment.
Soluble: Easily in common mineral acids.
Color and Odor: Gray, odorless solid.
Technical Note: To remove protective coating, soak steel wool in acetone for a few minutes.

Strontium Chloride

crystal
$SrCl_2 \cdot 6H_2O$
F.W. 266.64

Reagent	**S0129**	100 g	**$12.84**
	S0130	500 g	**36.42**
Laboratory grade	**S0440**	100 g	**$10.97**
	S0441	500 g	**31.94**

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 2250 mg/kg (for anhydrous salt).
Storage: Inorganic #2
Disposal: #26a

STRONTIUM CHLORIDE continued on next page.

Strontium Chloride *continued*

Shelf Life: Fair to poor; effloresces in air; deliquesces in moist air; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 10025-70-4

Strontium Chloride Solution

(as $SrCl_2 \cdot 6H_2O$)

1 Molar	**S0358**	500 mL	**$19.35**

Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good, if stored properly.
Color and Odor: Colorless, odorless liquid.

Strontium Nitrate

crystal
$Sr(NO_3)_2$
F.W. 211.63

Reagent	**S0131**	100 g	**$14.30**
Laboratory grade	**S0442**	100 g	**$12.80**
	S0443	500 g	**27.85**

★ **HAZARD ALERT:** Strong oxidant; fire risk in contact with organic material; slightly toxic. Possible body tissue irritant. LD_{50} 2750 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water; slightly in absolute alcohol.
Color and Odor: White, odorlesss solid.
CAS No. 10042-76-9

Strontium Nitrate Solution

(as $Sr(NO_3)_2$)

1 Molar	**S0359**	500 mL	**$16.65**
0.1 Molar			

★ **HAZARD ALERT:** Possible body tissue irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Succinic Acid

butanedioic acid
laboratory grade, powder

$(CH_2COOH)_2$	**S0133**	100 g	**$21.10**

F.W. 118.09

★ **HAZARD ALERT:** Slightly toxic by ingestion. LD_{50} 2260 mg/kg.
Storage: Organic #1
Disposal: #24a
Shelf Life: Indefinite
Soluble: Alcohol; slightly in water.
Color and Odor: White, odorless solid.
CAS No. 110-15-6

Sucrose

crystal
$C_{12}H_{22}O_{11}$
F.W. 342.31

Reagent	**S0134**	500 g	**$18.65**
	S0283	2 kg	**51.00**
Laboratory grade	**S0135**	1 kg	**$14.80**
cane sugar, white	**S0136**	2 kg	**21.95**

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; slightly in alcohol.
Color and Odor: White solid with malt odor.
CAS No. 57-50-1
Technical Note: Not for human consumption.

Sudan III Solution

0.01%, alcoholic staining solution

	S0159	100 mL	**$9.39**

★ **HAZARD ALERT:** Alcohol-based solution; flammable liquid; toxic by ingestion and inhalation.
Storage: Organic #9 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18a
Shelf Life: Good if stored safely.
Color and Odor: Red liquid with alcohol odor.

Sudan IV Solution

0.01%, alcoholic staining solution

	S0160	100 mL	**$11.15**

★ **HAZARD ALERT:** Alcohol-based solution; flammable liquid; moderately toxic.
Storage: Organic #9 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b
Shelf Life: Good if stored safely.
Color and Odor: Red liquid with alcohol odor.

Sugar, White Cane

see Sucrose

Sulfur, Flowers

laboratory grade, powder
sublimed

S	**S0138**	500 g	**$12.50**

A.W. 32.066

★ **HAZARD ALERT:** This finely divided form of sulfur can be a moderate fire or explosion risk. Sulfur has low toxicity. When sulfur is burned, toxic sulfur dioxide is produced. May be a skin irritant.
Storage: Inorganic #10
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in alcohol and other organic solvents; insoluble in water.
Color and Odor: Yellow solid with faint rotten egg odor.
CAS No. 7704-34-9

Sulfur, Roll

laboratory grade, flake

S	**S0140**	500 g	**$9.60**

A.W. 32.066

★ **HAZARD ALERT:** Dust or finely divided material in the container can be a moderate fire risk. When sulfur is burned, toxic sulfur dioxide is produced. Sulfur has low toxicity. May be a skin irritant.
Storage: Inorganic #10
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in alcohol and other organic solvents; insoluble in water.
Color and Odor: Yellow solid with faint rotten eggs odor.
CAS No. 7704-34-9

Sulfur, Precipitated

lac sulfur
laboratory grade, powder

S	**S0142**	500 g	**$13.50**

A.W. 32.066

SULFUR, PRECIPITATED continued on next page.

Hazardous Shipping Fee

Certain items sold by Flinn are classified as hazardous materials by the U.S. Department of Transportation and therefore require special handling to ensure safe transport. A flat fee of $32 per order is added to cover these handling requirements and such items can only be shipped to schools, museums and science centers.

Sulfur, Precipitated *continued*

★ **HAZARD ALERT:** This finely divided form of sulfur can be a moderate fire or explosion risk. Sulfur has low toxicity. When sulfur is burned, toxic sulfur dioxide is produced. May be a skin irritant.
Storage: Inorganic #10
Disposal: #26a
Shelf Life: Indefinite
Soluble: Slightly in alcohol and other organic solvents; insoluble in water.
Color and Odor: Yellow solid with faint rotten egg odor.
CAS No. 7704-34-9

Sulfur Hexafluoride Gas

lecture bottle	**LB1030**	0.5 lb (37 liters)	**$428.40**

★ **HAZARD ALERT:** May react violently with organometallics and chemically-active metals.
Storage: In an area dedicated to bottled gases.
Disposal: Completely empty lecture bottle in a well-operating fume hood, then follow #26a.
Shelf Life: Indefinite; if stored safely.
Soluble: Alcohol; slightly in water.
Color and Odor: Colorless, odorless.
CAS No. 2551-62-4

Sulfuric Acid

18 Molar

ACS, reagent	**S0228**	100 mL	**$ 10.41**
H_2SO_4	**S0143**	500 mL	**39.00**
F.W. 98.08	**S0144**	2.5 liters	**45.55**
	S0145*	2.5 liters	**51.95/1 201.44/4**

(*Packaged in PVC-coated bottle)

★ **HAZARD ALERT:** *Severely corrosive* to eyes, skin and other tissue; considerable heat of dilution with water; mixing with water may cause spraying and spattering. Solutions might best be made by immersing the mixing vessel in an ice bath. Even very dilute solutions are harmful to eyes and skin. ***Always add the acid to water, never the reverse;*** extremely hazardous in contact with finely divided materials, carbides, chlorates, nitrates, and other combustible materials. TLV 1 mg/m^3. LD_{50} 2140 mg/kg.
Storage: Inorganic #9 in a dedicated acid cabinet and away from any source of water; if an acid cabinet is not available, store in a Flinn *Saf-Cube*™.
Disposal: #24b
Shelf Life: Good, but only if stored away from water and under safe conditions. Sulfuric acid has an affinity to water—abstracting it from the air and from organic substances, hence it chars wood, sugar, etc. If sulfuric acid has turned dark brown on your shelf its purity would be in question.
Soluble: Water, evolving very considerable heat. Use an ice bath.
Color and Odor: Colorless liquid with sulfurous odor.
CAS No. 7664-93-9
Cap Safety Color Code: Yellow
Technical Note: Spilled sulfuric acid presents a very slippery floor problem. We hope you understand why it is essential to maintain a bucket of dry sand in the area where sulfuric acid is stored.
Safety Purchase Suggestion: Buy and store only small package sizes and small quantities. For safety reasons, Flinn offers larger sizes of sulfuric acid and other hazardous substances in PVC-coated bottles. We have attempted to price the products in these safer containers as low as possible.
*Sulfuric acid is exactly as described under catalog number S0144 but in a PVC-coated bottle. In the event of breakage, acid and glass shards are safely retained in a PVC outer envelope. The PVC-coated bottle is a safer package for science teachers.

Goggle Use

When is it appropriate to wear goggles? Science teachers often respond by citing specific situations (e.g., when working with strong bases, when working with acids, when working with biuret). A good general rule would be... WORKING WITH CHEMICALS... ANY CHEMICALS... WEAR GOGGLES!

Wear chemical splash goggles whenever working with chemicals, glassware or heat.

Sulfuric Acid Solution

(as H_2SO_4)

12.5 Molar	**S0380**	500 mL	**$18.45**
	S0406	1 liter	**31.50**
9 Molar	**S0414**	1 liter	**$29.60**
6 Molar	**S0415**	500 mL	**$16.80**
	S0416	1 liter	**26.70**
3 Molar	**S0417**	500 mL	**$11.90**
	S0418	1 liter	**21.75**
2 Molar	**S0205**	1 liter	**$17.10**
1 Molar	**S0202**	500 mL	**$11.60**
	S0203	1 liter	**15.70**
0.1 Molar	**S0420**	1 liter	**$12.80**

★ **HAZARD ALERT:** Treat all sulfuric acid solutions with the same caution you would have for concentrated sulfuric acid. For example, the pH of 0.05 M sulfuric acid solution is 1.2.
Storage: Inorganic #9; preferably in a dedicated acid cabinet.
Disposal: #24b
Shelf Life: Indefinite
Soluble: Water
Color and Odor: Colorless, odorless liquid.

T

Tes-Tape

see Glucose Test Strips

Test Papers (litmus, etc.)

see page 193

Thermit™

black	**T0007**	500 g	**$17.45**

★ **HAZARD ALERT:** When ignited, produces an extremely hot (>2000 °C) reaction mixture that will throw sparks 10–15 feet and is difficult to stop. Wear face, hand, and eye protection and use a safety shield when performing demonstration.
Storage: Inorganic #4 inside a Flinn *Saf-Stor*™ Can and then in a dedicated flammables cabinet.
Disposal: #26a
Shelf Life: Good if stored safely.
Color and Odor: White/gray/black, odorless solid.
CAS No. 69012-31-3
Technical Note: Thermit is a mixture of ferric oxide and very fine aluminum powder. The thermite reaction requires a temperature of almost 1200 °C for ignition, and is best performed using specially designed igniting sticks (see next listing, T0086).

Thermite Igniting Sticks

	T0086	pkg./10	**$52.35**

★ **HAZARD ALERT:** Thermite igniting sticks are a fire hazard when exposed to a flame or temperatures above 500 °F. Contact us for a technical data sheet relating to their use.
Storage: Inorganic #1 in a dedicated flammables cabinet.
Disposal: #26a
Shelf Life: Indefinite if kept dry.
Color and Odor: Silver gray metal on a copper stick, odorless.
Safety Purchase Suggestion: These igniting sticks are the easiest and safest method for starting thermite reactions. Please consider using them instead of magnesium metal ribbon or other chemical igniters.

Thymol Blue

indicator, sodium salt
pH 1.2 red to 2.8 yellow and 8.0 yellow to 9.2 blue
reagent grade, crystal

$C_{27}H_{29}NaO_5S$	**T0025**	1 g	**$13.25**
F.W. 488.58			

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite
Soluble: Alcohol and water.
Color and Odor: Black, odorless solid.
CAS No. 62625-21-2

Thymol Blue Indicator Solution

0.04%, aqueous

	T0045	100 mL	$10.70

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Dark blue, odorless liquid.

Thymolphthalein

indicator
pH 9.3 colorless to 10.5 blue
reagent grade, powder

$C_{28}H_{30}O_4$	T0073	5 g	$17.85
F.W. 430.52			

Storage: Organic #9
Disposal: #18b
Shelf Life: Indefinite
Soluble: Alcohol and acetone; not water.
Color and Odor: White, odorless solid.
CAS No. 125-20-2

Thymolphthalein Indicator Solution

0.04%, alcoholic

	T0080	500 mL	$19.30

★ **HAZARD ALERT:** Alcohol solution; flammable liquid.
For storage, disposal, etc., see Thymolphthalein, T0073.
Color and Odor: Colorless liquid with alcohol odor.

Tin

granular
20 mesh
Sn
A.W. 118.69

Reagent	T0013	100 g	$ 37.29
	T0063	500 g	132.89
Laboratory grade	T0090	100 g	$31.60

Storage: Inorganic #1
Disposal: #27a
Shelf Life: Indefinite
Soluble: Not water; acids and hot potassium hydroxide solution.
Color and Odor: Shiny gray, odorless solid.
CAS No. 7440-31-5

Tin, Foil

0.0015 thick x 12" wide	T0064	100 g	$ 37.29
Sn	T0017	500 g	117.25

For storage, disposal, etc., see Tin, granular, T0013.

Tin, Mossy

Sn	T0014	100 g	$ 30.13
	T0015	500 g	132.75

For storage, disposal, etc., see Tin, granular, T0013.

Tin, Sheet

Sn, 1/32" thick	T0089	12" x 4", approx. 125 g	$40.85
	T0088	12" x 12", approx. 500 g	103.12

For storage, disposal, etc., see Tin, granular, T0013.

Tin, Shot

Sn	T0057	25 g	$17.98
	T0016	100 g	38.52

For storage, disposal, etc., see Tin, granular, T0013.

Tin, Strips

Sn, 1/32" thick

6" long x 1/2" wide	T0087	pkg./6	$13.97

For storage, disposal, etc., see Tin, granular, T0013.

Tin(II)...Stannous... Tin compounds in which the tin has an ionic charge or oxidation number of two.

Tin(II) Chloride

stannous chloride
laboratory grade, crystal

$SnCl_2 \cdot 2H_2O$	S0120	100 g	$23.10
F.W. 225.65			

★ **HAZARD ALERT:** Moderately toxic; skin irritant; corrosive. LD_{50} 700 mg/kg.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Poor; absorbs oxygen from air and converts into an insoluble oxychloride; keep tightly closed; store in a Flinn *Chem-Saf*™ Bag. Moisture-sensitive.
Soluble: Water, alkalies, tartaric acid and alcohol.
Color and Odor: White solid with slight chlorine odor.
CAS No. 10025-69-1

Tin(II) Chloride Solution

1 Molar

(as $SnCl_2 \cdot 2H_2O$ in HCl)	S0354	500 mL	$22.80

★ **HAZARD ALERT:** Corrosive to body tissue; moderately toxic by ingestion.
Storage: Inorganic #2
Disposal: #24b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Toluene

toluol
reagent grade

$C_6H_5CH_3$	T0019	500 mL	$ 11.25
F.W. 92.14	T0061	1 liter	21.65/1
			125.94/6

★ **HAZARD ALERT:** Moderately toxic by ingestion, inhalation, and skin absorption; flammable liquid; dangerous fire risk. Possible skin irritant. Possible reproductive/fertility hazard. LD_{50} 636 mg/kg. TLV 377 mg/m^3.
Storage: Organic #3 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b. U-Listed (U220); purchase small amounts for effective inventory control.
Shelf Life: Good if stored safely.
Soluble: Alcohol; not water.
Color and Odor: Colorless liquid with a benzenelike odor.
CAS No. 108-88-3

TOP

see 4-tert-Octylphenol

1,2,3-Triketohydrindene Hydrate

see Ninhydrin

Tris-Acetate Buffer

TAE buffer
pH 7.8 buffer for DNA or RNA electrophoresis
50X buffer concentrate
100 mL of concentrate is enough to make
5 L of buffer solution

	FB0325	100 mL	$27.26

Cleaning and Scratching Glassware

Scratches are a real enemy of glass. Why? A scratch causes a stress point in the glass around which a break will occur. Have you ever watched glass being cut? The first thing done is to scratch or scribe the glass. Pressure is placed on the scratched line, and a clean break occurs. If you can clean glassware without using wire brushes that may scratch—great. The sooner dirty labware is washed, the easier it is to clean.

U

Universal Indicator Solution

pH range 4–10
color indicator chart is attached to the bottle

U0009*	35 mL	**$ 7.79**
U0001	100 mL	**10.72**
U0002	500 mL	**17.25**
U0011	1000 mL	**31.28**

★ **HAZARD ALERT:** Alcohol-based solution; flammable liquid.
Storage: Organic #9 in a dedicated flammables cabinet. If one is not available, store in a Flinn *Saf-Stor*™ Can.
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Dark green liquid with slight alcohol odor.
*Special, unique dropping bottle package called a Flinn *E-Z Drop*™.

Universal Indicator, Red Cabbage Extract

pH range 2–11
Powdered cabbage extract. Will make gallons of red cabbage indicator solution.

U0014 10 g **$16.30**

Storage: Organic #9
Disposal: #26a
Shelf Life: Indefinite, if stored in a cool, dry area.
Soluble: Water
Color and Odor: Dark maroon solid with cabbage odor.
Technical Note: Prepare a 0.2% solution to use as an indicator.

Rainbow Acid Universal Indicator, pH 1–7 U0012



Universal Indicator Solution, Rainbow Acid

pH range 1–7
color indicator chart attached to the bottle

U0012 100 mL **$11.05**

Storage: Organic #9
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Dark green liquid.
Technical Note: Rainbow spectrum of colors observed for pH values from 1–7. Excellent indicator to test acidity levels of common household substances.

Urea

laboratory grade, beads
NH_2CONH_2 **U0003** 500 g **$11.60**
F.W. 60.06

Storage: Organic #2
Disposal: #26a
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 57-13-6

Universal Indicator Combination Kit

FLINN EXCLUSIVE

Two great indicators, one low price!

Contains one bottle (100 mL) each of the standard universal indicator solution (pH 4–10) and the rainbow acid universal indicator (pH 1–7). Combination kit offers great versatility for identifying the pH range and acid–base properties of common household substances.

AP7149 2 x 100 mL **$19.28**

V

Vanillin

Reagent
4-Hydroxy-3-methoxybenzaldehyde
$C_8H_8O_3$ **V0007** 100 g **$37.20**
F.W. 152.15

★ **HAZARD ALERT:** Body tissue irritant
Storage: Organic #3
Disposal: #2
Shelf Life: Excellent, if stored safely.
Soluble: ethanol, diethyl ether, acetone
Color and Odor: Light yellow to white solid with a vanilla odor.
CAS No. 121-33-5

Vegetable Dyes

see Food Coloring Dyes and FD&C Food Dyes

Vermiculite

see Super Sorb® on page 584

Vinegar

Cider	**V0002**	3.78 liters	**$11.26**
White	**V0005**	3.78 liters	**$12.30**

Storage: Organic #1
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: Brown or clear liquid with acetic acid odor.
CAS No. 64-19-7

W

Washing Soda

see Sodium Carbonate

Water

Deionized	**W0007**	4 liters	**$11.37**
Distilled	**W0001**	4 liters	**11.33**

Storage: Miscellaneous nonhazardous material.
Disposal: #26b
Shelf Life: Indefinite if kept tightly closed. If your distilled water is stored for a long period, it will gradually become acidic, due to the presence of dissolved CO_2. Boiling the water before use will drive off and eliminate the dissolved CO_2.
Color and Odor: Colorless, odorless liquid.
CAS No. 7732-18-5

Water Glass

see Sodium Silicate Solution

Waterlock®

see Sodium Polyacrylate

Waxes

see individual listings (Paraffin, etc.)

X

Xylenes

reagent grade
$C_6H_4(CH_3)_2$ **X0001** 500 mL **$14.05**
F.W. 106.17

★ **HAZARD ALERT:** Flammable liquid; moderate fire risk; slightly toxic by ingestion and inhalation. Avoid skin contact. LD_{50} 4300 mg/kg. TLV 434 mg/m^3.
Storage: Organic #3 in a dedicated flammables cabinet. If one is not available, then store in a Flinn *Saf-Stor*™ Can.
Disposal: #18b. U-Listed (U239); purchase small amounts for effective inventory control.
Shelf Life: Good if kept tightly closed and stored safely.
Soluble: Alcohol; not water.
Color and Odor: Colorless liquid with airplane glue odor.
CAS No. 1330-20-7

Y

Yeast

Baker's
viable — **Y0008** — pkg./3 — **$11.10**
three 7 g packets

Brewer's — **Y0002** — 500 g — **$24.00**
powder, inactive

Storage: Miscellaneous, nonhazardous organic material.
Disposal: #26a
Shelf Life: Good if kept dry; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water
Color and Odor: Brown solid with malt odor.

Z

Zinc, Dust

laboratory grade
Zn — **Z0005** — 500 g — **$27.81**
A.W. 65.37

★ **HAZARD ALERT:** Zinc dust can be a dangerous fire risk; may form explosive mixture with air. If allowed to get damp in a confined bottle, heat will be generated and the mixture may even ignite; cases are known where bottles have exploded under pressure. ***Keep this product dry!***
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Good if kept dry. Store in a Flinn *Chem-Saf*™ Bag to ensure it is kept dry.
Soluble: Acids and alkalies; not water.
Color and Odor: Light gray, odorless solid.
CAS No. 7440-66-6

Zinc, Foil

0.010" x 10" x 36" — **Z0008** — ea. roll — **$33.65**
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.



Forms of Zinc
1. Mossy
2. Foil
3. Pieces
4. Granular
5. Dust
6. Strips
7. Shot

Zinc, Granular

reagent grade, 20–30 mesh
Zn — **Z0028** — 100 g — **$17.54**
A.W. 65.37 — **Z0002** — 500 g — **57.68**

★ **HAZARD ALERT:** Zinc metal dust could be flammable; dust may be present at the bottom of your bottle of this form of zinc.
★ **SPECIAL HAZARD ALERT:** Granular zinc is often used. See in a classic lab experiment to turn copper pennies into "silver" and then "gold". See the Gold Rush Chemical Demonstration Kit on page 237. Do *not* use sodium hydroxide in this reaction—the leftover basic zinc residue is a fire hazard. Call or write us to obtain a complimentary copy of a revised procedure for this demonstration using granular zinc and zinc chloride. Visit flinnsci.com to access publication No. 10991, Turning Copper Pennies into "silver" and "gold!"
Storage: Inorganic #1
Disposal: #26a
Shelf Life: Indefinite
Soluble: Acids and alkalies; not water.
Color and Odor: White/gray, odorless solid.
CAS No. 7440-66-6

Zinc, Mossy

laboratory grade
Zn — **Z0003** — 500 g — **$29.95**
Z0004 — 2 kg — **78.28**

★ **HAZARD ALERT:** Zinc metal dust could be flammable; dust may be present at the bottom of your bottle of this form of zinc.
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.
Technical Note: Due to the high purity of this zinc, it will not sufficiently produce hydrogen gas when introduced to an acid. The reaction can be catalyzed with a few mL of 0.5 M copper sulfate.

Zinc, Pieces

1" long
convenient for use with Kipp generator
Z0020 — 100 g — **$15.47**
Z0007 — 500 g — **42.65**
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.

Zinc, Sheet

1/32" thick — **Z0039** — 6" x 12", approx. 273 g — **$17.65**
Z0009 — 12" x 12", approx. 546 g — **33.07**
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.

Zinc, Shot

reagent grade — **Z0021** — 100 g — **$20.34**
Z0017 — 500 g — **35.53**
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.

Zinc, Strips

0.010" thick — **Z0024** — pkg./10 — **$12.36**
5" long x ½" wide
For hazard alert, storage, disposal, etc., see Zinc, Granular, Z0028.

Zinc Acetate

laboratory grade, crystal
$(CH_3CO_2)_2Zn \cdot 2H_2O$ — **Z0010** — 500 g — **$24.00**
F.W. 219.50

★ **HAZARD ALERT:** Possible body tissue irritant. Moderately toxic by ingestion. LD_{50} 794 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Good if kept tightly closed; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White solid with faint acetic acid odor.
CAS No. 5970-45-6

Zinc Chloride

reagent, granular
$ZnCl_2$ — **Z0022** — 100 g — **$ 10.40**
F.W. 136.29 — **Z0011** — 500 g — **14.75**

★ **HAZARD ALERT:** Both solid and solutions are severe skin irritants; moderately toxic. LD_{50} 350 mg/kg. TLV 1 mg/m^3 as fume.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Substance deliquescent; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 7646-85-7

In-service Topics

A school district or science department may be seeking good topics for in-service sessions. We suggest two topics:

1. Have a lawyer, experienced in tort law, address your group about your legal responsibilities.
2. Invite the local fire department to teach science instructors how to use a fire extinguisher and employ evacuation techniques.

Zinc Chloride Solution

(as $ZnCl_2$)

1 Molar	**Z0040**	500 mL	**$17.54**

★ **HAZARD ALERT:** Both solid and solutions are severe skin irritants.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Indefinite
Color and Odor: Colorless, odorless liquid.

Zinc Nitrate

flake
$Zn(NO_3)_2 \cdot 6H_2O$
F.W. 297.49

Reagent	**Z0029**	100 g	**$13.10**
	Z0012	500 g	**27.70**
Laboratory grade	**Z0042**	100 g	**$12.60**
	Z0043	500 g	**18.40**

★ **HAZARD ALERT:** Slightly toxic; severe body tissue irritant; strong oxidant; fire risk. LD_{50} 1190 mg/kg.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Indefinite
Soluble: Water and alcohol.
Color and Odor: White, odorless solid.
CAS No. 10196-18-6

Zinc Nitrate Solution

(as $Zn(NO_3)_2 \cdot 6H_2O$)

1 Molar	**Z0030**	500 mL	**$10.35**
0.1 Molar	**Z0026**	500 mL	**9.65**

★ **HAZARD ALERT:** Slightly toxic by ingestion; body tissue irritant.
Storage: Inorganic #3
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Zinc Oxide

laboratory grade, powder
ZnO **Z0013** 500 g **$25.70**
F.W. 81.38

★ **HAZARD ALERT:** If heated, fumes could be severely toxic; may react vigorously with some forms of rubber at elevated temperatures. TLV 5 mg/m^3 as fume.
Storage: Inorganic #4
Disposal: #26a
Shelf Life: Indefinite
Soluble: Acids and alkalies; not water and alcohol.
Color and Odor: Off-white, odorless solid.
CAS No. 131 4-13-2

Zinc Sulfate

granular
$ZnSO_4 \cdot 7H_2O$
F.W. 287.56

Reagent	**Z0023**	100 g	**$ 10.90**
	Z0014	500 g	**22.00**
Laboratory grade	**Z0044**	500 g	**$12.85**

★ **HAZARD ALERT:** Skin and mucous membrane irritant; slightly toxic. LD_{50} 1260 mg/kg.
Storage: Inorganic #2
Disposal: #26a
Shelf Life: Effloresces in dry air; store in a Flinn *Chem-Saf*™ Bag.
Soluble: Water; not alcohol.
Color and Odor: White, odorless solid.
CAS No. 7446-20-0

Zinc Sulfate Solution

1 Molar
(as $ZnSO_4 \cdot 7H_2O$) **Z0031** 500 mL **$10.30**

★ **HAZARD ALERT:** May cause skin and eye irritation.
Storage: Inorganic #2
Disposal: #26b
Shelf Life: Good
Color and Odor: Colorless, odorless liquid.

Zinc Sulfide

phosphorescent
laboratory grade, powder
ZnS **Z0041** 100 g **$44.00**
F.W. 97.45

★ **HAZARD ALERT:** Contact with acid liberates toxic and flammable hydrogen sulfide gas.
Storage: Inorganic #5
Disposal: #26a
Shelf Life: Poor; moisture-sensitive.
Soluble: Acids; not water.
Color and Odor: Yellow, odorless solid.
CAS No. 1314-98-3
Technical Note: Not all zinc sulfide is phosphorecent. Flinn's zinc sulfide is specially formulated to give phosphorescence—guaranteed.

How Much Can You Stand?

Various concentrations of chemicals are encountered in a "typical" school science laboratory atmosphere. Knowing what concentrations create unhealthy effects is not an easy task. An effort has been made to quantify exposure levels based on extensive experience and data. These levels are called Threshold Limit Values (TLVs). Please review the section of this catalog dedicated to TLVs on page 592.



Chemventory™

LEARN ABOUT THE ENHANCED CHEMVENTORY

SEE PAGE 574 FOR DETAILS!

Demineralizer, Cartridges, Bantam®

Standard Cartridge



Cartridge removes approximately 1725 grains of dissolved salts (expressed as sodium chloride). The amount of quality water this cartridge produces depends on the character of the starting water. The higher the level of ionizable impurities, the lower the volume of quality water produced. For example, each cartridge will purify about 172 gallons of water containing 10 grains per gallon (as NaCl) of dissolved solids.

Catalog No.	Description	Price/Each
AP1043	Standard Cartridge	$198.90

Ultrapure Cartridge

Cartridge removes 760 grains of dissolved salts as sodium chloride. The quality of the water delivered is remarkably high (million ohm resistance) and is virtually free of carbon dioxide with a pH of 6.8 to 7.2. A science teacher would select this cartridge only to fill the need for ultrapure quality water. Cartridge will purify about 76 gallons of water containing 10 grains per gallon (as NaCl) of dissolved solids.

Catalog No.	Description	Price/Each
AP1044	Ultrapure Cartridge	$189.75

Distilled or Demineralized Water—Which Do I Need?

Distilled water is free of inorganic materials, suspended impurities and most organic contaminants. To make or buy distilled water is expensive. While there may be school laboratory applications where distilled water is required, in many applications, demineralized water will do just as well. Demineralized water, like distilled water, is free of inorganic materials and most suspended contaminants. If you need organic-free water, purchase a still or distilled water.

Demineralizer, Hose Nipple Type, Cartridges and Accessories

Demineralizer, Barnstead, Hose Nipple Type



Excellent, economical source of pure water. Hose nipple cartridges easily connect to your water source using ordinary ⅜" laboratory tubing (not provided). No special equipment or hardware is required. The cartridges are single use, disposable cartridges. A dye resin in the cartridge changes color when the cartridge is exhausted. How many gallons of pure water will the demineralizer provide for the science teacher? The answer will depend on your water quality. Contact your local water department to determine the "grain" content of your water source. Select your cartridge based on local water quality.

If you wish to mount your "Hose Nipple" Demineralizer on the wall, purchase the Cartridge Wall Bracket Holder, AP1266. The wall holder is not furnished with the Hose Nipple Demineralizer.

Standard Cartridge

Two bed ion exchange resin with a "grain" capacity of 1650 grains of dissolved salts. This cartridge would be the science teacher's first choice for volume and economy.

Catalog No.	Description	Price/Each
AP1267	Standard Cartridge	$172.25

Demineralizer Installation/Use Tip

Always hook up the water inlet to the bottom nipple of the demineralizer cartridge. Always turn water off at inlet after use.

Ultrapure Cartridge

Ultrapure mixed bed ion exchange resin with a capacity of 915 "grains." Even though the "grain" capacity is low, the water produced is of "research" quality. If you might need CO_2-free water, this cartridge would be your choice. Plastic tubing is required and available separately.

Catalog No.	Description	Price/Each
AP1268	Ultrapure Cartridge	$191.40
AP8377	Plastic Tubing in 10-Foot Lengths, ⅜" i.d. x 1/16"	13.30

Organic Removal Cartridge



Cartridge contains an activated carbon for removal of organics and chlorine commonly found in tap water. This cartridge would normally be placed in line in front of the demineralizer cartridge so that a two-cartridge system is used. The first cartridge connected to your water supply would be organic removal. Follow that with a demineralizer cartridge.

Catalog No.	Description	Price/Each
AP1269	Organic Removal Cartridge	$177.20

Cartridge Wall Bracket Holder

Catalog No.	Description	Price/Each
AP1266	Cartridge Wall Bracket Holder	$62.35

Demineralizer Accessories

Hydrion Low Ion pH Test Kit

High-quality water may not have enough ions to provide a reliable pH value. If you use standard pH indicator paper, the indicator in the test paper may be the only contaminant present when you dip it in the water, resulting in an erroneous pH value. This low ion test kit provides you with a sample tube, special low ion test paper (roll of 25 feet) and a color comparison chart. Unlike most test paper, this paper is not to be dipped. Place the paper in the sample tube and add your unknown liquid. Cap the tube and shake, then read the pH value by holding the tube against the color comparison chart.

Catalog No.	Description	Price/Each
AP1660	Hydrion Low Ion pH Test Kit	$15.57

Water Hardness Testing Paper



Easy way to determine water hardness in seconds. Two test papers are packaged in one convenient plastic dispenser. The first test paper allows you to measure water hardness between 0–20 grains per gallon. The second measures water hardness between 10–50 grains per gallon. Both test papers are 4.5 meters in length, enough for over 100 tests.

Catalog No.	Description	Price/Each
AB1161	Water Hardness Testing Paper	$14.35

Distill, Deionize or Buy H_2O?

If your use of distilled water is minimal (e.g., a few gallons per month), then simply purchase the distilled water at your local supermarket. If you use a sufficient amount to justify the purchase of a water treatment device, then the following information will prove helpful. A definition of terms will assist you as you review the process chart at right.

Dissolved Ionized Solids—Solids that cannot be removed by filtration. Major examples are iron, calcium, magnesium, chlorine, carbonates and sodium.

Dissolved Gases—Examples are oxygen, nitrogen and carbon dioxide.

Dissolved Organics—Sediments, microorganisms and other organic material.

Bacteria—Single-celled microorganisms, some of which are the cause of disease.

Pyrogens—Toxic, fever-producing substances formed by various microorganisms.

Particulates—Matter in a fine state of subdivision.

If the water produced will be used by both the biology and chemistry departments, then distilled water is your best choice. In fact, if you examine the chart, you will quickly conclude that, except for dissolved gases, a still produces the best overall water quality.

Deionizing is usually good enough for water needed in general chemistry laboratory activity.

Other factors to consider:

- Water stills require regular cleaning and maintenance.
- Water stills are expensive to operate.
- Water stills take up a lot of space.
- A water still (if properly maintained) can give you decades of service.
- Deionizers (demineralizers) do not provide biological-quality water.
- Deionizers require repeated expenditures for cartridge replacement.
- Deionizers require little if any maintenance.

Water Purification Process Comparison

E = **Excellent** (capable of complete or near total removal)
G = **Good** (capable of removing large percentages)
P = **Poor** (little or no removal)

Purification Process	Major Classes of Contaminants					
	Dissolved Ionized Solids	Dissolved Gases	Dissolved Organics	Particulates	Bacteria	Pyrogens
DISTILLATION	E	P	G	E	E	E
DEIONIZATION	E	E	P	P	P	P

Desiccators

Desiccator, Scheibler

Heavy flint glass with wide ground glass rim (flange) to provide an air-tight seal. Height 9¼". Diameter at widest point 8⅛". Inside diameter of chamber 6". Use porcelain desiccator plate Catalog No. AP8252 for hot objects or plastic desiccator plate Catalog No. AP1046 for room temperature objects. You will need stopcock grease to lubricate and seal the flange ground glass surfaces. See page 190 for stopcock grease. Remember: *Never lift* a desiccator lid, always slide it from side to side.

Catalog No.	Description	Price/Each
AP8250	Desiccator, Scheibler	**$90.00**

Desiccator, Polypropylene

Tough and durable desiccator. Bottom portion is made of polypropylene. Upper portion is made of transparent polycarbonate. The dome lid is seated on an "O" ring in the base. A tubing connection (½" o.d.) allows a vacuum to be drawn on this desiccator. A removable polypropylene pan is provided to hold the desiccant and support the desiccator plate. A desiccator plate is not furnished but can be found below. This product is virtually indestructible except for exposure to heat.

Specifications:

Catalog No.	AP8251	AP4552
Inside Diameter (mm)	150	197
Height (mm)	210	241
Accepts Plate Size (mm)	140	190
Price/Each	**$92.50**	**$137.15**

Desiccator Accessories

Desiccant, Calcium Chloride

An effective drying agent for desiccators and drying tubes. Anhydrous, 4–8 mesh granules. Two sizes available.

Catalog No.	Description	Size	Price/Each
C0016	Desiccant, Calcium Chloride, Anhydrous	500 g	**$ 9.40**
C0017		2 kg	**22.50**

Desiccant, Drierite®

Your best choice when using a desiccator. Drierite® is Anhydrous Calcium Sulfate, granule size is 8 mesh. Available in two forms: indicating and non-indicating. Indicating means the desiccant changes color when fully saturated. 454-gram size.

Catalog No.	Description	Form	Price/Each
D0011	Desiccant, Drierite®	Non-Indicating	**$25.80**
D0012		Indicating	**43.50**

Desiccator Plate, Porcelain

Glazed on one side. Supported by three small feet.

Catalog No.	Description	Size (in mm)	Price/Each
AP8252	Desiccator Plate, Porcelain	140	**$60.75**

Desiccator Plate, Plastic

Useful as support plate for room temperature containers placed in a desiccator. Made of semi-expanded polypropylene. 140 mm in diameter. *Not for use with hot objects.*

Catalog No.	Description	Price/Each
AP1046	Desiccator Plate, Plastic	**$26.79**

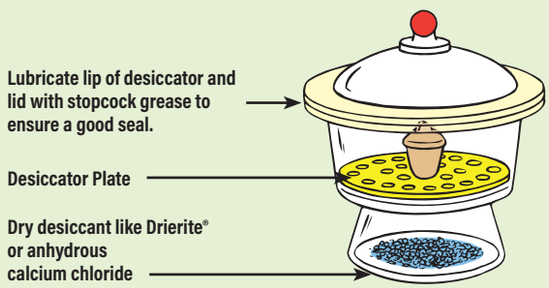


HOW TO Use a Desiccator

A desiccator will provide an atmosphere with low humidity for the storage of samples, precipitates, crucibles and other equipment.

Desiccants have a limited capacity to absorb moisture from the atmosphere. Learn how to tell when your desiccant is no longer effective.

Do not place hot items in a desiccator. As the items cool, they can create a partial vacuum in the desiccator and may spill when the desiccator is opened and air rushes in.



Dewar Flasks for Liquid Nitrogen

Dewar Flask, Small

A safe means of transporting, storing, handling and dispensing liquid nitrogen. Wide mouth opening allows for easy filling and dispensing. Manufactured from borosilicate glass, these flasks are very heavily insulated and wrapped with an exterior aluminum metal housing that extends nearly to the top rim of the flask adding extra safety protection. All flasks have a special vented, polypropylene stopper to minimize evaporation. Smaller flask may be used with a vacuum trap apparatus for cooling purposes.

▶ See free video at flinnsci.com.

Catalog No.	Description	Outside Diameter	Inside Diameter	Inside Depth	Capacity	Price/Each
AP1490	Dewar Flask, Small	3⅜"	2¾"	11⅞"	1000 mL	**$212.60**
AP1491		5⅞"	4¼"	7½"	1900 mL	**690.00**

Dewar Flask, Large

These lightweight Dewar flasks are recommended when required storage time exceeds 24 hours. Aluminum construction allows storage of liquid nitrogen for several weeks! Handles make dispensing a simple task.

▶ See free video at flinnsci.com.

Catalog No.	Description	Expiration Rate	Outside Diameter	Overall Height	Capacity	Price/Each
AP8560	Dewar Flask, Large	0.40 L/day	7⅝"	16⅝"	4 L	**$1074.50**
AP8562		0.22 L/day	11⅜"	21"	10 L	**1143.10**

Dishes

Crystallizing Dishes

Borosillicate glass dishes used for heating and cooling baths, crystallization, disposal by evaporation and sand baths for microscale experiments. Available in two sizes.

Catalog No.	Description	Size	Price/Each
GP9171	Crystallizing Dishes	80 x 40 mm	**$18.25**
GP9172		150 x 75 mm	**65.00**

Petri Dish, Borosilicate Glass

These dishes will remain clear after repeated wet or dry sterilization. Tops and bottoms are marked with different colored enamels for quick identification.

Catalog No.	Description	Price/Pkg.
GP3019	Petri Dish, Borosilicate Glass, 100 x 15 mm	**$54.00/6**
GP3020		**93.95/12**

Petri Dish, Disposable

Polystyrene. Sterile. Package of 20.

Catalog No.	Description	Size (mm)	Price/Each	Price/25 or More
AB1470	Petri Dish, Disposable, Pkg. of 20	50 x 15	**$8.16**	**$6.69**
AP8170		90 x 15	**9.54**	**8.01**

DISHES continued on next page.

HOW TO

Regenerate Desiccants

Used and exhausted Drierite® and calcium chloride desiccants can easily be regenerated. Spread the desiccant, one granule deep, in a shallow dish. Heat for one hour in an oven at 205 °C. Place the regenerated desiccant, while still hot, back into the original container. Tightly seal the container.

A temperature of less than 205 °C will not be sufficient to dehydrate the desiccant completely, even if you leave the desiccant in the oven longer than one hour.

The color of indicating desiccants tends to fade after several regenerations.



Dewar Flask, Small AP1490, etc.



Dewar Flask, Large AP8560



Dewar Flask, Large AP8562



Crystallizing Dishes GP9171, etc.



Petri Dish, Borosilicate Glass GP3019, etc.



Petri Dish, Disposable, AB1470, etc. and AB1471, etc.

Questions Most Commonly Asked About Liquid Nitrogen

How is liquid nitrogen made? Liquid nitrogen is made by cooling and compressing air until it liquifies. The liquid air is allowed to warm up, and the nitrogen boils off first and is collected, leaving the oxygen and argon as liquids. The collected nitrogen gas is then compressed and cooled back into a liquid. It is quite easy to produce and relatively inexpensive.

How long can liquid nitrogen be stored in a Dewar flask? Our best estimate is that a good 1000-mL Dewar flask will lose approximately 500 mL for every 24-hour period stored. The larger the Dewar flask, the slower the rate of loss.

Where can I purchase liquid nitrogen? We have had our best success purchasing liquid nitrogen from local welding supply firms. Also look in the Yellow Pages under "Gas."

How much does liquid nitrogen cost? Cost vary widely. Most outlets charge a minimum fee of $10.00. You may pay as little as $1.00 per liter to more than $3.00 per liter.

How can you safely transport liquid nitrogen in your car? Place the specially vented polypropylene stopper into the flask to minimize evaporation. Find a good-size cardboard carton that will be stable in your car. Place the Dewar flask in the center of the carton and stuff crumpled newspaper into the carton to tightly hold your flask. Place the carton with your flask in the car and transport it directly to your school. Do not store your Dewar flask in your car for an extended period of time. Transport the Dewar flask as far from the driver and passengers as possible to avoid any exposure from accidental spillage. Drive with the windows slightly vented, not tightly sealed.

Can I use a regular Thermos® bottle to hold liquid nitrogen? No, do not use a regular Thermos bottle! Why? Every Thermos-type vessel differs. The one you select to use could have a plastic exterior that would crack and break from the temperature of the $N_2(l)$. An unsafe situation would result. You might be tempted to use such a container and unknowingly place the screw cap on the Thermos. As the $N_2(l)$ warms, gas pressure will develop in the bottle and an explosion will result. Choose the safer option of using a dedicated and safer laboratory Dewar flask.

Is liquid nitrogen safe? Liquid nitrogen should never be stored or transported in a tightly sealed container. The expanded gas may cause the container to explode. Liquid nitrogen can cause frostbite on contact with skin. Wear protective clothing! If you accidentally spill liquid nitrogen on clothing, do not let the soaked clothing remain in contact with the skin. Always use liquid nitrogen in a well-ventilated area. Protective eyewear should be worn by the demonstrator and the demonstration participants.

How can I dispose of excess liquid nitrogen? As $N_2(l)$ warms in an open container, it simply returns to its natural gaseous state. The simple method of disposal is exposure to air at room temperature. Avoid doing this in a poorly ventilated area.

Dishes, continued

Petri Dish, Disposable, Partitioned

These are standard size (90 x 15 mm), sterile, polystyrene dishes divided into the number of compartments indicated.

Catalog No.	Description	No. of Compartments	Price/Pkg.
AB1471	Petri Dish, Disposable, Partitioned	2	$11.15/20
AB1472		3	11.95/25
FB1651		4	11.70/25

Petri Dish Holder

Neoprene-coated wire holder. Should easily handle incubation, sterilization and refrigeration. Will accommodate 18 dishes. Dimensions: 9 1/16" W x 4 3/8" D x 7 1/8" H.

Catalog No.	Description	Price/Each
AP1276	Petri Dish Holder	$46.80



Petri Dish Holder AP1276

Culture Dish

Heavyweight, clear, soda-lime glass dishes commonly referred to as specimen dishes or finger bowls. Dishes are securely stackable so that each one acts as a cover for the dish below. Convex bottoms eliminate cross-contamination from dish to dish. If used as culture dishes, they should be protected from harsh detergents and washed only with water and a non-abrasive sponge.

Catalog No.	Description	Diameter x Height	Approx. Volume (mL)	Price/Each (1–11)	Price/Each (12+)
AB1263	Culture Dish	3½" x 1½"	150	$11.00	$10.45
AB1264		4½" x 1¾"	300	12.50	11.95
AB1265		8¼" x 3"	1800	25.55	24.24



Culture Dish AB1263, etc.

Evaporating Dish, Disposable, Aluminum

Eliminate the need for cleaning and storing of glass evaporating dishes. These economical, lightweight aluminum dishes may be heated to 650 °C and come in 20 and 40-mL capacities. The flat-bottomed, crimped-sided dishes have lifting tabs that make them ideal for weighing, dispensing or moisture determinations. Package of 100.

Catalog No.	Description	Capacity	Price/Pkg. of 100
AP6389	Evaporating Dish, Disposable, Aluminum	20-mL	$12.00
AP6390		40-mL	13.31



Evaporating Dish, Disposable, Aluminum AP6389, etc.

Evaporating Dish, Porcelain, Economy Choice

Dish is glazed on the inside. 75-mL capacity.

Catalog No.	Description	Price/Each	Price/Pkg. of 10
AP6065	Evaporating Dish, Porcelain, Economy Choice	$7.98	$75.80

Evaporating Dish, Porcelain

Dishes have pouring spout and are entirely glazed except for rim.

Catalog No.	Description	Capacity (mL)	Price/Each	Price/Pkg. of 12
AP1271	Evaporating Dish, Porcelain	35	$11.99	$132.60
AP1272		70	13.75	148.68
AP1273		80	12.35	135.12

Evaporating Dish, Porcelain

Dishes have pouring spout and are entirely glazed except for the rim.

Catalog No.	Description	Capacity (mL)	Price/Each	Price/Pkg. of 12
AP1274	Evaporating Dish, Porcelain	120	$24.50	$270.48
AP1275		150	21.65	246.72





Evaporating Dish, Porcelain AP6065, AP1271, etc., and AP1274, etc.

Evaporating Dish, Borosilicate Glass

Dishes have beaded rim, pouring spout, and flat bottom.

Catalog No.	Description	Capacity (mL)	Diam./Ht. (mm)	Price/Each	Price/Pkg. of 6
GP3005	Evaporating Dish, Borosilicate Glass	130	80 x 45	$17.55	$ 98.58
GP3010		170	90 x 50	19.95	111.96



Evaporating Dish, Borosilicate Glass GP3005, etc.

DISHES continued on next page.

Dishes, continued

Syracuse Dish

Versatile dishes for micro-cultures and observation of microorganisms and small invertebrates. A bevelled upper edge and grooved bottom allow these dishes to be securely stacked. 67 mm outer diameter, 52 mm inner diameter.

Catalog No.	Description	Price/Each (1–11)	Price/Each (12+)
AB1266	Syracuse Dish	$8.50	$8.07

Weighing Dishes, Disposable

Made of a polystyrene-rubber formulation. These dishes are super flexible and allow the teacher or student to form pouring spouts. The carton is a dispensing type making it easy to secure one dish at a time. Packaged 500 dishes per dispenser.

Catalog No.	Description	Size L x W x D	Price/ 500-Dish Dispenser
AP1277	Weighing Dishes, Disposable	1⅝" x 1⅝" x 5⁄16"	$25.51
AP1278		3⅛" x 3⅛" x 1"	47.86
AP1279		5¼" x 5¼" x ⅞"	84.70



Syracuse Dish
AB1266



Weighing Dishes, Disposable
AP1277, etc.

Distillation, Water Stills

Water Quality and pH

An accurate and reproducible pH reading is almost impossible on *ultra pure* distilled or deionized water, which you would expect to have a pH of 7. Why? Most pH meters are unable to give accurate readings when few ions are present. Also, as soon as distilled or deionized water is exposed to the air, carbon dioxide gas starts to dissolve—thus lowering the pH of the water and eliminating accurate, reproducible pH readings.

Did you know that the pH paper you might use would change the pH and give you false readings? Solution: Use a low ion pH indicator. See page 195 to find this simple kit.

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM



Flinn Benchtop Water Distiller
AP9883





Portable Water Still
AP1050

Barnstead Mega-Pure® Water Still
AP1048

Water Distiller Selection Chart

Catalog No.	Description	Water Quality Resistivity*	Water Production (Liters/Hour)	Amount of Feed Water (Liters/Hour)	Power Requirements	Automatic Shutoff	Price/Each
AP9883	Flinn Benchtop Water Distiller	Very Good: 0.25–0.30 MΩ•cm	0.7	0.7	120V AC	Yes—End of Cycle	$ 459.00
AP8897	Merit Water Still	High or Very Good: 0.25–0.30 MΩ•cm	4.0	60	220V AC	Yes—High Temp.	2660.00
AP1048	Mega Pure Water Still	Excellent: 1 MΩ•cm	1.4	14	120V AC	Yes—Low Water	4419.00
AP1050	Portable Still	Excellent: 1 MΩ•cm	5.7	15	120V AC	Yes—Low Water	4370.00

*Note: Resistivity is a measure of how resistant the distilled water is to conducting a current. Impurities, such as ions, cause water to conduct a current better. The fewer impurities present in the water, the more resistant the water is to conducting a current. Therefore, high resistivity means high water quality. All of the water quality readings listed above are acceptable for the high school science laboratory.

Dry Baths

Mini Dry Bath

Lightweight mini dry bath with a maximum temperature of 100 °C. The front LCD screen displays both the temperature and time remaining. The aluminum heating block has room for fifteen 1.5 mL sample tubes. Alternate heating blocks are available by special order.

Catalog No.	Description	Price/Each
AP10050	Mini Dry Bath	$306.83

Dry Bath

This dry bath provides a wide range of temperature control, up to a maximum of 120 °C. Timer function goes up to 99 hours, 59 minutes. The aluminum heating block accommodates 5 and 15 mL tubes with well dimensions of 17 mm diameter and 48 mm depth. Holds up to 28 samples. Alternate heating blocks are available by special order.

Catalog No.	Description	Price/Each
AP10049	Dry Bath	$356.20

Thermo Mix Dry Baths

The Thermo Mix series allows for precise and efficient heating and mixing in a variety of applications, such as gene and protein denaturation, enzymatic reaction, bacterial growth, and more. Full specifications at flinnsci.com.

Catalog No.	Description	Functions	Temperature Range	Price/Each
AP9542	Thermo Mix, HCM100-Pro	Heating, cooling and mixing	15–100 °C	$2615.00
AP9544	Thermo Mix, HM100-Pro	Heating and mixing	Room Temp. to 100 °C	1126.92

Dry Erase Boards

11" x 16". Package of 12.

Catalog No.	Description	Price/Each
AP6276	Dry Erase Boards, Pkg. of 12	$71.10
AP6284	Liquid Board Cleaner, 8 oz.	7.05
AP6285	Dry Erase Markers, Box of 12	23.75

Dry Ice Maker

One 50-lb cylinder of CO_2 can make 10–16 250- to 350-g loosely packed blocks of dry ice. Safe, low-pressure system easily opens and closes and includes a built-in dial pressure gauge. Connects to a CO_2 cylinder with a nickel-plated connector. Body of the unit is made of transparent polycarbonate. Unit never gets too cold to handle! 5⅝" x 7½" x 6"H. *Note:* Not for use with a lecture bottle or refillable cylinder of CO_2.

Catalog No.	Description	Price/Each
AP7484	Compact Dry Ice Maker	$675.00



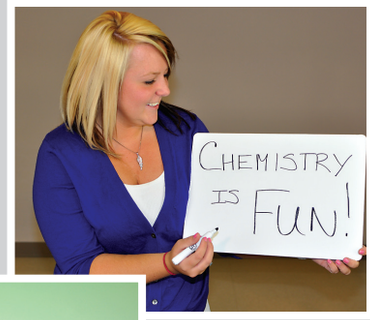
Mini Dry Bath
AP10050



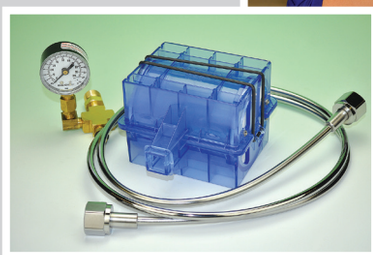
Dry Bath
AP10049



Thermo Mix,
HCM100-Pro
AP9542 and AP9544



Dry Erase Boards
AP6276, etc.



Compact Dry
Ice Maker
AP7484

SPOTLIGHT ON SAFETY



TEACHING GOOD SAFETY HABITS IS A MUST.

FLINN offers free resources with some safety tips and teacher-tested ideas that work.

One fundamental safety rule in the science laboratory is wearing safety goggles whenever heat, glassware, or chemicals are used. The struggle to get students to wear safety goggles can be a constant battle and a source of frustration for many teachers.

Find our FREE *Put Your Goggles On!* activity and more online at www.flinnsci.com/resources.

Electrochemistry

Electrodes

Catalog No.	Description	Dimensions	Reduction Half-Reaction	Standard Reduction Potential, E°	Price/Pkg.
A0178	Aluminum Strips	6" x ½"	$Al^{3+} + 3e^- \rightarrow Al(s)$	–1.66 V	$ 7.50/10
B0231	Brass Strips	6" x ½"	—	—	18.85/6
AP1817	Carbon, Graphite Pencil Leads	2½" x 1/16" dia.	Inert Electrode*		3.20/15
C0410	Carbon, Rods	4" x ¼" dia.	Inert Electrode*		13.60/6
C0182	Copper Strips	6" x ½"	$Cu^{2+} + 2e^- \rightarrow Cu(s)$	+0.34 V	14.28/6
			$Cu^{2+} + e^- \rightarrow Cu^+$	+0.15 V	
			$Cu^+ + e^- \rightarrow Cu(s)$	+0.52 V	
I0058	Iron Strips	6" x ½"	$Fe^{3+} + 3e^- \rightarrow Fe(s)$	–0.04 V	9.35/10
			$Fe^{3+} + e^- \rightarrow Fe^{2+}$	+0.77 V	
			$Fe^{2+} + 2e^- \rightarrow Fe(s)$	–0.45 V	
L0065	Lead Strips	6" x ½"	$Pb^{2+} + 2e^- \rightarrow Pb(s)$	–0.13 V	10.35/6
N0089	Nickel (Plated steel, magnetic)	5" x ½"	$Ni^{2+} + 2e^- \rightarrow Ni(s)$	–0.26 V	22.05/6
S0270	Silver Foil**	3" x 2"	$Ag^+ + e^- \rightarrow Ag(s)$	+0.80 V	57.50
T0087	Tin Strips	6" x ½"	$Sn^{4+} + 2e^- \rightarrow Sn^{2+}$	+0.15 V	13.97/6
			$Sn^{2+} + 2e^- \rightarrow Sn(s)$	–0.14 V	
Z0024	Zinc Strips	5" x ½"	$Zn^{2+} + 2e^- \rightarrow Zn(s)$	–0.76 V	12.36/10

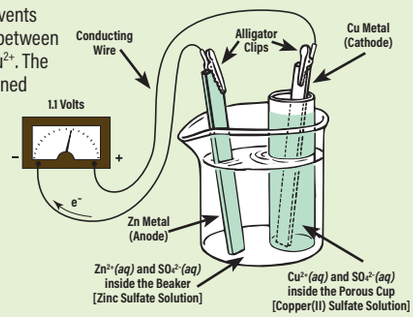
* Inert electrodes are electrodes made from a conducting, but unreactive, material. Thus, inert electrodes do not participate in the cell reaction. Instead, they provide a support surface for the reaction and a means for electron transfer.

** Silver foil makes a great electrode. 3" x 2" is about 5 grams and can make 12-15 mini electrodes.

HOW TO

Use a Porous Cup for an Electrochemical Cell

The porous cup prevents the direct reaction between the Zn metal and Cu^{2+}. The Cu^{2+} ions are contained in the porous cup.



Porous Cup

For voltaic cell experiments and other applications. Diameter: 3" x 1½".

Catalog No.	Description	Price/Each
AP6359	Porous Cup, Economy	$10.70

Metal Electrode Set

Includes one strip each of aluminum, brass, copper, iron, lead and zinc. All are 6" x ½", except zinc, which is 5" x ½".

Catalog No.	Description	Price/Each
AP4602	Metal Electrode Set	$11.70

Voltaic Cell with Porous Cup

Includes a polystyrene voltaic cell body with a porous cup that sits inside, two electrode brackets and electrodes—one each of iron, carbon, and aluminum and two each of copper and zinc.

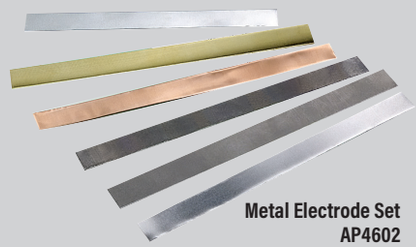
See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5623	Voltaic Cell with Porous Cup	$50.60

ELECTROCHEMISTRY continued on next page.



Porous Cup
AP6359



Metal Electrode Set
AP4602



Voltaic Cell with Porous Cup
AP5623

HOW TO

Prepare an Electrolysis Solution

A 1 M sodium sulfate solution makes an excellent neutral electrolysis solution. Prepare 100 mL of 1 M sodium sulfate solution by dissolving 32 grams of sodium sulfate decahydrate in 70 mL of distilled or deionized water. Once completely dissolved, dilute to a final volume of 100 mL using distilled or deionized water.

Electrochemistry, continued

Hofmann Electrolysis Apparatus

One-way glass stopcocks conveniently located on the top of this high-quality apparatus allow for easy collection of gases during electrolysis experiments. The large center reservoir bulb will easily handle the liquid displacement from the two side columns and prevent any overflow during your experiments. Electrodes and directions included. Requires ring stand, support clamp and a 9-V battery or DC power supply. Measures 41 x 17 cm.

Catalog No.	Description	Price/Each
AP5879	Hofmann Electrolysis Apparatus	$170.00

Hofmann Electrolysis Demonstration Apparatus

The clear glass collecting tubes are calibrated for easy measurement and observation. The apparatus has its own rugged ring stand base. The built-in thistle tube and stopcocks make for easy no-mess filling. Operates on a 9-V battery or DC power supply. Platinum electrodes are included. Replacement glass assembly and electrodes are available separately.

Catalog No.	Description	Price/Each
AP5439	Hofmann Electrolysis Demonstration Apparatus	$311.10
AP6410	Replacement Glass Assembly for AP5439	104.90
AP6217	Replacement Electrodes for AP5439, Pkg. of 2	54.75

Equipment Drawer Sets

Lab Equipment Drawer Set

FLINN EXCLUSIVE

Save money, as well as valuable time, by eliminating the need to set out supplies for each lab! Contains: Support stand (4" x 6"), ring clamp (4"), two utility clamps, pH paper, digital thermometer, crucible tongs (9"), forceps, flint lighter, wash bottle, test tube rack, two test tube holders, test tube brush, wire gauze, clay triangle (2"), nichrome wire, marking pencil, metric ruler, two glass stirring rods, one plastic stirring rod, rubber policeman, three medicine droppers, two plastic funnels (2¾"), two spatulas, and a scoop.

Catalog No.	Description	Price/Each
AP7450	Lab Equipment Drawer Set	$143.00

Advanced Equipment Drawer Set

FLINN EXCLUSIVE

Save time and money with our advanced equipment drawer set! Contains: four 50-mL beakers, two 150-mL beakers, two 250-mL beakers, two 400-mL beakers, crucible tongs, two 50-mL Erlenmeyer flasks, two 125-mL Erlenmeyer flasks, 250-mL, forceps, long-stem funnel, short-stem funnel, 10-mL graduated cylinder, 25-mL graduated cylinder, 100-mL graduated cylinder, pH test strips, spatula, stirring rod, test tube clamp, test tub rack, eight small test tubes, eight large test tubes and two watch glasses.

Catalog No.	Description	Price/Each
AP8726	Advanced Equipment Drawer Set	$236.65



Hofmann Electrolysis Apparatus AP5879



Hofmann Electrolysis Demonstration Apparatus AP5439



Lab Equipment Drawer Set AP7450



Titration Equipment Drawer Set AP9678

Titration Equipment Drawer Set

FLINN EXCLUSIVE

Equip your laboratory with our titration set! The set contains 12 burets, 12 buret filling funnels, 6 buret brushes, 6 support stands and 6 double buret clamps. Neatly store your burets in the included rack between labs.

Catalogue No.	Description	Price/Each
AP9678	Titration Equipment Drawer Set	$1810.50

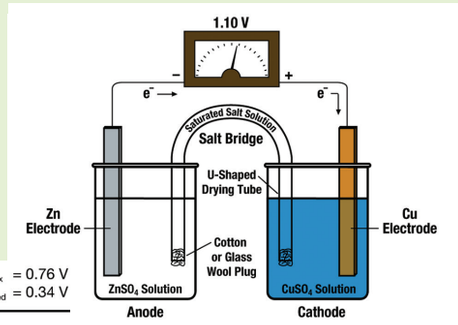
HOW TO

Determine an Electrochemical Cell Potential

What causes an electric current to flow? There must be an electrical potential difference between two points in a circuit. Electrodes made of materials that have different standard reduction potentials can provide these two points and allow a current to flow through an electrochemical cell.

An electrochemical cell should be designed such that oxidation occurs at one of the electrodes (the anode) while reduction occurs at the other electrode (the cathode). You can mix and match electrodes, using their standard reduction potentials, to design your own electrochemical cell. If the net cell potential is positive, electrons will flow from the anode to the cathode spontaneously. This is referred to as a voltaic cell. If the net cell potential is negative, an outside source of electrical energy, such as a battery, is required for a current to flow. A non-spontaneous cell like this is referred to as an electrolytic cell. The larger the difference between standard reduction potentials of two electrodes, the larger the voltage produced (voltaic cell) or needed to run the cell (electrolytic cell).

For tips on how to use a porous cup in an electrochemical cell, see above How To box.



Anode: $Zn(s) \rightleftharpoons Zn^{2+}(aq) + 2e^-$ $E^\circ_{ox} = 0.76$ V

Cathode: $Cu^{2+}(aq) + 2e^- \rightleftharpoons Cu(s)$ $E^\circ_{red} = 0.34$ V

Net Cell Reaction: $Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(s)$ $E^\circ_{net} = 1.10$ V

Eudiometers

Eudiometer Tubes

Use this instrument to measure the volume of gas produced or consumed in a chemical reaction. The borosilicate glass tube is closed at one end—and contains two platinum electrodes at this closed end. Easy-to-read graduation markings are printed on the tube.

See free How To video at flinnsci.com.

Catalog No.	Description	Subdivisions (mL)	Length (inches)	Price/Each
GP9167	Eudiometer Tube, 50-mL	0.1	22"	$55.00
GP2095	Eudiometer Tube, 100-mL	0.2	25¾"	59.94



Eudiometer Tube
GP9167, etc.

Faucets See page 150.

File, Triangular See page 199.

Filter Paper

Filter Paper, Qualitative

100 sheets per package.

See free video at flinnsci.com.

Catalog No.	Description	Size	Price/Pkg. of 100 sheets	Price/12 Pkgs. of 100 sheets
AP5896	Filter Paper, Qualitative	4.25 cm	$ 7.88	$ 89.88
AP3100		5.5 cm	7.40	83.76
AP2249		7.0 cm	5.95	67.92
AP3101		7.5 cm	8.23	93.84
AP3102		9 cm	7.25	81.72
AP3103		11 cm	9.00	102.60
AP3104		12.5 cm	9.77	111.48
AP3105		15 cm	12.80	144.12
AP3106		20 cm	24.40	278.16

Filter Paper Parameters

	Qualitative	Quantitative	Creped	Gooch Crucible
Flow Rate (mL/min)	60	30	235	40
Retention (µm)	6	3	24	5

Filter Paper, Quantitative

A very high grade, ashless filter paper for use in analytical applications and gravimetric analysis. 100 sheets per package.

See free video at flinnsci.com.

Catalog No.	Description	Size	Price/Pkg. of 100 sheets
AP8993	Filter Paper, Quantitative	4.25 cm	$25.30
AP8994		5.5 cm	28.60
AP8995		7.0 cm	29.15
AP8996		9.0 cm	38.80
AP8997		11.0 cm	42.99
AP8998		12.5 cm	54.15
AP8999		15.0 cm	62.65

Filter Paper, Quantitative, Extra-Fine

Ideal for filtering barium sulfate and other fine particulates. Grade 94 11-cm circles. 100 sheets per package.

Catalog No.	Description	Price/Pkg. of 100 sheets
AP7628	Filter Paper, Quantitative, Extra-Fine	$47.55

FILTER PAPER continued on next page.



Filter Paper, Qualitative
AP5896, etc.

Filter Paper, Quantitative
AP8993, etc.

Filter Paper Sizes

Standard 58 or 60° funnels—glass.

Funnel Diameter (mm)	35	45	55	65	75	90	100
Filter Paper Size (cm)	5.5	7.0	9.0	11.0	12.5	15.0	18.5

HOW TO

Filter and Decant

Folding Filter Paper

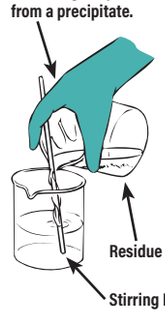


Fold and crease lightly.

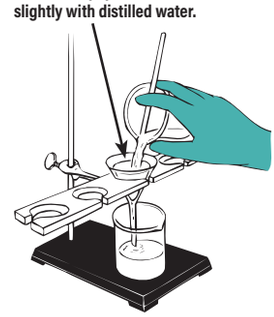
Fold again and tear off corner.

Open out like this.

Decanting a liquid from a precipitate.



Place filter paper in funnel and wet slightly with distilled water.



Pour solution slowly into funnel with the aid of a stirring rod. Using a wash bottle, wash any solid remaining in the beaker into the filter paper.

See free video at flinnsci.com.

Filter Paper, continued

Filter Paper, Creped

A rapid filtering grade with satisfactory retention and textured surface. Good for coarse precipitates such as aluminum hydroxide, etc. 100 sheets per package.

Catalog No.	Description	Size	Price/Pkg. of 100 sheets	Price/12 Pkgs. of 100 sheets
AP3110	Filter Paper, Creped	5.5 cm	$ 7.15	$ 81.12
AP3111		7.5 cm	8.25	94.08
AP3112		9 cm	10.20	116.16
AP3113		11 cm	10.45	119.04
AP3114		12.5 cm	13.15	150.00
AP3115		15 cm	15.05	171.72
AP3116		20 cm	22.05	251.28
AP6469		33 cm	48.08	531.00

Filter Paper for Gooch Crucibles See page 137.

Filtration Accessories

Filter Support Collars

This set of seven synthetic rubber adapter cones are designed to fit your filtering needs. Can be used with common laboratory filter funnels to form an air tight seal. They are often nested with adjacent sizes to accommodate various size filtering glassware or used individually. Great alternative to one hole rubber stoppers. Autoclavable.

Catalog No.	Description	Price/Each
AP10227	Filter Support Collars, Set of 7	$12.25

Filter Support Collar

Ideal for supporting glass funnels, Gooch crucibles, Büchner funnels, and other filtration devices. Size 3 fits a 250-mL filter flask. Size 4 fits a 500-mL and 1000-mL filter flask. The soft and flexible rubber forms a gas-tight seal during vacuum filtration.

Catalog No.	Description	Inside Diameter (mm)		Price/Each
		Top	Bottom	
AP8990	Filter Support Collar, Size 3	31	16	$6.26
AP8991	Filter Support Collar, Size 4	39	22	6.96
AP8992	Filter Support Collar, Size 5	50	30	7.14

Filtervac® Filter Aid

Filtervac® is a unique filter adapter made of molded rubber in disc form. Inside diameter of the socket at the top is 32 mm. Outside diameter of the entire disc is 76 mm. The underside of the disc is flat to seal tightly against the lip of the filter flask.

Catalog No.	Description	Price/Each
AP1920	Filtervac® Filter Aid	$16.40

Vacuum Filtration Set, Borosilicate Glass See page 297.

Stopper for Büchner Funnel

FLINN EXCLUSIVE

Specially fabricated rubber stoppers that accept polypropylene Büchner funnels. Stopper Size No. 6 will fit a 250-mL filtering flask, while stopper Size No. 7 will fit a 500-mL filtering flask.

Catalog No.	Description	Size	Price/Each
AP1521	Stopper for Büchner Funnel	No. 6	$2.20
AP1522		No. 7	2.20

Fittings and Fixtures, Laboratory

Connecting Shank

Required to enable tabletop installation of gas pedestals, Catalog Number AP1862. ⅜" IPS, 10 cm long with locknut and washer.

Catalog No.	Description	Price/Each
AP1863	Connecting Shank	$30.73

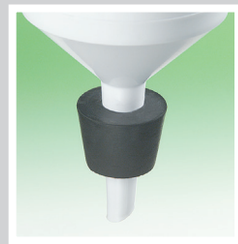
FREE VIDEO ABOUT HOW TO MAKE FLUTED FILTER PAPER AT FLINNSCI.COM



Filtervac® Filter Aid
AP1920



Filter Support Collar
AP8990, etc.



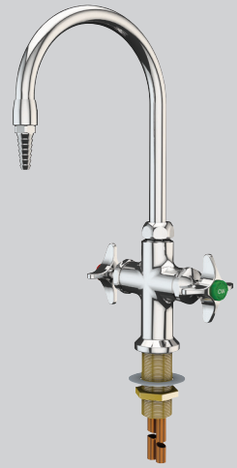
Stopper for
Büchner Funnel
AP1521, etc.



Filter Support Collars,
Set of 7
AP10227



Connecting Shank
AP1863



Water Faucet,
Mixing (Hot and Cold)
AP1855

Faucets, Water

Deck-mounted, faucet with rigid (non-movable) gooseneck. Fixture rises approximately 12¼" above the bench and extends 6" out from its base. Furnished with a removable, serrated hose connection. Below-the-deck mounting shank and ⅜" IPS female union connections are included. Faucet handles contain color-coded buttons: green for cold water, red for hot water. These heavy, chrome-plated fixtures will last for decades.

Catalog No.	Description	Price/Each
AP1855	Faucet, Water, Mixing (Hot and Cold)	$370.45

FITTINGS AND FIXTURES, LABORATORY continued on next page.

Fittings and Fixtures, Laboratory, continued

Gas Fixture

Chrome plated, heavy-duty gas fixture for use with AP1862 pedestal base. Serrated hose connection that is non-removable. ⅜" IPS male inlet.

Catalog No.	Description	Price/Each
AP1857	Gas Fixture	$73.80

Gas Jet Safety Caps See page 567.

Pedestal (Turret) Base

Heavy chrome plated fixture intended to be mounted on top of school's lab bench. Inlet is in the base. Two outlets are on opposite sides (180°) of the fixture. A shank (Catalog No. AP1863) will be required to mount this fixture. ⅜" IPS female inlet and outlet. Pedestal has a base diameter of 1½" and stands 2¾" high.

Catalog No.	Description	Price/Each
AP1862	Pedestal (Turret) Base, Two Outlet	$56.50

Serrated Hose Connection

This hose connection can be used for water and has 10 serrations. ⅜" NPS male inlet with straight threads.

Catalog No.	Description	Price/Each
AP1859	Serrated Hose Connection, Water	$37.60

Flashlights

Ray-O-Vac Workhorse® Flashlight

High quality flashlight. Durable plastic case. Includes batteries.

Catalog No.	Description	Price/Each
AP4389	Ray-O-Vac Workhorse® Flashlight	$18.00
AP6767	LED Flashlight (AA Batteries Included)	6.95
AP1425	D Battery	4.50

Penlight Flashlight

Provides up to four hours of continuous service. Durable clip switch.

Catalog No.	Description	Price/Each
AP9252	Penlight Flashlight	$10.05

Flasks, Boiling

Flask, Boiling, Flat Bottom, Florence, Borosilicate Glass

Catalog No.	Description	Capacity (mL)	Stopper Number	Price/Each	Price/Pkg.
GP3080	Flask, Boiling, Flat Bottom, Florence, Borosilicate Glass	125	2	$11.50	$ 67.92/6
GP3085		250	5	11.95	66.72/6
GP3090		500	6	15.75	88.20/6
GP3095		1000	8	19.95	111.96/6

Flask, Boiling, Round Bottom, Borosilicate Glass

Catalog No.	Description	Capacity (mL)	Stopper Number	Price/Each	Price/Pkg.
GP4005	Flask, Boiling, Round Bottom, Borosilicate Glass	100	2	$11.82	$132.60/12
GP4010		500	6	22.15	123.66/6

Flask, Boiling, Round Bottom, Short Neck, Ring Neck

Catalog No.	Description	Capacity (mL)	Stopper Number	Price/Each	Price/Pkg.
GP4075	Flask, Boiling, Round Bottom, Short Neck, Ring Neck	250	4	$22.85	$128.34/6
GP4077		1000	8	29.00	162.60/6

Flasks, Boiling, Accessories

Flask Stand, Round Bottom

Our ribbed flask stand fits all flask sizes, up to 10 liters. Made of polypropylene. 6¾" in diameter x 2" high.

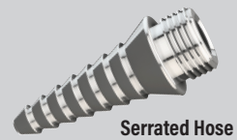
Catalog No.	Description	Price/Each
AP8948	Flask Stand, Round Bottom	$23.05



Gas Fixture
AP1857



Pedestal (Turret) Base
AP1862



Serrated Hose Connection
AP1859



Ray-O-Vac Workhorse®
Flashlight
AP4389



LED
Flashlight
AP6767



Penlight
Flashlight
AP9252

Flask, Boiling,
Flat Bottom, Florence,
Borosilicate Glass
GP3080, etc.





Flask, Boiling, Round Bottom,
Borosilicate Glass
GP4005, etc.

Flask, Boiling, Round Bottom,
Short Neck, Ring Neck
GP4075, etc.





Flask Stand, Round Bottom
AP8948

FLASKS continued on next page.

Flasks, Dewar See page 143.

Flasks, Distilling

Flask, Distilling, with Side Arm, Borosilicate Glass

Catalog No.	Description	Capacity (mL)	Stopper Number	Price/Each	Price/Pkg.	Price/Case
GP4065	Flask, Distilling, with Side Arm, Borosilicate Glass	125	2	$27.10	$156.96/6	$848.16/24
GP4070		250	3	33.45	129.08/4	1035.84/24

Flasks, Erlenmeyer

Organic Chemistry Glassware See page 296.

Flask, Erlenmeyer, Polymethylpentene

Polymethylpentene is "glass clear" plastic. Do not expose this plastic to strong oxidizers or hydrocarbons for long periods. Flask provided with polypropylene screw cap. Graduated in 25 mL intervals.

Catalog No.	Description	Capacity (mL)	Price/Each	Price/Pkg.	Price/Case
AP1374	Flask, Erlenmeyer, Polymethylpentene	125	$19.65	$110.94/6	$601.44/24
AP9163		250	26.60	151.74/6	808.80/24

Flask, Erlenmeyer, Borosilicate Glass

Flasks have heavy-duty rims. Graduated scale gives approximate volume.

Catalog No.	Description	Capacity (mL)	Stopper Number	Price/Each	Price/Pkg.	Price/Case
GP9166	Flask, Erlenmeyer, Borosilicate Glass	10	00	$10.48	$117.60/12	—
GP9156		25	0	7.60	88.44/12	$480.48/48
GP3021		50	1	6.75	79.44/12	425.28/48
GP3040		125	5	6.90	81.24/12	434.88/48
GP3045		250	6	6.00	67.32/12	356.16/48
GP3050		500	7	7.19	42.24/6	339.84/36
GP3055		1000	9	11.87	69.72/6	373.92/24
GP9155		2000	10	28.35	—	212.24/8
GP9160		4000	10	83.49	—	—

Flask, Erlenmeyer, Borosilicate Glass, Economy Choice

Same thermal characteristics and mechanical strength as with standard borosilicate glass Erlenmeyer flasks; however, gently flared rim is not as heavily tooled. Economically priced. Ideal for student use and your budget!

Catalog No.	Description	Capacity (mL)	Price/Each	Price/Pkg.	Price/Case
GP9135	Flask, Erlenmeyer, Borosilicate Glass, Economy Choice	125	$5.50	$63.60/12	$352.32/48
GP9140		250	5.40	63.48/12	337.44/48
GP9145		500	7.00	39.96/6	316.80/36

Flask, Erlenmeyer, Borosilicate Glass, with Screw Cap

Flask has screw thread and is provided with cap (color may vary).

Catalog No.	Description	Capacity (mL)	Price/Each	Price/Pkg.	Price/Case
GP4085	Flask, Erlenmeyer, Borosilicate Glass, Screw Cap	250	$30.10	$168.00/6	$869.76/24
GP4086		500	31.10	173.58/6	904.56/24
GP4087		1000	40.00	223.26/6	580.68/12

Flask, Erlenmeyer, Borosilicate Glass, Wide Mouth

Wide mouth, heavy-duty rim. Graduations indicate approximate volumes.

Catalog No.	Description	Capacity (mL)	Price/Each	Price/Pkg.	Price/Case
GP4080	Flask, Erlenmeyer, Borosilicate Glass, Wide Mouth	125	$ 8.30	$93.12/12	$487.68/48
GP4081		250	6.95	77.88/12	408.48/48
GP4082		500	7.25	40.26/6	312.84/36
GP4083		1000	13.05	72.84/6	375.84/24

FLASKS continued on next page.



Flask, Distilling, with Side Arm, Borosilicate Glass GP4065, etc.



Flask, Erlenmeyer, Polymethylpentene AP1374, etc.



Flask, Erlenmeyer, Borosilicate Glass GP9166, etc.



Flask, Erlenmeyer, Borosilicate Glass, Economy Choice GP9135, etc.



Flask, Erlenmeyer, Borosilicate Glass, with Screw Cap GP4085, etc.



Flask, Erlenmeyer, Borosilicate Glass, Wide Mouth GP4080, etc.

Flasks, Filtering

Flask, Erlenmeyer, Borosilicate Glass, Synthware®

Hand-blown to ensure heavy and uniform wall. With joint. Stopper is not supplied.

Catalog No.	Description	Capacity (mL)	Joint Size	Price/Each	Price/Pkg.
GP9308	Flask, Erlenmeyer, Borosilicate Glass, Synthware®	125	19/22	$16.63	$93.36

Flask, Filtering, Borosilicate Glass

Heavy duty flask with side tubulation. Graduated to indicate approximate volume. Filter flasks should never be heated. All sizes fit 5⁄16" to 1⁄4" i.d. tubing.

Catalog No.	Description	Capacity (mL)	Stopper Number	Price/Each	Price/Pkg.
GP4072	Flask, Filtering, Borosilicate Glass	250	6	$23.00	$129.12/6
GP4073		500	7	30.45	169.98/6
GP4074		1000	8	58.15	326.16/6

Flasks, Volumetric

Flask, Volumetric, Polymethylpentene

Polymethylpentene is "glass clear" plastic. Do not expose this plastic to strong oxidizers or to hydrocarbons for long periods of time.

Catalog No.	Description	Capacity (mL)	Price/Each	Price/Pkg.
AP1281	Flask, Volumetric, Polymethylpentene	250	$46.80	$222.30/5
AP1282		500	52.31	248.35/5

Flask, Volumetric, Borosilicate Glass

High quality volumetric flasks with snap-on plastic closures.

See free How To video at flinnsci.com.

Catalog No.	Description	Capacity (mL)	Price/Each	Price/Pkg.	Price/Case
GP4030	Flask, Volumetric, Borosilicate Glass	100	$30.60	$176.22/6	$473.76/12
GP4035		250	35.00	201.48/6	547.92/12
GP4040		500	39.25	227.28/6	614.16/12
GP4045		1000	60.20	173.40/3	466.98/6

Replacement Caps for Volumetric Flasks

Catalog No.	Description	Size	Price/Each
AP1542	Replacement Caps for Volumetric Flasks	100 mL	$2.89
AP1543		250 mL	3.90
AP1544		500 mL	4.80
AP1545		1000 mL	5.05



Flask, Erlenmeyer, Borosilicate Glass, Synthware® GP9308



Flask, Filtering, Borosilicate Glass GP4072, etc.



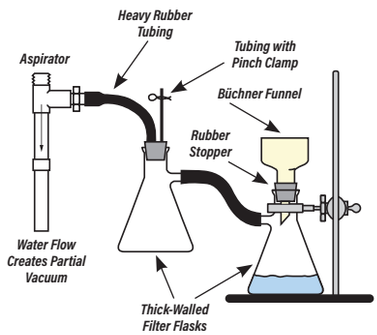
Flask, Volumetric, Polymethylpentene AP1281, etc.



Flask, Volumetric, Borosilicate Glass GP4030, etc.

HOW TO

Set Up a Vacuum Filtration



A safety trap is recommended to prevent water from backing up into filter flask. Both the filter flask and safety trap should be clamped to ring stands.

See How To video at flinnsci.com.

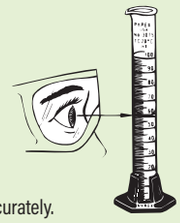
HOW TO

Measure Liquid Volumes

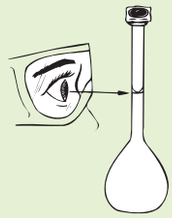
Beakers are used to measure approximate volumes.



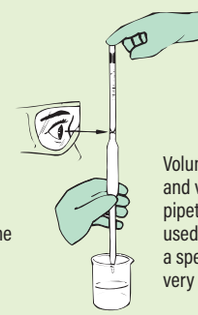
Graduated cylinders are used to measure volumes accurately.



For accurate volume readings always look at the meniscus at eye level.



Read at the bottom of the meniscus.



Volumetric flasks and volumetric pipets are each used to measure a specific volume very precisely.

Forceps

Forceps
Nickel-plated steel. Fine points with blunt tips. 4½" overall length.

Catalog No.	Description	Price/Each	Price/Pkg. of 6
AP8328	Forceps	$3.65	$20.40

Forceps/Magnifier
When the forceps are fully extended from the magnifier, the instrument is automatically in focus. The lens is 4X power, shatter-resistant and recessed in its holder to protect it from scratching and damage. The forceps are nickel-plated steel with very fine pointed tips and are 3" long.

Catalog No.	Description	Price/Each
AP1902	Forceps/Magnifier	$12.90

Funnel Support

Support furnished with metal clamp for attaching to ring stand. Holds four funnels, 2" to 3½" in diameter.

Catalog No.	Description	Price/Each
AP8222	Funnel Support	$36.20

Funnels

Funnel, Filtering, Polymethylpentene
These "glass clear" plastic funnels are very durable but not intended for vacuum filtration. Unique helicoid internal ribs provide very rapid filtration using standard filter paper.

Catalog No.	AP1286	AP1287	AP1288	AP1289
Top i.d. (mm)	51	70	70	100
Filter Paper Size (cm)	7.5–9.0	11.0–12.5	11.0–12.5	15.0–18.5
Stem Length (mm)	150	150	70	108
Stem o.d. (mm)	7.5	7.5	10.0	10.0
Price/Each	**$ 5.25**	**$ 5.50**	**$ 6.50**	**$ 7.25**
Price/Pkg.	**29.58/6**	**31.08/6**	**36.72/6**	**27.56/4**
Price/Case	**235.08/36**	**248.76/36**	**195.12/24**	**142.40/16**

Vacuum Filtration Set, Borosilicate Glass See page 297.

Funnel, Long Stem, Borosilicate Glass
Funnels have a beaded rim and heavy wall for strength. Formed to a 60° angle, which permits accurate fitting of the filter paper, thus reducing filtering time.

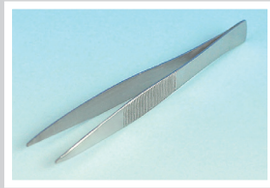
Catalog No.	GP5005	GP5010	GP5015	GP5020
Top i.d. (mm)	55	65	75	100
Filter Paper Size (cm)	9.0	11.0	12.5	18.5
Stem o.d. (mm)	8	8	8	9
Price/Each	**$ 11.71**	**$ 12.85**	**$ 12.65**	**$ 18.85**
Price/Pkg.	**135.12/12**	**151.20/12**	**148.56/12**	**109.68/6**
Price/Case	**724.32/48**	**828.00/48**	**799.20/48**	**596.40/24**

Funnel, Short Stem, Fluted, Borosilicate Glass
Funnels have a beaded rim and heavy wall for strength. Formed to a 60° angle, which permits accurate fitting of the filter paper, thus reducing filtering time. Depressed inside fluting further decreases filtering time.

Catalog No.	GP5040	GP5045	GP5050	GP5055
Top i.d. (mm)	50	65	75	100
Filter Paper Size (cm)	9.0	11.0	12.5	18.5
Stem o.d. (mm)	8	8	8	9
Price/Each	**$ 12.72**	**$ 13.93**	**$ 15.51**	**$ 20.90**
Price/Pkg.	**148.68/12**	**163.92/12**	**182.28/12**	**123.06/6**
Price/Case	**798.72/48**	**877.44/48**	**981.12/48**	**660.00/24**



Forceps/Magnifier AP1902



Forceps AP8328



Funnel Support AP8222



Funnel, Filtering, Polymethylpentene AP1286, etc.



Funnel, Long Stem, Borosilicate Glass GP5005, etc.



Funnel, Short Stem, Fluted, Borosilicate Glass GP5040, etc.

FUNNELS continued on next page.

Funnels, continued

Funnel, Standard Stem, Polypropylene

60° angle funnel is designed for speedy filtrations. External ribbing prevents airlock. Parallel stem measures 9–11 mm outer diameter.

Catalog No.	AP8837	AP8838	AP8839	AP8840
Top i.d. (mm)	55	65	75	97
Filter Paper Size (cm)	9.0	11.0	12.5	18.5
Stem Length (mm)	60	55	55	70
Price/Each	**$ 5.60**	**$ 5.45**	**$ 5.75**	**$ 11.20**
Price/Pkg.	**64.44/12**	**63.48/12**	**33.42/6**	**64.50/6**
Price/Case	**261.00/36**	**258.12/36**	**270.72/36**	**347.04/24**

Funnel, Utility, Polypropylene

Catalog No.	Description	Top i.d. (mm)	Filter Paper Size (cm)	Price/Each	Price/Each Qty 12 or more
AP9151	Funnel, Utility, Polypropylene	55	9	**$1.05**	**$ .97**
AP9152		65	11	**1.18**	**1.11**

Funnel, Utility, Polyethylene

Made of linear polyethylene. Durable and lightweight.

Catalog No.	Description	Top i.d.	Price/Each	Price/Pkg.
AP3200	Funnel, Utility, Polyethylene	2¾" (70 mm)	**$2.70**	**$30.48/12**
AP3201		3½" (90 mm)	**2.92**	**32.76/12**
AP3202		4¼" (108 mm)	**3.70**	**42.00/12**

Funnel, Utility, PMP

Made of durable polymethylpropylene (PMP) with a diameter of 196 mm (almost 8"). The 33-cm filter paper shown below fits perfectly into the funnel.

Catalog No.	Description	Price/Each
AP6432	Funnel, Utility, PMP	**$40.70**
AP6469	Filter Paper, 33 cm, Pkg. of 100	**48.08**

Funnels, Büchner

Büchner Funnel, Polypropylene

This two-piece funnel is unbreakable and resistant to corrosion. May be used for vacuum filtration. If you wish to speed up the filtering process you should consider the polyethylene Büchner filter discs.

Catalog No.	Description	To Accommodate Filter Paper Size	Price/Each
AP1129	Büchner Funnel, Polypropylene	5.5 cm	**$23.14**
AP1130		7.0 cm	**18.15**
AP1131		9.0 cm	**34.40**

Büchner Funnel, Porcelain, Coors

Glazed inside and out except for rim. Permanent, perforated plate mounted inside.

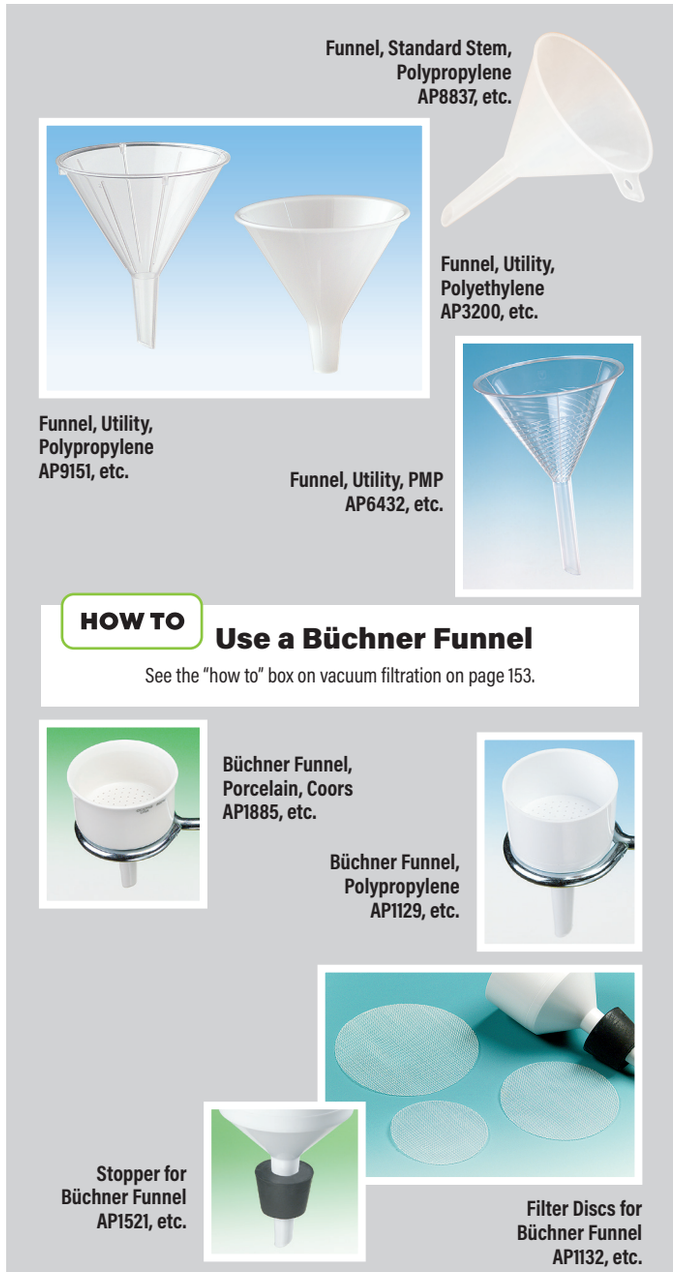
Catalog No.	Description	Height (mm)	Filter Paper Size (cm)	Volume (mL)	Price/Each
AP1885	Büchner Funnel, Porcelain, Coors	100	4.0	25	**$37.40**
AP1886		120	5.5	70	**46.80**
AP1283		130	7.0	120	**63.80**
AP1284		150	9.0	240	**79.80**

Synthware® Filter Funnel, Büchner

Contains sealed-in glass disc. Pressure should not exceed 15 psi.

Catalog No.	Description	Size	Type	Price/Each
GP9313	Synthware® Filter Funnel, Büchner	30 mL, 30 mm	Fine	**$41.75**

Vacuum Filtration Set, Borosilicate Glass See page 297.



HOW TO **Use a Büchner Funnel**

See the "how to" box on vacuum filtration on page 153.

Filter Discs for Büchner Funnel

Polyethylene discs used to support and keep filter paper off the perforated surface of the Büchner funnel. These discs will reduce the hole blockages, keep the filtering surface free, and increase the filtration speed. Not necessary for use of the Büchner funnel—but helpful.

Catalog No.	Description	To Accommodate Filter Paper Size	Price/ Pkg. of 10
AP1132	Filter Discs for Büchner Funnel	5.5 cm	**$22.35**
AP1133		7.0 cm	**24.80**
AP1134		9.0 cm	**25.25**

Stopper for Büchner Funnel

FLINN EXCLUSIVE

Specially fabricated rubber stoppers that accept polypropylene and porcelain Büchner funnels. Stopper Size No. 6 will fit a 250-mL filtering flask, while stopper Size No. 7 will fit a 500-mL filtering flask.

Catalog No.	Description	Size	Price/Each
AP1521	Stopper for Büchner Funnel	No. 6	**$2.20**
AP1522		No. 7	**2.20**

FUNNELS continued on next page.

Funnels, Powder

Powder Funnel, Polypropylene

Catalog No.	Top Inside Diameter (mm)	Stem Outside Diameter (mm)	Stem Length (mm)	Price/Each
AP2268	66	11	26	$4.70
AP2270	84	25	27	6.65
AP2269	98	26	27	7.55
AP2271	154	25	30	8.80

Funnels, Separatory

Separatory Funnel, Polypropylene

This Squibb separatory funnel is pear shaped and molded of polypropylene with a screw top and a PTFE stopcock. The molded polypropylene will provide sufficient visibility of the liquid interface.

Catalog No.	Description	Capacity (mL)	Price/Each
AP1290	Separatory Funnel, Polypropylene	100	$ 30.60
AP1291		250	33.15
AP7695		500	108.00

Separatory Funnel, Borosilicate Glass

Squibb pear-shaped separatory funnel with PTFE stopcock plug and polyethylene stopper.

See free How To video at flinnsci.com.

Catalog No.	Description	Capacity (mL)	Price/Each
GP5058	Separatory Funnel, Borosilicate Glass	60	$ 102.83
GP5059		125	114.31
GP5060		250	130.00

Separatory Funnel, Borosilicate Glass Synthware®

Hand-blown to ensure heavy and uniform wall. With joint. Stopper is not supplied.

Catalog No.	Description	Size	Type	Stopcock Size	Price/Each
GP9314	Separatory Funnel, Borosilicate Glass Synthware®	125	24/40	2 mm	$112.90
GP9315		250	24/40	4 mm	124.60

Furnace, Benchtop

Heat treat small steel parts, perform ignition tests, conduct gravimetric analysis, determine volatile and suspended solids, and ash most types of organic and inorganic samples. Reaches a maximum temperature of 1100 °C. One display shows actual temperature or set point. Ceramic fiber insulation permits faster heat-up, reducing energy consumption. Improved temperature uniformity due to embedded heating element on top and both sides. Safety switch stops power to heating elements if door is opened. Thermocouple break protection, 1.3 L capacity, 5" D x 4" W x 3.8" H interior, 13" L x 9" W x 14" H exterior, 1060 W, 120 V, 60 Hz, 20 lb.

Catalog No.	Description	Price/Each
AP7601	Furnace, Benchtop	$1663.22



Powder Funnel, Polypropylene AP2268, etc.



Separatory Funnel, Polypropylene AP1290, etc.



Separatory Funnel, Borosilicate Glass GP5058, etc.



Separatory Funnel, Borosilicate Glass Synthware® GP9314, etc.

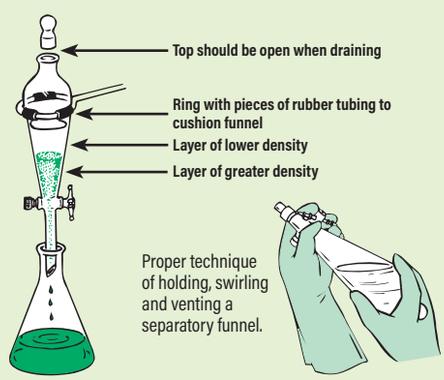


Furnace, Benchtop AP7601

HOW TO

Use a Separatory Funnel to Separate Immiscible Liquids

1. Use a separatory funnel that will hold at least twice the total volume of solution to be extracted and the extraction solvent.
2. Support the funnel in a ring stand and pour the solution to be extracted into the funnel.
3. Next, pour the extraction solvent into the funnel.
4. Stopper the funnel and hold the stopper in place.
5. Invert and gently swirl the funnel. Do not shake the funnel or an undesirable emulsion may form.
6. While the funnel is inverted, open the stopcock to release the built-up pressure.
7. Close the stopcock and repeat steps 5 and 6 several times.
8. Place the funnel back in the ring support and allow the two layers to separate.
9. Remove the stopper and open the stopcock to drain off the bottom layer.



Proper technique of holding, swirling and venting a separatory funnel.

Gases, Refillable Cylinders

Instead of buying a new gas cylinder every year, you save money by only purchasing a refill. Refillables are also environmentally sound, eliminating unnecessary disposal problems. Refilling is recycling. Also note that refillables contain twice the volume of lecture bottles. This means you will save money by purchasing gas less often.

Flinn's return process for refillable cylinders is easy. Every time you need a gas, purchase a refillable cylinder. The price of the refillable cylinder includes the cost of the gas and a deposit on the cylinder.

If you need to refill a cylinder, send us an order for the refillable cylinder of gas you wish to purchase and contact us to return your empty cylinder. Your new cylinder of gas will promptly be sent to you. When we receive your empty cylinder, a credit will be applied to your account. If you wish to return an empty cylinder that does not require a refill, contact us for return instructions so a credit is correctly applied to your account.

See free video at flinnsci.com.

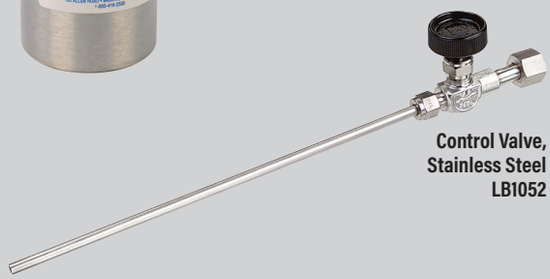
Catalog No.	Description	Contents of Bottle	Price/Each*
LB1060	Carbon Dioxide	1 lb. (250 Liters)	**$449.25**
LB1065	Helium	3.6 cu. ft. (100 Liters)	**449.25**
LB1070	Hydrogen	3.6 cu. ft. (100 Liters)	**437.00**
LB1075	Nitrogen	4.0 cu. ft. (112 Liters)	**394.80**
LB1080	Oxygen	3.4 cu. ft. (95 Liters)	**435.00**

***Price includes a refundable cylinder deposit.**



- **Save Money—**After the first purchase, you pay only for the cost to refill.
- **Environmentally Sound—** Refilling is recycling.
- **No Disposal Problems**

Gases, Refillable Cylinders LB1060, etc.



Control Valve, Stainless Steel LB1052

Gases, Refillable Cylinder Accessories

Control Valve, Stainless Steel

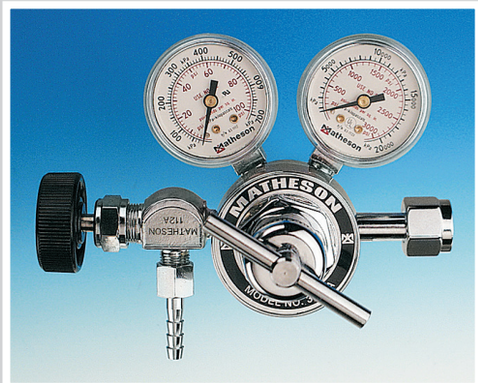
The most economical choice for dispensing gas from a refillable cylinder. Has a single-stage control valve that connects directly to your refillable gas cylinder. Provides coarse control through a manually operated valve. Fill balloons or attach tubing to the 10" stainless steel stem. For use with the refillable gas cylinders shown on page 157.

Catalog No.	Description	Price/Each
LB1052	Control Valve, Stainless Steel	**$387.00**

Refillable Cylinder Regulator, Brass

Provide your refillable cylinder with accurate pressure control with this single-stage regulator. Deliver pressure from 0–60 PSI. Two gauges show delivery pressure and the amount of gas remaining in the refillable cylinder. Not for use with corrosives like ammonia. Your best choice when you need to dispense gas often.

Catalog No.	Description	Price/Each
LB2005	Refillable Cylinder Regulator	**$625.00**



Refillable Cylinder Regulator, Brass LB2005

GASES continued on next page.

HOW TO

Prepare O_2 and CO_2 Yourself

Oxygen Gas Preparation

Oxygen can be generated by using 30% hydrogen peroxide (H_2O_2). It is vital that you give this substance your highest level of safety consciousness for it is very hazardous. Set up the apparatus to create a gas generator. A drying tube containing anhydrous calcium chloride (Catalog Nos. C0016 or C0017) or Drierite® (Catalog Nos. D0011 or D0012) will also be required since the O_2 will have an undesirably high water content. Place two grams of manganese dioxide (Catalog Nos. M0025 or M0026) in the flask. Now dilute 50 mL of 30% H_2O_2 to 100 mL using distilled water. Then add the diluted H_2O_2 through the dropping funnel into the flask. This process will generate about 6 liters of oxygen. ***Do not use potassium chlorate to generate oxygen.***

Carbon Dioxide Gas Preparation

CO_2 gas can be produced from dry ice. One to two pounds of dry ice should provide sufficient gas for use by 40–50 students. You will have to set up a generator with apparatus that will enable you to heat the dry ice by placing chunks in a water bath. The evolution of gas is not sufficient unless warmed by water. Your delivery tube (from the generator) should be rather long to allow the gas to reach room temperature. A drying tube will also have to be part of the apparatus to remove moisture. Using about 25 grams of calcium carbonate (Catalog Nos. C0347 and C0012) and 6 M hydrochloric acid will evolve approximately 6 liters of CO_2 at room temperature and sea level pressure. A drying tube should be a part of the generation apparatus.

Gases, Lecture Bottles

The standard lecture bottle is 2" in diameter and 15" long. A lecture bottle will fill approximately five 11" balloons with gas. These lecture bottles are not refillable. Please consider our refillable gas cylinders on page 157.

Catalog No.	Gas	Contents of Bottle	Price/Each
LB1005	Carbon Dioxide	0.5 lb. (125 liters)	$273.20
LB1010	Helium	2 cu. ft. (56 liters)	441.27
LB1015	Hydrogen	2 cu. ft. (56 liters)	295.30
LB1025	Oxygen	2 cu. ft. (56 liters)	296.05
LB1030	Sulfur Hexafluoride	0.5 lb. (38 liters)	428.40

Gases, Lecture Bottle, Accessories

Lecture Bottle Regulator

Two-stage precision regulator allows for control of the delivery pressure and control of the pressure in the attached lecture bottle. Very compact unit (6" x 4" x 4"); made almost entirely of brass. *Cannot* be used with a corrosive gas like ammonia. Contact us for prices on a two-stage regulator for use with corrosive gases. A swivel inlet fits nicely on your lecture bottle. The exit valve is a ⅛" NPT male and a mating hose connection is furnished at no additional cost. Only a wrench is required to mount the regulator and affix the exit (threaded or tubing). **Note:** For use with nonrefillable lecture bottles only.

Catalog No.	Description	Price/Each
LB1050	Lecture Bottle Regulator	$550.95

Lecture Bottle Control Valve, Brass

The most economical choice for dispensing gas from a lecture bottle. Has a single-stage control valve that connects directly to your lecture bottle. Provides coarse control through a manually operated valve. Fill balloons or attach tubing to the brass stem.

Catalog No.	Description	Price/Each
LB1051	Lecture Bottle Control Valve, Brass	$464.10

Lecture Bottle Control Valve, Stainless Steel

Similar to LB1051 but of stainless steel and with 10" stem for use with ammonia gas. This control valve will only fit ammonia gas lecture bottles and refillable gas cylinders.

Catalog No.	Description	Price/Each
LB1052	Lecture Bottle Control Valve, Stainless Steel	$387.00

Balloons, Latex

Mixed color balloons. A 12" balloon will hold approximately 11 liters of helium gas when fully inflated (approximately one half of a mole.) A lecture bottle of helium will fill about five 12" balloons.

Catalog No.	Description	Price/Pkg.
AP1900	Balloons, Latex, 12", Pkg. of 20	$6.45
AP6420	Balloons, Latex, 5", Pkg. of 50	7.55

Lecture Bottle Carrier/Holder

This heavy-duty, six-place lecture bottle carrier/holder can transport lecture bottles within your science department or you can use it for permanent storage instead of allowing your cylinders to roll around in a drawer or off a shelf. Made of sturdy PVC.

Catalog No.	Description	Price/Each
AP1904	Lecture Bottle Carrier/Holder	$159.14

Wrench, Adjustable

Fits the various valve and control fittings for lecture bottles. 6".

Catalog No.	Description	Price/Each
AP1499	Wrench, Adjustable	$21.91

Balloon Volume Data	
Latex Balloon Size	Approx. Volume of Gas
9"	6.2 Liters
10"	8.5 Liters
11"	11.3 Liters
12"	14.7 Liters
14"	23.5 Liters
16"	35.1 Liters
20"	68.5 Liters



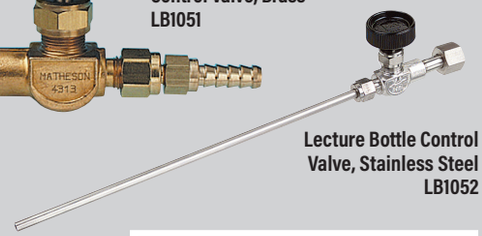
Gases, Lecture Bottles LB1005, etc.



Lecture Bottle Regulator LB1050



Lecture Bottle Control Valve, Brass LB1051



Lecture Bottle Control Valve, Stainless Steel LB1052



Balloons, Latex AP1900



Lecture Bottle Carrier/Holder AP1904



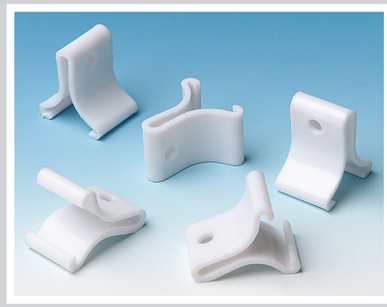
Wrench, Adjustable AP1499

Glue Gun See page 199.

Hooks, Ceiling

Ceiling Hangers
Hang objects (up to 0.9 kg) from banners to plumb bobs. Package of 10.

Catalog No.	Description	Price/Pkg. of 10
AP6534	Ceiling Hangers	$5.55



Ceiling Hangers
AP6534

FLINNSCI.COM
VISIT US ONLINE

Hot Plates

Flinn Hot Plates
FLINN EXCLUSIVE

The Flinn Hot Plate is a "state of the art" device. The space-age ceramic top has excellent chemical resistance, high impact strength, and has an unsurpassed flat surface. The flatter the surface, the better the heat transfer. An electrical input controller provides fine temperature control from ambient temperature to 540 °C. You can reach a rapid boil in just eight minutes—twice as fast as comparable hot plates! The square top is isolated from the die-cast aluminum base so your laboratory benchtops are protected against heat damage. Heating elements are embedded in the ceramic top so it has no exposed or glowing heating elements. A power indicator light warns when the heating function is turned on.
Specifications: 120 volts, 500 watts, 540 °C maximum temperature.

Catalog No.	Description	Size of Top	Price/Each
AP9801	Hot Plate, Flinn	4" x 4"	$318.25
AP9802		7" x 7"	385.00
AP8213	Replacement Ceramic Top	4" x 4"	165.00
AP8215		7" x 7"	202.35



Flinn Hot Plate,
7" x 7"
AP9802

Flinn Hot Plate,
4" x 4"
AP9801

HOT PLATES continued on next page.

Flinn Goggle Sanitizer
FLINN EXCLUSIVE

Designed to meet the demanding needs of your science laboratory, this unique goggle sanitizer has been specifically designed by Flinn Scientific for science teachers. Special features:

- Racking system conveniently stores chemical splash goggles or safety glasses without stacking.
- The light viewing screen, 15-minute timer and instructions on the cabinet front allow for ease of use and save valuable bench/storage space as it can be placed up against other cabinets.
- Longer life, high-intensity ultraviolet 25-watt lightbulb improves sanitizing performance.
- Safety message silk-screened on the cabinet front reminds students "Safety First."
- A great price! You won't find a better price anywhere.

Using a goggle sanitizer allows several classes of students to safely share goggles. Five-minute exposure of UV light will kill over 99.5% of all bacteria present.

Safety and ease of use were the primary considerations in the Flinn goggle sanitizer design. A keyed lock allows the doors to be secured during sterilization. Safety door switches automatically shut off the UV light source if a door is accidentally opened. The light viewing screen confirms UV light is being generated.



Digital models available. Constructed of 24-gauge steel with a white baked enamel finish; comes fully assembled. A heavy-duty 8' (96") neoprene cord is provided. Can be shipped UPS. Goggles not included.
Dimensions:

- Large: 28½" H x 26¼" W x 10¼" D; holds 36 goggles.
- Small: 28½" H x 19" W x 10¼" D; holds 20 goggles.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each	Price/Each Qty. of 3 or more
SE1000	Flinn Goggle Sanitizer, Large	$799.00	$757.26
SE1094	Flinn Goggle Sanitizer, Digital, Small	637.50	603.04
SE1001	Replacement UV Lamp	79.55	72.79

Hot plate features to consider:

1. Safety Features

Automatic Shutoff: Ensures the hot plate turns off if left unattended, which is especially helpful in a busy classroom setting.

Hot Surface Indicator Light: Shows when the surface is still hot, reducing the risk of accidental burns for students and teachers.

Splash Guard/Protection: Keeps spills contained and prevents liquids from reaching the heating element, which is safer and helps the hot plate last longer.

2. Temperature Control and Range

Basic Temperature Control: Look for a model with simple, adjustable temperature settings that allow easy control without advanced calibration.

Moderate Temperature Range: A hot plate that reaches up to 400°C is generally enough for most school experiments, without requiring high-end equipment.

3. Durable Surface Material

Ceramic or Porcelain Coating: Both are chemically resistant, making them ideal for school labs where different substances are used.

Sturdy Base Material: A metal or hard plastic base can resist damage from spills and bumps.

4. Size and Portability

Compact Design: Choose a hot plate that is small enough to store easily but large enough for standard classroom beakers.

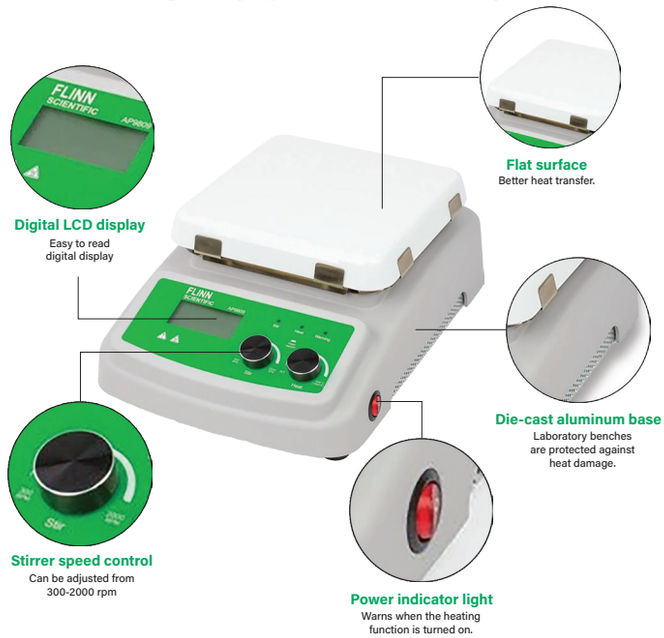
Lightweight and Portable: A lighter hot plate is easier to move between storage and different lab stations, especially if space is limited.

5. Ease of Use

Simple Interface: Basic controls (like a single knob or digital button for temperature) make it quick to set up and adjust.

Quick Heating Time: A hot plate that heats up and cools down quickly can save class time and allow students to focus on experiments.

PRODUCT DETAILS



Backed by the FLINN WARRANTY

Flinn hot plates benefits:

- **Safety features**
- **Temperature uniformity**
- **Chemical resistant**
- **Heating and stirring combo**
- **Analog vs. digital**
- **Accurate results**



Flinn Scientific Hot Plate, 4" x 4" AP9801

The Flinn Scientific Hot Plate has excellent chemical resistance, high impact strength and an unsurpassed flat ceramic surface.

$318.25



Flinn Scientific Hot Plate/Magnetic Stirrer, 4" x 4" AP9804

An electrical input controller provides fine temperature control from ambient temperature to 540 ºC.

$576.00



Flinn Scientific Hot Plate/Magnetic Stirrer, 7" x 7" AP9805

The square top is isolated from the die-cast aluminum base so your laboratory benchtops are protected against heat damage.

$605.00



Flinn Scientific Digital Hot Plate, 7" x 7" AP9807

You can reach a rapid boil in just eight minutes—twice as fast as comparable hot plates!

$364.00

Hot Plates, continued

Flinn Digital Hot Plates

FLINN EXCLUSIVE

Quickly set the desired temperature of this hot plate using an LCD digital display, which indicates the current operating temperature. State-of-the-art ceramics provide a remarkable top surface, offering high-impact strength, excellent chemical resistance and a bright white color to enhance solution visibility. Heating elements are embedded in the ceramic top so there are no exposed or glowing heat sources. Reaches maximum temperature (540 °C) within 15 minutes. A "HOT" warning flashes if the work plate temperature is above 50 °C even when turned off. Includes three-wire grounded cord and plug.

Specifications: 120 volts, 500 watts, 540 °C maximum temperature, ± 0.1 °C resolution.

Catalog No.	Description	Size of Top	Price/Each
AP9806	Flinn Digital Hot Plate	4" x 4"	$409.00
AP9807		7" x 7"	364.00
AP8213	Replacement Ceramic Top	4" x 4"	165.00
AP8215		7" x 7"	202.35

Accessories for Flinn Digital Hot Plates

Catalog No.	Description	Price/Each
AP9878	Temperature Sensor, 230 mm	$ 88.87
AP9879	Temperature Sensor, 230 mm, Glass-Coated	82.83
AP9880	Temperature Sensor, 100 mm	66.65
AP9882	Temperature Sensor and Support Clamp Set	116.10

Hot Plate/Magnetic Stirrer, Flinn See page 188.

Multi-Channel Hot Plates/Stirrers See page 189.

Hot Plate, Digital, Cimarec™

This newly designed hot plate retains its solid, flat ceramic top that is chemical resistant and provides good, even heat transfer. The large surface area brings solutions to temperature quickly, with boiling reached in less than eight minutes. New features include a hot surface alert system for protection from accidental burns. Bright red warning lights are displayed when the top surface is above 50 °C (122 °F). The warning is displayed even when the unit is unplugged! The hot plates are also equipped with an easy-to-read digital display of temperature settings, adjustable in 1 °C increments, from 5 °C up to 540 °C (41 °F to 1004 °F). Low-profile body provides stability and the power cord is detachable, making storage much easier. Integral ring stand holder accepts ½" diameter support rod (Flinn Catalog No. AP8228), UL listed.

Cimarec Hot Plate electrical requirements: 4" x 4"—120 volts, 4.75 amps, 410 watts; 7" x 7"—120 volts, 13 amps, 1040 watts. Maximum temperature: 540 °C (1004 °F).

Catalog No.	Description	Size of Top	Price/Each
AP6581	Hot Plate, Digital, Cimarec™	4" x 4"	$346.80
AP6572	Replacement Cimarec™ Top	4" x 4"	166.97

Hot Plate, Stovetop Burner

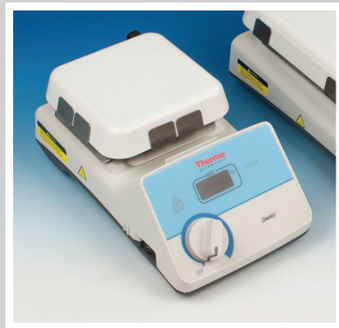
An economy-priced electric hot plate. Durable metal housing with adjustable knob for heat control. Not compatible with GFI electrical outlets. 120 V.

Catalog No.	AP4830	AP4831
Description	Single Stovetop Burner	Double Stovetop Burner
Watts	1000 W	1500 W
Burner No. & Size	Single 6" diameter	Double 6" diameter
Dimensions	13" W x 9" D x 2½" H	22" W x 9" D x 2½" H
Price	$127.50	$137.75



Flinn Digital Hot Plate, 7" x 7" AP9807

Flinn Digital Hot Plate, 4" x 4" AP9806



Hot Plate, Cimarec™, 4" x 4" AP6581



Hot Plate, Single Stovetop Burner AP4830

Hot Plate, Double Stovetop Burner AP4831

HOT PLATES continued on next page.

HOW TO

Extend the Life of Your Hot Plate

Hot plates are an investment. Use the following tips to properly care for that investment.

1. Always place a vessel on the hot plate when heating the hot plate. If a vessel is not present to absorb some of the heat, the top could crack.
2. Do not heat metal vessels (including aluminum foil) or sand baths on hot plates with ceramic or aluminum tops. This may cause the ceramic top to crack or the aluminum top to melt. For metal vessels, we suggest a stovetop burner, such as AP4830.
3. Do not use abrasive cleansers on the top plate. Abrasives can scratch the plate, creating weak points that can eventually crack. Instead, choose non-abrasive liquid or gel cleansers for cleaning the top.
4. Keep the space between the top plate and the base of the hot plate clean and free of debris. If this space becomes plugged, air will not be able to properly flow through it. Air flow is needed to prevent premature burnout of the heating element or controls.

Hot Plates, Accessories

Reaction Blocks for Round-Bottom Flasks

Aluminum reaction blocks machined for use with round bottom flasks. For use with DLAB hot plates with round heating elements. A small hole facilitates easy use of a temperature probe.

Catalog No.	Description	Size	Price/Each
AP10037	Reaction Blocks for Round-Bottom Flasks	100 mL	$ 95.65
AP10038		250 mL	104.80
AP10039		500 mL	110.50

Hydrometer Cylinder

Two cylinders are available. AP8599 is a borosilicate glass cylinder with a pour spout and 700-mL capacity; 55 cm high x 5 cm wide. AP6752 is a clear PMP plastic cylinder with a pour spout and 600-mL capacity; 36 cm high x 5 cm wide.

Catalog No.	Description	Price/Each
AP8599	Hydrometer Cylinder, Glass	$57.00
AP6752	Hydrometer Cylinder, Plastic	35.64

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VISIT US ONLINE

Hydrometer, Universal

Specific gravity, salinity, and Baumé determinations for both light and heavy liquids can be made with this universal hydrometer. Floats upright in a very stable manner. Easy to read. Measures 15" in length. Graduations are as follows:

Scale	Range	Subdivisions
Specific Gravity	0.7 to 2.0	0.01
Baumé for liquids lighter than water	70 to 10	1°
Baumé for liquids heavier than water	0 to 70	1°

Catalog No.	Description	Price/Each
AP4314	Hydrometer, Universal	$28.60

Incentives and Awards, Success in Science™

Bookmarks

FLINN EXCLUSIVE

Reward student success with a bookmark that doubles as a measurement tool! Ruler side features both metric and English units. Reverse side has a periodic table, BIG and small things, SI units and prefixes, and Safety First tips! Package of 32 has eight of each of the four designs. 8" x 2".

Catalog No.	Description	Price/Pkg.
AP2006	Success in Science™ Bookmarks, Pkg. of 32	$9.29

Mole Dollars

Make Mole Dollars the currency of your classroom. Give them out as extra-credit or incentive awards and collect them for late assignments, quiz retakes, etc.

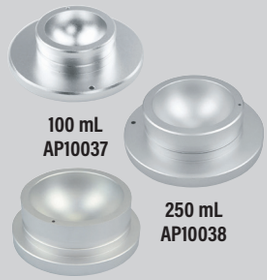
Catalog No.	Description	Price/Pkg. of 50
AP6564	Mole Dollars	$7.60

Pencils

Yellow, #2 pencil with black "Success in Science™" imprint.

Catalog No.	Description	Price/Each	Price/Pkg. of 100
AP2007	Success in Science™ Pencil	$ 0.64	$61.00

Reaction Blocks for Round-Bottom Flasks



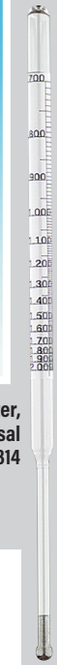
100 mL AP10037

250 mL AP10038

500 mL AP10039

Hydrometer Cylinder, Glass AP8599





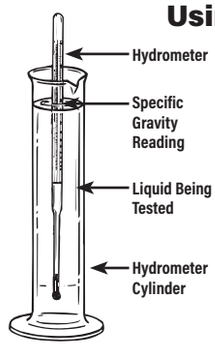
Hydrometer Cylinder, Plastic AP6752



Hydrometer, Universal AP4314

HOW TO

Measure Specific Gravity Using a Hydrometer



1. The liquid and hydrometer should be at room temperature and clean prior to use.
2. Fill a tall cylinder about three-fourths full of the liquid to be tested.
3. Slowly immerse the hydrometer in the liquid to a point just below where it naturally sinks.
4. Allow the liquid and hydrometer to come to rest.
5. Take the reading at the liquid surface level.

Success in Science™ Bookmarks AP2006





Mole Dollars AP6564

Success in Science™ Pencils AP2007



Incubators

Incubator

Dependable incubator for cultures, eggs and biologicals. Has a see-through tinted acrylic door with an ivory baked-on enamel exterior. Temperatures up to 70 °C can be maintained accurately and uniformly. The heat-sensitive controller maintains temperatures within 2 °C. Chrome-plated adjustable shelf and fixed bottom shelf. Unit is equipped with separate power and element-on indicator lights. Laboratory thermometer included. Capacity: 19.8 liters. Interior: 12" W x 10" D x 10" H. Exterior: 12⅞" W x 10¾" D x 15" H. UL listed.

Catalog No.	Description	Price/Each
AP1565	Incubator	$570.00

Incufridge

Versatile Incufridge combines the best of both worlds! Functions as both an incubator and a refrigerator, helping save valuable lab space and funds! Unique unit provides either heating or cooling functions in the temperature range from 7–60 ˚C with a precision of 0.7 ˚C. The Incufridge is controlled by a microcomputer that accurately holds the desired temperature. Features a three-digit illuminated temperature display and an internal light for easy viewing. Includes a 12 V DC power adapter and 2 removable shelves with plastic liners able to hold beakers and flasks up to 500 mL. Capacity: 33 L. Exterior dimensions: 15" W x 15½" H x 23" D. Interior dimensions: 12" W x 10¼" H x 16½" D.

Catalog No.	Description	Price/Each
AP9955	Incufridge	$2034.90

Inoculating Loops for Flame Test

Inoculating Loop, Nichrome Wire

Overall length 8" with 25 gauge wire and aluminum handle. Wire portion 3" long.

Catalog No.	Description	Price/Each
AP1051	Inoculating Loop, Nichrome Wire	$3.85

Inoculating Loop, Platinum

This platinum loop will better resist constant exposure to acid and flame than the nichrome wire loop (AP1051). Overall length 26 cm with 28 gauge wire and bakelite handle with nickel-plated brass rod. Wire portion 1½" long.

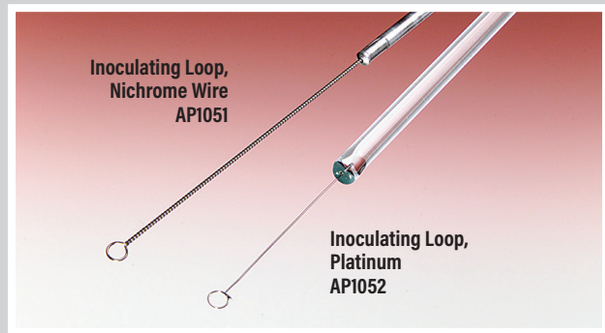
Catalog No.	Description	Price/Each
AP1052	Inoculating Loop, Platinum	$54.85

Jars See page 116.

Jars, Bell See page 179.

Kimwipes® See page 201.





HOW TO

Do a No-Fuss Flame Test

Using platinum or nichrome wire loops for flame tests can be frustrating since the wire loops must be impeccably cleaned. Any contamination will lead to poor results.

Cotton swabs are an inexpensive alternative to platinum and nichrome wire loops. Just moisten the cotton swab in distilled water. Then dip a moistened swab into a metallic salt (e.g., lithium chloride, sodium chloride, strontium chloride, barium chloride, potassium chloride or calcium chloride). Insert the swab, now containing a few metallic salt crystals, into a burner flame. Observe the color of the flame. The water on the swab will help prevent it from catching on fire. Repeat the procedure with a new swab and a different metallic salt. Wood splints can also be used for flame tests; see page 100.

HOW TO

Use an Inoculating Loop for a Flame Test

1. Carefully clean a platinum or nichrome wire loop by dipping it into a small amount of concentrated hydrochloric acid.
2. Heat the wet-with-acid wire loop in the blue flame of a laboratory burner until it glows cherry red. Any change in the flame color is an indication that the wire loop is not yet clean and the cleaning process should be repeated. Any contamination of the wire loop will yield misleading results.
3. Dip the wire loop into a solution (about 1 Molar) containing the metallic ion to be tested (e.g., lithium chloride, sodium chloride, strontium chloride, barium chloride, potassium chloride, cupric chloride or calcium chloride).
4. Hold the wire loop in the flame and observe the flame color.
5. Repeat the entire procedure with the other metallic salt solutions, making sure to thoroughly clean the wire loop between each sample.

Metallic Ion	Flame Color
Ba^{2+}	Green/yellow
Ca^{2+}	Brick red/yellow orange
Li^{+}	Crimson/scarlet
K^{+}	Violet
Na^{+}	Yellow
Sr^{2+}	Bright red
Cu^{2+}	Azure blue

Knives

Laboratory Knife

Catalog No.	Description	Price/Each
AP9243	Laboratory Knife, Stainless Steel	$6.70

Labels

Labeling Tape

Tape adheres to glass, plastic, metal, paper and rubber and peels off without leaving an adhesive residue. Pencil, ball-point pen or felt tip marker will remain legible under heavy use. Tape is water- and acid-resistant and withstands autoclaving.

Catalog No.	Description	Tape Size	Length	Color	Price Per Roll
AP1367	Labeling Tape	½"	120 ft.	Yellow	$13.65
AP1292		½"		Red	13.45
AP1368		½"		White	14.35
AP1293		¾"		Yellow	17.70
AP1369		¾"		Red	17.70
AP1370		¾"		White	17.90
AP1371		1"		Yellow	22.35
AP1294		1"		Red	22.00
AP1372		1"		White	23.25
AP5369	Labeling Tape	¾"	43⅔ ft.	White	12.50
AP5370		1"		White	16.45

Labeling Tape Dispenser

Unique labeling tape dispenser has a convenient writing platform which allows both left- and right-handed users to write on the labeling tape. Weighted base with a non-skid bottom. Dispenser accepts 120 ft. rolls of labeling tape listed above. Does not accept AP5369 and AP5370. Labeling tape not included.

Catalog No.	Description	Price/Each
AP8864	Labeling Tape Dispenser	$114.85

Time Tape®, Rainbow Pack

Time Tape® withstands temperatures down to –23 °C and up to 121 °C. Tape will perform well in incubators, autoclaves, refrigerators, freezers and above the water line in a water bath. Application temperatures can be as low as 0 °C. Rainbow pack contains 24 rolls of tape in assorted colors—five white, four yellow, and three each of blue, green, orange, red and pink. Each roll is ½" wide x 42' 8"long.

Catalog No.	Description	Price/Each
AP5420	Time Tape®, Rainbow Pack	$141.78

Laboratory Labels

Ideal for general purpose labeling, the permanent, pressure-sensitive adhesive on these white smudgeproof labels will keep them securely applied between –54 and 93 °C (not autoclavable). Each label is 1" x 2". 1,000 labels per roll.

Catalog No.	Description	Price/Each
AP5368	Laboratory Labels	$28.25

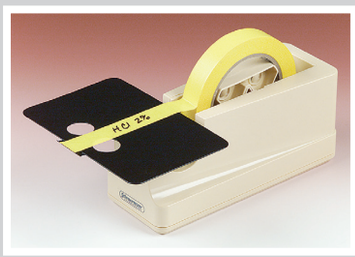
LABELS continued on next page.



Laboratory Knife
AP9243



Labeling Tape
AP1367, etc.



Labeling Tape
Dispenser
AP8864



Time Tape®,
Rainbow Pack
AP5420



Laboratory Labels
AP5368

SAFETY TIP

Become a Label Fanatic!

- Do not use chemicals from unlabeled containers.
- Do not place labels on top of one another.
- Label chemicals clearly and permanently.

An unlabeled container will become tomorrow's "Mystery Substance." A wax pencil or label can help eliminate a future problem and a lot of expense.



YOU MAKE IT—YOU LABEL IT!

Minimum label requirements:

1. Identity of contents
2. Date of preparation
3. Concentration
4. Hazard alert (if applicable)
5. Your name

Labels, continued

Labels
For labeling Beral-type pipets and other micro apparatus. Provided in a dispensing carton. Adhesive back, 24 mm (15⁄16") square, roll of 1,000 labels.

Catalog No.	Description	Price/Each
AP1735	Labels, Adhesive	$45.78

Laboratory Labels, Polypaper®
Polypaper® is a special polyolefin "paper" that has exceptional strength and resistance to moisture and chemicals. Polypaper is virtually indestructible! Label are fresh- and saltwater proof, non-absorbent, lint-free, and resistant to mildew, tearing, fraying, curling, aging, and discoloration. Chemical spills rinse off easily. Polypaper labels will not curl, wrinkle, or melt when used in inkjet printers, laser printers or photo copiers. Pressure-sensitive adhesive adheres well to plastics, glass, or metal. Labels measure 1½" x ¾". 65 labels per sheet; 10 sheets per package.

Catalog No.	Description	Price/Pkg.
AP5371	Laboratory Labels, Polypaper®	$116.55

Safety Labels See page 578.

Shelf Labels See page 578.

Lamps

Desk Lamp
Metal shade with flexible gooseneck arm mounted on a sturdy base. 16½" high. 60-watt incandescent bulb or 13-watt CFL bulb, not included.

Catalog No.	Description	Price/Each
AP7547	Desk Lamp	$30.70

LED Light Fixture See Plant Stands, page 498.

Infrared Lamp and Reflector
This infrared lamp and reflector features a vented aluminum reflector, push-through switch in socket, strong double-swivel clamp with vinyl grips, 6-ft. cord, and a 125-watt infrared heat lamp. Reflector diameter is 8½". Socket is non-metallic in accordance with UL. Replacement lamp is available.

Catalog No.	Description	Price/Each
AP5372	Infrared Lamp and Reflector	$55.06
AP5897	Replacement Infrared Lamp, 125 W	18.20

Lamp Bulb, Clear
150-watt bulb creates intense light for illumination work. Bulb fits medium screw base (i.e., AP5372).

Catalog No.	Description	Price/Each
AP6421	Lamp Bulb, Clear	$16.15

Ultraviolet Lamps See pages 212–213.

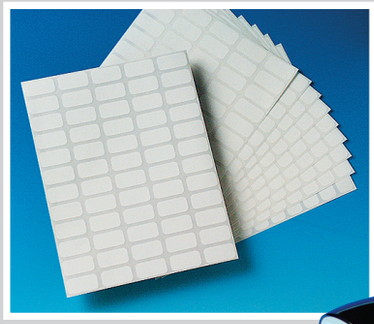
Lasers See page 389.

Latex Sheeting
Also called rubber dam material. A natural rubber sheet that features a smooth surface on both sides, exceptional resiliency, and excellent tear resistance. Each sheet is 0.25 mm thick, 30 gauge.

Catalog No.	Description	Price/Each
AP4573	Latex Sheeting, 12" x 12"	$ 9.35
AP6349	Latex Sheeting, 42" x 42"	37.45



Labels
AP1735



Laboratory Labels, Polypaper®
AP5371



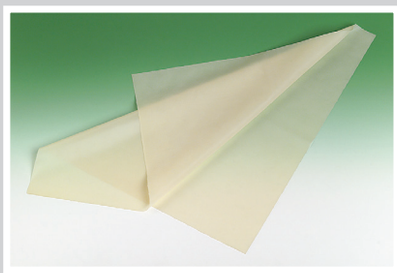
Desk Lamp
AP7547



Infrared Lamp and Reflector
AP5372



Lamp Bulb, Clear
AP6421



Latex Sheeting
AP4573, etc.

Light Boxes

White Light Illuminator
Shatter-resistant Plexiglas top gives maximum light diffusion and minimum glare. The box has a durable stainless steel frame and its 10" x 12" surface is ideal for most demonstration glassware. LED.

Catalog No.	Description	Price/Each
AP6395	White Light Illuminator	$144.00

Light Sticks

Each light stick will remain lit for about 12 hours. Packaged in individual foil wrappers the sticks can be stored in this wrapper until ready for use—up to four years. Each light stick measures 6" x ⅝" long diameter.

Catalog No.	Description	Price/Each
AP1443	Light Stick, Green	$4.05
AP2066	Light Stick, Red	4.00
AP2067	Light Stick, Blue	3.85
AP2068	Light Stick, Yellow	4.00
AP2069	Light Stick, Orange	3.85
Please specify your color choice.		

Magnets See page 371.

Magnifiers

Magnifier, Plastic, Dual Lens
The 3X lens is 1¾" in diameter, the 6X lens is ¾" in diameter.

Catalog No.	Description	Price/Each
AB1134	Magnifier, Plastic, Dual Lens	$2.66

Magnifier, Pocket, Folding
4X lens in a plastic frame. Folds into a protective hard case. ⅜" x 2½".

Catalog No.	Description	Price/Each
AP2017	Magnifier, Pocket, Folding	$4.95

Magnifier, Pocket, Folding, Double Lens
Double lens. Rugged plastic frame and case. Lens size is 1".

Catalog No.	Description	Magnification	Price/Each
AP4383	Magnifier, Pocket, Folding, Double Lens	10X	$14.25

Magnifier, Pocket, Folding
10X lens mounted in nickel-plated case that slides into a nickel-plated brass body. Vinyl case is provided.

Catalog No.	Description	Price/Each
AP4384	Magnifier, Pocket, Folding	$13.20

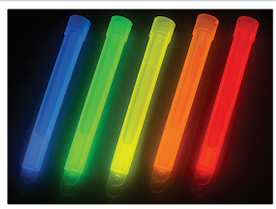
Magnifier, Reading Glass
2.5X rectangular lens measures 3⅞" x 2". Molded in a plastic, one-piece frame with an offset handle.

Catalog No.	Description	Price/Each	Price/Pkg. of 10
AP4385	Magnifier, Reading Glass	$19.70	$187.30

MAGNIFIERS continued on next page.

White Light Illuminator AP6395





Light Sticks AP1443, etc.





Magnifier, Plastic, Dual Lens AB1134



Magnifier, Pocket, Folding AP2017



Magnifier, Pocket, Folding, Double Lens AP4383

Magnifiers, continued

Magnifier, Reading Glass
Low priced glass, wide field, hand-held.

Catalog No.	Description	Power	Diameter	Price/Each	Price/Pkg. of 10
AP8256	Magnifier, Reading Glass	2.5X	2"	$ 7.95	$75.60
AP4386		2.5X	2½"	10.30	97.80
AP4387		2X	3"	10.95	104.00
AP4388		2X	4"	11.15	105.90

Magnifier, Tripod
Wide field lens in focusing mount. Useful in elementary biology. 10X magnification. Diameter of lens 20 mm.

Catalog No.	Description	Price/Each	Price/Pkg. of 10
AP8255	Magnifier, Tripod	$11.05	$105.00

Magnifier, Jumbo, Folding
Jumbo 10-cm lens with 5X magnification is mounted on a sturdy plastic self-supporting frame—keeping both hands free. The 13-cm square base has metric and English graduations molded into the plastic.

Catalog No.	Description	Price/Each
AP6020	Magnifier, Jumbo, Folding	$17.40

Magnifier with Stand
The 2½" diameter magnifier is mounted on a black base. Double universal joints provide easy focus and adjustment. Magnification is 2.8X.

Catalog No.	Description	Price/Each
AB1135	Magnifier with Stand	$26.62

Mantles, Heating and Accessories

Heating Mantle
Safe, efficient, form-fitting heaters for evenly distributed applications of heat to round bottom flasks and similar shaped vessels. The heating elements are thoroughly enclosed in an insulating glass fabric that makes the mantle suitable for heating flammable liquids for which other forms of heating would not be safe. The glass fabric is covered with grounded stainless steel mesh providing extra safety in case of an accidental spill. Temperature limit is 450 °C. Input must be regulated by a variable temperature controller (such as Catalog No. AP4434) to control heating and protect the heating mantle.

Catalog No.	Description	Size	Price/Each
AP7231	Heating Mantle	100 mL	$510.00
AP7232		250 mL	556.00

Temperature Controller
Set and regulate temperature for heating mantles listed above. Controller compensates for line voltage fluctuations and ambient temperature changes. Maximum load current is 15 amps. One standard, duplex outlet included. Five-foot, three-wire cord and plug also provided.

Catalog No.	Description	Price/Each
AP4434	Temperature Controller	$332.65

Digital vs. Mercury Thermometers Melting Point Determination

For years, mercury thermometers set the standard for accuracy in melting point measurements. Accuracy came with a cost—a high cost in many cases—the hazard of broken thermometers, mercury spills and environmental contamination. More and more states are now banning all mercury thermometers for this very reason. Concerned about the safety of teachers and students, and dedicated to maintaining quality science education, we recently compared the accuracy and precision of melting point instruments equipped with mercury and digital thermometers. We tested three different standard samples and found no difference in accuracy and improved precision using the new melting point apparatus with precision digital thermometer.



Melting Point Apparatus



Avoid the hazards associated with traditional oil baths or mercury thermometers—use the melting point apparatus to easily and accurately determine melting points. The melting point apparatus offers many notable features:

- Provides precise melting points up to 400 °C.
- Temperature resolution of 0.1 °C.
- Accepts up to three samples simultaneously using glass capillary tubes.
- Fits up to 2 mm diameter capillary tubes.
- Press a key to record up to six readings without need to make a written record.
- Oven temperature automatically reverts to ramp-start setting; test consecutive samples under identical conditions.
- 8X magnification focusing eyepiece and light give a clear view of the heating block.
- Safe and quick to use—unit heats up or cools down within just 5 minutes.

Melting point apparatus unit comes complete with a package of 100 capillary tubes and instructions; 115 Volts.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7431	Melting Point Apparatus	$1953.00
GP7047	Capillary Tubes, 90 mm length, 100 tubes/vial	14.09

Metric Measurement

Compass/Protractor

Circles from 10 mm (⅖") to 120 mm (4¾") can be created in 1-mm (1⁄16") increments. Includes accurate spinning protractor, with straight edges having scales in inches/mm.

Catalog No.	Description	Price/Each
AP6522	Compass/Protractor	$4.65

Liter Cube Set

Use this hands-on set to demonstrate volume relationships. Students can fill the 1-L cube with flats (100 cubic centimeters), rods (10 cubic centimeters), and units (1 cubic centimeter) to visualize the size of metric volume units. Durable plastic set will stand up to repeated student use. Includes 1-L cube, 9 flats, 9 rods, and 10 units.

Catalog No.	Description	Price/Each
AP4787	Liter Cube Set	$23.15

Meter Stick, Hardwood, English/Metric

Top quality hardwood. One side of the stick has centimeter graduations with 1-mm divisions. The other side has inch graduations with ⅛-inch divisions.

Catalog No.	Description	Length	Finish	Price/Each	Price/ Pkg. of 12
AP5402	Meter Stick, Hardwood, English/ Metric	½ meter	Natural	$ 4.46	$ 47.64
AP8294		1 meter	Natural with Plain Ends	6.45	73.20
AP5384		1 meter	Natural with Brass Ends	7.50	78.36
AP5385		1 meter	White	11.90	135.48

Meter Stick, Hardwood, Double-Sided Metric

Top quality, hardwood meter stick. Both sides of the stick have centimeter graduations with 1-mm divisions. Natural finish with plain ends.

Catalog No.	Description	Price/Each	Price/Pkg. of 12
AP6012	Meter Stick, Hardwood, Double-Sided Metric	$6.73	$76.68

Meter Stick, Plastic

White plastic meter stick has centimeter graduations with ½-cm divisions on one side and centimeter graduations with 1-mm divisions on the other side.

Catalog No.	Description	Price/Each	Price/Pkg. of 12
AP5383	Meter Stick, Plastic	$11.40	$128.40

Meter Stick, Four-Sided

Four meter sticks in one! Each side is marked with a different metric unit—1 m, 10 dm, 100 cm, 1000 mm. Plastic design provides years of useful service.

Catalog No.	Description	Price/Each
AP4788	Meter Stick, Four-Sided	$17.70

Micrometer

Measures items up to 25 mm in 0.01 mm divisions. Rugged, all-metal construction.

Catalog No.	Description	Price/Each
AP5373	Micrometer	$32.05

Protractor

Six-inch plastic protractor for measuring 180° in ½° graduations.

Catalog No.	Description	Price/Each
AP9286	Protractor, 180°	$1.45

Ruler, Metric, Clear

Flat, clear, flexible, plastic ruler is 30 cm in length. Graduated in decimeters down the middle, centimeters on one side, and millimeters on the other side. Red markings will not fade and cannot be scratched off.

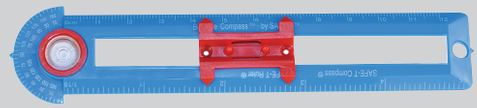
Catalog No.	Description	Price/Each	Price/Pkg. of 10
AP5386	Ruler, Metric, Clear	$2.16	$20.40

Ruler, Metric, Junior

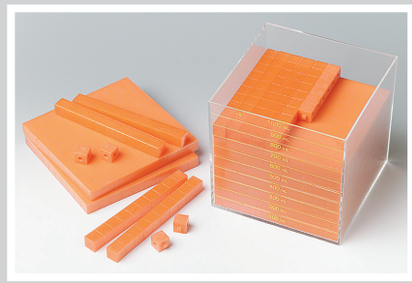
Yellow plastic ruler with easy-to-see black markings is 30 cm in length. One side is graduated in centimeters. The other side is graduated in millimeters.

Catalog No.	Description	Price/Each	Price/Pkg. of 10
AP5391	Ruler, Metric, Junior	$1.51	$14.20

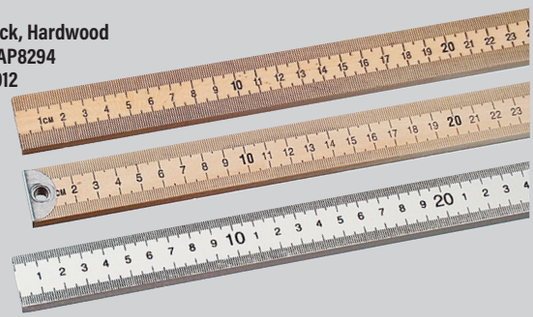
METRIC MEASUREMENT continued on next page.



Compass/Protractor
AP6522



Liter
Cube Set
AP4787



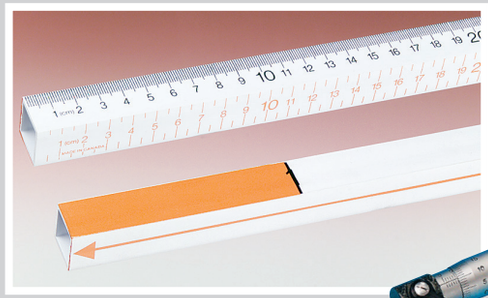
Meter Stick, Hardwood
AP5402, AP8294
and AP6012

AP5384

AP5385



Meter Stick, Plastic
AP5383



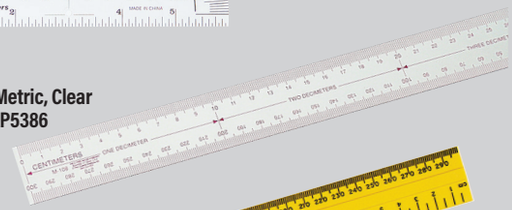
Meter Stick,
Four-Sided
AP4788



Micrometer
AP5373



Protractor
AP9286



Ruler, Metric, Clear
AP5386



Ruler, Metric, Junior
AP5391

Metric Measurement, continued

Ruler, Metric, Relationship

Yellow plastic ruler with easy-to-see black raised markings is 30 cm in length. One side is graduated in centimeters. The other side displays the relationship between decimeters, centimeters, and millimeters. The underside of the ruler lists the SI units and symbols for length, volume, mass, and area.

Catalog No.	Description	Price/Each	Price/Pkg. of 10
AP5392	Ruler, Metric, Relationship	$1.45	$13.60

Ruler, Metric/Decimal-Inch, Clear

Flat, clear, flexible, plastic ruler is 30 cm in length. Graduated in centimeters on one side and inches on the other side. A zero centering scale is printed down the middle. Red markings will not fade and cannot be scratched off.

Catalog No.	Description	Price/Each	Price/Pkg. of 10
AP5388	Ruler, Metric/Decimal-Inch, Clear	$3.05	$28.60

Ruler, Metric/English, Aluminum

Anodized aluminum ruler will provide accurate readings year after year. Graduated in centimeters on one side and inches on the other side. Total length is 30 cm.

Catalog No.	Description	Price/Each	Price/Pkg. of 12
AP5390	Ruler, Metric/English, Aluminum	$9.65	$90.70

Ruler, Metric/English, Clear, Flexible

Flat, clear, flexible, plastic rulers, 15 cm or 30 cm in length. Graduated in centimeters on one side and inches on the other side. Black markings will not fade and cannot be scratched off.

Catalog No.	Description	Length	Price/Each	Price/Pkg. of 10
AP5387	Ruler, Metric/English, Clear, Flexible	6"	$1.25	$ 10.70
AP6324		12"	1.75	14.30

Ruler, Metric/English, Opaque

Metric/English. Durable, non-transparent plastic.

Catalog No.	Description	Length	Price/Each	Price/Pkg. of 10
AP8290	Ruler, Metric/English, Opaque	6"	$1.25	$ 11.40
AP4684		12"	1.34	12.40

Ruler, Metric/English, Transparent

Metric/English. Durable, transparent plastic.

Catalog No.	Description	Length	Price/Each	Price/Pkg. of 10
AP1872	Ruler, Metric/English, Transparent	6"	$1.25	$11.40
AP4685		12"	1.90	17.50

Vernier Calipers

Double scale range is 59 or 120 mm. Readability of 1/128" or 0.1 mm. Roller adjustment ensures accuracy. Storage case included.

Catalog No.	Description	Price/Each
AB1006	Vernier Calipers, Steel	$12.25
AB1007	Vernier Calipers, Plastic	11.35

Trundle Wheel

Simply roll the wheel along the ground, and after each revolution the wheel will click to let you know you've traveled one meter. Graduations on wheel in 1-cm intervals.

Catalog No.	Description	Price/Each
AP4745	Trundle Wheel	$43.05

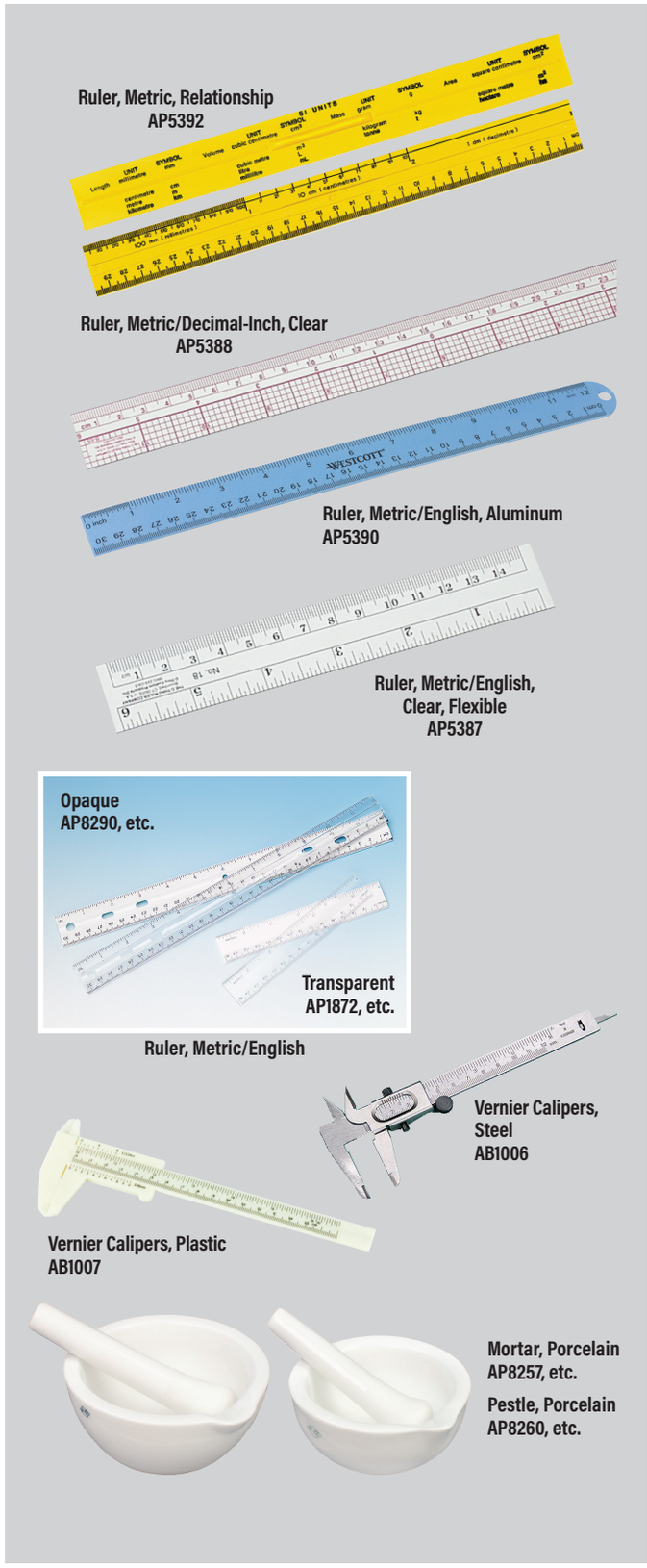
Mirrors See page 387.

Mortars and Pestles

Mortar, Porcelain

With lip, glazed outside, mortar only.

Catalog No.	Description	Capacity (mL)	Diameter (mm)	Height (mm)	Price/Each	Price/Case
AP8257	Mortar, Porcelain	50	70	47	$25.50	$445.14/18
AP8258		65	80	53	37.20	649.62/18
AP8259		145	90	70	40.85	475.80/12



Pestle, Porcelain

Glazed to grinding surface, pestle only.

Catalog No.	For Mortar No.	Description	Price/Each	Price/Case
AP8260	AP8257	Pestle, Porcelain	$26.60	$464.94/18
AP8261	AP8258		25.05	419.40/18
AP8262	AP8259		29.75	346.08/12

MORTARS AND PESTLES continued on next page.

Mortars and Pestles, continued

Mortar and Pestle Set, Porcelain, Flinn

Thick walls with even glazing around the outside. Pouring spout allows for safe dispensing. Pestle is partially glazed. Capacity 65-mL.

Catalog No.	Description	Price/Set
AP7704	Mortar and Pestle Set, Porcelain, Flinn	$33.00

Mortar and Pestle Set, Porcelain, Economy Choice

This low-cost mortar and pestle set performed well in our laboratory tests. The mortar has a capacity of 65 mL and a pour spout.

Catalog No.	Description	Price/Set
AP6066	Mortar and Pestle Set, Porcelain, Economy Choice	$10.90

Mortar and Pestle, Glass

Mortars have pouring spout.

Catalog No.	Description	Capacity	Height	Price/Each
AP1053	Mortar and Pestle, Glass	2 oz.	2 1/16"	$22.05
AP1054		4 oz.	3 1/16"	24.80

Ovens, Laboratory

Lab Oven

Economically priced to satisfy any school budget. Features include:

- Temperatures over 200 °C
- Automatic thermo control
- Two adjustable shelves
- 1-year warranty
- Gravity convection
- Spirit-filled thermometer

Catalog No.	AP1055	AP1193
Volume (cubic feet)	0.7	2.0
Maximum Temperature	>200 °C	>200 °C
Voltage	115 V	115 V
Watts	600 W	1200 W
Chamber Dimensions W x H x D	12" x 10" x 10"	18" x 16" x 12"
Outside Dimensions W x H x D	14¼" x 17½" x 12¼"	20" x 25½" x 14"
Price/Each	**$739.50**	**$999.00**

Thermocenter TC40 Lab Oven

The SalvisLab Thermocenter sets standards in quality and design. Short heating and precise temperature control make the Thermocenters true experts in heating and drying tasks. The peculiarity of this multi-functional dry and heat cabinet is in a unique system «everything-in-the-door». Above all, the system guarantees full flexibility in the placement of the interior. Thanks to the touch screen, the operation is even easier and more manageable than before. SwissTEQ in its unique form.

Programmable independency, real-time clock, safety class 3.3, USB and RJ45 interface, touch screen, standard 6mm entry port, and an ambient temperature probe.

Catalog No.	AP9865
Volume (l)	40
Maximum Temperature	>200 °C
Watts	1100 W
Chamber Dimensions W x H x D	340 x 370 x 330 mm
Outside Dimensions W x H x D	460 x 490 x 526 mm
Price/Each	**$3125.00**

Pans See page 202.

Paper

Chromatography Paper See page 127.

Filter Paper See page 149.

Lens Paper See page 494.

Test Paper See page 193.

Weighing Paper See page 107.



Mortar and Pestle Set, Porcelain, Economy Choice AP6066

Mortar and Pestle Set, Porcelain, Flinn AP7704



Trundle Wheel AP4745



Mortar and Pestle, Glass AP1053, etc.

HOW TO

Use a Mortar and Pestle Safely

- Both before and after grinding a sample, clean and dry the mortar and pestle thoroughly.
- Never grind two materials together without first determining if it is safe. Consult the chemicals' hazard alerts, material safety data sheets and safety handbooks prior to use.
- Explosions have resulted when the two previous rules were not observed.

A "Never"!

NEVER grind a strong oxidizing agent (like potassium chlorate) together with a strong reducing agent because what may result is a highly exothermic reaction. We repeat, *NEVER* grind potassium chlorate with anything! If mixing is required, grind the substances separately and then gently mix, using a glass stirring rod.



Oven, Laboratory AP1055, etc.



Thermocenter TC40 Lab Oven AP9865

Parafilm® M

Simply the best temporary seal available! A thermoplastic, self-sealing, pliable, colorless film that can be used to seal almost anything. Film will handle 24-hour exposure to common acids, but is completely soluble in organic solvents. Available in rolls in a dispenser carton.

Catalog No.	Description	Width	Length	Price/Each
AP1500	Parafilm® M	2"	250 ft.	$38.76
AP1501		4"	125 ft.	34.68
AP1502		20"	50 ft.	70.58

Pencil Compass

Accurate circles up to 12" in diameter. Scale is divided into eighths of an inch. Locking pencil holder with pencil included.

Catalog No.	Description	Price/Each
AP5356	Pencil Compass	$2.96

Pencils

See details at flinnsci.com.

Catalog No.	Description	Color	Price/Each	Price/Pkg.
AP5895	Colored Pencils, Set of 12	Red, Erasable	$15.13	—
FB0643		Assorted	10.50	—
AP6400	Prismacolor® Art Pencils, 24-Color Set		42.70	—
AP8291	Wax Pencil	Black	1.70	$19.20/12
AP8292		Red	1.65	18.72/12
AP8469		Blue	1.65	18.72/12
AP5981	Wax Pencil Set, Heat-Resistant	One Each (Red, Blue, Black)	6.00	—



Pens

Chromatography Pens See page 131.

Sharpie® Felt Tip Pens

Pen permanently marks plastic, glass or paper. Markings are waterproof and can be autoclaved. Ink dries quickly.

Catalog No.	Description	Color	Price/Each
AP1297	Sharpie® Felt Tip Pens	Black	$ 3.20
AP9300		Assorted	18.05

Transparency Pens See page 100.

pH and mV Meters

Choosing a pH Meter that's Right for You!

pH meters are widely used in chemistry, biology and Earth and environmental science experiments to provide more accurate and precise pH measurements that can be obtained using indicators or pH paper. The following guide will help you understand the terminology used to describe pH meters and how to select a pH meter that's right for you.

- The electrode is the most important part of the pH meter. All modern pH meters feature an internal combination electrode—an ion-selective electrode permeable to H^+ ions is combined internally with a reference electrode. This lets the pH meter automatically convert mV measurements to pH values.
- Electrodes are also the most sensitive and fragile element of a pH meter. Gel-filled electrodes require almost no maintenance and are generally more durable, especially for classroom or field use. Refillable electrodes are more accurate and may have a longer life, but they also require periodic maintenance to refill the electrode body with the appropriate electrolyte solution.
- A pH meter is in essence a very sensitive voltmeter. An instrument-quality pH meter allows readings of both mV and pH units. This versatility allows the user to check the performance accuracy of the electrode.
- The pH value of a solution depends on temperature. The effect is small (0.003 pH units per degree Celsius). Modern, instrument-quality pH meters feature automatic temperature compensation, or ATC, which automatically corrects the pH reading for the actual temperature by means of a temperature sensor built into the electrode. Some pH meters also allow manual temperature correction.

See the following selection chart for the characteristics of pH meters available from Flinn Scientific.

Flinn pH Meter Selection Chart for Science Teachers

Catalog No.	pH Meter Model	pH Range & Accuracy (±)	mV Range & Resolution	Line- or Battery-Operated	Type of Readout	Temp. Control	Combination Electrode	Price/Each
AP8673	Flinn	-2.00–20.00 0.02	NA	Battery (3 V) Furnished	LCD	NA	Gel-Filled	$ 53.56
AP8901	Oyster	0.00–14.00 0.02	-999–999 1.1	Battery (9 V) Furnished	LCD	Manual or Auto (0–100 °C)	Gel-Filled	294.00
AP7708	Portable pH Meter Kit	0.00–14.00 0.02	-499–499 0.1	Battery (4 AAA) Furnished	LCD	Manual or Auto (-5–80 °C)	Gel-Filled	397.10
AP7452	pH and Conductivity Meter, Benchtop	0.00–14.00 0.02	±1999.9 0.1	AC Adapter	LCD	Manual or Auto (-5–80 °C)	Gel-Filled	575.00
AP9701	Flinn Desktop Digital pH Meter	0.00–14.00 0.02	0–1999 1.0	AC Adapter	LED	Automatic (0–100 °C)	Refillable	594.00
AP9702	Flinn Benchtop Touchscreen pH Meter	-2.00–19.00 0.002	-1999–1999 0.1	AC Adapter	LCD Touch-screen	Automatic (0–100 °C)	Refillable	745.00
AP7633	Advanced pH Meter Kit, Benchtop, Orion Star™	-2.00–16.00 0.1, 0.01	±1999.9	AC Adapter (or 4 AA Batteries)	LCD	Automatic (-5–105 °C)	Refillable	987.00

See free How to Store, Maintain and Calibrate pH Electrodes video at flinnsci.com.

pH METERS continued on next page.

pH Meters, continued

Flinn pH Meter

FLINN EXCLUSIVE

- Large easy-to-read display
- Replaceable electrode
- Slim design easily fits into test tubes
- One 3 V battery is included.
- Can be immersed to a depth of 80 mm
- Store the electrode with a few drops of pH 7 buffer or tap water. Never use deionized or distilled water and never store dry.
- Upon receipt, pH meters must be removed from packaging and stored according to included instructions.



Range: -2.00–20.00 pH Resolution: 0.01 pH
Accuracy: Better than ±0.02 pH Calibration: 3 point
Battery Life (1 x 3 V): 3,000 hours Dimensions: 188 x 50 x 17 mm

Catalog No.	Description	Price/Each	Price/Each Quantity 3–5	Price/Each Quantity 6–11	Price/Each Quantity 12 or more
AP8673	Flinn pH Meter	$53.56	$52.48	$51.45	$50.52
AP7215	Replacement Electrode*	25.05	24.77	24.51	24.24

*For meters purchased 2019 or later.

FLINN EXCLUSIVE

Flinn pH Calibration Kit



The Flinn pH calibration kit includes 100-mL bottles of pH 4 and pH 7 solutions, calibration screwdriver, and instructions.

Catalog No.	Description	Price/Each
AP8720	Flinn pH Calibration Kit	$17.45

SPER Test Tube pH Pen



Simple-to-use test tube pH pen is designed for one-handed operation. Highly stable and accurate readings with a large LCD display, it automatically calibrates to pH 4, 7 and 10 buffers and can be adjusted to recognize non-standard buffers as well. Features hold function and auto power-off with low battery indicator. The case is IP65 waterproof and will float if accidentally dropped into the water. Comes with 2 button-cell batteries and a built-in electrode that is kept moist with a protective cap.

Catalog No.	Description	Price/Each
AP10069	SPER Test Tube pH Pen	$69.90

pH Meter Accuracy

The accuracy of pH meters depends on the accuracy of the buffer solutions used for calibration. For greatest accuracy, use only fresh and accurately prepared buffer solutions when calibrating your pH meter.

SPER Portable pH Pen



Highly stable and accurate readings with a large LCD display. Designed for simple one-handed operation. Automatically calibrates to pH 4, 7 and 10 buffers. Features hold function and auto power-off with low-battery indicator. Displays temperature in both °C and °F. Comes in a waterproof case and will float if accidentally dropped into the water.

Catalog No.	Description	Price/Each
AP10071	SPER Portable pH Pen	$99.00

Oyster pH Meter



The Oyster pH meter is perfect for use in the lab or outside in the field. Unique impact-resistant case design offers large ½" LCD display built into an adjustable hinged cover. Microprocessor-based unit with splash proof housing and front panel tactile touch pad to set slope and calibrate. Meter automatically shuts off when cover is closed. pH range is 0–14 with accuracy of 0.02 pH and resolution of 0.01 pH. Manual or automatic temperature compensation from 0–100 °C. Operates on 9 Volt battery for 100 hours of continuous use. Includes pH electrode, sample pH buffers, neck strap, carrying case, and a 9 Volt battery.

Catalog No.	Description	Price/Each
AP8901	Oyster pH Meter	$294.00
AP1430	Replacement 9 Volt Alkaline Battery	6.32

Vernier Probeware See pages 537–538.

Portable pH Meter Kit



With its low cost, and features you only expect on high-end benchtop pH meters, this pH/mV/temperature meter is perfect for any lab. Its lightweight design and hard plastic carrying case make it portable and easy to use in the field.

- Range: 0–14 pH, -499–499 mV, -5–80 °C
- Resolution: 0.01 pH, 0.1 mV, 0.1 °C
- Accuracy: ±0.02 pH, ±0.2 mV, ±1 °C
- Manual or automatic temperature compensation
- Automatic buffer recognition
- Scroll 99 data points and display maximum and minimum readings
- Simultaneous display of pH or mV, temperature, time, and date
- Automatic battery shutoff, low battery indicator, and USB port

Includes instruction manual, 4 AAA batteries, detachable temperature compensated pH probe with 3½' cable, pH buffers 4, 7, and 10, and distilled water. 5-year warranty. Meter will accept any pH electrode with a BNC connector. Replacement ATC electrode is available separately.

Catalog No.	Description	Price/Each
AP7708	Portable pH Meter Kit	$397.10
AP7561	ATC/pH Replacement Electrode	94.70

Flinn Desktop Digital pH Meter

FLINN EXCLUSIVE

Measure pH and temperature with the Desktop Digital pH Meter. The pH and temperature readings are easy to adjust on the large easy-to-read blue screen using the keyboard's buttons. The unit is easy to calibrate and operate for all of your pH and temperature data collections. The unit comes with a pH meter, rechargable pH composite electrode, electrode holder, power adapter, pH standard buffer solution and instruction manual.



- Measuring ranges: 0.00–14.00 pH range, 0–1999 mV, 0–60 °C
- Resolution: pH: 0.01, mV: 1 mV
- Accuracy: pH: ±0.02, mV: 0.1 mV–1 mV
- AC power supply (220 V)
- Dimensions (mm): 290 x 210 x 95

Catalog No.	Description	Price/Each
AP9701	Flinn Desktop Digital pH Meter	$594.00

pH and Conductivity Meter, Benchtop

This affordable benchtop meter does it all—pH, mV, conductivity, total dissolved solids (TDS), salinity and temperature. Designed for student use with durable construction and easy operation, this meter is perfect for the school science lab. Results measured together with time, date and temperature are easy to read on a large LCD display.

- Range: 0–14 pH, -1999–1999 mV, 0–1999 µS/cm, -5–80 °C
- Resolution: 0.01 pH, 0.1 mV, 0.01–1 µS/cm, 0.1 °C
- Accuracy: ±0.02 pH, ±0.2 mV, ±1% fs + 1d, ±0.5 °C
- Automatic or manual temperature compensation and ranging
- Automatic buffer recognition
- Digital and analog outputs; Min/Max and 99 data points
- Data hold
- 5 calibration points
- Electrode status indication



Comes ready for use with ATC conductivity and pH electrodes, multiple electrodes holder arm, AC adapter, computer cable and software. Meter will accept any pH or ORP probe with a standard BNC connector. Dimensions: 8½" x 6½" x 2¼".

Catalog No.	Description	Price/Each
AP7452	pH and Conductivity Meter, Benchtop	$575.00

pH METERS continued on next page.

pH Meters, continued

Flinn Benchtop Touchscreen pH Meter



Measuring pH and temperature has never been easier than with this fully digital benchtop pH meter. A large LCD touchscreen provides easy-to-read pH and temperature data and can be operated with touchscreen buttons. Unit is self calibrating, and performs experimental calculations. The USB interface allows for use with a computer. Includes pH meter, pH combined electrode, temperature electrode, electrode holder, pH standard buffer solution, 12 V power adapter and instruction manual.

FLINN EXCLUSIVE

- Measuring ranges: -2.00–19.99 pH range, -1999–1999 mV, -5.0–105.0 °C
- Resolution: pH: 0.01–0.001, Temperature: 0.01 °C
- Accuracy: pH: ±0.002, 0.1 mV–1 mV, ±0.2 °C
- Automatic and manual temperature compensation
- Able to store up to 200 data sets (printed and deleted)
- 5 calibration points
- Standard RS-232 and USB interface
- Dimensions (mm): 215 x 170 x 35

Catalog No.	Description	Price/Each
AP9702	Flinn Benchtop Touchscreen pH Meter	$745.00

HOW TO

Understanding pH

The pH scale represents the acidity or alkalinity of an aqueous solution. pH is defined as the negative logarithm of the hydrogen ion concentration of a solution. pH = $-\log[H^+]$.

Absolutely pure water is the standard used in determining pH value. Since the pH scale is derived from the chemical properties of water, the scale cannot be used with non-aqueous solutions. The pH scale was established with a range of 0 to 14 pH units. The low end of the scale is acid, the high end alkaline, with pH 7.00 at the midpoint as neutral.

Each unit on the pH scale represents a tenfold difference in acidity level. For example, pH 4 is ten times as acidic as pH 5. A pH 3 solution has ten times the acidity level of a pH 4 solution and 100 times the acidity level of a pH 5 solution.

Advanced pH Meter Kit, Benchtop, Orion Star™



The benchtop design is durable, easy-to-operate and gives stable and accurate pH readings—perfect for students.

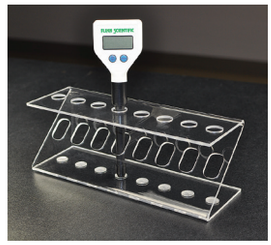
- Large LCD displays pH or mV reading and temperature
- Splash-proof exterior and wall-mountable
- Automatic or manual pH calibration
- Three-point calibration with auto-buffer recognition
- Storage memory for 50 data points
- Range: –2.00 to 16.00 pH, –5 to 105 ºC
- Resolution: 0.1, 0.01 pH; 0.1 ºC • Accuracy: ±0.01 pH; ±0.1 ºC

Instrument comes complete with pH meter; combination pH/temperature ATC refillable electrode; electrode arm and holder; universal power adapter; solution kit containing 60 mL each of electrode storage, refill, and cleaning solutions; and pH 4, 7 and 10 buffers. Includes instructions and CD with detailed manual and trouble-shooting guide. Accepts any pH probe with a standard BNC connector. Also able to operate on 4 AA batteries, available separately. 3-year warranty.

Catalog No.	Description	Price/Each
AP7633	Advanced pH Meter Kit, Benchtop, Orion Star™	$987.00

pH Meter Accessories





pH Meter Accessories

See details at flinnsci.com.

Catalog No.	Description	Price/Each
AP1300	Buffer Set for pH Meter Calibration	$36.60
AP7526	Electrode Rack	60.40
AP8692	Electrode Swing Arm	120.35
AP1391	pH Combination Electrode Replacement	154.50
AP1296	Electrolyte Solution, Saturated	7.95

Phosphorescent Materials

Low Ion pH Test Kit



High-quality water may not have enough ions to provide a reliable pH value. If you use standard pH indicator paper, the indicator in the test paper may be the only contaminant present when you dip it in the water, resulting in an erroneous pH value. This low ion test kit provides you with a sample tube, special low ion test paper (roll of 25 feet) and a color comparison chart. Unlike most test paper, this paper is not to be dipped. Place the paper in the sample tube and add your unknown liquid. Cap the tube and shake, then read the pH value by holding the tube against the color comparison chart.

Catalog No.	Description	Price/Each
AP1660	Low Ion pH Test Kit	$15.57

Phosphorescent Vinyl Sheet



Glow-in-the-dark vinyl sheet gives off a yellow-green glow upon absorption of light. Simply place an object, such as your hand, on the vinyl sheet and expose it to light. Turn off the lights, and remove your hand from the sheet. The area where your hand was will remain dark while the region of the sheet that was exposed to light will phosphoresce, or glow in the dark! In a darkened room, exposure to a camera flash will provide the same glow. Great for demonstrating the principles of absorption and emission of light, particularly the process of phosphorescence. Material has an adhesive backing and can be easily cut with scissors. Each sheet is 12" x 12".

Use different color LED micro lights with the phosphorescent vinyl sheet to demonstrate the effect of wavelength on light energy and phosphorescence! For free activity instructions, please contact Flinn Scientific and request Publication No. 10978, *Phosphorescence and LED Lights.*

Catalog No.	Description	Price/Each
AP4794	Phosphorescent Vinyl Sheet	$25.45
AP7784	LED Micro Light, Yellow	14.50
AP7781	LED Micro Light, Blue	14.18

HOW TO

Properly Store and Maintain pH Electrodes

- Most slow, unresponsive pH meters can be rejuvenated by simply soaking the electrode bulb in a saturated solution of KCl for 30 minutes.
- Gel-filled combination electrodes should be stored in a pH 4 buffer solution with a few drops of saturated potassium chloride. This slightly acidic solution allows the electrode to respond faster. Do not use distilled or deionized water; the low ionic strength extracts ions from the electrode bulb, causing a slower response. Tap water may be used for short-term storage.
- Use and store electrodes in a vertical position.
- Between samples, rinse electrodes with distilled or deionized water.
- Never wipe the end of an electrode. Dry it by blotting with a lint-free paper like Kimwipes®.
- To prevent breakage during use, always use an electrode swing arm or holder to assist in raising and lowering the electrode into solutions.
- An electrode rack will help prevent electrode breakage during storage.

See free video at flinnsci.com.

Pipets

Beral-Type Pipets

Type	Shape	Approx. Capacity (mL)	Bulb Draw Approx. (mL)	Stem Diameter (mm)	Overall Length (mm)	Delivers Drops Per mL	Catalog No.	Price/Pkg.
Thin Stem		4	3	2.5	153	20	AP1718	$ 2.23 Pkg. of 20
							AP1444	32.50 Pkg. of 500
Micro Tip		5	3.5	5	144	50	AP1719	3.00 Pkg. of 20
							AP1517	55.78 Pkg. of 500
Micro Tip, Small		1.75	1	1.25	50	43	AP2082	3.04 Pkg. of 20
							AP2032	54.41 Pkg. of 500
Extra-Large Bulb		8	6	6.25	150	22	AP1720	2.63 Pkg. of 20
							AP1445	33.69 Pkg. of 400
Graduated		5	3.5	5	153	25	AP1721	2.23 Pkg. of 20
							AP1516	37.74 Pkg. of 500
Wide Stem		7.5	3.5	7.8	153	22	AP2253	2.65 Pkg. of 20
							AP8480	38.18 Pkg. of 500
Super Jumbo		15	7.7	3	150	22	AP8850	3.41 Pkg. of 20
							AP8842	37.98 Pkg. of 250
Needle Tip		2	1	1	100	34	FB1260	59.32 Pkg. of 400

Pipet Holder

Ideal for holding or storing most Beral-type pipets—cassette tape case.

Catalog No.	Description	Price/Each
AP1519	Pipet Holder	$ 1.13

Dropping Pipet, Glass

300 mm, 20 mL capacity, with suction bulb.

Catalog No.	Description	Price/Each	Price/Pkg. of 12
GP7026	Dropping Pipet, Glass	$3.60	$41.28

Dropping Pipet, Plastic

Giant Beral-type pipet with one-piece molded bulb, 300 mm long, 23 mL capacity, 22 drops per mL.

Catalog No.	Description	Price/Each	Price/Pkg. of 25
AP8828	Dropping Pipet, Plastic	$ .63	$14.00

Medicine Dropper

Length of straight glass body is 76 mm. 2 mL capacity. Rubber bulb.

Catalog No.	Description	Price/Each	Price/Pkg. of 12	Price/Case
AP5102	Medicine Dropper	$ .40	$ 4.32	$64.80/144

Pasteur Pipets

Glass, ungraduated with long, machine-drawn capillary tips approximately 1 mm i.d. Body of pipet is 7 to 7.5 mm o.d. with small constriction below the upper end to accommodate a cotton plug. Two sizes are available. Also available are high-quality latex pipet bulbs that are made especially for these pipets.

Catalog No.	Description	Overall Length	Tip Length	Price/Pkg.
GP7042	Pasteur Pipets	146 mm	51 mm	$17.05/200
GP7043		229 mm	127 mm	18.75/200
AP9150	Pasteur Pipet Bulbs	—	—	8.60/12

Mohr Pipet, Glass

Calibrated "to deliver" (EX or TD). Color-coded band at top for easy size identification.

Catalog No.	Description	Capacity x Graduation Intervals	Price/Each
GP7005	Mohr Pipet	1 mL x 0.01 mL	$11.00
GP7010		2 mL x 0.02 mL	11.90
GP7015		5 mL x 0.05 mL	13.00
GP7020		10 mL x 0.1 mL	15.25
GP7025		25 mL x 0.1 mL	22.55

PIPETS continued on next page.



HOW TO

Avoid the Interchanging of Dropping Pipets

Tape a test tube to the side of each dispensing bottle. The test tube can be the receptacle to hold the dropping pipet for that particular reagent. Simple, safer, less dripping and spillage and reduced pipet mix-up. In addition, you might also color-code the bottles with their corresponding droppers by using colored plastic tape.

Pipets, continued

Serological Pipet

GP7056, etc.

Glass pipets are calibrated "to deliver."

Catalog No.	Description	Capacity	Graduation Intervals	Price/Each
GP7056	Serological Pipet	1 mL	0.01 mL	$ .57
GP7057		2 mL	0.01 mL	.61
GP7058		5 mL	0.1 mL	.89
GP7059		10 mL	0.1 mL	1.02

Serological Pipets, Polystyrene

Individually wrapped, sterile plastic serological pipets. Pipets can be reused with proper cleaning. Affordable enough to be disposable. Package of 50.

Catalog No.	Description	Capacity	Graduation Intervals	Price/Pkg.
AP7897	Stereological Pipets, Polystyrene	1 mL	0.01 mL	$25.35
AP7898		5 mL	0.02 mL	42.75

Volumetric Pipet

Volumetric pipets are also known as transfer pipets. Calibrated "to deliver" (TD). No "blow-out" is required to accurately empty the pipet.

Catalog No.	Description	Capacity	Color Code	Price/Each
GP7028	Volumetric Pipet	2 mL	Orange	$10.79
GP7029		5 mL	White	12.89
GP7030		10 mL	Red	14.09
GP7031		25 mL	Blue	22.75



GP7028, etc.

GP9176, etc.

Volumetric Pipet, Economy Choice

Outstanding accuracy at a lower price!

Catalog No.	Description	Capacity	Color Code	Price/Each
GP9176	Volumetric Pipet, Economy Choice	5 mL	White	$ 9.80
GP9177		10 mL	Red	10.70

StepMate Stepper Pipet

Based on the principle of positive displacement, the StepMate Stepper is designed for trouble-free and reliable dispensing of liquids, especially for high viscosity, high density and high vapor pressure fluids. Fits seven different disposable syringes (0.5–50 mL) and has up to 48 dispensing steps. Dispensed volumes range from 10 µL to 5 mL.

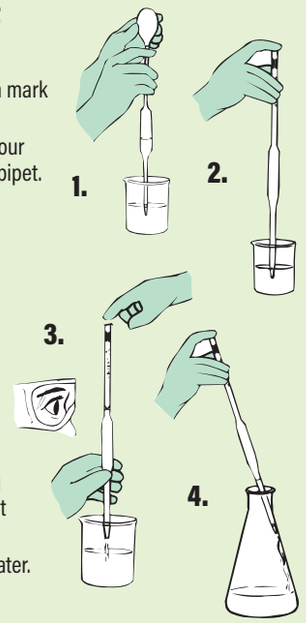


Catalog No.	Description		Price/Each
AP10035	StepMate Stepper Pipet		$145.28
AP10040	StepMate Disposable Syringes	0.5 mL	11.30
AP10043		5 mL	11.08
AP10044		12.5 mL	11.30
AP10045		25 mL	10.95
AP10046		50 mL	8.05

HOW TO Use a Pipet

Never Pipet by Mouth!

1. Fill the pipet just past the graduation mark by using a pipet bulb.
2. Quickly remove the bulb and place your forefinger over the upper end of the pipet.
3. Release your forefinger slowly until the bottom of the meniscus is on the graduation mark.
4. Touch the pipet tip to the inside wall of the vessel.
5. Allow the liquid to drain into the receiving vessel.
6. Touch the tip of the pipet to the side of the receiving vessel until the flow ends.
7. Do not force out the liquid remaining in the tip of the pipet unless the pipet says "TC" (to contain) on it.
8. Practice your technique using tap water.



Pipets, Accessories

Pipet Filler, Graduated

End the frustration of trying to find the correct pipet bulb. This easy-to-use pipet filler has a graduated insertion point that fits 1-mL to 25-mL pipets.



Catalog No.	Description	Price/Each
AP7082	Pipet Filler, Graduated, Pkg. of 3	$27.60

Pipet Filler

Four steps enable you to fill a serological and volumetric pipet, up to 25 mL in size, while only manipulating the safety pipet filler and avoiding dangerous solutions. Simply insert the pipet in the device, let out the bulb's air, suck in liquid and empty the pipet. The bulb is made of highly chemical-resistant silicon rubber. Glass valves. Easy to use and clean. ▶ See free How To video at flinnsci.com.



Catalog No.	Description	Price/Each
AP1887	Pipet Filler	$20.40

Pipet Helper

This unique device is fast, efficient and offers very accurate one-handed control of pipeting. Fits glass or plastic pipets from 0.1 mL to 100 mL. Includes a filter to prevent chemical contamination. Connection components, including the filter, are autoclavable. Replacement filters are available.



Catalog No.	Description	Price/Each
AP8741	Pipet Helper	$114.30
AP7712	Pipet Helper Filter (for AP8741 purchased after 2014)	16.16

PIPETS, ACCESSORIES continued on next page.

Pipet Bulb Selection Chart Listed by Flinn Catalog Numbers

Pipet	Pipet Bulb	Pipet	Pipet Bulb
AP5102	AP8601*, AP8600	GP7030	AP8608*, AP8609
GP7005	AP8605*, AP8606–AP8609	GP7031	AP8609*
GP7010	AP8605*, AP8606–AP8609	GP7042	AP9150*, AP8601
GP7015	AP8607*, AP8608, AP8609	GP7043	AP9150*, AP8607, AP8601
GP7020	AP8607*, AP8608, AP8609	GP7056	AP8604*, AP8603, AP8605, AP8606
GP7025	AP8608*, AP8609	GP7057	AP8606*, AP8603–AP8605
GP7026	AP8603*	GP7058	AP8608*, AP8607, AP8609
GP7028	AP8607*, AP8606, AP8608, AP8609	GP7059	AP8608*, AP8609
GP7029	AP8607*, AP8608–AP8609		

*Denotes best choice

Pipets, Accessories, continued

Pipet Filler, Fast Release



A knurled thumbwheel operates a rack-and-pinion plunger that controls the syringe. One-hand operation enables the user to fill or deliver with remarkable accuracy since the rack and pinion performs so smoothly and precisely. Rapid-release lever allows for quick emptying. The filler has a tapered socket that accepts the pipet. The pipet fillers are color-coded for use with different sizes of pipets. Polyethylene with silicone rubber ring seals. Easy to disassemble for cleaning.

Catalog No.	Description	For Pipet Size	Color Code	Price/Each
AP1306	Pipet Filler, Fast Release	2 mL	Blue	$23.15
AP1307		10 mL	Green	23.75
AP1308		25 mL	Red	29.05

Pasteur Pipet Bulbs See page 178.

Levo Pipet Filler



Levo motorized pipet fillers are perfect for filling and dispensing liquids. The lightweight ergonomic design fosters good precision and accuracy, and comfortable touch-sensitive concave triggers offer fine speed control. Simply press the buttons to fill or gravity dispense liquids from plastic and glass pipets ranging from 1–100 mL. The lithium-ion battery charges in less than 3 hours and allows for 8 hours of continuous use. Nose cone is autoclavable. Includes an AC charge, wall/bench charging stand and 2 replaceable (0.45 µm) hydrophobic filters. Levo Plus features an LCD display. 1 year warranty.

Catalog No.	Description	Price/Each
AP9843	Levo Plus Pipet Filler	$171.40
AP10034	Levo ME Pipet Filler	127.15

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Pipet Bulbs, Rubber



Molded of heavyweight natural rubber. Good replacement bulbs for pipets and medicine droppers. Select the size and shape to best fit your needs.

Catalog No.	Description	Capacity (mL)	Color	Bore i.d. (mm)	Diameter (mm)	Length (mm)	Price/Each	Price/Each Quantities of 12 or more
AP8600	Pipet Bulbs, Rubber	1	Black	6	11	30	$ .40	$ .33
AP8601		2	Red	6	13	32	.50	.45
AP8603		5	Red	4	29	41	4.75	4.56
AP8604		8	Red	4	25	40	3.50	3.38
AP8605		10	Red	4	35	52	3.80	3.67
AP8606		15	Red	4	35	55	3.75	3.60
AP8607		35	Red	6	45	66	5.05	4.83
AP8608		60	Red	6	55	82	5.60	5.35
AP8609		90	Red	6	64	98	10.31	9.79

Micropipet Racks See page 177.

Pipet Washer



Durable pipet washer thoroughly cleans pipets quickly and easily. Simply set the pipet washer in the sink, connect it to a faucet, add the pipets, add the soap, and turn on the water. You can soak pipets for hours by turning the water off once washer is full. Holds up to 24 pipets and can also be used to clean glass tubing. 13¾" L x 12¾" W x 29" H.

Two accessories are available. The Pipet Basket allows for easy and safe transfer of pipets. Place dirty pipets in the basket for convenient transfer to the pipet washer. Basket also fits inside the Pipet Jar. The jar is for soaking dirty pipets before transferring them to the pipet washer where a constant flow of water will rinse the pipets. Use the Pipet Washer, Basket, and Jar as a full three-part system or individually to suit your needs. Each piece of equipment is available separately.

Catalog No.	Description	Price/Each
AP7541	Pipet Washer	$361.55
AP7657	Basket for Pipet Washer	102.10
AP7658	Jar for Pipet Washer	132.40

Pipet Support Stand



Holds 28 pipets in vertical position. Two support discs are held in place by a central column. Upper disc has 10 holes (14 mm in diameter) and 18 holes (11 mm in diameter). Lower disc has 28 holes (4 mm in diameter). Overall 18 cm high x 18 cm in diameter. Polypropylene.

Catalog No.	Description	Price/Each
AP1313	Pipet Support Stand	$39.95

Pipet Support Rack



This sturdy polypropylene rack holds 50 pipets in a vertical 5 x 10 arrangement. Top and middle decks have 16-mm diameter holes; bottom deck holes are tapered from 16 mm to 6 mm diameter. Standard pipet tips will not fall through the bottom deck holes and hit the table surface. The end plates have handles for easy carrying. Autoclavable at 121 °C. Dimensions are 21 x 11 x 22 cm.

Catalog No.	Description	Price/Each
AP5382	Pipet Support Rack	$42.85

Pipets, Micropipets

Micropipets, Variable-Volume



Adjustable volume and easy-to-read digital displays. Made from mechanically durable and autoclavable material. Fitted with a tip ejector. All pipets come factory calibrated and are adjusted to give the volume as specified. Includes: instruction manual, calibration certificate, shelf hanger, tip sample and service tool. *Micropipet tips are required and available separately.*

Catalog No.	Description	Range (Microliters)	Readability (Microliters)	Price/Each
AP8088	Micropipets, Variable-Volume	0.5–10	0.1	$246.90
AP8089		2–20	0.1	252.20
AP8090		10–100	1	244.60
AP8091		20–200	1	257.20
AP8092		100–1000	1	265.83

Micropipets, Fixed-Volume



Affordable, fixed-volume micropipets that are accurate and reliable! Two sizes are available. Includes micropipet tips.

Catalog No.	Description	Price/Each
FB2151	Micropipets, Fixed-Volume, 10-µl	$39.60
FB1517	Micropipets, Fixed-Volume, 25-µl	46.00

PIPETS, MICROPIPETS continued on next page.

Pipets, Micropipets, continued

Micropipet Tips



Tips are manufactured in a precision molding facility from polypropylene. Inner radial rings enable an airtight grip on the tip cone, eliminating leakage. The tip's smooth surface is hydrophobic to provide low liquid retention, increased accuracy and repeatability and also ensures that the tip will be ejected properly. DNase, RNase and pyrogen free.

Catalog No.	Description	Sterile or Nonsterile	Racked or Bagged	Capacity	Pkg. Size	Price/Pkg.
AP9907	Micropipet Tips	Nonsterile	Bagged	0.1–20 µL	1000	**$71.00**
AP8077		Sterile	Racked	0.5–200 µL	960	**85.25**
AP8078		Sterile	Racked	100–1000 µL	960	**96.00**
AP8079		Nonsterile	Bagged	0.5–10 µL	1000	**56.00**
AP8199		Nonsterile	Bagged	10–200 µL	1000	**56.00**
AP8080		Nonsterile	Bagged	200–1000 µL	1000	**57.50**
AP9705		Nonsterile	Boxed	5000 µL	100	**49.00**
AP9704		Sterile	Racked	5000 µL	50	**41.00**

DLAB dPette™ Adjustable Volume Electronic Micropipets



Adjustable volume pipets that combine the ergonomic and lightweight features of a manual pipet with the advanced features of a motor-driven electronic pipet.

- Two buttons handle all operations and settings.
- Adjust volume by turning the parameter knob.
- Select from three different modes: pipetting, dispensing and diluting.
- Bright, digital displays shows the selected mode, volume, battery level and more.
- High-accuracy, high-performance motor.
- Adjustable speeds for aspiration and dispensing.
- Lithium-ion battery and two charging modes enable longer operation.
- Easily calibrate by connecting it to a computer (USB).

Catalog No.	Description	Volume Range	Increments	Price/Each
AP9531	DLAB dPette™ Adjustable Volume Electronic Micropipets	5–50 µL	0.1 µL	**$393.56**
AP9532		30–300 µL	1 µL	**399.90**
AP9533		100–1000 µL	5 µL	**385.98**

Flinn Lab Essentials Kit



By: The Flinn Staff

Make sure you have these essential items in your lab! Kit includes one each of the following best-selling laboratory items:

- Flinn pH Meter, AP8673 (see page 172 for detailed description)
- Flinn Digital Pocket Thermometer, AP6049 (see page 195 for detailed description)
- Timer, Count up/Count down, AP8874 (see page 198 for detailed description)
- Flinn Visor Goggles, AP1362 (see page 572 for detailed description)

A must-have sampler kit for your laboratory!

Catalog No.	Description	Price/Each
AP7476	Flinn Lab Essentials Kit	**$117.50**

DLAB MicroPette™ Micropipets



Features include the following:

- Ergonomic design with comfortable finger support
- Easy-to-read volume display and low-force tip ejector
- Simple calibration and maintenance
- Manufactured from chemical-resistant materials
- Each MicroPette is supplied with an individual calibration certificate according to ISO8655. The quality control testing includes gravimetric testing of each pipet with distilled water at 22 °C.
- Half-autoclavable—the lower part of the unit may be exposed to steam autoclaving at 121 °C for 20 minutes.
- MicroPette Plus micropipets are fully autoclavable.
- Eight-channel micropipets feature a rotating head.
- Linear and carousel micropipet stands are also available.

Adjustable-Volume Micropipets

Catalog No.	Description	Autoclavable	Volume	Price/Each
AP9504	MicroPette™ Plus Adjustable-Volume Micropipets	Full	0.1–2.5 µL	**$130.32**
AP9505		Full	0.5–10 µL	**130.32**
AP9506		Full	2–20 µL	**130.32**
AP9507		Full	5–50 µL	**123.00**
AP9508		Full	10–100 µL	**130.32**
AP9509		Full	20–200 µL	**130.32**
AP9510		Full	50–200 µL	**124.00**
AP9511		Full	100–1000 µL	**130.32**
AP9512		Full	200–1000 µL	**127.00**
AP9513		Full	1000–5000 µL	**130.32**

Eight-Channel Adjustable-Volume Micropipets

Catalog No.	Description	Autoclavable	Volume	Price/Each
AP9502	MicroPette™ Adjustable-Volume Micropipets	Half	5–50 µL	**$130.43**
AP9527	MicroPette™ Plus Adjustable-Volume Micropipets	Full	0.5–10 µL	**209.30**
AP9528		Full	5–50 µL	**284.65**
AP9529		Full	50–300 µL	**275.35**

Micropipet Stands



Catalog No.	Description	Type	Price/Each
AP9534	Micropipet Stands	Linear	**$27.75**
AP9535		Carousel	**48.00**

Pitchers See page 112.

Plates

Glass Plates, Cobalt



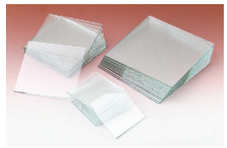
High quality, dark blue cobalt glass filter—not just blue glass like other low-cost alternatives. In flame tests, a mixture of sodium and potassium salts will produce an orange flame. This is because sodium's orange flame masks potassium's violet flame. If viewed through this filter, the orange color is blocked so that a violet-colored flame can be seen.

Catalog No.	Description	Size	Price/Pkg. of 6
AP1057	Glass Plates, Cobalt	2" x 2"	**$37.50**
AP1058		3" x 3"	**60.70**
AP1059		4" x 4"	**91.85**

PLATES continued on next page.

Plates, continued

Glass Plates, Plain, Single Strength



Catalog No.	Description	Size	Price/Pkg. of 12
AP8263	Glass Plates, Plain, Single Strength	2" x 2"	$17.05
AP8264		3" x 3"	20.00
AP8265		4" x 4"	20.85

Spot Plates See page 187.

Pliers See page 200.

Plugs, Foam

Open-celled plastic foam plugs are non-toxic, non-absorbent, completely breathable and may be repeatedly autoclaved. Sold in packages of 10.

Catalog No.	Description	Fits Container Mouth Diameter	Container Guide	Price/Pkg.
AB1392	Plugs, Foam, White, Pkg. of 10	27–34 mm	250 mL Standard and 125 mL Wide-Mouth Flasks	$6.25
AB1393		35–44 mm	1000 mL Standard, 250 mL and 500 mL Wide-Mouth Flasks	8.43

Polarizing Film See page 385.

Power Strips and Extension Cords

Power Strip

Heavy duty, UL listed power strip protected up to 15 amps by a circuit breaker. Four-foot cord. Grounded plug. 125V/60Hz.

Catalog No.	Description	Price/Each
AP9280	Power Strip, 6 outlet	$25.45

Power Strip, Surge Protector



Industrial-grade surge protector features six high-insulating ceramic duplex receptacles with three-line grounded protection, LED surge function status indicator, 120 Volt/15 amp push-to-reset circuit breaker, master on/off switch, rugged metal housing, and a 3-ft power cord.

Catalog No.	Description	Price/Each
AP5403	Power Strip, Surge Protector	$35.30

Extension Cord, Two Conductor

UL listed. 125 V/60 Hz rated up to 13 amps.

Catalog No.	Description	Length	Price/Each
AP9282	Extension Cord, Two Conductor	25'	$11.49
AP9283		50'	23.36

Power Supplies

Power Supply, AC/DC



A solid state power supply with a built-in ammeter and voltmeter. Separate DC and AC terminals provide steady delivery of adjustable from 0–30 volts DC and 0–40 volts AC (maximum load of 5 amperes). A rear-mounted, grounded convenience outlet supplies 0–110 volts AC. Panel meters display DC volts and DC amperes. Fuse protected with an LED pilot light and three-wire grounded plug.

Catalog No.	Description	Price/Each
AP4418	Power Supply, AC/DC	$281.55

Power Supply, DC



Rugged, versatile power supply at an economical price. Snap and banana plug terminals for safe and easy connections. Large, easy-to-read displays are available in either analog or digital formats. Features a fail-safe current cutoff circuit to automatically protect against overloads and short circuits.

Catalog No.	Description	Format	Voltage	Current	Price/Each
AP5902	Power Supply, DC	Analog	0–30 V	0–5 A	$275.40
AP5903		Digital	0–50 V	0–3 A	292.42

Power Supply, Multiple Voltage Battery Eliminator



Convenient, fixed-voltage power supply substitutes for a wide variety of batteries including AA, AAA, C, D, and 9-volt types. Voltage is easily selected with the turn of a dial. Designed so the output voltage does not increase during adjustment between voltage ranges. Connections are provided by two 4-mm banana jacks. A fuse in series with supply output provides short circuit protection. Plugs into a standard electrical outlet, 120 V AC, 60 Hz, 1 amp max.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5375	Power Supply, Multiple Voltage Battery Eliminator	$147.90

Power Supply, High Voltage, AC/DC



Ideal for physics experiments requiring high voltages. Three separately regulated, independent supplies provide 0–1000 V DC at 10 mA, 0–50 V DC at 10 mA, and filament voltage taps supplying 1–6 V AC in integer steps. Supplies can be safely connected in any voltage pattern due to the internal floating grounds. Large analog meter is easy to read and voltage changes are as easy as turning the adjustment knobs. Eight 4-mm banana plug jacks. 3¾" x 10" x 8½". Weighs 2.6 kg.

Catalog No.	Description	Price/Each
AP5792	Power Supply, High Voltage, AC/DC	$951.70

Power Supply, Low Voltage, DC



Versatile DC power supply offers four-way variable regulated power with overload protection. Each of the four outputs from this power supply are precisely held at specific voltage levels and are protected from overload, shorts and excessive current demand. Qualitative analysis of V=IR can be obtained using simple calibration methods for analog meters. Outputs: 12 volts DC at 1 amp, 0–20 volts DC at 2 amps, 5 volts DC at 3 amps.

Catalog No.	Description	Price/Each
AP9279	Power Supply, Low Voltage, DC	$239.25

Power Supply, Dual Output, Low Voltage, DC



Two independent, fully regulated outputs. Each output's voltage can be continuously varied between 0 and 20 volts with a current of up to 2 amps. Easy-to-read digital meter that displays the current and voltage readings. Once set, the voltage and current will be precisely held. A single 5-volt at 2-amp regulated output is also built-in. For high-voltage needs, the independent outputs can be used together. Externally controlled cutoff circuit automatically protects against overloads, short circuits and personal injuries.

Catalog No.	Description	Price/Each
AP6530	Power Supply, Dual Output, Low Voltage, DC	$376.10

Pumps, Vacuum

Microscale Bell Jar and Vacuum Set



Safely conduct lab experiments involving vacuum and air pressure with our microscale bell jar and vacuum set. Instruction and experiment booklet included. Bell jar diameter 7 cm; height 8.5 cm.

Catalog No.	Description	Price/Each
AP5995	Microscale Bell Jar and Vacuum Set	$69.14

Vacuum Pump, Hand-Operated, Nalgene®



Easy-to-use pump made of high-quality, corrosive-resistant polyvinyl chloride. Will maintain a vacuum of 25 inches of mercury and hold this level constant for 24 hours. Aspring-loaded valve is provided so vacuum can be released without disconnecting the pump from the line. The vacuum pump nozzle fits ¼" i.d. tubing with 2 feet of tubing provided with the pump. Gauge monitors vacuum in both centimeters and inches of mercury. Pump is sealed and self-lubricating. Intended for siphoning, filtration, and indirect fluid transfer.

Note: For bell jars and vacuum chambers, use AP1597 vacuum pump.

Catalog No.	Description	Price/Each
AP2289	Vacuum Pump, Hand-Operated, Nalgene®	$152.71

Vacuum Pump, Single-Stage



Low-maintenance, economical, single-stage vacuum pump is fast and easy to operate. Oil-less operation produces a moderate vacuum of 150 mm Hg (⅕ normal pressure). It can also push a pressure of 3,192 mm Hg, which is 4.2 times normal room pressure. Other specifications include 31 liters/min. open flow, motor speed of 1725 rpm, ⅛ hp, gauges, on/off switch on cord, carrying handle, rubber feet, 115 V, 60 Hz, 15 lbs. net weight. Accepts ¼" i.d. tubing.

Note: For the classic Boil Water in a Bell Jar experiment, we recommend using the Two-Stage Vacuum Pump, Catalog No. AP1597.

Catalog No.	Description	Price/Each
AP1712	Vacuum Pump, Single-Stage	$841.50
AP8789	Vacuum Tubing, 10 feet	31.78

Vacuum Pump, Two-Stage



Quiet, dependable vacuum pump. The rotary sliding vane produces a free air capacity of 85 liters per minute. Other features/specifications include: direct drive; oil trap; pump speed of 3360 rpm; ½-hp, 110-V, 60-Hz motor; oil capacity of 300 mL; and two intake ports for ¼" or ½" i.d. tubing. Weighs 30 lbs and dimensions are 11" H x 14" L x 5¼" W; 1-pint bottle of high-viscosity pump oil included. Contact Flinn Scientific for free demonstration instructions and activities.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP1597	Vacuum Pump, Two-Stage	$953.70
AP1598	Pump Oil, quart	21.00
AP8789	Vacuum Tubing, 10 feet	31.78
AP5353	Valve, Three-Way	62.75

Pumps, Vacuum, Accessories

Buzzer in a Vacuum



Students are always perplexed when asked, "Do sound waves travel in a vacuum?" Demonstrate this concept with the Buzzer in a Vacuum device. The buzzer operates on a DC power source. Turn the power on, and it buzzes loudly. Connect a vacuum pump to the jar assembly and turn on the pump. As air is pumped out of the jar, the sound of the buzzer becomes fainter. When all the air is removed, you can barely hear the sound. Slowly allow air to re-enter the jar and the sound of the buzzer becomes stronger. Requires ¼" tubing. Vacuum pump available separately.

Catalog No.	Description	Price/Each
AP4532	Buzzer in a Vacuum	$88.15

Bell Jars



High quality, flint glass bell jars. Glass is crystal clear, allowing students to easily view experiments performed inside the jar. Bell jars with a ground glass stopper offer the flexibility for evacuation or for pressurizing the inside of the jar using an external air source/pump. The nickel-plated vacuum plate (AP8618) works well with both the large and small bell jars. The polycarbonate plastic plate (AP1869) may be used with the large bell jars. Dimensions of small bell jars: 6" o.d. x 10" tall. Dimensions of large bell jars: 10" o.d. x 16" tall.

▶ See free How To Boil Water in a Bell Jar video at flinnsci.com.

Catalog No.	Description	Capacity	Price/Each
AP6655	Small Bell Jar with Molded Knob, Glass	3.5 L	$126.88
AP6656	Small Bell Jar with Ground Glass Stopper, Glass	3.5 L	171.46
AP1870	Bell Jar with Molded Glass Knob, Glass	13 L	297.74
AP1871	Bell Jar with Ground Glass Stopper, Glass	13 L	350.94

Bell Jar, Plastic



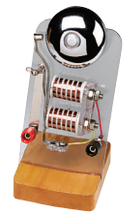
An easy-to-use, lightweight bell jar. The jar is transparent amber. It inverts on top of a vacuum base plate. The jar seals against a neoprene gasket in the AP1869 vacuum plate. Made of polyetherimide (PEI). PEI has good to excellent chemical resistance to acids, bases, aliphatic alcohols and hydrocarbons, and saturated, halogenated hydrocarbons.

Catalog No.	Description	Size Diam. x Height	Capacity	Price/Each
AP1868	Bell Jar, Plastic	12" x 12"	18.9 L	$849.00

Stopcock Grease

See page 123.

Demonstration Bell



This large demonstration bell is perfect for many topics in physical science. Banana plug jacks make for easy connections. Operates on a 6-volt battery. Bell assembly is 18 x 9 x 4.5 cm and includes a 9 x 9 x 2.5 cm polished wood base.

Catalog No.	Description	Price/Each
AP7105	Demonstration Bell	$23.14

PUMPS, VACUUM, ACCESSORIES continued on next page.

SAFETY TIP

Vacuum Pump

- Place strips of masking tape or electrical tape up, down and around any vessel you use under reduced pressure.
- Always provide a relief valve of some kind to enable the slow release of vacuum.
- A false conclusion is that the vacuum produced by a water aspirator will not create a collapsing force, but a water aspirator may create a collapsing force equal to 80% of that produced by a vacuum pump.
- Do not pry a bell jar away from the vacuum base. Slide the bell jar from side to side while lifting.
- Never evacuate soft glass bottles or flat flasks. Apply a vacuum only to vessels designed for vacuum application (e.g., heavy-walled filter flasks).
- Avoid evacuating vessels larger than 2 liters unless the vessel is placed behind a safety shield.
- Inspect all glassware to make sure it is free of cracks, chips, scratches or breaks.

Pumps, Vacuum, Accessories, continued

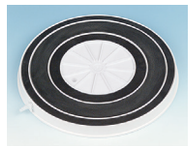
Vacuum Chamber with Plate



Save money! Purchase a complete vacuum chamber system. Safe polycarbonate bell jar is 6" in diameter, stands 9" tall and has excellent chemical resistance. Clear plastic allows for easy observation of air pressure effects. Vacuum plate is also polycarbonate plastic with an outside diameter of 7½". The side-mounted tubing adapter accepts ¼" i.d. vacuum tubing (AP8789). For use with (AP1712 or AP1597) vacuum pumps.

Catalog No.	Description	Price/Each
AP4506	Vacuum Chamber with Plate	$239.25

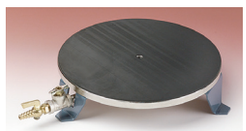
Vacuum Plate



White polycarbonate plastic, 13½" in diameter. Supplied with thick gasket to accept either glass or plastic bell jars. A tubing adapter that accepts ¼" i.d. vacuum tubing is located on the outside rim of the vacuum plate.

Catalog No.	Description	Price/Each
AP1869	Vacuum Plate	$133.75

Vacuum Plate, Nickel Plated



Large enough to accommodate bell jars up to 10" diameter (accommodates all bell jars, except AP1868). Fabricated from ½" steel plate for strength. Surface ground flat to provide a good seal. Plate is nickel plated for corrosion resistance. Comes complete with barbed hose connection, vacuum release valve, and a rubber gasket to provide a tight seal. Accepts ¼" i.d. tubing.

Catalog No.	Description	Price/Each
AP8618	Vacuum Plate, Nickel Plated	$350.75

Dewar Flask, Small See page 143.

Vacuum Tubing



Extra thick-walled black rubber tubing is great for all your vacuum applications. This machine-made tubing is guaranteed not to collapse under normal conditions. Supplied in 10-foot lengths. Inside diameter is ¼" and the wall thickness is 3⁄16".

Catalog No.	Description	Price/Each
AP8789	Vacuum Tubing, 10 feet	$31.78

Valve, Three-Way



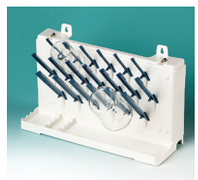
Handy, three-way stopcock shuts off the vacuum supply quickly and easily with the turn of a valve! Serrated tubulations accept ¼" to ⅜" i.d. tubing. Removable leakproof plug is made of chemical-resistant, non-stick PTFE. Three-way valve allows for connection of two or all three arms. Pressure rated to 35 psi.

Catalog No.	Description	Price/Each
AP5353	Valve, Three-Way	$62.75

Racks, Drying

Buret Rack, Flinn See page 121.

Drying Rack, Plastic



Chemical-resistant ABS plastic racks are convenient for draining or drying any size glassware. Each rack contains three sizes of nylon pegs, mounted at a 45° angle for optimum drying. Pegs may be rearranged to meet your individual glassware drying needs. Assembly required; instructions included.

1-Tier Rack 19 pegs. Overall dimensions: 16" L x 7½" W x 9¼" H.

2-Tier Rack 38 pegs. Overall dimensions: 16" L x 7½" W x 16¼" H.

Catalog No.	Description	Tiers	Price/Each
AP8943	Drying Rack, Plastic	1	$157.74
AP5381		2	191.40

Drying Rack, Poxygrid®



Epoxy-coated steel wire drying rack. Three rows of hairpin-loop supports hold labware with 18-mm i.d. necks or larger. The fourth row has 12 straight pins, 102 mm long, to accommodate smaller items. A polystyrene tray at the bottom catches dripping water. Rubber-tipped feet prevent skidding. Stand may also be wall-mounted using the wire loops provided on the back. Overall dimensions are 43 x 17 x 48 cm.

Catalog No.	Description	Price/Each
AP5428	Drying Rack, Poxygrid®	$138.24

Drying Rack, Vinyl-Coated



Can be used upright on a table or hung on the wall. Spot-welded steel wire is vinyl-coated with removable, galvanized iron drain pan. Has 18 pegs (127 mm long, 76 mm apart) and 72 pegs, (76 mm long, 38 mm apart). Pegs provide suitable draining angles regardless of position. Overall base dimensions in upright position: 48.3 cm H x 47 cm W x 18.4 cm D.

Catalog No.	Description	Price/Each
AP1064	Drying Rack, Vinyl-Coated	$181.00

Drying Rack, Wooden



Drying rack studded with 18 pins (127 mm long) and 72 pins (76 mm long). Overall dimensions are 508 x 508 mm. Complete with hangers for mounting on a wall. All hardwood, including the pegs. This well-made product will last a lifetime.

Catalog No.	Description	Price/Each
AP1063	Drying Rack, Wooden	$211.50

Reaction Plates and Strips

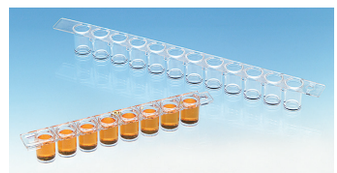
Combination Reaction Plate



Four 12-well strips and one-half of a 24-well plate have been combined into a single combination reaction plate to give 48 small wells and 12 larger wells.

Catalog No.	Description	Price/Each	Price/Pkg. of 10	Price/Case
AP8567	Combination Reaction Plate	$3.80	$36.90	$254.00/50

Reaction Strips



8- and 12-well reaction strips. Use the reaction strip holder to organize the strips into plates of multiples of 8 or 12 wells. Individual strips can be viewed from almost any direction to observe precipitates, colors, forms, etc. Combinations of two solutions can be mixed simultaneously. Simply place solutions in each of the two strips and then invert one strip over the other and shake slightly.

Catalog No.	Description	Number of Wells	Capacity Approx. mL	Price/Each	Price/Case
AP1724	Reaction Strips	8	0.3	$1.16	$106.00/100
AP1446		12	0.3	2.35	82.40/40

Reaction Strip Holder

Reaction strip frame will hold twelve 8-well strips and eight 12-well strips. Strips fit snugly into the frame.

Catalog No.	Description	Price/Each
AP1514	Reaction Strip Holder	$6.75

PUMPS, VACUUM, ACCESSORIES continued on next page.

Reaction Plates and Strips, continued

Reaction Plates



Clear polystyrene plates—think of them as micro test tubes or beakers! Sample identification is easy since each plate is organized into rows of wells marked on the two axes by letters and numbers. The reaction plates are stackable for convenient storage and are easy to clean with a supply of cotton swabs. Surface tension holds the liquid in the wells of the 0.3-mL capacity plates, allowing you to view the plates in an inverted position. A slight shake of the plate will release the contents. Lid included with AP1725 only.

Catalog No.	Number of Wells	Approx. Capacity of Each Well (mL)	Overall Dimensions (L x W x D)	Price/Each	Price/ Pkg. of 10	Price/ Case of 50
AP1725	6	14	5" L x 3 5/16" W x 7/8" D	$6.41	$60.90	$405.50
AP1447	24	2.8	5" L x 3 3/8" W x 7/8" D	4.75	45.10	302.50
AP8822	48	1.6	5" L x 3 3/8" W x 13/16" D	7.50	71.20	470.50
AP1448	96	0.3	5" L x 3 3/8" W x 9/16" D	4.12	38.90	254.50

Reaction Strip Plugs, 8-Well

Use these plastic strip plugs in 12- or 8-well reaction strips, in combination reaction plates, or to seal 8 wells at a time in a 96-well reaction plate. Cut the strips to seal 12, 4, or even 1 well at a time.

Catalog No.	Description	Price/Each
AP9019	Reaction Strip Plugs, 8-well	$1.95

Refrigerator, Explosion-Proof



Thermo Scientific explosion-proof laboratory refrigerators, freezers and combinations units are particularly suited for safe storage in hazardous environments. See full specifications at flinnsci.com.

Catalog No.	Description	Price/Each
AP7600	Refrigerator, Explosion-Proof	$5500.00

Must be shipped by motor truck freight.

Ring Stands See Stands, Support on page 187.

Rings, Support

Ring, Support



Made of zinc plated steel with straight shank. Requires use of a clamp holder like Flinn AP8219. See page 128.

Catalog No.	Description	Interior Diameter	Price/Each
AP1065	Ring, Support	2"	$ 6.75
AP1066		3"	8.80
AP1067		4"	10.40

Ring, Support, with Rod Clamp



Zinc-plated steel shank secured to screw clamp. Distance is 4½" from center of support to center of ring.

Catalog No.	Description	Interior Diameter	Price/Each
AP8230	Ring, Support, with Rod Clamp	2"	$ 9.97
AP1320		3"	15.50
AP8232		4"	12.00
AP1321		5"	17.60
AP8234		6"	15.40

Rods

Rods, Soft Glass

5 mm x approximately 2 feet. Package of 10.

Catalog No.	Description	Price/Pkg. of 10
GP9035	Rods, Soft Glass	$18.80

Rubber Policeman

Will fit 5 mm glass rod Catalog No. GP5075 (not furnished). Sealed end cut at an angle to help in use at the bottom of a vessel.

Catalog No.	Description	Price/Each
AP1650	Rubber Policeman	$1.08

Stirring Rods, Plastic

One end is a paddle stirrer. Polypropylene. Length: 9⅝".

Catalog No.	Description	Price/Each	Price/Pkg. of 10
AP8150	Stirring Rods, Plastic	$3.46	$30.20

FLINNSCI.COM
VISIT US ONLINE

Stirring Rods, Glass

Both ends fire-polished. 200 mm long x 5 mm diameter.

Catalog No.	Description	Price/Each	Price/Pkg. of 10	Price/Pkg. of 100
GP5075	Stirring Rods, Glass	$ .66	$6.20	$80.00

Support Rod, Aluminum



Useful for supporting ramps to create inclined planes or a steady support for pendulum experiments. Can be used with clamp holders (AP8219) to attach to support stands. Measures 7⅞" long, ¼" dia.

Catalog No.	Description	Price/Each
AP7938	Support Rod, Aluminum	$3.40

Rotary Evaporators

DLAB Digital Rotary Evaporators



Digital display for speed and temperature combined with patented spring sealing ring allows for optimal control and performance. Two models are available. See flinnsci.com for full specifications.

Catalog No.	Description	Type	Price/Each
AP9558	Rotary Evaporator	Vertical	$3248.00
AP9559		Diagonal	3248.00
AP9682	Rotary Evaporator Seal		35.68

Must be shipped by motor truck freight.

Rotators

DLAB Rotators



DLAB rotators provide gentle, effective mixing of biological samples held in 1.5 mL to 50 mL micro tubes. Useful for applications such as immune precipitations, latex diagnostics and prevention of blood coagulation.

Catalog No.	Description	Price/Each
AP9752	DLAB Rotator, Adjustable Angle, Digital	$584.54
AP9753	DLAB Rotator, Ajustable Angle, Economy Choice	363.48
AP9754	DLAB Rotator, Digital	705.47

Rulers See page 169.

Salinity Meters See flinnsci.com.

Scissors



Scissors, Office Type

Catalog No.	Description	Price/Each
AP4396	Scissors, Office Type, 7" Long	$12.70



Scissors, Heavy Duty

Catalog No.	Description	Price/Each
AP8949	Scissors, Heavy Duty, Stainless Steel	$10.10



Scissors, Student

Catalog No.	Description	Price/Each
AP5394	Scissors, Student	$5.05

Scoops



Scoop without Handle

Trough-shaped, tapered at one end. 6½" long overall.

Catalog No.	Description	Price/Each	Price/Pkg. of 12
AP8338	Scoop without Handle	$3.32	$37.32

Screwdrivers See page 201.

Shakers and Mixers

DLAB Orbital Shaker, Digital

DLAB orbital shakers are ideal for almost any vessel in the lab from microcentrifuge tubes to petri dishes and plates to conical flasks. Features include:

- Maximum load capacity of 2 kg with platform
- Quiet operation
- Voltage: 100–240 V, 50/60 Hz
- Dimensions: 294 x 348 x 123 mm



Catalog No.	Description	Price/Each
AP9749	DLAB Orbital Shaker, Digital	$509.85

DLAB Microplate Mixer

Capable of holding single or double microplates. Features include a wide speed range from 0 to 1500 rpm, optional adapters, maintenance-free brushless DC motor, orbital shaking movement with a 4.5 mm diameter, maximum shaking weight of 0.5 kg, 100 to 240 V, 50/60 Hz. Dimensions: 260 x 150 x 80 mm.



Catalog No.	Description	Price/Each
AP9751	DLAB Microplate Mixer	$257.20
AP9771	Universal Top Plate for DLAB Microplate Mixer	16.50

Spatulas



Spatulas, Disposable

Polypropylene spatulas with hollow core are autoclavable and shatter-resistant. Overall length 8½".

Catalog No.	Description	Price/Each
AP7296	Spatulas, Disposable, 300 per box	$54.50



Spatula

Stainless steel; blade length 6". Blade width ⅘". Overall length 8".

Catalog No.	Description	Price/Each	Price/Pkg. of 6
AP8336	Spatula	$12.05	$68.52

Spatula, Micro

Stainless steel. Overall length 8¼". Flat end 1½" long and ⅝" wide.

Catalog No.	Description	Price/Each
AP1322	Spatula, Micro	$7.56



Spatula, Micro, Economy Choice

Stainless steel. Overall length 8⅝". Flat end ¹⁵⁄₁₆" L and ¼" W. Bent end is ⅞" L and ¼" W.

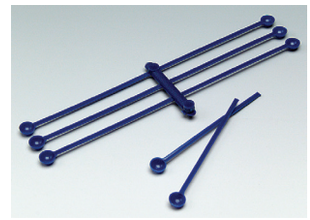
Catalog No.	Description	Price/Each
AP7681	Spatula, Micro, Economy Choice	$4.80



Spatula/Spoon, Micro

Stainless steel. Overall length 9". Spoon end 1¼" L x ⅞" W. Flat end 1¾" L x ⅜" W.

Catalog No.	Description	Price/Each
AP1323	Spatula/Spoon, Micro	$8.10



Microspatulas

Unique spatulas suitable for dispensing micro amounts. Even small enough for dispensing into 96-well plates. Eight spatulas per package.

Catalog No.	Description	Price/Each
AP9015	Microspatulas	$3.15



Spatula/Spoon, Porcelain

Entirely glazed: spoon on one end, spatula on the other.

Catalog No.	Description	Length	Price/Each
AP1325	Spatula/Spoon, Porcelain	5⅛"	$26.70
AP1326		7"	37.60

Spectrophotometers

The Flinn Scientific **Spectrophotometer**

All you ever wanted in a spectrophotometer at a price you can finally afford!

- Designed by high school science teachers for high school science teachers
- Simple one-button operation
- Precise and accurate results
- Durable, sleek design
- Free Flinn Scientific Spectrophotometer Laboratory Manual with 14 time-tested experiments
- One-Year Warranty

FLINN EXCLUSIVE



Easy-to-see stable LCD display shows transmittance and absorbance simultaneously.

Easy-to-use operating instructions.

Sample compartment accepts standard 13 x 100 mm test tubes or 10 mm square cuvets.

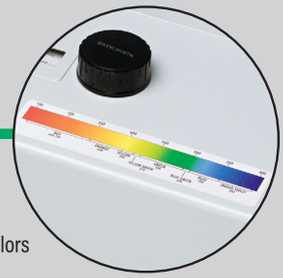
Built-in automatic filter wheel allows students to use an amazingly wide wavelength range of 335–1000 nm.

Easily adjustable wavelength knob and highly visible wavelength readout.

Simple one-button blanking and 100% transmittance adjustment saves student time and reduces student error.

Easy-to-replace, long-lasting tungsten-halogen light bulb.

Durable plastic housing:
- Resists chemical spills.
- Is non-corroding.
- Prevents spills from entering unit.



Visible spectrum display relating colors to wavelength.

See free video at flinnsci.com.

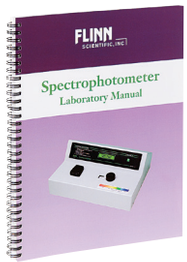
Wavelength Range (nm)	335–1000
Wavelength Accuracy	±2
Percent Transmittance Readability	0.1%
Power Requirement	110 V AC; 50 Hz
Dimensions	16" W x 7" H x 12" D

Catalog No.	Description	Price/Each
AP7026	Flinn Scientific Spectrophotometer	**$1407.00**
AP1082	Test Tubes, 13 x 100 mm, Box/12	**71.25**
AP7016	Lamp, Replacement	**53.20**
AP1141	Kimwipes®, 4½" x 8½", Box/280	**6.90**

Flinn Scientific Spectrophotometer Laboratory Manual

FLINN EXCLUSIVE

When you order the Flinn Scientific Spectrophotometer, you will also receive the *Flinn Scientific Spectrophotometer Laboratory Manual* for free. This reference provides 14 practical, teacher-tested experiments. Most of the experiments are chemistry related and vary in difficulty from the introductory use of the spectrophotometer to AP® Chemistry. Several biological and environmental science experiments are also included as well as a detailed teacher's guide, preparation notes, sample data and graphs. 144 pages, 8½" x 11", spiral-bound.



Catalog No.	Description	Price/Each
AP7038	Flinn Scientific Spectrophotometer Laboratory Manual	**$51.08**

Flinn Multi-Sample Spectrophotometer

FLINN EXCLUSIVE

Load up to four samples at once with this great instrument. An easy-to-load sample holder can be moved using a mechanical arm to shuttle between samples without unloading and reloading the instrument. This makes for fast data collection in large classes! Other features include:

- Simple operation and exceptional durability
- Precise and accurate results
- One-year warranty
- Easy-to-read, stable LCD display
- Sample compartment accepts standard-size cuvettes
- Industry-leading wavelength range of 320–700 nm
- Long-lasting bulb



Catalog No.	Description	Price/Each
AP8502	Flinn Multi-Sample Spectrophotometer	**$1326.00**

SPECTROPHOTOMETERS continued on next page.

Spectrophotometers, continued

Spectronic 200



Durable spectrophotometer automatically performs a zero %T measurement at start-up and features a one-button 100%T measurement. Unit offers fast, full-wavelength scanning capability and takes measurements every two seconds. Features a rubber keypad that forms a seal with the top cover to prevent spills from entering the instrument and a clearly marked wavelength knob avoids that confusion. Internal sample compartment easily lifts out for convenient cleaning. Removable cuvet racks are designed to hold six square or test-tube cuvets. Adjustable tilt screen with pre-loaded software displays a live color spectrum indicator. Connect to a remote computer through a USB-B connection or use a USB-A for a printer or USB memory device. Includes 10 plastic ½" cuvets and 2 cuvet racks. Replacement lamps are available at flinnsci.com.

- Display: Adjustable LED
- Wavelength Range: 340–1000 nm
- Wavelength Accuracy: ±2 nm
- Percent Transmittance Readability: 0.3%T
- Dimensions: 15½" W x 3½" H x 12" D
- Power Requirement: 100–120 AC, 50–60 Hz

Catalog No.	Description	Price/Each
AP7453	Spectronic 200	$2091.00

Spectronic Spectrophotometer Accessories

Catalog No.	Item	Description	Price
AP1082	Test Tubes	Selected Test Tubes, 13 x 100 mm, Box/12	$71.25
AP7053	Cuvets, ½", Square	Pkg./10, Plastic, 2.5-mL	7.80
AP9149	Cuvets, ½", Square Disposable	Set of 100 Cuvets and 20 Lids, 3.5-mL	29.05
AP1141	Kimwipes®	4½" x 8½", Box/280	6.90

UV-Vis Spectrophotometer



Ultraviolet and visible spectroscopy with one instrument! Features an extended key panel for easy operation and convenient programming. Large LCD display is visible from any angle. Unit is user-friendly with an intuitive and task-driven menu. Internal memory is capable of storing up to 200 test methods/standard curves. Includes two packages of 10-mm square cuvets—4 glass cuvets for visible spectroscopy and 2 quartz cuvets for UV wavelengths. 19½" L x 14¾" W x 9" H.

- Wavelength range: 200–1000 nm; wavelength accuracy: ±2 nm
- Slit width: 4 nm
- Photometric accuracy (Absorbance, A): ±0.004 A at 0.5 A
- USB/RS-232 ports
- 100–240 V
- One-year warranty

Catalog No.	Description	Price/Each
AP7596	UV-Vis Spectrophotometer	$5355.00

Spectroscopes and Accessories

Project Star Student Spectrometer



Heavy-duty, yet compact version of the traditional spectrometer. Allows for viewing and measurement of spectral lines to an accuracy of ±1 nanometer. Includes a 10-page activity booklet.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6040	Project Star Student Spectrometer	$48.17

Spectroscope



This inexpensive, handheld, diffraction grating spectroscope will measure wavelengths of light from 400–700 nanometers (nm) with an accuracy of ±5 nm. Overall length: 20 cm; scale length: 37 mm. Instructions are included.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8696	Spectroscope	$14.55

Star Spectrum Tube (Hydrogen/Helium Mixture)

Spectrum tubes are glass tubes filled with a gas, usually that of an element or small molecule. Sealed metal electrodes are located at the ends of each tube. When a spectrum tube is placed in a spectrum tube power supply and the power supply is turned on, an electrical discharge is passed through the tube, causing electrons in the gas to be excited. As the electrons relax, they emit light-a characteristic color for each gas. When students view the lighted tube through a spectroscope, they can observe the unique set of spectral lines for each gas. Spectrum tubes should only be used intermittently and are not intended as a continuous source of light. It is normal for the iodine spectrum tube to contain small pieces of solid iodine.

Catalog No.	Description	Price/Each
AP10222	Star Spectrum Tube (Hydrogen/Helium Mixture)	$46.60

RSpec Explorer

Spectroscopy the whole class can see! The RSpec Explorer makes it possible for an entire class or lecture hall to see study light spectra and emission lines at the same time with a real example. Unit is very easy to use—simply position the spectrometer about a meter from the light source and connect it to a computer. The internal camera automatically focuses and adjusts to current light conditions. Project the computer screen and voila, the entire class can see the colorful spectra! Includes software to display colorful spectra and generate intensity graphs. Seven instructional videos are also included to show you how to set up and get started. Specifications: Windows XP or later.

Catalog No.	Description	Price/Each
AP7840	RSpec Explorer	$457.25

Spectroscope, Advanced

Measure the angles of prisms using the Law of Reflection, demonstrate optics phenomena with a diffraction grating or measure the wavelengths of monochromatic light sources with this economical spectrometer. Reliable results will be obtained while students work with this precise instrument.

Specifications:

- Resolution: 1°
- Focal Length of Lens: 130 mm
- Field of View: 5.7°
- Relative Aperture: 1:7.2
- Grating: 600 Lines/mm
- Weight: 2 kg
- Telescope Scales: accurate to 50 angstrom
- Dimensions: 28 x 24 x 26 cm

Catalog No.	Description	Price/Each
AP5716	Spectroscope, Advanced	$383.50

Flinn C-Spectra®—An Instant Spectroscope

FLINN EXCLUSIVE



Use Flinn C-Spectra® as an alternative to a spectroscope to clearly observe the emission spectra of gases in spectrum tubes. Simply view the light source through the C-Spectra to observe a spectrum—the angle for holding it isn't even critical! As with any diffraction grating, several orders of a spectrum will be observed. C-Spectra can also be used to view flame tests. In this case, the spectra of the elements are observed as a diffracted, diffused flame, not as discrete lines.

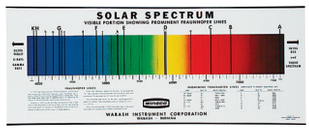
C-Spectra is a holographic replica. Because of its holographic nature, every segment contains the ability to produce the same pattern. Thus, a single 6" x 12" piece of C-Spectra can be cut into smaller pieces for student use. When cut into 1½" squares, a single sheet of C-Spectra provides approximately 30 pieces. C-Spectra is washable and should be cleaned with a soft cloth and mild detergent. Take care as it will scratch. 500 lines/mm.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP1714	Flinn C-Spectra®, 6" x 12" Sheet	$15.30

Spectrum Charts

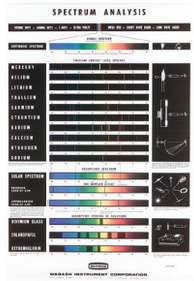
Solar Spectrum Chart



This handsome wall chart, covering the visible portion of the solar spectrum, shows the wavelength and letter assignment of the more prominent Fraunhofer lines. These dark lines, some narrow, some wide, are absorption lines of specific elements in the Earth's or the sun's atmosphere. Chart includes a table identifying the element responsible for each line in the spectrum and a brief history and description of Fraunhofer lines. Chart is heavy paper stock with metal binding strips across the top and bottom. The top strip includes two tabs for wall hanging. Measures 71 x 28 cm.

Catalog No.	Description	Price/Each
AP5624	Solar Spectrum Chart	$31.05

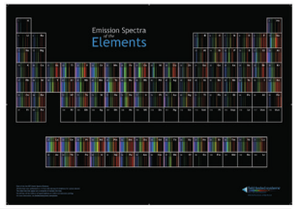
Spectrum Analysis Chart



This full-color chart is an excellent reference when teaching spectrum analysis. The bright line (emission) spectra of ten elements are shown along with the electromagnetic spectrum with a detailed visible spectrum, the solar spectrum, Doppler Effect and others. Line drawings illustrate the methods of producing various spectra and the applications of spectrum analysis. Measures 69 x 119 cm.

Catalog No.	Description	Price/Each
AP8676	Spectrum Analysis Chart	$36.90

Spectra of the Elements Poster



This laminated poster is 24" x 36" and is a high-quality, high-resolution print with brilliant colors.

Catalog No.	Description	Price/Each
AP8921	Spectra of the Elements Poster	$35.60

Spectrum Set

FLINN EXCLUSIVE

Spectrum Set



Set of graphical models to represent emission spectra. CD contains 15 spectra: air, argon, bromine, carbon dioxide, chlorine gas, helium, hydrogen, iodine vapor, krypton, mercury vapor, neon, nitrogen, oxygen, water vapor, and xenon.

Catalog No.	Description	Price/Each
AP1992	Spectrum Set	$38.00

Spectrum Tubes and Accessories



Spectrum Tubes

Spectrum tubes are glass tubes filled with a gas, usually that of an element or small molecule. Sealed metal electrodes are located at the ends of each tube. When a spectrum tube is placed in a spectrum tube power supply and the power supply is turned on, an electrical discharge is passed through the tube, causing electrons in the gas to be excited. As the electrons relax, they emit light—a characteristic color for each gas. When students view the lighted tube through a spectroscope, they can observe the unique set of spectral lines for each gas. Spectrum tubes should only be used intermittently and are not intended as a continuous source of light.

Catalog No.	Description	Price/Each	Catalog No.	Description	Price/Each
AP1328	Air	$50.18	AP1336	Krypton	$51.67
AP1329	Argon	52.58	AP1337	Mercury Vapor	78.68
AP1330	Bromine Vapor	81.80	AP1338	Neon Gas	53.07
AP1331	Carbon Dioxide	51.70	AP1339	Nitrogen Gas	53.07
AP1332	Chlorine Gas	67.16	AP1340	Oxygen Gas	53.07
AP1333	Helium Gas	53.30	AP1341	Water Vapor	54.30
AP1334	Hydrogen Gas	56.10	AP1342	Xenon	66.30
AP1335	Iodine Vapor*	75.85			

*Note: It is normal for the iodine spectrum tube to contain small pieces of solid iodine.

Observed Color of Glowing Spectrum Tubes

Gas	Color	Gas	Color
Air	Pink	Iodine Vapor	White with faint violet
Argon	Violet	Krypton	Blue-purple
Bromine Vapor	Faint Blue	Mercury Vapor	Light blue-green
Carbon Dioxide	Faint blue-green	Neon	Red-orange
Chlorine	Blue-green	Nitrogen	Yellow-orange
Helium	Orange	Oxygen	Lavender
Hydrogen	Magenta	Water Vapor	Dark Pink
		Xenon	Blue

Spectrum Tube Power Supply



Student/teacher safety was a prime consideration in the design of this spectrum tube power supply. Specially molded spectrum tube sockets easily enable the tube(s) to be placed in position but also provide maximum protection for the user against accidental electrical contact. The sockets are fully shielded. A current-limiting transformer operates from your 110 V AC line to provide the voltage to operate spectrum tubes. The bottom socket of the power supply is spring loaded to facilitate easy tube placement and removal. The power supply is confined within a heavy metal box. A pilot light, 6-foot grounded power cord and an on/off switch are built into the unit. Dimensions: 14½" H x 4½" W x 3" D.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP1327	Spectrum Tube Power Supply	$270.30

HOW TO

Make Your Own Slides of Spectra

Slides of spectra can be made using the Flinn C-Spectra® and your 35 mm camera. Film with a rating equal to 300 or more would be required. The Flinn C-Spectra® can be found on page 184.

Focus the Flinn C-Spectra® by eye. Set the camera at infinity for 4–5 second exposure with a wide open shutter. The camera should be on some steady device like a tripod. Much like the photographer of old, you must rig a light-tight system (using heavy black cloth) that excludes all light from the camera except that from the focused Flinn C-Spectra®. Since the Flinn C-Spectra® is available in 8" x 10" sheets, you can do some lightproof rigging between the camera and the spectrum tube.

Spectrum Tubes and Accessories, continued

Spectrum Tube System

Safe and convenient design! Electrodes are internal to eliminate the risk of electric shock. System includes a power supply that accommodates one tube and a convenient storage unit that stores up to six additional tubes. Long-lasting spectrum tubes are safe and protected against accidental breakage by a hard polymer shell. All electrical parts are enclosed and a magnetic interlock system prevents an electric current unless the tube is properly inserted. Power supply can be raised to adjust the height of the light-emitting region. Base is 10" x 7"; power supply is 11" high; spectrum tubes are 6" x 1½" with a light-emitting region of 2".

Catalog No.	Description	Price/Each
AP7616	Spectrum Tube System	$275.40
AP7617	Neon Spectrum Tube	51.90
AP7618	Hydrogen Spectrum Tube	51.90
AP7619	Helium Spectrum Tube	51.90
AP7620	Nitrogen Spectrum Tube	52.40
AP7621	Argon Spectrum Tube	52.40

Flinn Emission Spectra Manual

FLINN EXCLUSIVE

By: Walter Rohr, Retired, Eastchester High School, Eastchester, NY

No more wondering what the line spectra should look like! See a visual representation of the color peaks associated with gases such as argon, helium, hydrogen, mercury and neon as well as 10 others. Manual contains a detailed introduction on spectrum tubes, a chart for each tube containing all emission spectra lines with wavelength and intensity readings and a graphical representation of the lines. 18 pages, 8½" x 11", soft cover.

Catalog No.	Description	Price/Each
AP5957	Flinn Emission Spectra Manual	$10.69

Splints, Wood

Thin wood, dimensions: 140 x 5 x 1 mm.

Catalog No.	Description	Splints/Pkg.	Price/Pkg.
AP4444	Wood Splints	100	$2.35
AP4455		1000	9.35

Sponges

Cellulose Sponges

Catalog No.	Description	Size (L x W x H)	Price
AP1343	Cellulose Sponges	6" x 3⅜" x 1"	$3.25/Pkg. of 2
AP1344		6" x 4¼" x 1⅝"	4.15/Each
AP1345		7½" x 4⅜" x 1 11/16"	9.90/Each

Cellulose Sponge, with Scrubber Pad

6" x 3⅛" x 1".

Catalog No.	Description	Price/Each
AP5458	Cellulose Sponge, with Scrubber Pad	$3.70

Spoons

Deflagration Spoon

Stainless steel spoon, 16" long with ¾" diameter cup.

Catalog No.	Description	Price/Each
AP1346	Deflagration Spoon	$8.15

Measuring Spoons

¼, ½, 1 teaspoon, and 1 tablespoon.

Catalog No.	Description	Price/Each
AP9284	Measuring Spoons	$3.00

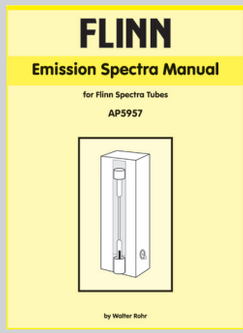
Plastic Spoons, Pkg. of 24

Catalog No.	Description	Price/Each
AP9285	Plastic Spoons, Pkg. of 24	$3.35





Spectrum Tube System
AP7616



Flinn Emission Spectra Manual
AP5957



Splints, Wood
AP4444, etc.

HOW TO

Use Wood Splints for Flame Tests

Simply soak the wood splints overnight in solutions containing metallic cations (e.g., Ba^{2+}, Ca^{2+}, Cu^{2+}, Li^{+}, K^{+}, Na^{+}, Sr^{2+}). Then hold one saturated wood splint in a flame and observe the vivid color. Repeat with splints from each of the solutions. Flinn has developed a student laboratory kit using this concept. For details, see the Flame Test Kit on page 245.

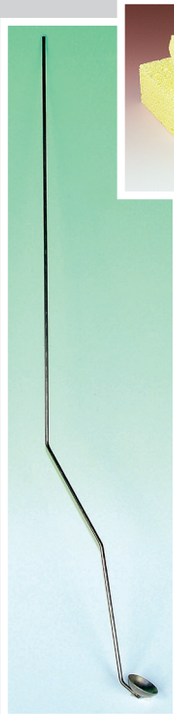
See free video at flinnsci.com.



Cellulose Sponges
AP1343, etc.



Cellulose Sponge, with Scrubber Pad
AP5458



Deflagration Spoon
AP1346





Measuring Spoons
AP9284

Plastic Spoons
AP9285

Spot Plates

Spot Plates, Polystyrene



These polystyrene spot plates are a low-cost alternative to porcelain. While considered disposable, the spot plates can be reused many times.

Catalog No.	Description	Price/Pkg. of 12
AP6399	Spot Plates, Polystyrene, 12-Well	$11.52

Spot Plates, Polystyrene, Clear



Versatile 15-well plate can be used as either a spot plate or reaction plate. A microspatula is included with each plate for transferring solids to the wells. Suitable for reactions involving mineral acids. Not recommended for use with organic solvents. Package of 10.

Catalog No.	Description	Price/Pkg. of 10
AP6404	Spot Plates, Polystyrene, Clear	$18.88

Spot Plate, Porcelain



Plates glazed on all visible surfaces. The outside diameter of each well is 21 mm with a well depth of 7 mm. Plates have 12 wells. The blue plate is used to observe white precipitates.

Catalog No.	Description	Color	Size (mm)	No. of Wells	Price/Each
AP1061	Spot Plate, Porcelain	White	118 x 91	12	$28.02
AP8946		Blue	118 x 91	12	68.54

Spot Plate, Porcelain, Economy Choice

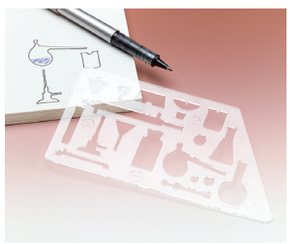


A terrific value! Suitable for all lab applications, this 12-well, white spot plate will hold 1 mL of liquid in each well. The plate is glazed on all visible surfaces for easy cleaning. Plate size 115 x 95 mm; well diameter 21 mm; well depth 7 mm.

Catalog No.	Description	Price/Each
AP6064	Spot Plate, Porcelain, Economy Choice	$13.57

Stencils

Stencil, Drawing

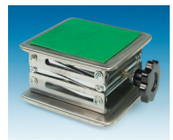


Chemistry apparatus drawing stencil includes burners, beakers, flasks, test tubes, and more. Plastic. 4¾" x 3".

Catalog No.	Description	Price/Each
AP5438	Stencil, Drawing	$2.16

Stands, Support

Lab Jack

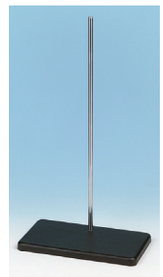




Ideal for supporting beakers, flasks, water baths, stirrers, and other lab equipment. Easily elevates from 3" to 10½" by simply turning the knob. Supports loads up to 45 kg. Made of high strength chrome-plated steel. Platform measures 6" x 6".

Catalog No.	Description	Price/Each
AP5405	Lab Jack	$110.10

Buret Support Stand



May be used as general purpose support stand, but designed for use as a buret holder using a buret-holding clamp. Cast iron, black enamel finish. Base is 7" W x 13" L. Includes 24"-long rod that is ½" in diameter.

Catalog No.	Description	Price/Each
AP1347	Buret Support Stand	$96.67

Support Stand



Heavy cast rectangular base of plate steel, finished in hard enamel. Excellent stability. Support rod of zinc-plated steel.

Catalog No.	Description	Base Size	Rod Size	Price/Each
AP8226	Support Stand	4" x 6"	5/16" x 18"	$19.35
AP8228		6" x 9"	½" x 24"	24.99
AP5998		6" x 11"	½" x 36"	31.90

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Support Stand, Economy Choice



A good, but less expensive alternative. 5" W x 8" L and provides excellent stability. The zinc-plated steel rod stands 20½" high with a diameter of ⅜". You will not have any problems using existing clamps on this support stand.

Catalog No.	Description	Price/Each
AP4550	Support Stand, Economy Choice	$27.50

Support Stand, Triangular Base



Heavy, cast iron triangular base gives these support stands extra stability even when fully equipped with clamps and apparatus. The support rod is located in the center of the base allowing for full 360º use. Base is finished with black enamel; support rod is plated steel. Two sizes available.

Catalog No.	Description	Rod Size (Diameter x Height)	Price/Each
AP5421	Support Stand, Triangular Base	⅜" x 22"	$26.22
AP5422		½" x 26"	35.10

Stirrers, Magnetic

DLAB EcoStir™ Magnetic Stirrer



EcoStir™ is affordable and lightweight! Features include:

- Maintenance free, brushless DC motor
- Rare earth magnets for strong stirring power
- Stepless speed regulation range of 300–2000 rpm
- Silent and vibration-free design
- PET top provides excellent chemical resistance.
- Shaft can be fitted with a pH sensor or sensors for other purposes.

Catalog No.	Description	Price/Each
AP9552	DLAB EcoStir™ Magnetic Stirrer	$80.60

Mini Magnetic Stirrer



Inexpensive, yet very efficient. Stirring action speed is adjustable from 100–1000 rpm, depending on the viscosity of the medium you are stirring. The ABS plastic top is easy to clean and can hold up to a 1-liter beaker. Do not place hot materials on this top since it is plastic and will melt. Dimensions: 12 cm L x 12 cm W x 4.6 cm H.

Catalog No.	Description	Price/Each
AP8578	Mini Magnetic Stirrer	$148.00

DLAB FlatSpin™ Compact Magnetic Stirrer



With excellent stirring functionality, the ultra-thin, compact design of the FlatSpin™ magnetic stirrer takes up less bench space and makes storage easier. Features include:

- Wide range of speed from 15–1500 rpm
- Automatic reverse rotation for excellent mixing
- PET top provides excellent chemical resistance
- Ultra silent operation, lightweight and vibration-free

Catalog No.	Description	Price/Each
AP9551	DLAB FlatSpin™ Compact Magnetic Stirrer	$158.45

Flinn Mini Magnetic Stirrer

FLINN EXCLUSIVE

Our Flinn mini magnetic stirrer may be small but is an enormous time-saver. All the features you need in a magnetic stirrer are provided at an affordable price.



- Powerful enough to stir 1000 mL of liquid up to 2000 rpm.
- Stirring speed adjustable from 350-2000 rpm.
- ABS plastic outer shell and anti-slip foot pads.
- Splash-proof sealed components and LED display screen
- Working diameter: 110 mm
- Maximum stirring capacity: 5,000 mL
- Includes mini-stir bar and AC/DC adapter.

Catalog No.	Description	Price/Each
AP8503	Flinn Mini Magnetic Stirrer	$207.90

Flinn Magnetic Stirrer



With a very flat 7" x 7" stirring surface and cast aluminum base, the Flinn Magnetic Stirrer uses state-of-the-art ceramics to provide a remarkable top surface. The ceramic material offers high-impact strength, excellent chemical resistance and a bright white color to enhance solution visibility. Continuously variable stirring speeds from 300 to 2000 rpm using a maintenance-free brushless DC motor. Supplied with a PTFE-coated stirring bar. Complete with three-wire grounded cord and plug. Replacement Ceramic Top is available separately. 120 volts, 30 watts.

Catalog No.	Description	Price/Each
AP9803	Flinn Magnetic Stirrer	$425.00
AP8215	Replacement Ceramic Top	202.35





Flinn Magnetic Stirrers/ Hot Plates

FLINN EXCLUSIVE

Bright, white ceramic top material offers high-impact strength and chemical resistance. Stirrer speed can be adjusted from 200 rpm to 2500 rpm. The heating elements are embedded so there are no exposed heat sources. Unit will reach maximum temperature (538 °C) within eight minutes. Power indicator lights are provided for both stirring and/or heating. Includes a PTFE-coated stirring bar, three-wire grounded cord and plug. Integral ring-stand holder accommodates ½" diameter support rod.

- 4" x 4": 120 volts, 3.5 amps, 405 watts.
- 7" x 7": 120 volts, 9.2 amps, 1086 watts.

Catalog No.	Description	Size of Top	Price/Each
AP9804	Flinn Magnetic Stirrer/Hot Plate	4" x 4"	$576.00
AP9805		7" x 7"	605.00
AP8213	Replacement Ceramic Top	4" x 4"	165.00
AP8215		7" x 7"	202.35

Please contact us for step-by-step instructions regarding the replacement of your Flinn stirrer or Flinn hot plate/stirrer ceramic tops.



Flinn Digital Hot Plates/ Magnetic Stirrers

FLINN EXCLUSIVE

Quickly set the desired temperature using an LCD digital display, which indicates the current operating temperature. Bright, white ceramic top offers high-impact strength and chemical resistance. Heating elements are embedded so there are no exposed heat sources. Reaches maximum temperature (540 °C) within 15 minutes. Stirrer speed control can be adjusted from 300 to 2000 rpm using a maintenance-free brushless DC motor. A "HOT" warning flashes if the work plate temperature is above 50 °C even when turned off. Includes three-wire grounded cord and plug.

Catalog No.	Description	Size of Top	Price/Each
AP9808	Flinn Digital Hot Plates/ Magnetic Stirrers	4" x 4"	$644.70
AP9809		7" x 7"	753.00
AP8213	Replacement Ceramic Top	4" x 4"	165.00
AP8215		7" x 7"	202.35

Accessories for Flinn Digital Hot Plates

Catalog No.	Description	Price/Each
AP9878	Temperature Sensor, 230 mm	$ 88.87
AP9879	Temperature Sensor, 230 mm, Glass-Coated	82.83
AP9880	Temperature Sensor, 100 mm	66.65
AP9882	Temperature Sensor and Support Clamp Set	116.10

STIRRERS, MAGNETIC continued on next page.

Stirrers, Magnetic, continued

DLAB Multi-Channel Magnetic Stirrers and Hot Plates



ADDITIONAL STIRRERS AT FLINNSCI.COM

AP9546



DLAB Multi-Channel Magnetic Stirrers and Hot Plates

Space saving units with multiple stirring positions and speed control channels. Features include:

- Maintenance-free brushless DC motor
- Stirring speed range of 0–1100 rpm
- High magnetic adhesion to control spin bar
- Stainless steel work plate with a silicon cover

Catalog No.	AP9546
Stirring Positions	10
Functions	Stirrer
Work Plate Dimensions (W x D)	180 x 450 mm
Voltage	100–120/200–240V, 50/60Hz
Speed Range	0–1100 rpm
Temperature Range	—
Overheating Proctection	—
Dimensions (W x D x H)	180 x 622 x 65 mm
Price/Each	**$1061.65**

Stir Station

The Stir Station will work effectively with beakers as small as 50-mL and as large as 1-L. Easy-to-use speed control quickly fine-tunes the stirring speed from 50 to 1250 rpm. Chemical-resistant stirring platform is sufficiently lit from below with three cool-light LED bulbs. Conveniently positioned removable ring stand post is affixed to the stirrer base at a distance that easily accommodates most buret or utility clamps. Operates with the included 120-V AC power adapter or with four C batteries (not included). 250 x 100 x 50 mm.



Catalog No.	Description	Price/Each
TC1558	Stir Station	**$180.75**

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Stirrers, Magnetic, Accessories



Magnetic Stirring Bar

PTFE stirring bars molded around Alnico-V magnets. Extra strong, white in color. Can be used on stirrer hot plates at temperatures up to 250 °C. Resistant to most common lab chemicals.

Catalog No.	Description	Size (Length x Diameter)	Price/Each
AP1088	Magnetic Stirring Bar	1" x 5/16"	**$3.05**
AP1089		1 5/16" x 5/16"	**3.60**
AP1090		2" x 5/16"	**5.05**



AP5396, etc.

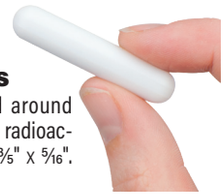


AP1353

Magnetic Stirring Bar, with Molded-on Pivot Ring

Octagonal shape magnetic stirring bars provides greater surface area and added turbulence. Molded-on pivot ring aids in reducing friction, chattering and the marring of plastic containers. Stirring bars consist of an Alnico-V magnet encapsulated in a PTFE coating. Store in pairs to maintain magnetic strength. Six sizes available. Six-piece assortment includes two each of 1" x 5/16", 1½" x 5/16" and 2" x 5/16" sizes.

Catalog No.	Description	Size (Length x Diameter)	Price/Each
AP5396	Magnetic Stirring Bar, with Molded-on Pivot Ring	1" x 5/16"	**$ 6.14**
AP5397		1½" x 5/16"	**6.96**
AP5398		2" x 5/16"	**8.20**
AP5399		1" x 3/8"	**6.72**
AP5400		1½" x 3/8"	**7.90**
AP5401		2" x 3/8"	**11.11**
AP1353	Six-piece Assortment		**35.25**



Disposable Magnetic Stirring Bars

Polygonal magnetic stirring bars are PTFE molded around Alnico magnets. Ideal for single-use applications with radioactive reagents or for preventing cross-contamination. 1 3/8" x 5/16". Package of 100.

Catalog No.	Description	Price/Pkg.
AP7549	Disposable Magnetic Stirring Bars	**$169.00**



Magnetic Stirring Bar Retriever

The entire retriever is totally encased in chemical-resistant polypropylene. Overall length: 12".

Catalog No.	Description	Price/Each
AP1091	Magnetic Stirring Bar Retriever	**$18.61**

Orbital Shaker See flinnsci.com.

Stopcock Grease

Silicone lubricant with high film strength. Ideal for lubricating stopcocks or sealing desiccators and vacuum chambers. 5-ounce tube.

Catalog No.	Description	Price/Each
AP1095	Stopcock Grease, Silicone	$47.80

Stoppers, Rubber

Rubber Stoppers

Stopper Hole Size	No. Stoppers Per Pound	Size	Catalog No. Solid	Price Per Pound	Catalog No. One-Hole	Price Per Pound	Catalog No. Two-Hole	Price Per Pound
3 mm	90	00	AP2219	$16.75	AP2220	$16.75	AP2221	$16.75
3 mm	63	0	AP2222	16.75	AP2300	16.75	AP2310	16.75
4 mm	52	1	AP2223	16.75	AP2301	16.75	AP2311	16.75
5 mm	45	2	AP2224	16.75	AP2302	16.75	AP2312	16.75
5 mm	33	3	AP2225	16.75	AP2303	16.75	—	—
5 mm	28	4	AP2226	16.75	AP2304	16.75	AP2314	16.75
5 mm	24	5	AP2227	16.75	AP2305	16.75	AP2315	16.75
5 mm	21	5½	AP2231	16.75	AP2237	16.75	AP2243	16.75
5 mm	18	6	AP2228	16.75	AP2306	16.75	AP2316	16.75
5 mm	16	6½	AP2232	16.75	AP2238	16.75	AP2244	16.75
5 mm	13	7	AP2229	16.75	AP2307	16.75	AP2317	16.75
5 mm	10	8	AP2230	16.75	AP2308	16.75	AP2318	16.75
5 mm	9	9	AP2233	16.75	AP2239	16.75	AP2245	16.75
5 mm	7	10	AP2234	16.75	AP2240	16.75	AP2246	16.75
5 mm	7	10½	AP2235	12.56	AP2241	16.75	AP2247	16.75
5 mm	6	11	AP2236	16.75	AP2242	16.75	—	—

Rubber Stoppers, Assortments

Each one-pound bag has a mix of the most popular whole-number sizes of black stoppers. Choose from all solid, all one-hole, all two-hole, or a combination of solid, one-hole and two-hole (AP2320).

Catalog No.	Description	Sizes	Price/Lb
AP2320	Rubber Stoppers, Assorted	1 to 6	$18.50
AP6229	Rubber Stoppers, Solid	00 to 7	19.56
AP6230	Rubber Stoppers, One-Hole	00 to 7	17.75
AP6231	Rubber Stoppers, Two-Hole	2 to 8	18.43

Stoppers, Rubber, Accessories

Stopper/Cork Organizer See page 203.

Stopper Sizer

Provides size information in stopper ranges 00 to 12 and cork sizes 0 to 26. The opposite side of the sizer has a circular scale for sizing tubing diameters between 4 mm and 52 mm. Sizer is made of durable plastic.

Catalog No.	Description	Price/Each
AP2251	Stopper Sizer	$17.70

Stopwatches See page 198.

SAFETY TIP

Safer Method for Inserting Glass Tubing into Rubber Stoppers

A safe and convenient way for inserting glass tubing and thermometers into rubber stoppers is to insert a cork borer (AP8848) that just fits over the item to be inserted into the rubber stopper. Thread the tubing or thermometer through the cork borer, and then remove the cork borer. To remove thermometers or tubing from rubber stoppers, just reverse the process.



Stopcock Grease, Silicone
AP1095



Rubber Stoppers
AP2219, etc.

Rubber Stopper Sizing Table*

Stopper Size	Bottom Diameter (mm)	Top Diameter (mm)	Fits Opening i.d. (mm)
00	10	14	11–13
0	13	17	13–15
1	14	18	14–16
2	15	19	15–17
3	18	23	18–21
4	20	25	20–23
5	23	27	23–25
5½	25	29	25–27
6	26	32	26–30
6½	27	34	27–32
7	30	37	30–35
8	33	41	33–39
9	38	45	38–43
10	43	50	43–48
10½	45	53	45–51
11	48	56	48–54

*Rubber stoppers and corks are sized differently. This table is for sizing rubber stoppers only. To size corks, see page 135.

FREE HOW TO SELECT STOPPERS VIDEO AT FLINNSCI.COM



Stopper Sizer
AP2251

Straws

Straws, Plastic, Wrapped
Jumbo plastic straws are 8" long with a diameter of ¼". Package of 500.

Catalog No.	Description	Price/Pkg.
AP6025	Straws, Plastic, Wrapped	$12.75

String

Fishing Line, Monofilament
Monofilament fishing line, 10-lb test, 1425 ft.

Catalog No.	Description	Price/Each
AP6938	Fishing Line, Monofilament	$9.10

String, Thin
Three-ply cotton/polyester blend. 75 g ball.

Catalog No.	Description	Price/Each
AP4823	String, Thin	$2.10

String, Twine See Twine, pages 100 and 312.

Syringes

Syringe, without Needle
All disposable syringes have Luer Lock tips except AP5389, which has a slip tip. Not sterilized. Use with syringe tip caps listed for gas collection and gas law experiments.

Catalog No.	Description	Size (mL)	Graduations (cc)	Price/Each
AP5389	Syringe, without Needle	1	0.01	$ 0.57
AP1728		3	0.1	0.82
AP1729		6	0.2	0.98
AP1730		12	0.2	1.38
AP1731		20	1.0	2.26
AP1732		35	1.0	2.89
AP8754		60	1.0	5.85
AP6315		140	5.0	12.40

Syringe, with Needle
Disposable, plastic syringe. Luer Lock tip has hyperdermic-type needle on the end. Needle is open and needle tip comes off. 10-mL capacity.

Catalog No.	Description	Price/Pkg. of 10
AP1149	Syringe, with Needle	$12.45

Syringe Accessories

Syringe Tip Cap
These tip caps form a super-tight seal for Luer or Luer Lock syringes. Perfect for gas compressiblility and microscale gas law experiments or anytime you need to cap your syringe.

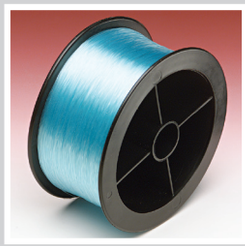
Catalog No.	Description	Price/Pkg. of 10
AP8958	Syringe Tip Cap	$3.25

Syringe Extender/Adapter
Attach syringe to glassware using this 1½" syringe extender/adapter.

Catalog No.	Description	Price/Each
AP7680	Syringe Extender/Adapter	$2.50



Straws, Plastic, Wrapped
AP6025



Fishing Line, Monofilament
AP6938



String, Thin
AP4823



Syringe, without Needle
AP5389, etc.



Syringe, with Needle
AP1149



Syringe Tip Cap
AP8958

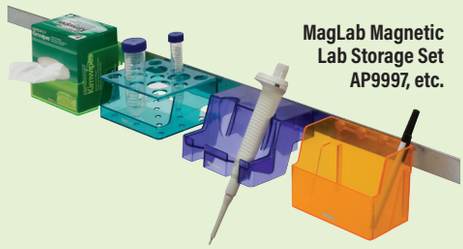


Syringe Extender/ Adapter
AP7680

SYRINGE ACCESSORIES continued on next page.

MagLab Magnetic Lab Storage Set
Organize your lab with the MagLab Magnetic Lab Storage! Each component comes with a powerful magnet and is made of durable plastic. The magnet holds securely to most metal surfaces, or you can create your own with the metal plate provided.

Catalog No.	Description	Price/Each
AP9997	MagLab Magnetic Lab Storage Set	$71.00



MagLab Magnetic Lab Storage Set
AP9997, etc.

Syringe Accessories, continued

Syringe Stopcock, Replacement
Connects to and forms a tight seal with Luer Lock syringes.

Catalog No.	Description	Price/Each
AP9159	Syringe Stopcock, Replacement	$6.15

Tape

Duct Tape
All-purpose cloth duct tape. Roll is 1.92" wide x 60 yards long.

Catalog No.	Description	Price/Each
AP9290	Duct Tape	$12.25

Electrical Tape
Black rubber tape for electrical insulation. Roll is ¾" wide x 60 feet long.

Catalog No.	Description	Price/Each
AP6011	Electrical Tape	$3.30

Labeling Tape See page 164.

Magnetic Tape
Flexible magnetic tape has an adhesive on one side and a magnet on the other. The magnetic side will stick to a magnetic chalkboard. Hundreds of laboratory and classroom uses! Easily cut with scissors. Each roll of tape is ½" wide x 10 feet long.

Catalog No.	Description	Price/Each
AP4586	Magnetic Tape	$4.85

Masking Tape
Masking tape makes a fine label. Write on it with a felt-tipped pen and you have just fashioned a permanent label. Color: off white. Size: ¾" wide x 60 yds.

Catalog No.	Description	Price/Roll
AP1734	Masking Tape	$4.75

Velcro® Dot Tape
Two-foot long strip contains 24 hook-and-loop pairs. Dots are ¾" in diameter.

Catalog No.	Description	Price/Each
AP6842	Velcro® Dot Tape	$11.85

Tesla Coils

Tesla Coil
Self-contained, handheld Tesla coil produces a high voltage at a high frequency. Coil can be used to light fluorescent bulbs, spectrum tubes and incandescent bulbs without wires or touching! The heavy-duty case is a convenient handle. See the 2" electrode has an output between 10,000 to 50,000 volts at a frequency of approximately 500 kHz. The intensity of the 1" spark is adjustable by a knob on the end of the unit. Unit is designed for intermittent use and must be turned off to cool after ten minutes of use. AP5443 is equipped with an ON/OFF momentary switch in the handle for improved safety.

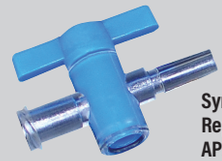
Catalog No.	Description	Price/Each
AP1594	Tesla Coil	$303.05
AP5443	Tesla Coil, with ON/OFF Safety Switch	441.30

Tesla Coil, Tabletop
Use this hands-free Tesla coil to demonstrate the unusual properties of high-frequency electrical phenomena. Teach many important topics such as transformers, electromagnetism, resonating electrical circuits, electric inductance, capacitance, and electrical power transmission with this 50,000-watt Tesla coil. The set includes two antenna plates, small neon lightbulb, mini discharge electrode, and lamp socket. Detailed instructions containing background information and 18 experiments are also provided.

Catalog No.	Description	Price/Each
AP6479	Tesla Coil, Tabletop	$382.80



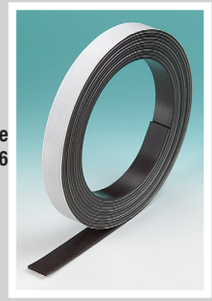
Duct Tape
AP9290



Syringe Stopcock, Replacement
AP9159



Electrical Tape
AP6011



Magnetic Tape
AP4586



Masking Tape
AP1734



Velcro® Dot Tape
AP6842



Tesla Coil
AP1594, etc.



Tesla Coil, Tabletop
AP6479

Test Papers

Assorted Test Papers

Supplied in closed plastic containers of 100 strips.

Catalog No.	Description	Use	Price Per Vial	Price 12 Vials
AP7901	Cobalt Chloride	Paper indicates relative humidity by color change: pink indicates high humidity; blue indicates low humidity.	$2.69	$30.36
AP7912	Congo Red	For strong acids. pH 3.0 (blue-violet) to 5.0 (red)	2.20	24.96
AP7893	Lead Acetate	Used to test for hydrogen sulfide (H_2S) vapors. Paper must be moistened with water prior to use.	2.26	25.92
AP7923	Litmus, Blue	Used to test for acids. pH 4.3 (red) to 6.8 (blue-violet)	1.79	19.68
AP7934	Litmus, Neutral	Used to test for acid or alkali.	1.57	17.28
AP7945	Litmus, Red	Used to test for alkali. 6.8 (blue-violet) to 8.1 (blue)	1.68	18.36
AP7967	Methyl Violet	pH 0.2 (yellow) to 2.0 (blue-violet)	2.47	28.32
AP7978	Phenolphthalein	Very sensitive to ammonia vapors. pH 8.2 (colorless) to 10.0 (pink)	2.24	25.44
AP7989	PTC* (phenylthiocarbamide)	Used to test for the genetic ability to experience a bitter taste from PTC. Occurs in 70% of the population.	3.55	40.44
AP7890	Potassium Iodide, Starch	Used to test for peroxides and other oxidizing agents. Color varies from white through blue to black.	2.57	29.04
AP7891	Sodium Benzoate Taste Test	Used to test for genetic ability to taste sodium benzoate. This may taste sweet, bitter, salty, or be tasteless, depending on genetic characteristics.	3.75	42.72
AP7892	Thiourea Taste Test	Used to test for the genetic ability to experience a bitter taste from thiourea. Some individuals can taste either PTC or thiourea, but not both.	3.75	42.72
AP7990	Control Taste Paper	Used as an untreated control for taste tests with PTC, sodium benzoate and thiourea.	1.65	18.60

Acid Rain Survey Kit

Each kit includes enough materials for an entire class—15 sample tubes with caps, 5 color comparison charts and enough test paper (pH 3.0–6.0) for 75 determinations. Also included is a vial of 100 of Hydrion 0–12 pH test paper for testing and comparing the pH values of other liquids. All components are completely portable for use in the field.



Catalog No.	Description	Price/Each
AP7054	Acid Rain Survey Kit	$31.90

PTC Paper*

PTC paper is paper soaked with phenylthiocarbamide (PTC). The LD_{50} for PTC is 3 mg/kg. Such a low LD_{50} suggests that this is a very toxic substance. The solution to make the taste test paper contains approximately 50 mg of PTC per liter of water. We calculate that each strip of PTC paper would contain approximately 0.03 mg of PTC. We estimate that a person weighing about 50 kg (110 pounds) would have to lick and ingest 5,000 2" x ¼" strips of PTC paper to reach the LD_{50}. A few sensitized individuals may have an allergic reaction to PTC.

Test Papers, Strips
AP7901, etc.



HOW TO

Re-blue Blue Litmus Paper

Blue litmus paper can turn red over time due to absorption of carbon dioxide in the air. To re-blue your blue litmus paper, place a spatula-tip full (approximately 1 g) of powdered ammonium carbonate [$(NH_4)_2CO_3$] in the vial with the blue litmus paper.

Acid Rain Test Strips



Kit contains 15 strips of pH test paper and a color comparison chart—designed for measuring the pH of rain in the range of 3.0 to 6.0.

Catalog No.	Description	Price/Each
AP1834	Acid Rain Test Strips	$1.70

Lead Testing Paper



Color change of pink to a deep purple-red indicates the presence of lead in solutions or on surfaces. Limits of sensitivity: 0.05 micrograms on surfaces, 5 milligrams/liter (5 ppm) in solutions. The presence of as little as 50 ppb in solution can be determined by using evaporation techniques. Forty 25 x 40 mm size sheets.

Catalog No.	Description	Price/Each
AP9288	Lead Testing Paper	$71.40

Water Hardness Testing Paper

See pages 141 and 511.

Test Papers—pH

Hydrion AB pH Test Paper



Hydrion AB pH test paper displays sharp color changes that cover the pH range between 2.0 and 11.0. Type A paper covers the even pH range between 2.0 and 10.0 (2–4–6–8–10). Type B paper covers the odd pH range between 1.0 and 11.0 (3–5–7–9–11). The AB dispenser contains 30 feet of pH paper—enough paper for over 200 tests. Supplied in a double roll dispenser with color charts and convenient tear-off tabs. Refills contain five 15-foot rolls of one type of paper and two color charts. Packed in heat-sealed aluminum foil and tightly secured in a plastic case.

Hydrion AB pH Test Strips are the same paper as the Hydrion AB pH Test Paper, but packaged in convenient strips. Each vial contains 100 strips of one type of paper. Type A covers even pH intervals (2, 4, 6, 8, 10). Type B covers even pH intervals (1, 3, 5, 7, 9, 11).

Catalog No.	Description	Price/Each
AP150	Hydrion AB pH Test Paper, Roll	$13.95
AP149	Type B Refill, Roll	29.75

Catalog No.	Description	Price/Vial	Price/Pkg. of 10 Vials
AP147	Type A pH Test Strips	$2.25	$19.90
AP146	Type B pH Test Strips	2.60	23.00

TEST PAPERS—pH continued on next page.

Test Papers—pH, continued

Hydrion Insta-Chek 0–13 pH Test Paper

0–13 pH range. Includes two 15-foot rolls and color charts. Refill includes five 15-foot rolls.

Catalog No.	Description	Price/Each
AP5894	Hydrion Insta-Chek 0–13 pH Test Paper	$14.83
AP5412	Hydrion Insta-Chek 0–13 pH Test Paper, Refill	33.50

Hydrion Spectral 1–14 pH Test Paper

1–14 pH range. Includes one 15-foot roll in despenser with color chart.

Catalog No.	Description	Price/Each
AP8577	Hydrion Spectral 1–14 pH Test Paper	$8.24

Hydrion Ultrafast 0–14 pH Test Paper

0–14 pH range. Includes two 15-foot rolls: one to measures 0–13 and the other measures 12.5–14. Refill includes five 15-foot 0–13 rolls.

Catalog No.	Description	Price/Each
AP5411	Hydrion Ultrafast 0–14 pH Test Paper	$15.85
AP5412	Hydrion Insta-Chek 0–13 pH Test Paper, Refill	33.50

Hydrion Narrow Range pH Test Paper

A sharp color change for each half pH unit. Supplied in a plastic dispenser case with color chart and convenient tear-off tabs. Each roll measures 15 feet.

Catalog No.	Description	pH Range	Price/Each
AP310	Hydrion Narrow Range pH Test Paper	0.0–1.5	$7.60
AP320		1.4–2.8	8.05
AP325		3.0–5.5	7.85
AP333		4.8–6.7	7.95
AP334		4.5–7.5	7.95
AP335		6.0–8.0	7.95
AP350		6.8–8.4	7.95
AP358		8.0–9.5	7.95
AP375		10.0–12.0	7.95
AP395		12.5–14.0	7.95

Hydrion Pocket pH Set

0–14 pH range. Includes one 0–13 15-ft roll and six narrow range 15-ft roll. Each 15-foot roll of paper is supplied in a plastic dispenser case with color chart and convenient tear-off tabs. Set is packaged in a durable carton for permanent storage.

Catalog No.	Description	Price/Set
AP170	Hydrion Pocket pH Set	$49.20

pH Meter

Be sure to review our catalog listings for pH meters, particularly the Flinn pH meter—a pH meter at a reasonable price for science departments with limited budgets. See page 171.

Hydrion 1–12 pH Test Strips

1–12 pH range. 100 strips per vial. Color charts included.

Catalog No.	Description	Price/Vial	Price/Pkg. of 10 Vials
AP1107	Hydrion 1–12 pH Test Strips	$2.83	$26.10

Dip-and-Read pH Test Strips

Plastic strips with indicator pads at one end. 50 strips per package. Color chart included.

Catalog No.	Description	pH Range	Price/Pkg.
FB0497	Dip-and-Read pH Test Strips	3.0–6.0	$ 9.85
FB0498		5.0–9.0	10.05
FB0499		1–14	11.00

TEST PAPERS—pH continued on next page.



Hydrion Insta-Chek 0–13 pH Test Paper AP5894, etc.



Hydrion Spectral 1–14 pH Test Paper AP8577



Hydrion Ultrafast 0–14 pH Test Paper AP5411, etc.

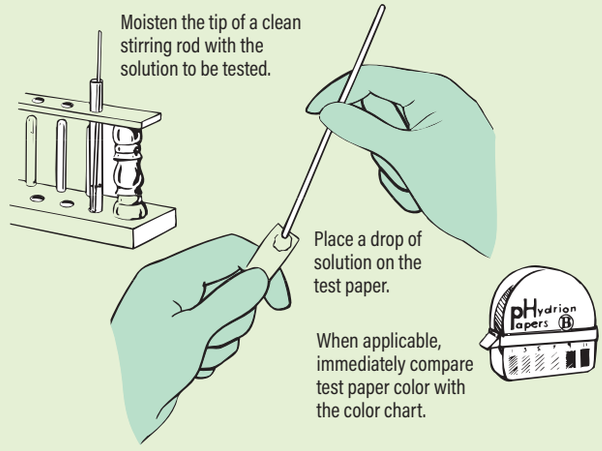


Hydrion 1–12 pH Test Strips AP1107



Dip-and-Read pH Test Strips FB0497, etc.

HOW TO Use Test Paper



Test Papers—pH, continued

Dip-and-Read Universal pH Test Strips

0–14 pH range. 100 strips per package.

Catalog No.	Description	Price/Pkg.
AP9287	Dip-and-Read Universal pH Test Strips	$16.11

Universal Indicator Color Chart

FLINN EXCLUSIVE

Available two ways. Use the overhead transparency whenever your students are using Flinn universal indicator to determine the pH of a solution. The color of each pH is clearly displayed on the overhead projector and can be seen across the laboratory. The chart displays the colors and pH values of each pH unit from 4 to 10.

Catalog No.	Description	Price/Each
AP8765	Universal Indicator Charts, 2¾" x 3½", Pkg. of 30	$7.15

Hydrion Low Ion pH Test Kit

High-quality water may not have enough ions to provide a reliable pH value. If you use standard pH indicator paper, the indicator in the test paper may be the only contaminant present when you dip it in the water, resulting in an erroneous pH value. This low ion test kit provides you with a sample tube, special low ion test paper (roll of 25 feet) and a color comparison chart. Unlike most test paper, this paper is not to be dipped. Place the paper in the sample tube and add your unknown liquid. Cap the tube and shake, then read the pH value by holding the tube against the color comparison chart.

Catalog No.	Description	Price/Each
AP1660	Hydrion Low Ion pH Test Kit	$15.57

Hydrion One-Drop pH Indicator Kit

1–11 pH range. The indicator solution method provides the simplest and most convenient method of pH estimation—simply add a few drops of this concentrated indicator solution to the desired solution, compare with the provided color chart, and you have a pH reading! Kit includes one sample tube with cap, 24-mL bottle of indicator solution and laminated color chart, packaged in a sturdy plastic case.

Catalog No.	Description	Price/Each
AP1687	Hydrion One-Drop pH Indicator Kit	$14.95

Thermometers, Digital

Flinn Digital Pocket Thermometer, Economy Choice

FLINN EXCLUSIVE

Our digital thermometer is compact, waterproof and easy to use. The shorter length (4¾") probe and lightweight (36 g) design allows you to take temperatures in test tubes, flasks or even small beakers with little chance of tipping them over. Features include an on/off switch, °C/°F button, data hold button, 0.7-second sampling rate and automatic shutoff after 10 minutes. Stainless steel probe fits in its own plastic case with a pocket clip. 8" overall length. Uses one 1.5-volt battery, included.

Temperature Range: –50 to 150 °C / –58 to 300 °F
Resolution: 0.1 °C / 0.2 °F **Accuracy:** ±1 °C / ±2 °F
▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6049	Flinn Digital Pocket Thermometer, Economy Choice	$31.62

Flinn Digital Thermometer

FLINN EXCLUSIVE

Features include an on/off switch, °C/°F button, data hold button, 0.7 sec. sampling rate, and automatic shutoff after 10 minutes. The long, 8" stainless steel probe makes this a versatile thermometer for use in any lab situation. Pointed-tip design allows measurement in liquids, gases, or even semi-solids. Includes a protective probe cover for storage. 11" overall length. Uses one 1.5-volt battery, included.

Temperature Range: –50 to 200 °C / –58 to 392 °F
Resolution: 0.1 °C / 0.2 °F **Accuracy:** ±1 °C / ±2 °F
▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8716	Flinn Digital Thermometer	$41.82

Efficient Use of pH Paper

Get more uses out of your pH paper rolls by giving students smaller pieces. A small piece provides the same information as a larger piece.



Flinn Digital Thermometer, with Extension Probe

FLINN EXCLUSIVE

Removable, 12 cm stainless steel probe allows for a measurement range of –50 to 200 °C and –58 to 392 °F with an accuracy of ±1 °C and a resolution of 0.1 °C. One-meter cable makes remote temperature readings easy. On/Off, Max/Min and Hold buttons. Built-in tilt-stand, wall hanger slot, backside magnet—use whichever you like. Conveniently sized: 9.6 x 6.5 x 1.5 cm. One AAA battery included with a life of 3,000 hours of continuous use.



▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8559	Flinn Digital Thermometer, with Extension Probe	$43.50

THERMOMETERS, continued on next page.

Thermometers—What Kind to Buy?

Routine Student Use

Select between digital, spirit-filled (n-hexane plus a red dye) or Ever-Safe® thermometers. Digital thermometers are the safest, most convenient to use and easiest to read. For calorimetry experiments involving heat of solution or heat of reaction calculations, the greater precision afforded by digital thermometers permits more accurate determinations than other thermometers. Both spirit-filled and Ever-Safe thermometers contain solvents, which may cling to the walls of the thermometer column, making them a slightly less accurate than digital or mercury thermometers. Mercury thermometers present an ongoing and serious chemical hazard if broken and spilled and are thus no longer available. At least seven states have banned the use of mercury thermometers. Digital thermometers are the overall best option when selecting a thermometer.

Non-Routine Student Use

For those few labs where the highest accuracy is required, digital thermometers are the best choice. We have tested the accuracy of melting point determinations using both digital and mercury thermometers. The digital thermometers gave comparable results and excellent agreement with literature values.

For Ovens and Incubators

Do not use mercury-filled thermometers in hot ovens or incubators. A broken mercury thermometer in a hot appliance is an invitation to fill the lab with mercury vapor.

Hazard Alert

Mercury has a Threshold Limit Value (TLV) of 0.025 mg per cubic meter of air. In a room with approximate dimensions of 40' x 30' x 9', four broken thermometers could raise the mercury vapor level to the established TLV on a hot day. Review the extensive discussion of TLVs on pages 594–595.

Total or Partial Immersion—What's the Difference?

Total immersion thermometers should be submerged in the medium up to the reading point. For example, if you are measuring the temperature of boiling water (100 °C), then the thermometer should be immersed in the water to the 100 °C mark.

Partial immersion thermometers need only to be immersed to the immersion line. The immersion line is generally just above or just below the first graduation mark.

Total immersion thermometers produce more accurate results since the thermometer stem and bulb are both at the same temperature; however, they are not always convenient. For more accurate temperature readings, make sure you know if the thermometer you are using is calibrated for partial or total immersion and follow the above guidelines.

Thermometer Quality

Know what you're getting before you buy! The market is full of thermometers with a wide variety of quality. Flinn carries only high-quality, non-mercury thermometers. Other supply houses may be supplying so-called "best quality" thermometers; however, they are often less accurate and have markings that easily wear off. Flinn guarantees you'll be pleased with the accuracy and overall quality of our thermometers.

Why Do Spirit-Filled Thermometer Columns Separate?

- Improper handling
- Thermal or mechanical shock
- Improper storage; always store thermometer in an upright (vertical) position
- Bore diameter is 15–20 times larger in a spirit thermometer than a mercury thermometer

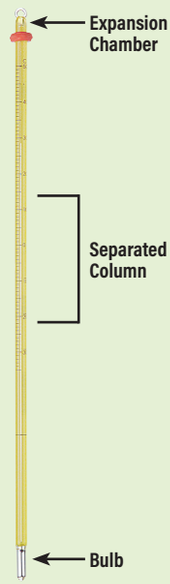
How to Reunite Separated Thermometer Columns

A common problem in school laboratories is a separated spirit-filled or mercury column in a thermometer. It may be possible to reunite the liquid column using the following procedure.

Cooling Method: Place a small piece (about 1 in^3) of dry ice in a 150-mL borosilicate beaker. Over the dry ice, pour about 75 mL of one of the following organic solvents: acetone, isopropyl alcohol or ethyl alcohol. There will be a lot of gas evolution (CO_2) as the dry ice evaporates, but soon it will subside as the dry ice (–78 °C) cools off the organic liquid. This mixture will be very cold, so don't put your fingers in it. Hold your separated column thermometer in a vertical position with the bulb portion down. *Gradually* immerse the *bulb only* into your cold dry ice/alcohol bath. The column (broken column parts and all) will retreat into the bulb. Continue to immerse the *bulb only* until all parts of the liquid column are in the bulb. If all the broken column parts will not retreat into the bulb, remove the bulb from the cooling bath, allow the bulb to warm for 3–5 minutes and repeat the process. If the column will still not reunite, abandon this method.

Alerts: Do not touch the supercooled bulb until it warms for several minutes at room temperature. Do not immerse the very cold bulb in another liquid until it warms. Locate a tray of some kind in which to do the entire procedure so if a mercury thermometer breaks, you have a tray beneath the thermometer to control the spilled mercury. *Remember: Immerse the bulb only and never immerse the stem or column. Freezing the column will cause the bulb to fracture.*

Do not swing the thermometer to create centrifugal force to reunite a broken mercury column. This practice is dangerous, could fill the room with mercury or vapor droplets if the thermometer breaks and should not be done.



Thermometers, Digital, continued

IR Thermometer



Take readings of surfaces and measure the temperature of solids and liquids. Read internal temperature on the large backlit LCD display. Features include programmable high and low alarms, clear instructions, and 2 AAA batteries. Dimensions: 5½ x 1½ x ¾" (140 x 38 x 19 mm); probe is 3".

Temperature Range: Probe -40 to 280 °C; Infrared thermometer -40 to 200 °C

Resolution: Probe and Infrared thermometer 0.1 °C

Accuracy: Probe ±2 °C below freezing and ±1 °C for all other temperatures; Infrared thermometer ±3 °C from -40 to 20 °C and 1 °C for all other temperatures.

Catalog No.	Description	Price/Each
AP7622	IR Thermometer	$97.15

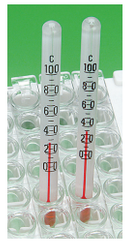
Thermometers, Indoor/Outdoor



Large, 12" diameter, easy-to-read instrument. Numbers are 1¼" in size. The instrument is accurate to within ±2° C. Thermometer is calibrated in both Celsius and Fahrenheit.

Catalog No.	Description	Price/Each
AP1627	Thermometer, Indoor/Outdoor	$35.60

Thermometer, Microscale



Easily fit into the wells of a microscale reaction plate. Range is 0–100 °C with 5° graduations. Scale is permanently fused into the glass. Length is 2⅜".

Catalog No.	Description	Price/Each
AP8713	Thermometer, Microscale	$4.60

Plastic-Backed Thermometer



Plastic-backed thermometer reads in both Celsius and Fahrenheit scale. ±2° accuracy; non-toxic.

NEW!

Catalog No.	Description	Price/Each
AP11602	Plastic-Backed Thermometer	$1.50

Thermometers, Spirit-Filled



Ever-Safe® Thermometer

A 12"-long non-mercury thermometer with an accuracy range of ±1 °C. The bright-colored fluid against a white background with permanently fused markings makes this thermometer very easy to read. Should be stored in an upright position to prevent the column from separating. Anti-roll device included.

Catalog No.	Range	Immersion Depth	Price/Each	Price/Pkg. of 12
AP8870	–20 to 110 °C	Total	$13.05	$148.92
AP8871	–20 to 150 °C		15.00	171.24
AP8872	–20 to 110 °C	Partial	12.95	147.60
AP8873	–20 to 150 °C		15.00	171.12

Metal-Backed Thermometer



Non-mercury thermometer is securely fastened onto an aluminum metal backing for added durability. Easy-to-read temperature scales are printed on the metal backing. Celsius scale is graduated with 1-degree divisions; Fahrenheit scale is graduated with 2-degree divisions.

Catalog No.	Description	Temperature Range	Price/Each	Price/Pkg. of 12
AP5406	Metal-Backed Thermometer	–20 °C to 110 °C 0 °F to 230 °F	$4.35	$44.16
AP5407		–20 °C to 110 °C	3.50	35.76

Spirit-Filled Thermometer



A safer, non-mercury alternative. While these instruments are not as accurate as mercury-filled thermometers, they are "good enough" considering the hazards posed by mercury contamination. Available as partial or total immersion. 12" long with 1 °C subdivisions. To prevent column separation, always store in an upright position.

Catalog No.	Range	Immersion Depth	Price/Each	Price/Pkg. of 12
AP1452	–20 to 110 °C	Partial	$7.15	$ 81.12
AP1110	–20 to 150 °C		9.00	102.00
AP1451	–20 to 110 °C	Total	6.75	77.04
AP1111	–20 to 150 °C		6.75	77.04

Spirit-Filled Thermometer, Blank

Make your own thermometer! Ungraduated partial immersion, spirit-filled, white back, 12" thermometer. Range is –20 to 110 °C.

Catalog No.	Description	Price/Each
AP2263	Thermometer, Blank, Spirit-Filled	$8.15

PTFE-Coated, Spirit-Filled Thermometer



A tough PTFE coating makes these spirit-filled thermometers shatterproof and resistant to acids and corrosive chemicals. Even if broken, they remain leakproof and the red colored spirit is completely contained. Designed with toughened bulbs at each end for added strength. Thermometers come with anti-roll-off devices to prevent rolling when placed on the lab bench, and feature yellow backs and vertical numerals for easy reading. Available in short 8" length. To prevent column separation, always store in an upright position.

Catalog No.	Length	Range	Subdivisions	Immersion Depth	Price/Each
AP1825	8"	–10 to 110 °C	1 °C	Partial	$15.95
AP1826		–10 to 150 °C			16.30
AP1827		–10 to 110 °C		Total	15.95
AP1828		–10 to 150 °C			16.25

Want to Take Temperature Readings with Your Computer?

See the Technology section on page 535.

Thermometers, Oven

Oven Thermometer with Probe



The thermometer has an 8" metal probe, which is designed to be inserted into the thermometer hole in the oven while the thermometer face remains outside the oven. Thermometer reads to 250 °C in increments of 2 °C. If the entire thermometer is placed inside the oven, it will only withstand temperatures up to 150 °C. The 1¾" diameter thermometer face has black graduations and a fine black pointer. Stainless steel clamp is included for attaching the thermometer to the wall of the beaker.

Catalog No.	Description	Price/Each
AP1112	Oven Thermometer with Probe	$22.95

Thermometer Accessories

Thermometer Anti-Roll-Off Device



A simple and effective plastic sleeve that is easily slipped onto the end of any standard laboratory thermometer to prevent bench roll-off and breakage. Fits all thermometers.

Catalog No.	Description	Price/Pkg. of 25
AP8408	Thermometer Anti-Roll-Off Device	$6.80

THERMOMETERS, SPIRIT-FILLED continued on next page.

Thermometer Accessories, continued

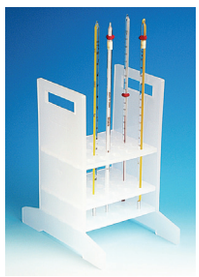
Thermometer Holder



This convenient polypropylene thermometer holder clips onto the edge of a beaker or other container and holds a thermometer vertically for safe, accurate reading. The thermometer is held in place by an expandable ring that accepts 3.2-mm to 11-mm diameter thermometers. Withstands temperatures up to 121 °C.

Catalog No.	Description	Price/Pkg. of 3
AP5408	Thermometer Holder	$20.76

Thermometer Storage Rack

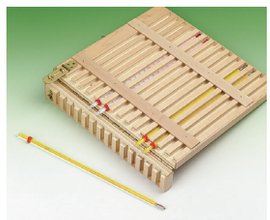


Safely storing thermometers in an upright position will prevent the thermometer column from separating. This heavy-duty polypropylene storage rack will hold a class set of 25 thermometers. Two carrying handles are provided for easy transport to and from the lab. Sturdy wide base will prevent accidental tipping. Size is 21 x 26 x 15 cm.

Catalog No.	Description	Price/Each
AP5996	Thermometer Storage Rack	$54.23

Flinn Thermometer Storage Rack

By: Raleigh Philp, Science Teacher-Retired, Arcadia, CA



Science teachers report that storing, transporting and dispensing thermometers to students is a problem that needs a solution. A science teacher created this rack aimed at solving that problem.

The rack measures approximately 12½" L x 12" W and accepts 14 12"-long thermometers. Instead of your expensive instruments rolling around a drawer, they are placed in the rack that is hinged so it can be placed in the lab on days thermometers will be used. Students can take their thermometers from the rack and return them upon completion of the lab. The instructor can quickly tell if thermometers are missing. The rack can be folded, locked and stored. A really valuable tool to protect and store expensive thermometers.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP1506	Flinn Thermometer Storage Rack	$51.45

Timers

Timer, Count Up/Count Down, with Clock

Timer provides three important functions:

- **Count up timer:** Stopwatch feature measures in 1 second intervals and has a range of 0 to 24 hours.
- **Count down timer:** Comes with an alarm and time-out function. Measures in 1 second intervals and has a range of 0 to 24 hours.
- **Digital real time clock**



Display is ½" wide. Timer is 2½" x 2¼" x ¾". Includes a 1.5 volt battery.

Catalog No.	Description	Price/Each
AP8843	Timer, Count Up/Count Down, with Clock	$42.75

Timer, Minute

Countdown timer can be set for 1 to 60 minutes measuring in 1-minute intervals. Loud 4-second alarm sounds at the end of countdown period. Timer is 3" x 3" and will stand upright for easy viewing.

Catalog No.	Description	Price/Each
AP1570	Timer, Minute	$17.89

Timer, Count Up/Count Down, with Clock, Large Display



Display size is 2½" high x 3" wide and can be easily read across the room. Timer provides three important functions: count up stopwatch, count down timer, and real-time clock. The clock and count up stopwatch are simultaneously displayed or at the flip of a switch two count down timers can be displayed. Both count down timers can be run independently of one another. An alarm will sound when each timer reaches the end of the countdown.

All timers have a range of 24 hours that measure in one second intervals. Timer can be wall mounted or folded for benchtop use. Provided with one AAA battery.

Catalog No.	Description	Price/Each
AP8874	Timer, Count Up/Count Down, with Clock, Large Display	$46.85

Timer, Stopwatch, Flinn

FLINN EXCLUSIVE



Electronic, water-resistant stopwatch with a quartz crystal. Stopwatch has 24-hour range. A liquid crystal display (LCD) provides great readability. Time range is in minutes, seconds, and 1/100 seconds. Split interval, clock and calendar functions are all integral parts of this timing instrument. Provided with a neck cord. Battery is included.

Catalog No.	Description	Price/Each
AP1572	Timer, Stopwatch, Flinn	$15.30

Timer, Stopwatch, Multi-Feature



Use this sturdy timer as a stopwatch or a countdown timer. Stopwatch mode times up to 1 hour with 1/100-second resolution and continues to time for 24 hours in 1-second increments. Stopwatch features include single-action timing, time-in/-out, cumulative-/interval-split and elapsed time. Unique dial design provides countdown timing in 16 preprogrammed increments up to 60 minutes or user-programmed increments up to 1 hour. An alarm sounds for the final 3 seconds of the countdown and for 3 additional seconds at zero time. Batteries, lanyard and a certificate of calibration included.

Catalog No.	Description	Price/Each
AP5409	Timer, Stopwatch, Multi-Feature	$49.64

Timers, Student



Don't pass up these affordable student timers. The simple three-key operation coupled with the display showing hours, minutes, seconds, and 1/100 of seconds make these timers ideal for classroom activities and labs. Timers will automatically shut off when not in use. Box of 12.

Catalog No.	Description	Price/Pkg. of 12
AP6396	Timers, Student	$116.25

Timer, Universal



Precise timing for laboratory work. Case measures 8½" x 8½" x 2¼". Has both rubber feet for bench use or key slot holes for wall mounting. Dial is 8" in diameter. Timer figures are very large. The outer circle of numbers reads elapsed time. The inner circle of numbers can be used as a stopwatch. Unit has a built-in buzzer that will sound at the end of each timing cycle.

Laboratory appliances can be automatically switched on or off with this electric timer. Two entirely separate and grounded outlets are provided. Outlet "A" is controlled by a switch and can either make or break a circuit when the timer reaches zero. Outlet "B" is independent of a switch and always will break a circuit at zero on the timer.

Electrical Specifications:

Input Voltage: 100 to 130 V AC, 50/60 Hz, or 210 to 250 V AC, 50/60 Hz.

Power Rating of AC outlets: Maximum 750 watts combined load both outlets at 120 V AC. UL listed.

Total Time Range: 60 minutes by minutes and seconds.

Catalog No.	Description	Price/Each
AP1571	Timer, Universal	$272.13

TIMERS continued on next page.

Tong Dip

Protective Vinyl Tong Dip

Dip tongs, clamps or practically anything and give them a vinyl coat. Dipping will improve the chemical resistance characteristics of most items. Detailed directions are provided. 14.5-ounce size. No heat is required for application.

Catalog No.	Description	Price/Each
AP1612	Protective Vinyl Tong Dip	$34.97

Tongs

Beaker Tongs

For handling beakers from 50 to 2000 mL capacity. Made of cadmium-plated, 1¼" steel wire. Overall length 9½". Maximum jaw opening 6". Available with and without protective sleeves.

Catalog No.	Description	Price/Each
AP8236	Beaker Tongs	$ 9.40
AP1113	Beaker Tongs with Protective Sleeves	12.25

Crucible Tongs

Cadmium-plated steel construction. 10" long overall, spring-like jaws with 3" jaw opening. End of jaw tips serrated to provide a surer grip.

Catalog No.	Description	Price/Each
AP8266	Crucible Tongs	$8.93

Utility Tongs

Steel, nickel-plated, 8¼" overall length. Utility tongs are useful for handling a wide variety of apparatus (i.e., small beakers, test tubes, wire gauze squares).

Catalog No.	Description	Price/Each
AP1359	Utility Tongs	$4.70

Tongue Depressors

Dimensions are 6" x ¾".

Catalog No.	Description	Price/Pkg.
AP4412	Tongue Depressors, Non-Sterile, Pkg./500	$26.25

Tools

Crimping Tool

Versatile tool can be used to cut practically anything, including metal.

Catalog No.	Description	Price/Each
AP5898	Crimping Tool	$13.70

File, Triangular

Perfect for cutting glass tubing.

Catalog No.	Description	Length	Price/Each	Price/Pkg. of 10
AP8295	File, Triangular	4"	$ 8.80	$83.60
AP8401		6½"	7.95	75.60
AP8402		7"	9.35	88.80
AP8975		10½"	10.76	102.20

File, Triangular, Handle

Securely holds AP8401, AP8402, and AP8975 triangular files.

Catalog No.	Description	Price/Each
AP8826	File, Triangular, Handle	$6.65

Glue Gun

Lever-action, dual temperature glue gun for almost any application. Easy to handle and works great for wood, plastic, ceramics, fabrics, paper, and metals. Especially handy for innovative science teachers who construct their own microscale equipment. Uses ½" glue sticks.

Catalog No.	Description	Price/Each
AP9011	Glue Gun	$25.50
AP9012	Glue Sticks, Package of 24	10.70

Hammer

Quality, 16-oz, curved claw hammer. Overall length 14".

Catalog No.	Description	Handle Type	Price/Each
AP4436	Hammer	Hickory Wood	$18.00

TOOLS continued on next page.



Tools, continued

Lab Tool Kits

FLINN EXCLUSIVE

Individual Lab Tool Kit contains one of each of the following: stainless steel scoop, crucible tongs, test tube clamp with grips, metal forceps, plastic stirring rod, 8" glass stirring rod, angled rubber policeman and a clear plastic Metric/English ruler—all in a zipper-lock bag. The Classroom Set contains 15 of each item organized in a durable, chemical-resistant tray.

Catalog No.	Description	Price/Each
AP7086	Lab Tool Kit, Individual	$ 16.98
AP7151	Lab Tool Kit, Classroom Set	241.15

Mechanic's Pliers Set

Set includes one each of locking grip pliers, long nose pliers, lineman's pliers, diagonal cutting pliers and crimping/stripping pliers.

Catalog No.	Description	Price/Each
AP5997	Mechanic's Pliers Set	$37.75

Pliers, Channel Lock Type

Catalog No.	Description	Overall Length	Widest Jaw Opening	No. of Jaw Positions	Price/Each
AP4441	Pliers, Channel Lock	10"	1½"	5	$19.00

Pliers, Long Nose, with Side Cutter

Overall length 6⅝"; nose length 1⅞".

Catalog No.	Description	Price/Each
AP8389	Pliers, Long Nose, with Side Cutter	$11.50

Pliers, Slip Joint

Overall length 6½"; widest jaw opening 1".

Catalog No.	Description	Price/Each
AP4443	Pliers, Slip Joint	$10.95

Screwdriver, Slotted Head Blade

Made of chrome-vanadium steel. High quality plastic handle.

Catalog No.	Description	Overall Length	Blade Length	Price/Each
AP8395	Screwdriver, Slotted Head Blade	6⅝"	4"	$7.45

Screwdriver Set, Jeweler's

Set includes one nickel-plated body with screw chuck which accepts five different screwdriver sizes. Four of the blades are straight, one is a Phillips head type.

Catalog No.	Description	Price/Each
AP8411	Screwdriver Set, Jeweler's	$10.31

Tape Measure

Catalog No.	Description	Price/Each
AP8400	Tape Measure	$9.75

Tape Measure, Metric

A tough and extremely flexible fiberglass measuring tape. Length is 1.5 m (150 cm) with centimeter/millimeter markings on one side and inches on the reverse. Markings are clear and permanent, and punched metal tips protect the ends. Package of 10.

Catalog No.	Description	Price/Pkg.
FB0524	Tape Measure, Metric, Pkg. of 10	$16.20

Tape Measure, Wind-Up Type, English

Tape is constructed of 0.13-mm thick steel with easy-to-read black and red markings. Lightweight, high-strength plastic case. In two lengths.

Catalog No.	Description	Length	Price/Each
AB1144	Tape Measure, Wind-Up Type, English	50 ft.	$33.05
AB1172		100 ft.	58.50

TOOLS continued on next page.



Lab Tool Kit, Individual AP7086



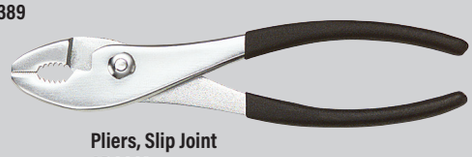
Mechanic's Pliers Set AP5997



Pliers, Channel Lock Type AP4441



Pliers, Long Nose, with Side Cutter AP8389



Pliers, Slip Joint AP4443



Screwdriver, Slotted Head Blade AP8395



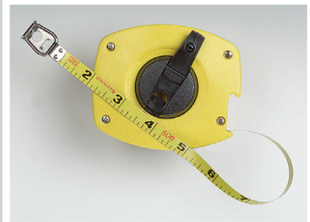
Screwdriver Set, Jeweler's AP8411



Tape Measure AP8400



Tape Measure, Metric FB0524



Tape Measure, Wind-Up Type, English AB1144, etc.

Tools, continued

Tape Measure, Wind-Up Type, Metric

Fiberglass tape will not rust, scratch or tear, making it ideal for outside use. Markings are clear and easy to read. One side of tape is graduated in cm while the other is in inches. Plastic wind-up case provides safe and easy storage.

Catalog No.	Description	Length	Price/Each
AP6021	Tape Measure, Wind-Up Type, Metric	10 m	$18.00
AP6323		30 m	29.99

Tin Snips

Straight pattern snips primarily used for straight cuts.

Catalog No.	Description	Price/Each
AP8393	Tin Snips	$23.25

Tool Kit, 5-Piece

Assortment contains 4⅝" and 6⅝" long slotted head screwdrivers, tin snips, diagonal-cutting pliers, and long-nose, side-cutting pliers.

Catalog No.	Description	Price/Each
AP5901	Tool Kit, 5-Piece	$56.50

Wrench, Adjustable

Catalog No.	Description	Overall Length	Jaw Opening	Price/Each
AP1499	Wrench, Adjustable	6"	¾"	$21.91

Towels and Wipes

Kleenex® Tissues

Standard two-ply absorbent facial tissue for light, general use. Not suggested for use on optical parts.

Catalog No.	Description	Price/Each
AP1144	Kleenex Tissues	$6.60

Kimwipes®

Useful for cleaning or drying. Absorbent, creped soft surface is lint free. In pop-up dispenser. Available in two sizes.

Catalog No.	Description	Size	Wipes Per Box	Price/Box
AP1141	Kimwipes	4½" x 8½"	280	$ 6.90
AP1142		15" x 16⅞"	140	16.82

SOFT-TEK Cleaning Cloth

Non-abrasive micro-fiber cloth is specially engineered to trap dust and dirt without scratching your fine optics. Easily removes smudges, fingerprints, and dirt. Washable; measures 8" x 8" square.

Catalog No.	Description	Price/Each
AP6189	SOFT-TEK Cleaning Cloth	$8.00

Trays and Totes

Compartment Tray



Organize your lab drawers with these handy compartment trays. Each tray is 12" x 17" and will fit most laboratory bench drawers. Trays are made of strong, high impact white polystyrene for durability and long life.

The three-compartment tray is perfect for holding long, slender items up to 16" in length; two compartments are 4" wide and one is 5½" wide.

The five-compartment tray is very versatile with a center compartment measuring 4" x 16". The four side compartments are either 4" x 7½", or 5½" x 7½".

Catalog No.	Description	# of Compartments	Price/Each
AP8944	Compartment Tray	3	$87.05
AP8945		5	81.50

Dropping Bottle Trays See page 114.

Sterlizing Pan See page 202.



Tape Measure, Wind-Up Type, Metric, 10 m
AP6021



Tape Measure, Wind-Up Type, Metric, 30 m
AP6323



Tin Snips
AP8393

Tool Kit, 5-Piece
AP5901





Wrench, Adjustable
AP1499



Kimwipes
AP1141, etc.

Kleenex Tissues
AP1144



SOFT-TEK Cleaning Cloth
AP6189

Demonstration Tray, Large



Your days of worrying about cleanup after those fun but messy chemical demonstrations are over! Now you can perform demonstrations in this extra-large plastic tray—the rounded edges and 2" lip contain all of the chemical overflow and make cleanup a breeze. It can also be useful when dispensing chemicals to minimize or contain spills. Plastic tray resists detergents, acid and alkaline solutions in the pH range of 3–10 and most solvents—and it won't corrode or warp! Tray measures 30" x 20" x 2".

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5429	Demonstration Tray, Large	$104.00

Sterilizing Tray

Ideal for sterilizing instruments and cleaning glassware and equipment. Molded polypropylene trays have rounded corners and smooth, tapered sides for easy nesting. Steam autoclavable at 121 °C.

Catalog No.	Description	Size (L x W x H)	Price/Each
AP5413	Sterilizing Tray	12" x 7¾" x 5⅛"	$39.00
AP5414		19" x 10½" x 5⅛"	41.65

TRAYS AND TOTES continued on next page.

Trays and Totes, continued

Tote Tray
Constructed of heavy-duty plastic, easy to clean, and difficult to break or crack. Each tray comes with a label holder to help identify the contents of the tray. Four sizes available.

Catalog No.	Description	Size	Price/Each
AB1088	Tote Tray	19" x 9" x 4½"	$23.90
AB1089		13" x 10½" x 4½"	26.55
AB1090		13" x 10½" x 2"	21.70
FB1030		19" x 13¾" x 4⅜"	30.90

Utility Carrier
Made entirely of low-density polyethylene. Resilient and damage-resistant. Useful for carrying laboratory apparatus and reagents. Also useful as a toolbox. Handle molded into center divider. Dimensions are 14⅝" L x 9⅜" W x 6" D.

Catalog No.	Description	Price/Each
AP2293	Utility Carrier	$24.10

Plastic Utility Pan
A 7-liter plastic pan. Perfect for anything—from experiments to dishwashing. 12¾" x 10" x 5¼" deep. Not autoclavable.

Catalog No.	Description	Price/Each
AP9176	Plastic Utility Pan	$6.25

Clear Plastic Pan
Clear polycarbonate, one-gallon pan. Useful as an aquarium, terrarium, frog pan, pneumatic trough, or see-through planter. 8¾" x 8⅝" x 4¾" deep.

Catalog No.	Description	Price/Each
AP9171	Clear Plastic Pan	$22.70

Pan, Rectangular, Aluminum
Aluminum pans are an economical choice for large water baths or for use as a demonstration tray. Large size is perfect for long apparatus. Pan measures 20⅝" x 12⅞" x 2 3⁄16".

Catalog No.	Description	Price/Pkg. of 4
AP7101	Pan, Rectangular, Aluminum	$16.60

Storage Container with Lid
Ideal for the storage of preserved materials—permitting easier retrieval of specimens than from a deep plastic bucket. Storage box measures 17" x 11" x 6½" and is inert to chemicals commonly used in preservatives.

Catalog No.	Description	Price/Each
AP5909	Storage Container with Lid	$23.36

TRAYS AND TOTES continued on next page.



Flinn Lab Essentials Kit
By: The Flinn Staff

Make sure you have these essential items in your lab! Kit includes one each of the following best-selling laboratory items:

- Flinn pH Meter, AP8673
- Flinn Digital Pocket Thermometer, AP6049
- Timer, Count up/Count down, AP8874
- Flinn Visor Goggles, AP1362

A must-have sampler kit for your laboratory!

Catalog No.	Description	Price/Each
AP7476	Flinn Lab Essentials Kit	$117.50



Trays and Totes, continued

Stopper/Cork Organizer

This bright blue, chemical-resistant, high-density polyethylene container can be used for many laboratory storage uses. Use it to sort and organize rubber and cork stoppers or to store other laboratory equipment from stirring rods to glass plates to test tubes. Use the container as a storage or carrying tote.

The components listed can be mixed and matched, allowing you to design and construct over a hundred different compartment sizes. Up to 7 long dividers and 11 short dividers can be used to create a maximum of 96 1½"-square compartments. Just 3 long and 3 short dividers create 16 2½" x 3¾" compartments—perfect for sorting 16 different sizes of stoppers.

Clear plastic lid keeps the contents clean and visible. Containers stack easily on top of one another, with or without the lid. Clear 3" x 5" label holders snap securely onto any side of the container to help easily identify the stored contents. Container is 16½" x 10⅞" x 6". Customize this container to fit your laboratory storage needs!

Catalog No.	Description	Price/Each
AP4593	Stopper/Cork Organizer	$25.38
AP4594	Long Dividers	5.15
AP4595	Short Dividers	4.15
AP4596	Clear Plastic Lid	15.60
AP4597	Label Holders	4.70

Triangle, Pipe Stem

Made of iron wire covered with pipe clay.

Catalog No.	Description	Pipe Length	Price/Each	Price/Pkg. of 6
AP8330	Triangle, Pipe Stem	1½"	$3.35	$19.26
AP8331		2"	3.60	20.88
AP8332		2½"	3.65	21.00

Tripods

Black, enameled cast iron ring with detachable legs. Ring outer diameter is 3½". Inner diameter is 1¾".

Catalog No.	Description	Leg Height	Price/Each
AP1114	Tripod	6"	$16.85
AP1115		9"	21.35

Troughs

Pneumatic Trough

Stainless steel; resistant to corrosion. Removable platform provided to accommodate three gas collecting bottles. Trough is provided with an overflow outlet and is tapered to allow nesting during storage. Dimensions are 10" long x 7" wide x 4" high.

Catalog No.	Description	Price/Each
AP8334	Pneumatic Trough	$85.00

Pneumatic Trough, Polypropylene

One-piece, rugged, polypropylene construction yet lightweight. Will resist impact and corrosion. Trough is provided with an overflow outlet and gas inlet. Built-in platform accommodates three 8-ounce collecting bottles. The trough is tapered to allow nesting during storage. Trough dimensions are 12½" long x 7¼" wide x 3¾" high.

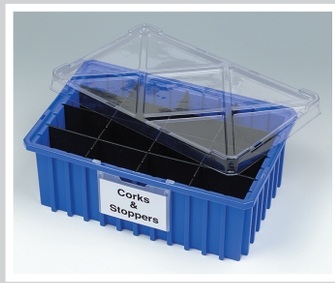
Catalog No.	Description	Price/Each
AP1311	Pneumatic Trough, Polypropylene	$40.41

Tubes, Capillary

Capillary tubes are either 100 mm or 90 mm in length and have an inside diameter of approximately 1.3 to 1.4 mm. You can select from tubes that are open on both ends (used for spotting TLC plates) or closed on one end (used for melting point determinations).

Catalog No.	Description	Length (mm)	End Open or Closed	Price/Vial of Approx. 100 Pieces
GP7046	Tubes, Capillary	100	Both Open	$12.68
GP7047		90	One Open	14.09

TUBES continued on next page.

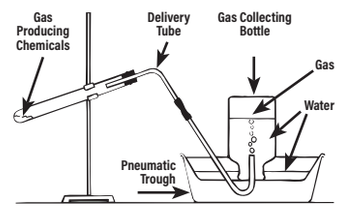


Stopper/Cork Organizer AP4593, etc.

HOW TO

Collect a Gas by Water Displacement

- Fill a gas collecting bottle (or test tube) to the rim with water.
- Place a small piece of paper over the mouth of the bottle.
- Carefully invert the bottle into a water-filled pneumatic trough. Make sure no water is spilled out of the bottle when it is inverted.
- Remove the paper from the mouth of the bottle. Insert the delivery tube into the bottle and start the gas-producing process.





Triangle, Pipe Stem AP8330, etc.



Tripod AP1114, etc.



Pneumatic Trough AP8334



Pneumatic Trough, Polypropylene AP1311



Capillary Tubes GP7046, etc.

Tubes, Centrifuge

Centrifuge Tube
Flint glass, ungraduated, conical, 15 mL.

Catalog No.	Description	Price/Each	Price/Pkg. of 12
GP6071	Centrifuge Tube	$2.74	$31.32

Centrifuge Tube, Borosilicate Glass
Uniform glass distribution in the wall, taper, and bottom to improve mechanical strength and prevent the formation of failure-causing stress regions during centrifuging. GP6073 has white enamel graduations upward from the tip. Beaded rim; conical.

Catalog No.	GP6047	GP6072	GP6073
Description	Centrifuge Tube, Borosilicate Glass		
Graduations	Ungraduated		0.1 mL
Capacity	5 mL	15 mL	15 mL
o.d. (mm)	13	17	17
Length (mm)	101	120	119
Price/Each	**$ 8.95**	**$ 8.80**	**$ 19.15**
Price/Pkg. of 12	**100.92**	**99.24**	**218.16**



Centrifuge Tube
GP6071



Centrifuge Tube, Borosilicate Glass
GP6047, etc.



Microcentrifuge Tubes
FB0002, etc.



Glass Demonstration Tube
GP9146

SAFETY TIP

Centrifuge Tubes
Very frequently the cause of centrifuge tube breakage is tiny glass shards. These shards are embedded in the rubber cushions at the very bottom of the shield that accommodates the centrifuge tube in the centrifuge head. A tiny pinpoint of glass sets up a stress point on the tube and breakage easily occurs. Check your centrifuge tube cushions and replace them if glass shards are present. If a tube breaks while the centrifuge is operating, that may signal the time to replace the cushion.

Microcentrifuge Tubes
High-quality, autoclavable polypropylene "reaction" tubes. The snug-fitting shield-shape hinged caps are readily manipulated with one hand, yet will stay closed during use. Added thickness at tubes' conical bottoms prevents failure and leakage. The standard 1.5-mL (10.6 x 39.5 mm) tubes have frosted writing areas. Available in three colors in dispenser boxes of 500.

Catalog No.	Description	Color	Price/Pkg. of 500
FB0002	Microcentrifuge Tubes	Natural	$24.00

TUBES continued on next page.

Tubes, Demonstration

Glass Demonstration Tube
FLINN EXCLUSIVE

Colorful demonstrations of acids and bases, pH, indicators, and the solubility of gases can be displayed for the whole class to see. The formation of a solid from the diffusion of vapors can be easily seen. Even equilibrium can be explored in the tube. The 24"-long clear flint glass tube has an outer diameter of 14 mm. The tube's heavy wall thickness provides rigidity and reduces breakage. Two rubber stoppers are provided. Instructions with sample demonstration included.

▶ See free video at flinnsci.com.

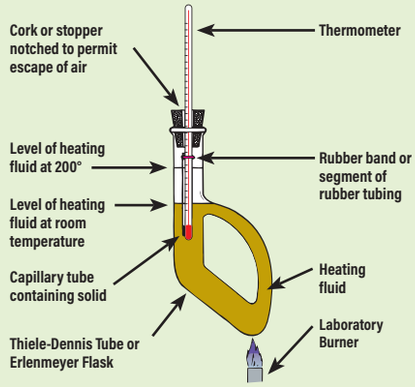
Catalog No.	Description	Price/Each
GP9146	Glass Demonstration Tube	$19.15

HOW TO

Make Melting Point Determinations Using a Thiele-Dennis Tube
A small quantity of the substance in question is placed into a small capillary tube. The capillary tube (with the unknown inside) is then attached to a thermometer. A rubber band will do it.

Fill the Thiele-Dennis tube (or an Erlenmeyer flask) with water if the melting point of the solid is less than 100 °C or oil if the melting point is greater than 100 °C (silicon oil is best, but corn oil will do). Remember that heated oils may both expand and also smoke slightly at elevated temperatures. The rubber band may come loose if subjected to hot oil. Immerse the thermometer (with the capillary tube attached) so that the rubber band is kept out of the oil.

Heat the Thiele-Dennis tube (see drawing) at a temperature rise of about 10 °C per minute to get a rough melting point. Then repeat the procedure, heating the tube at a much slower rate (about 1 °C per minute) to get an accurate melting point. A pure substance will begin to melt abruptly, and the melting will be complete within a 1–2 °C temperature range. The unique configuration of the Thiele-Dennis tube is designed to create continuous oil flow when heated so no stirring or shaking is required. Convection currents created by the heat do the stirring for you.



Tubes, Drying

Drying Tube, Polyethylene

Endcap fittings of polypropylene accept ¼" to ⅜" o.d. tubing.

Catalog No.	Description	Price/Each	Price/Pkg. of 12
AP6520	Polyethylene Drying Tube	$3.50	$35.88

Drying Tube, Straight

Flint glass with one bulb. Requires stopper size 00 or cork size 4.

Catalog No.	Description	Size	Price/Each
GP7050	Straight Drying Tube	100 mm	$5.47

Drying Tube, U-Shaped

Flint glass. Requires stopper size 00 or cork size 4.

Catalog No.	Description	Size	Price/Each
AP1117	U-Shaped Drying Tube	100 mm	$ 9.60
AP1118		150 mm	10.40

Tubes, Eudiometer See page 149.

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Tubes, Gas Measuring

Gas Measuring Tube, Borosilicate Glass

Closed at the zero end of the tube. Graduated.

Catalog No.	Description	Capacity	Subdivisions	Stopper Size	Cork Size	Price/Each
GP5067	Gas Measuring Tube, Borosilicate	50 mL	0.1 mL	00	4	$23.31
GP5068		100 mL	0.2 mL	1	6	35.55

Tubes, Melting Point, Thiele

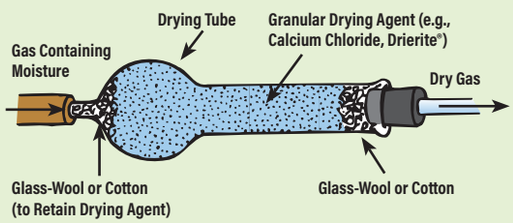
The Thiele-Dennis tube is a modified Thiele tube which improves and increases the rate of circulation. Tube diameter is 25 mm. Economy choice melting point tube is excellent for high school use. Tube diameter is 23 mm.

Catalog No.	Description	Price/Each
GP6090	Thiele-Dennis Melting Point Tube	$9.12
AP6991	Melting Point Tube, Thiele, Economy Choice	16.40
S0451	Silicone Oil, 250 mL	22.45

TUBES continued on next page.

HOW TO

Use a Drying Tube



Gases can be dried by passing them through a drying tube packed with a drying agent.



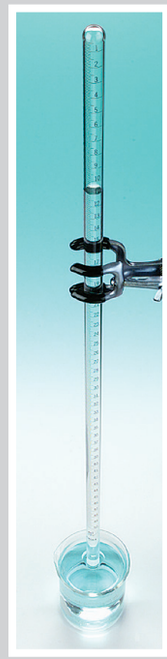
Drying Tube, Polyethylene AP6520



Drying Tube, Straight GP7050



Drying Tube, U-Shaped AP1117



Gas Measuring Tube, Borosilicate Glass GP5067, etc.



Thiele-Dennis Melting Point Tube GP6090

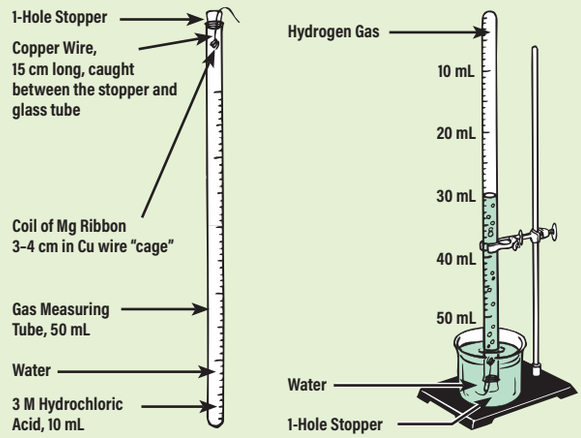


Melting Point Tube, Thiele AP6991

HOW TO

Use a Gas Collecting Tube for Determining Molar Volume

- Carefully invert the completely filled tube into a large container of water.
- As hydrogen gas is produced, water is displaced through the one-hole stopper.
- Allow the reaction to proceed to completion.
- Equalize the gas pressure with the atmosphere by adjusting the height of the tube so the water levels are the same inside and out.



Tubes, Test

Test Tube, Plastic

Molded from PS for clarity or PP for impact strength and stability to common chemicals. Lighter weight, durable and safety.

Catalog No.	o.d. x Length (mm)	Type	Pkg. Size	Price/Pkg.
AP11582	12 x 75	Polystyrene	500	$40.81
AP11583	12 x 75	Polypropylene	500	39.85
AP11584	16 x 100	Polystyrene	500	42.00
AP11585	16 x 100	Polypropylene	500	38.25

Test Tube, Plastic

Neutral color cap for test tubes. Available as a flange-type cap or flex cap.

Catalog No.	o.d. x Length (mm)	Type	Pkg. Size	Price/Pkg.
AP11586	13	Flange Type	1000	$26.22
AP11587	16	Flange Type	1000	32.58
AP11588	13	Flex Cap	1000	23.25
AP11589	16	Flex Cap	1000	28.41

Culture Tube with Snap Cap, Sterile

Dual-position ribbed PE cap. Can be left loose for aerobic work or sealed for anaerobic cultures. Sterilized by Gamma radiation. Zip-lock package, tamper-proof and re-sealable eliminating the risk of contaminations.

Catalog No.	o.d. x Length (mm)	Type	Pkg. Size	Price/Pkg.
AP11590	12 x 75	Polypropylene	25	$41.25
AP11591	12 x 75	Polypropylene	25	37.90
AP11592	12 x 75	Polystyrene	25	40.25
AP11593	12 x 75	Polystyrene	25	45.35
AP11594	17 x 100	Polypropylene	25	42.90
AP11595	17 x 100	Polypropylene	25	46.55
AP11596	17 x 100	Polystyrene	25	44.98
AP11597	17 x 100	Polystyrene	25	44.15

Test Tubes with Rims

Borosilicate glass tubes have fire-polished rims and optimal wall thickness for maximum heat and chemical resistance.

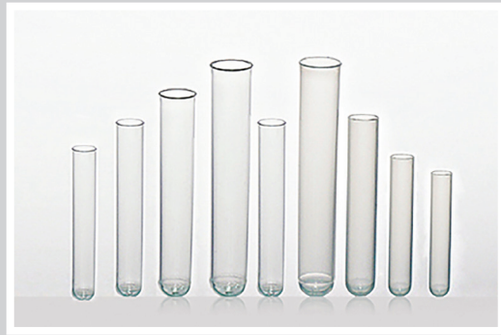
Catalog No.	o.d. x Length (mm)	Capacity (mL)	Price/Each	Price/Pkg.	Price/Case
GP6005	12 x 75	5	$ 0.58	$27.50/50	$ 140.00/200
GP6010	13 x 100	9	0.60	29.00/50	168.00/200
GP6015	15 x 125	14	0.85	40.00/50	216.00/200
GP6020	16 x 150	20	0.89	42.50/50	228.00/200
GP6025	18 x 150	27	0.89	41.50/50	206.00/200
GP6030	20 x 150	34	1.11	54.00/50	288.00/200
GP6035	25 x 150	55	1.83	88.50/50	466.00/200
GP6040	25 x 200	70	2.20	106.50/50	570.00/200

Test Tubes without Rims

Rimless, borosilicate glass tubes for convenience in plugging and rack storage. Ends are fire polished. Commonly referred to as culture tubes.

Catalog No.	o.d. x Length (mm)	Capacity (mL)	Price/Each	Price/Pkg.	Price/Case
GP6060	6 x 50	0.5	$ 0.58	$ 39.60/72	$504.00/720
GP6061	10 x 75	3.0	0.60	41.76/72	604.80/720
GP6062	12 x 75[1]	5.0	0.62	43.20/72	626.40/720
GP6063	13 x 100[2]	9.0	0.64	44.64/72	561.60/720
GP6064	16 x 100	11.0	0.72	48.96/72	512.64/576
GP6065	16 x 125	15.0	0.80	55.44/72	581.76/576
GP6066	16 x 150	20.0	0.89	61.92/72	656.64/576
GP6067	18 x 150	27.0	1.00	66.96/72	679.68/576
GP6068	20 x 150	34.0	1.10	74.16/72	794.88/576
GP6069	25 x 150	55.0	2.00	139.68/72	754.56/288

[1]Known as Kahn Tube
[2]Known as Wasserman Tube



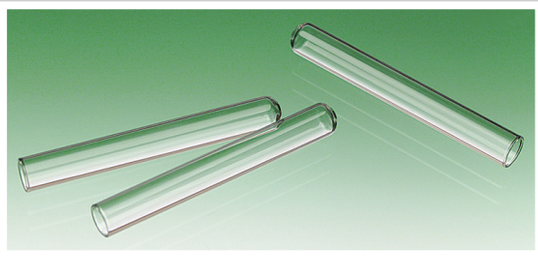
Test Tube, Plastic
AP11582, etc.



Test Tube, Plastic
AP11586, etc.



Culture Tube with
Snap Cap, Sterile
AP11590, etc.



Test Tubes without Rims, Disposable
GP9165, etc.

Test Tubes without Rims, Disposable

Rimless tubes exactly the same as those tubes listed above except these have a lighter wall thickness and are considered disposable in industry. However, these tubes will hold up to repeated use. Commonly referred to as culture tubes. Not intended for high heat.

Catalog No.	Description	Size (mm)	Pkg. Size	Price/Pkg.
GP9165	Test Tubes without Rims, Disposable	6 x 50	300	$ 25.83
GP7034		10 x 75	250	19.62
GP7035		12 x 75	250	19.68
GP7036		13 x 100	250	24.55
GP7037		16 x 100	250	31.15
GP7038		16 x 125	250	36.14
GP7039		16 x 150	250	38.71
GP9263		18 x 150	125	27.23
GP7041		20 x 150	250	88.76
GP9164		25 x 150	250	143.45

TUBES, TEST continued on next page.

Tubes, Test, continued

Test Tubes with Screw Caps

Borosilicate glass tubes and specially formulated caps are autoclavable. Caps are fabricated from a special formula resistant to the effects of temperature and steam in autoclaving. White marking spot provides an excellent surface for pencil notations. Caps have a cemented-in, white rubber liner. 20 x 150 mm tubes have a capacity of approximately 30.0 mL.

Catalog No.	Description	Price/Each
GP9158	Test Tubes with Screw Caps	$2.01

Test Tubes with Screw Caps, Plastic

Graduated, clear plastic tubes with screw caps have conical bottoms. Designed for use in a centrifuge, these affordable tubes are convenient for routine lab tests where the sample tubes must be capped to mix the reagents. Perfect for soil and water tests. Polystyrene, 125 mm long x 18 mm outer diameter Capacity 15 mL. Sold in packages of 30.

Catalog No.	Description	Price/Each
AP7116	Test Tubes with Screw Caps, Plastic	$21.23

Mini Soda Bottles—Giant Test Tubes

All plastic soda bottles start as a small plastic bottle known as a preform. When the bottler is ready to fill the bottle with soda, the preform is heated and blown into a larger bottle, such as a 2-liter soda bottle. These thick-walled, durable polyethylene preforms are a great substitute for glass test tubes. Perfect for storing liquids, gel crystals or mixtures to be used or displayed in your classroom throughout the entire school year. In the biology laboratory, they are ideal for growing or cloning plants, collecting water samples and displaying specimens. Not for use with strong acids and bases or organics. Not autoclavable. 40-mL capacity. Each preform measures approximately 12 cm long x 2.5 cm diameter. Caps are available separately (AP6996), or provide your own from 2-liter soda bottles. Packages of 30.

Catalog No.	Description	Price/Pkg.
AP5395	Mini Soda Bottles—Giant Test Tubes, Pkg. 30	$31.73
AP6996	Caps for Mini Soda Bottles, Pkg. 30	10.55

Mini Soda Bottle Tubes and Rack

FLINN EXCLUSIVE

By: The Flinn Staff

The perfect tubes and rack for your classroom or student activity! Thick-walled durable PET mini soda bottle preform tubes are a great substitute for your breakable glass test tubes. Can be used for a variety of chemistry demonstrations, biology activities and much more.

Comes with 5 mini soda bottle tubes and caps and a unique demonstration rack. Each tube has a 40-mL capacity. Not autoclavable or for use with strong acids, bases or organics.

Catalog No.	Description	Price/Each
AP7518	Mini Soda Bottle Tubes and Rack	$30.36

Heavy-Walled Test Tubes

Borosilicate ignition tubes with heavy walls perform well when continually used at temperatures up to 500 °C, or for short periods to 600 °C.

Catalog No.	Description	o.d. x Length (mm)	Price/Each	Price/Pkg.	Price/Case
GP9174	Heavy-Walled Test Tubes	14 x 100	$2.96	$210.24/72	$1108.80/288
GP6074		16 x 125	3.11	220.32/72	1186.56/288
GP6077		25 x 200	7.28	172.08/24	1147.20/120



Test Tubes with Screw Caps, Plastic AP7116



Mini Soda Bottles—Giant Test Tubes AP5395



Mini Soda Bottle Tubes and Rack AP7518



Heavy-Walled Test Tubes GP9174, etc.

Tubes, Test, Accessories

Test Tube Basket

Ideal for sterilizing, incubating, rinsing, transporting, or storing test tubes. Steam autoclavable at 121 °C. Sturdy white, polypropylene construction. Available in two sizes, with or without lids. Simply invert the baskets with lids for easy draining. Baskets with lids are stackable for maximum use of storage space.

Catalog No.	Description	H x L x W (in)	Price/Each
AP5327	Test Tube Basket	5 x 4 x 4	$26.65
AP5328		6 x 6 x 6	36.20
AP5329	Test Tube Basket with Lid	5 x 4 x 4	32.56
AP5330		6 x 6 x 6	42.20

TUBES, TEST, ACCESSORIES continued on next page.

SAFETY TIP

Heating and Cooling Glassware

- Never heat a glass vessel to dryness over an open flame.
- Do not put hot glassware on cold or wet surfaces, and do not put cold glassware on hot surfaces.
- Do not heat glassware that is etched, cracked, chipped or scratched.
- Cool all labware slowly.
- Do not heat thick-walled glassware, such as bottles and graduated cylinders, over a direct flame.
- Do not heat glassware directly on electrical heating elements.
- Do not look down into any vessel being heated.



Tubes, Test, Accessories, continued

Test Tube Clamp See page 132.

Test Tube Rack, Economy Choice
Corrosion-resistant plastic rack accepts six tubes in a row. Holes are 25 mm in diameter. Six drying pins are provided. The rack is shipped disassembled. Assembly is simple. Plastic rack will not withstand high heat. Dimensions are 9½" x 3" x 3⅝".

Catalog No.	Description	Price/Each
AP4417	Test Tube Rack, Economy Choice	$11.75

Test Tube Slant Rack
The end plates of this rack allow it to lie at either a 5 or 20 degree angle so that both short- and long-butt agar slants can be easily and consistently prepared. Holes are letter- and number-keyed. Rack is autoclavable and will not float in a water bath. Accepts 40 tubes.

Catalog No.	Description	Tube Size (mm)	Price/Each
AB1260	Test Tube Slant Rack	15–16	$92.60

Test Tube Rack, Polypropylene, Stacking
Sturdy, rigid, polypropylene racks feature interlocking end plates for secure stacking when loaded with tubes up to 10 cm long. Polypropylene is an excellent choice for a test tube rack because it is chemical resistant and will not shatter or stain. Rows are numbered and lettered for easy identification. End plates have handles for easy carrying. Steam autoclavable at 121 °C. Both racks measure 10⅝" x 4⅞" x 5¼".

Catalog No.	Description	Holds Tube Size	Tube Places	Price/Each
AP5379	Test Tube Rack, Polypropylene, Stacking	13–16 mm	40	$54.00
AP5380		16–20 mm	40	56.00

Test Tube Rack, Polypropylene, Submersible
Molded of autoclavable polypropylene that is heavier than water. Each rack has numbered and lettered rows. The racks will stack. The racks are shipped disassembled. Assembly is simple. Should you wish to disassemble the rack to save space, that is also possible. Outside dimensions are 9¾" x 4⅛" x 2½" high.

Catalog No.	Description	Holds Tube Size	Tube Places	Price/Each
AP1677	Test Tube Rack, Polypropylene, Submersible	13 mm	90	$19.24
AP1678		16 mm	60	19.72
AP1679		20 mm	40	20.43

Test Tube Rack, Polypropylene, Submersible, Round
Same as rectangular shaped racks listed above. Round racks fit conveniently into beakers, ice baths and other round vessels. Removable handle is included. Dimensions are 3¼" high, 3⅝" in diameter.

Catalog No.	Description	Holds Tube Size	Tube Places	Price/Each
AP4414	Test Tube Rack, Polypropylene, Submersible, Round	16 mm	14	$27.85
AP4415		20 mm	9	28.20

Test Tube Rack, Polypropylene
Space-saving polypropylene rack holds 60 10–13 mm test tubes—many more and a wider range than conventional test tube racks. Design ensures tubes stay in one position. Steam autoclavable at 121°C. Dimensions are 9½" x 4¾" x 2½".

Catalog No.	Description	Price/Each
AP5378	Test Tube Rack, Polypropylene, Support	$24.95

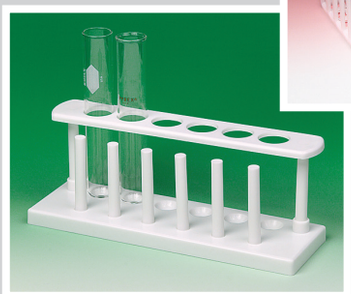
Test Tube Rack, Wood, 6-Tube
A beechwood, oil finished, glued rack with dovetailed lock joints. Rack accepts six tubes in a row. Six drying pins. Two hole sizes available.

Catalog No.	Description	Hole Size	Price/Each
AP8220	Test Tube Rack, Wood, 6 Tube	22 mm	$13.29
AP8565		25 mm	15.85

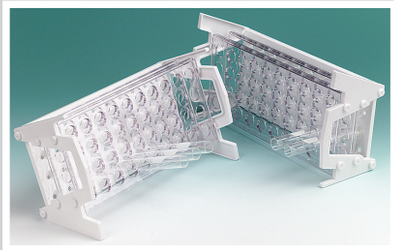
TUBES, TEST, ACCESSORIES continued on next page.



Test Tube Basket
AP5327, etc.



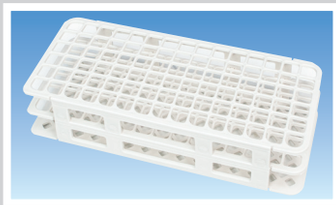
Test Tube Rack,
Economy Choice
AP4417



Test Tube
Slant Rack
AB1260



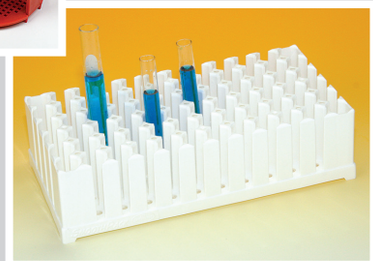
Test Tube Rack,
Polypropylene, Stacking
AP5379, etc.



Test Tube Rack,
Polypropylene,
Submersible
AP1677, etc.



Test Tube Rack,
Polypropylene,
Submersible, Round
AP4414, etc.



Test Tube Rack,
Polypropylene
AP5378

Tubes, Test, Accessories, continued

Test Tube Rack, Wood, 12-Tube

A beechwood, oil-finished rack, glued using dovetailed lock joints. Rack accepts 10 tubes up to 19 mm in diameter and two tubes up to 25 mm in diameter. The heavy base includes 12 drying pins and a groove for holding stirring rods, pipets, etc.

Catalog No.	Description	Price/Each
AP1319	Test Tube Rack, Wood, 12-Tube	$21.74

Test Tube Rack, Wood, Double Row

Top quality wooden racks conveniently hold 12 test tubes—six tubes per row. Two sizes available.

Catalog No.	Description	Holds Tube Size	Price/Each
AP5376	Test Tube Rack, Wood, Double Row	22 mm	$16.82
AP5377		26 mm	16.68

Test Tube Rack, Wood, 13-Tube

A beechwood, oil finished rack, glued using dovetailed lock joints. Rack accepts 13 tubes. Six drying pins. Top shelf holes are 13⁄16" in diameter. Middle shelf holes are 1" in diameter.

Catalog No.	Description	Price/Each
AP1318	Test Tube Rack, Wood, 13-Tube	$20.72

Test Tube Rack, Wood, Semi-micro

Top quality wooden rack holds fifteen 13-mm or 16-mm test tubes. Solid one-piece durable construction will last for years.

Catalog No.	Description	Price/Each
AP5999	Test Tube Rack, Wood, Semi-micro	$14.10

Gas-Generating Bottles and Kits

See pages 115–116.

Wire Test Tube Racks

Heavy gauge steel. Two sizes available. 20-tube rack accepts 2 rows of 10 tubes each and is available with or without a black epoxy coating. 40-tube rack accepts 4 rows of 10 tubes each and is available with or without a black epoxy coating.

Catalog No.	Description	Coating	Tube Places	Holds Tube Size	Price/Each
AP1316	Wire Test Tube Racks	None	20	22 mm	$32.06
AP1317		Black Epoxy			30.83
AP1314		None	40	19 mm	29.77
AP1315		Black Epoxy			32.18

Tubes, Thistle

Thistle Tube, Glass

A useful piece of glassware for adding chemical solutions to a reaction vessel, such as those used in the generation of gases. Thistle tubes minimize the risk of a reaction occurring too quickly and bubbling over. When the stem of the tube is submerged, there is no risk of chemicals traveling back up to the top of the thistle tube due to pressure build-up. 300 mm x 40 mm x tube o.d. 6 mm.

Catalog No.	Description	Price/Each	Price/Case
GP8004	Thistle Tube, Glass	$12.55	$142.92/12

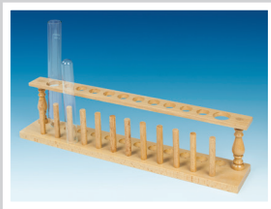
Thistle Tube, Polyethylene

A safe, student-friendly, and economical method for delivering a solution to your gas generator set-up. 250 mm x 35 mm x tube o.d. 6.5 mm.

Catalog No.	Description	Price/Each
AP8160	Thistle Tube, Polyethylene	$5.65



Test Tube Rack, Wood, 6-Tube
AP8220, etc.



Test Tube Rack, Wood, 12-Tube
AP1319



Test Tube Rack, Wood, Double Row
AP5376, etc.



Test Tube Rack, Wood, 13-Tube
AP1318

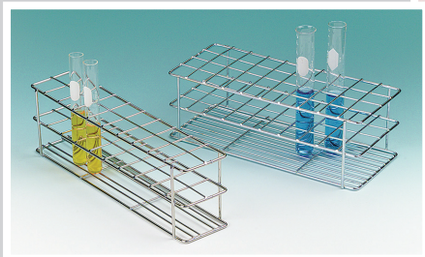


Test Tube Rack, Wood, Semi-micro
AP5999

Thistle Tube, Glass
GP8004

Thistle Tube, Polyethylene
AP8160





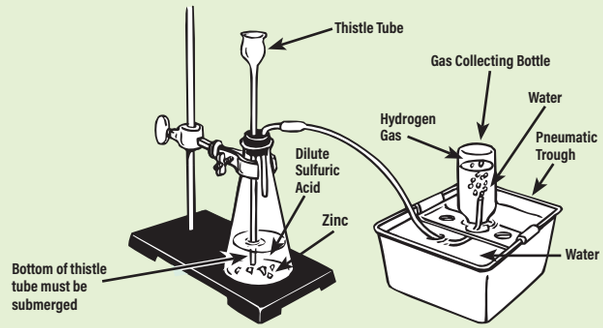
Test Tube Rack, Wire, 40-Tube
AP1314

Test Tube Rack, Wire, 20-Tube
AP1316

HOW TO

Set Up a Thistle Tube Gas Generator

- Discard the first bottle of hydrogen gas collected since it will contain air which, in turn, contains oxygen. Hydrogen mixed with oxygen is an explosion hazard.
- Carbon dioxide gas can be generated using the same setup with marble chips and hydrochloric acid.
- Thistle tube must always be submerged below the liquid level.



Tubing Connectors

Tubing Connector, Bent, Flint Glass, 90° Angle

Catalog No.	Description	Fits Tubing i.d.	Length	Price/Each
AP4592	Tubing Connector, Bent, Flint Glass, 90°-Angle	3/16"	12"	$10.55

Tubing Connector, Straight, Polypropylene

Catalog No.	Description	Fits Tubing i.d.	Price/Each
AP8878	Tubing Connector, Straight, Polypropylene	3/16"	$5.65
AP8879		1/4"	5.65
AP8880		3/8"	5.55

Tubing Connector, Straight, Flint Glass

Catalog No.	Description	o.d.	i.d.	Length	Price/Each
AP8379	Tubing Connector, Straight, Flint Glass	5/16"	1/4"	2½"	$5.95

Tubing Connector, T-Shaped, Flint Glass

Catalog No.	Description	o.d. (mm)	i.d. (mm)	Arm Length (mm)	Stem Length (mm)	Price/Each
AP8381	Tubing Connector, T-Shaped, Flint Glass	6	4	50	50	$5.07

Tubing Connector, Y-Shaped, Flint Glass

Catalog No.	Description	i.d.	Arm Length	Price/Each
AP8384	Tubing Connector, Y-Shaped, Flint Glass	1/4"	2"	$5.15

Tubing Connectors, Assortment

This assortment of 76 fittings contains every tubing connector needed for general laboratory setups. Includes straight tubing connectors, T-connectors, quick disconnects, straight-stepped tubing connectors, Y-connectors and polyethylene cup-type stoppers in a clear, hinged-top, polystyrene storage box makes.

Catalog No.	Description	Price/Each
AP5416	Tubing Connectors, Assortment	$169.10

Tubing, Glass

Glass Tubing, Borosilicate Glass, 24" Lengths

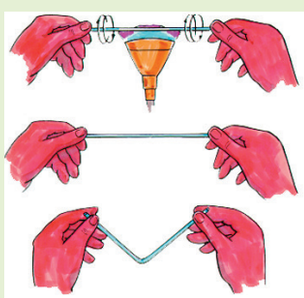
Catalog No.	Description	Outer Diameter	Inner Diameter	Price/Pkg. of 10
GP9005	Glass Tubing, Borosilicate Glass, 24" Lengths	5 mm	3 mm	$12.90
GP9010		6 mm	4 mm	14.60
GP9015		7 mm	5 mm	14.75

Glass Tubing, Soft Glass, 24" Lengths

Catalog No.	Description	Outer Diameter	Inner Diameter	Price/Pkg. of 10
GP9020	Glass Tubing, Soft Glass, 24" Lengths	5 mm	3 mm	$11.70
GP9025		6 mm	4 mm	13.50
GP9030		7 mm	5 mm	15.85

HOW TO

Bend Glass Tubing



Use a wing top on the burner. Rotate tubing in the flame until the glass becomes soft and the flame becomes yellow.

Remove from flame and hold for two seconds to distribute heat evenly.

Bend ends upward with a smooth, even motion.

See free video at flinnsci.com.

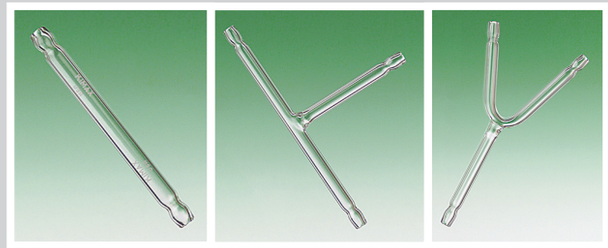
TUBING, GLASS continued on next page.

Tubing Connector, Bent, Flint Glass, 90° Angle
AP4592





Tubing Connector, Straight, Polypropylene
AP8878, etc.



Tubing Connector, Straight, Flint Glass
AP8379

Tubing Connector, T-Shaped, Flint Glass
AP8381

Tubing Connector, Y-Shaped, Flint Glass
AP8384



Tubing Connectors, Assortment
AP5416



Glass Tubing, Borosilicate Glass, 24" Lengths
GP9005, etc.

Glass Tubing, Soft Glass, 24" Lengths
GP9020, etc.

Tubing, Glass, continued

Glass Tubing, Biology Assortment

Assortment includes six 24" pieces of each of the following: 5- and 6-mm soft glass stirring rods and 5-, 6- and 7-mm outer diameter soft glass tubing.

Catalog No.	Description	Price/Each
GP9163	Glass Tubing, Biology Assortment	$49.00

Glass Tubing Cutter

Cut glass tubing up to 38 mm outer diameter. Spring-loaded cutter stays open until used. Die cast of nickel-plated zinc alloy.

Catalog No.	Description	Price/Each
AP5418	Glass Tubing Cutter	$18.35

Tubing, Latex, Amber

Smooth-walled, amber color, semi-transparent, made of pure, natural rubber latex. Great flexibility and fine chemical resistance. Good for most lab applications. Possible allergen.

Catalog No.	Description	i.d. (Inches)	Wall Thickness (Inches)	Price/10 Ft. Length
AP2077	Latex Tubing in 10-Foot Lengths	3/16	1/16	$12.50
AP2078		1/4	1/16	13.20
AP2079		3/8	1/8	50.00
Catalog No.	**Description**	**i.d. (Inches)**	**Wall Thickness (Inches)**	**Price/50 Ft. Length**
AP8756	Latex Tubing in 50-Foot Lengths	1/8	1/16	$ 55.10
AP8757		3/16	1/16	59.20
AP8758		1/4	1/16	63.50
AP8759		3/8	1/8	146.30
AP8760		1/2	3/32	164.80

Tubing, Plastic

Plastic Tubing

Halogenated vinyl plastic. Clear, resilient, comparable to rubber in toughness. Also referred to as Tygon tubing.

Catalog No.	Description	i.d. (Inches)	Wall Thickness (Inches)	Price/10 Ft. Length
AP8373	Plastic Tubing, in 10-Foot Lengths	1/8	1/16	$ 8.25
AP8374		3/16	1/16	11.00
AP8375		1/4	1/16	12.20
AP8377		3/8	1/16	13.30
AP8378		1/2	1/16	15.95
Catalog No.	**Description**	**i.d. (Inches)**	**Wall Thickness (Inches)**	**Price/50 Ft. Length**
AP1161	Plastic Tubing, in 50-Foot Lengths	1/8	1/16	$31.85
AP1162		3/16	1/16	31.85
AP1163		1/4	1/16	38.57
AP1164		5/16	1/16	50.00
AP1165		3/8	1/16	53.15
AP1166		1/2	1/16	65.95

Plastic Tubing Assortment

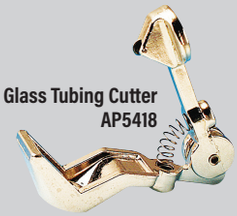
Assortment contains 10 ft each of 1/8", 3/16", and 5/16" i.d. clear, vinyl, plastic tubing. Wall thickness is 1/16" on each piece of tubing.

Catalog No.	Description	Price/Each
AP5426	Plastic Tubing Assortment	$30.25

TUBING continued on next page.



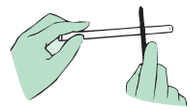
Glass Tubing, Biology Assortment GP9163



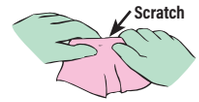
Glass Tubing Cutter AP5418

HOW TO

Cut and Fire Polish Glass Tubing



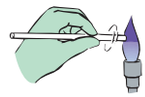
Wear eye protection. Score the glass tubing with a triangular file.



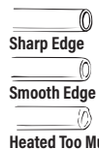
To protect your hands, wrap a cloth around the glass tubing. Place your thumbs opposite the scratch.



Apply pressure with your thumbs and, with a quick motion, snap the tubing away from you.



Rotate the tubing in a laboratory burner flame until the edges are smooth and rounded.



Fire polishing glass tubing can eliminate sharp edges. Soft glass (not borosilicate) tubing will easily fire polish. Borosilicate glass tubing will require the hottest possible flame.

▶ See free video at flinnsci.com.



Plastic Tubing AP8373, etc.

HOW TO

Select the Correct Tubing for Your Laboratory Application

Latex Tubing	For use with general chemical and biological applications.
Plastic Tubing	Great for water. Not for use with Bunsen burners (it is gas permeable) or organic solvents.
Rubber Tubing	Recommended for Bunsen burners and vacuums. Vacuum tubing should have a 3/16" wall thickness (Catalog No. AP8789).

Tubing, Rubber

Rubber Tubing, Black

Uniform, medium wall tubing. Tubing is handmade and black in color. Seamless with low sulfur content. Very durable for general school laboratory use.

Catalog No.	Description	i.d. (Inches)	Wall Thickness (Inches)	Price/10 Ft. Length
AP8283	Rubber Tubing, Black, in 10-Foot Lengths	¼	1/16	$15.50
AP8284		¼	⅛	16.35
AP8285		5/16	1/16	17.03
AP8286		⅜	3/32	18.30
AP8287		½	⅛	29.75
Catalog No.	**Description**	**i.d. (Inches)**	**Wall Thickness (Inches)**	**Price/Box of 50 Feet**
AP1175	Rubber Tubing, Black, in Box of 50 Feet	3/16	1/16	$52.80
AP1176		¼	1/16	55.59
AP1177		¼	⅛	81.60
AP1178		5/16	1/16	66.25
AP1179		⅜	3/32	77.05
AP1180		½	⅛	128.05

Synthetic Rubber Tubing, Latex-Free

This flexible yet firm latex-free rubber tubing is impermeable to gas and ideal for many applications. Temperature tolerance of –20 °F to 212 °F. 5/16"inner diameter. 3/32" wall thickness.

Catalog No.	Description	Price/Each
AP7651	Synthetic Rubber Tubing, Latex-Free, 10 Ft. Length	$32.64

Rubber Tubing, Red

Catalog No.	Description	i.d. (Inches)	Wall Thickness (Inches)	Price/10 Ft. Length
AP8277	Rubber Tubing, Red, in 10-Foot Lengths	¼	⅛	$19.10
AP8279		⅜	3/32	19.70
AP8280		½	⅛	28.60
Catalog No.	**Description**	**i.d. (Inches)**	**Wall Thickness (Inches)**	**Price/Box of 50 Feet**
AP1182	Rubber Tubing, Red, in Box of 50 Feet	3/16	1/16	$ 52.50
AP1183		¼	1/16	62.30
AP1184		¼	⅛	89.50
AP1185		5/16	1/16	68.40
AP1186		⅜	3/32	82.50
AP1187		½	⅛	119.26

Tubing, Vacuum See page 180.

Twine See pages 100 and 312.

Ultraviolet Detection Beads and Paper

See page 415.

Ultraviolet Lamps

Ultraviolet Lamp

Use this black light to discover which substances fluoresce or phosphoresce when exposed to longwave ultraviolet light. Show your students that everyday products like Vaseline®, Sensodyne® toothpaste and Liquid Tide® all fluoresce under a black light. Demonstration/instruction sheet provided. Fixture operates on 120 V AC/60 Hz. UL listed.

Catalog No.	Description	Price/Each
AP9030	Ultraviolet Lamp, 18"	$53.85
AP6076	Replacement Ultraviolet Lamp Bulb	21.31

Rubber Tubing, Black
AP8283, etc.



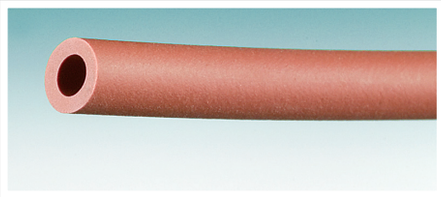
HOW TO

Choose the Right Rubber, Plastic or Latex Tubing

Glass Tubing (o.d.)	Recommended Tubing Size (i.d.)		
	Rubber	Plastic	Latex
5 mm	3/16" (AP1175)	3/16" (AP8374)	3/16" (AP2077)
6 mm	3/16" (AP1175)	3/16" (AP8374)	3/16" (AP2077)
7 mm	¼" (AP8277)	¼" (AP8375)	¼" (AP2078)
5/16"	¼" (AP8277)	¼" (AP8375)	¼" (AP2078)
½"	—	—	⅜" (AP2079)

Synthetic Rubber Tubing, Latex-Free
AP7651





Rubber Tubing, Red
AP8277, etc.

Ultraviolet Lamp, 18"
AP9030





Ultraviolet Lamp, Handheld
AP1901

Ultraviolet Lamp, Handheld

Handheld black light produces long-wave ultraviolet light, ideal for fluorescence or phosphorescence experiments. Provided with a hanging tab, wrist lanyard, and durable plastic case. The ultraviolet tube is easily replaced. Requires four AA batteries (not included). 6⅜" long x 2⅛" wide x ⅞" deep.

Catalog No.	Description	Price/Each
AP1901	Ultraviolet Lamp, Handheld	$45.70
AP2075	Replacement 6", Black Light Ultraviolet Tube	22.75
AP1423	Battery, AA, for Ultraviolet Lamp (Four batteries required.)	2.75

ULTRAVIOLET LAMPS continued on next page.

Ultraviolet Lamps, continued

Ultraviolet Lamp, Short Wave

Battery-operated ultraviolet lamp is completely portable and compact enough to be carried in a pocket. Produces a reliable source of shortwave (254 nm) ultraviolet light. Includes a nylon strap for easy transport. Operates on four AA batteries (not included). Dimensions: 15.9 cm L x 2.5 cm W x 5.6 cm D.

Catalog No.	Description	Price/Each
AP6658	Ultraviolet Lamp, Short Wave	$146.53
AP1423	Battery, AA, for Ultraviolet Lamp (Four batteries required)	2.75

Ultraviolet Pen Light

This 9 LED ultraviolet pen flashlight operates at 395 nm. Small compact form with solid aluminum construction. Operates on 3 AAA batteries (included).

Catalog No.	Description	Price/Each
AP6485	Ultraviolet Pen Light	$25.45

Ultrasonic Cleaners

Flinn Ultrasonic Cleaners

FLINN EXCLUSIVE

Flinn ultrasonic cleaners clean deep inside hard to reach surfaces. Units have an easy-to-use interface with one-touch on/off switch and digital temperature toggle. Contains a chemical-resistant tank for easy filling and cleaning.

Catalog No.	Description	Size	Price/Each
AP8493	Flinn Ultrasonic Cleaner	600 mL	$ 45.32
AP8494		2500 mL	134.90

Vials

Shell Vials

Soft glass (not borosilicate) vial with a flat bottom. Vial lip is fire polished and smooth. Not intended to have a cap. If you wish to cap this vial, use a rubber stopper, cork or Parafilm® (see page 171).

Catalog No.	Description	Dimensions Height x Dia.	Capacity	Price/Each	Price/ Pkg. of 12	Price/ Pkg. of 144
AP4792	Shell Vials	6 x 1.7 cm	8 mL	$1.31	$14.40	$221.76
AP1150		7 x 2.1 cm	16 mL	1.35	15.00	240.48
AP4793		9.5 x 2.5 cm	30 mL	1.64	18.84	315.36

Snap-Seal™ Vials

Made of unbreakable, translucent polypropylene. The stay-in-place hinged cap has a secure sealing mechanism ensuring against leakage or accidental opening. Autoclavable with excellent chemical resistance. Containers have permanent graduations in milliliters and ounces and a markable area on the cap. Available in three sizes in packages of ten.

Catalog No.	Description	Capacity	Price/Pkg. of 10
FB0015	Snap-Seal™ Vials	45 mL	$7.00
FB0016		120 mL	8.20
FB0017		300 mL	11.05

Film Canisters with Caps

These are the film canisters you have been looking for! Inner-sealing caps make them ideal for "Alka-Seltzer®" rockets. Translucent canisters are also useful for storage of small items.

Catalog No.	Description	Price/Pkg.
AP8151	Film Canisters with Caps, Pkg. of 30	$20.12

Vials with Screw-on Cap

Glass vials are perfect for microscale experiments. Two sizes available: 1 dram (approximately 3.5 mL) and 2 drams (approximately 7 mL). PTFE-lined screw caps.

Catalog No.	Description	Price/Each
AP9103	Vials with Screw-on Cap, 1 Dram/Pkg. of 144	$148.60
AP9104	Vials with Screw-on Cap, 1 Dram/Pkg. of 12	18.80
AP9105	Vials with Screw-on Cap, 2 Dram/Pkg. of 144	188.60
AP9106	Vials with Screw-on Cap, 2 Dram/Pkg. of 12	22.05



Vials with Snap-on Cap

Store cultures, specimens, or other items in these handy plastic vials. Clear polystyrene with an easy snap-on plastic top.

Catalog No.	Description	Dimensions Height x Dia.	Capacity	Price/Pkg. of 12
AP4663	Vials with Snap-on Cap	5 x 2.5 cm	25 mL	$ 8.75
AP9250		6.5 x 3 cm	50 mL	11.15

Sterile Specimen Container

This 4-ounce specimen cup features a sterile inner surface and leak-resistant, screw-on lid. Container marked in 10 cc (ml) and 0.25 ounce increments up to 120 cc. Features translucent polypropylene base and polyethylene lid. Sold individually.

Catalog No.	Description	Price/Each
FB2309	Sterile Specimen Container	$1.22

Watch Glass, Borosilicate

Commonly used as covers for beakers. Fire-polished edges to prevent chipping. Flinn only carries watch glasses that are made of borosilicate glass, so these can even be gently heated in a burner flame to dry precipitates or evaporate solutions to dryness. Non-borosilicate watch glasses will shatter when heated and are a potential safety risk.

Catalog No.	Description	Diameter (mm)	Price/Each	Price/Pkg. of 12	Price/Case of 144
GP8006	Watch Glass, Borosilicate	65	$3.96	$46.32	$637.92
GP8007		75	4.00	46.20	766.08
GP8008		90	4.17	48.84	796.32
GP8009		100	4.95	58.20	940.32

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Water Baths

Water Bath

Economical, controlled temperature water baths—ideal for classroom biotechnology use. Thermostatically controlled and precisely adjustable, each is ideal for enzyme incubations and microbiological applications. Adjustable temperature ranges from ambient to 99.9 °C. Durably constructed with a seamless, leakproof, polypropylene chamber. The chamber is highly resistant to corrosion and chemical attack and is easy to clean. An integral wide flange protects the front panel controls—preventing costly damage and potential shock hazards. 5.5 L model features large three digit temperature display. Temperature of this model may be manually calibrated to fit your laboratory needs.

Catalog No.	Description	Outer Dimensions	Inner Dimensions	Capacity	Price/Each
AP7300	Water Bath, 0.5 L	8" Dia. x 4½" H	4" Dia. x 2½" H	0.5 Liters	$354.35

Weighing Dishes and Paper See page 107.

Wire Gauze Squares

Wire Gauze Squares, Nichrome

Nichrome wire is used to make these flame shields that are placed between a crucible or other glass or porcelain vessel and the flame. These very expensive wire gauze squares will provide an almost indefinite life expectancy.

Catalog No.	Description	Size	Price/Each	Price/Pkg. of 10
AP1699	Wire Gauze Squares, Nichrome	4" x 4"	$11.30	$ 106.20
AP1700		5" x 5"	11.75	111.40
AP1701		6" x 6"	17.40	165.20

Wire Gauze Squares, Steel

Our least expensive wire gauze squares. These steel squares are just a fraction of the cost of the nichrome squares listed above, but will provide years of useful service. The wire size is 0.46 mm. 16 mesh.

Catalog No.	Description	Size	Price/Each	Price/Pkg. of 10
AP8350	Wire Gauze Squares, Steel	4" x 4"	$2.15	$20.10
AP8352		5" x 5"	2.64	24.80

Wire Gauze Squares, Steel, with Ceramic Centers

Exactly the same as the steel wire gauze squares listed above, but with a clay-like material (diatomaceous earth) molded to form a center.

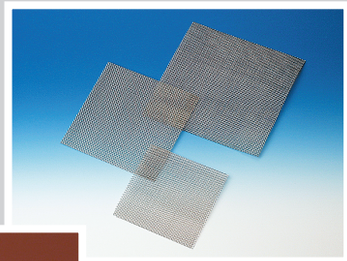
Catalog No.	Description	Size	Diameter of Ceramic Center (Approx.)	Price/ Each	Price/ Pkg. of 10
AP1188	Wire Gauze Squares, Steel, with Ceramic Centers	4" x 4"	3¼"	$3.00	$28.30
AP1189		5" x 5"	3½"	3.50	32.70



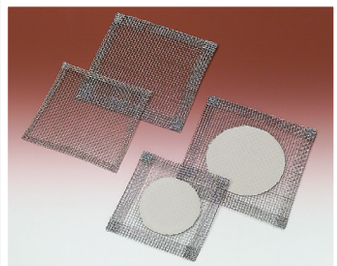
Water Bath, Laboratory
AP9251



Water Bath, 0.5 Liters
AP7300



Wire Gauze Squares, Nichrome
AP1699, etc.



Wire Gauze Squares, Steel, with Ceramic Centers
AP1188, etc.

Wire Gauze Squares, Steel
AP8350, etc.



Watch Glass, Borosilicate
GP8006, etc.

SAFETY TIP

Extinguishing Small Fires



Small fires can be put out by smothering.

FLINN

Chemistry

Whether your students are new to the world of chemistry or studying advanced principles, Flinn Scientific offers **lab activities, resources and lab supplies for your academic needs.**

216 **Advanced Placement® Chemistry**
226 **Books and Review Materials**
226 **Charts and Posters**
227 **Chemical Demonstration Kits**
246 **Chemistry Laboratory Kits**
299 **Chemistry of Toys**
285 **Elements**
246 **Flinn's *Exploring Chemistry*™ Kits**
286 **Games and Puzzles**
289 **Microscale Chemistry**
292 **Models**
296 **Mole Activities**
323 **Organic Chemistry**
298 **Periodic Tables**
297 **Spectroscopy**
399 **Tie-Dyeing**
302 **Video Cameras**

FLINNconnect™

The Best of Our Best

Our BEST 32 labs covering the 20 most essential Chemistry topics.

Designed to allow you to "do" more science, **FLINNconnect** covers the top 20 most crucial Chemistry topics your students need to learn.

This supplemental and comprehensive full-year courseware integrates direct instruction with hands-on labs. Concepts are designed for single-class periods to save you planning and prep time.

Available in three options, comprehensive instructional material covers 20 units and includes text, images, formative and summative assessment, and videos and animations.

Catalog No.	Description	Includes	Price/Each
AP11600	**FLINNconnect** Kit Bundle: General Chemistry Lab Kits Bundle	Labs Bundle: Digital Labs + Materials	**$1650.00**
AP11601	**FLINNconnect** Complete: General Chemistry Courseware + Lab Kits Bundle	Complete: Labs Bundle + Digital Courseware	**1675.00**
EL0100	**FLINNconnect** Digital Courseware: General Chemistry Lab and Instructional Course Content	Digital Only: Courseware + Labs	**279.00**

FLINNprep™ has you covered for AP® Chemistry

Prepare Your Students for Success

FLINNprep is part of PAVO

A complete learning solution to support and prepare students for the fast pace and rigor of advanced courses. Carefully following the College Board guidelines for AP we have developed a variety of solutions in accordance with the guidelines as well as the new Unit Breakouts.

FLINNprep is found within PAVO. PAVO is our award-winning gateway to comprehensive digital content. Educators can customize content, assign students work and monitor progress.

FLINNprep Courses: Textbook Alternatives

Online digital courses take students through BIG IDEAS and UNITS, one-by-one with content, supporting videos, assessments and practice exams.

FLINNprep Lab Solutions

Comprehensive Courses Plus Inquiry Labs: These unique blended labs enable a flipped classroom model by offering a combination of lab videos and simulations plus physical, inquiry-based labs.

Inquiry Lab Kits

Aligned to AP curriculum standards, these engaging inquiry labs include comprehensive background information, step-by-step procedures, student worksheets, teacher notes and the basic materials needed for each experiment.

Wet/Dry Inquiry Lab for One Period

Save valuable lab and lecture time with Flinn's Wet/Dry Inquiry Labs for One Period AP Chemistry! These tested inquiry labs are standards-based, and include real sample data. Flinn offers 16 wet/dry inquiry lab kits designed and developed to meet current AP Chemistry guidelines and the needs of the teacher and student.

POGIL®

The College Board specifically calls out using POGIL activities as one of the learning strategies for teaching AP Courses. Only available from Flinn, POGIL is available in digital PDF format.

Review Demonstration Kits

Select these engaging activities to help students review for the AP Chemistry Exam. Choose from the five products, each containing three separate demonstrations. Students observe and record data, perform calculations and analyze the results to answer AP-style essay questions. Kits include all consumable chemicals and equipment needed for three demonstrations for two complete class sections.

Flinn Classic Laboratory Kits

Only six labs in your curriculum must be inquiry-based to meet College Board requirements. Flinn's tried-and-true Classic Labs meet standards and provide valid lessons for AP Chemistry students.

Flinn Inquiry Transition Guides are 2–3 pages each and include an Opportunity for Inquiry section. The guides show how each lab aligns with the Enduring Understandings, Essential Knowledge, Learning Objectives and Science Practices in the revised AP Chemistry Curriculum Framework.

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Advanced Placement®—FLINNprep™

FLINNprep™ for AP® Chemistry

FLINNprep courses and inquiry labs use a blended approach that saves time, increases student engagement and comprehension and leads to better exam scores.

FLINN EXCLUSIVE



FLINNprep is the only AP Solution that offers inquiry labs that connect the labs back to course content and the AP Exam.

Whether you want to use FLINNprep for a single discipline with your class or you want to adopt it for multiple disciplines across your school or district, we can create a custom solution for you. You can purchase the online course or inquiry labs or both for each discipline. Accompanying physical lab kits are available.

Lab Solution	Gold Bundle Lab Kits & 1 Year Access to Digital Content	Platinum Bundle Lab Kits & 3 Year Access to Digital Content
Digital student and teacher lab instructions	✓	✓
Introductory videos	✓	✓
Technique videos	✓	✓
Apply what you learned on the exam videos	✓	✓
Sample inquiry procedures and data	✓	✓
AP® style practice exam questions	✓	✓
Reteach videos	✓	✓
Virtual reality simulations	✓	✓
Downloadable lab instructions	✓	✓
Physical lab materials for hands-on practice	✓	✓
30% off inquiry lab kits for years 2 and 3		✓
Flinn scientist concierge service		✓
Inquiry Labs for AP® Chemistry: 16 Labs	✓	✓

16 Investigations

- Analysis of Food Dyes in Beverages
- Percent Copper in Brass
- Gravimetric Analysis of Calcium and Hard Water
- Acidity of Beverages
- Separation of a Dye Mixture Using Chromatography
- Qualitative Analysis and Chemical Bonding
- Green Chemistry Analysis of a Mixture
- Analysis of Hydrogen Peroxide
- Separating a Synthetic Pain Relief Mixture
- Rate of Decomposition of Calcium Carbonate
- Kinetics of Crystal Violet Fading
- Designing a Hand Warmer
- Applications of Le Chatelier's Principle
- Acid–Base Titrations
- Buffers in Household Products
- Properties of Buffer Solutions

Visit flinnpavo.com—Online Course for AP Chemistry

AP® Chemistry

FLINNprep Course for AP Chemistry is a complete review of Chemistry's most important concepts with additional units of advanced Chemistry topics. Units include:

- Nomenclature
- Atomic Structure and Periodic Trends
- Chemical Reactions
- Bonding Basics
- Structures and Properties
- Stoichiometry
- Gases
- Solutions
- Acids and Bases
- Equilibrium
- Thermochemistry
- Kinetics
- Electrochemistry
- Photoelectron Spectroscopy & Mass Spectrometry

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Inquiry Lab Kits
for AP® Chemistry

These engaging inquiry lab activities are aligned to the latest AP curriculum standards. They include comprehensive background information, step-by-step procedures, student worksheets, teacher notes and the basic materials needed for each experiment.

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FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM



Gravimetric Analysis of Calcium and Hard Water— Inquiry Lab Kit & Digital Content
AP7660





Applications of Le Chatelier's Principle— Inquiry Lab Kit & Digital Content
AP7659

Catalog No.	Inquiry Lab	Type	Price/Each
AP7654	Designing a Hand Warmer—Big Idea 5, Investigation 12, Primary Learning Objective 5.7	Inquiry Lab Kit & Digital Content	$ 64.10
AP7665	Buffers in Household Products—Big Idea 6, Investigation 15, Primary Learning Objective 6.20	Inquiry Lab Kit & Digital Content	76.95
AP7659	Applications of Le Chatelier's Principle—Big Idea 6, Investigation 13, Primary Learning Objective 6.9	Inquiry Lab Kit & Digital Content	107.00
AP7720		Refill Kit	69.25
AP7656	Acid-Base Titrations—Big Idea 6, Investigation 14, Primary Learning Objective 6.13	Inquiry Lab Kit & Digital Content	62.95
AP7663	Properties of Buffer Solutions—Big Idea 6, Investigation 16, Primary Learning Objective 6.18	Inquiry Lab Kit & Digital Content	67.80
AP7642	Analysis of Food Dyes in Beverages—Big Idea 1, Investigation 1, Primary Learning Objective 1.15	Inquiry Lab Kit & Digital Content	46.40
AP7714		Refill Kit	20.50
AP7660	Gravimetric Analysis of Calcium and Hard Water—Big Idea 1, Investigation 3, Primary Learning Objective 1.19	Inquiry Lab Kit & Digital Content	39.25
AP7644	Kinetics of Crystal Violet Fading—Big Idea 4, Investigation 11, Primary Learning Objective 4.2	Inquiry Lab Kit & Digital Content	51.55
AP7719		Refill Kit	25.05
AP7648	Rate of Decomposition of Calcium Carbonate—Big Idea 4, Investigation 10, Primary Learning Objective 4.1	Inquiry Lab Kit & Digital Content	127.15
AP7718		Refill Kit	27.10
AP7661	Separation of a Dye Mixture Using Chromatograph—Big Idea 2, Investigation 5, Primary Learning Objective 2.10	Inquiry Lab Kit & Digital Content	85.65
AP7643	Percent Copper in Brass—Big Idea 6, Investigation 13, Primary Learning Objective 6.9	Inquiry Lab Kit & Digital Content	80.50
AP7715		Refill Kit	50.55
AP7645	Acidity of Beverages—Big Idea 6, Investigation 14, Primary Learning Objective 6.13	Inquiry Lab Kit & Digital Content	72.40
AP7664	Qualitative Analysis and Chemical Bonding—Big Idea 2, Investigation 6, Primary Learning Objective 2.22	Inquiry Lab Kit & Digital Content	102.95
AP7647	Analysis of Hydrogen Peroxide—Big Idea 1, Investigation 1, Primary Learning Objective 1.15	Inquiry Lab Kit & Digital Content	57.70
AP7717		Refill Kit	34.25
AP7662	Separating a Synthetic Pain Relief Mixture—Big Idea 3, Investigation 9, Primary Learning Objective 3.10	Inquiry Lab Kit & Digital Content	75.10
AP7653	Green Chemistry Analysis of a Mixture—Big Idea 3, Investigation 7, Primary Learning Objectives 3.5 and 3.3	Inquiry Lab Kit & Digital Content	40.35

Flinn Wet/Dry Inquiry Labs
for One Period AP® Chemistry

FLINN EXCLUSIVE

Wet/Dry Inquiry Labs for One Period AP Chemistry—16-Kit Bundle

By: The Flinn Staff

Make the most of your valuable lab and lecture time with the AP Chemistry Guided-Inquiry Wet/Dry Labs for One Period! The prep time for you is minimal and all labs may be completed in one 50-minute wet lab period. Purchase all 16 experiments as one cost-saving bundle!

1. Acid–Base Titration Curves
2. Buffer Target Lab
3. Distribution of Acetic Acid Between Water and 1-Octanol
4. Analysis of a Mixture Through Gas Laws and Titration
5. Solventless Aldol Condensation, an Example of Green Chemistry
6. Investigating the Reaction of Nickel with Ethylenediamine
7. Flameless Ration Heater: Thermochemistry and Redox in Action
8. Copper, Silver and Gold: Analysis of an Alloy
9. Activity-Station Exploration of Metals
10. Candy Chromatography
11. Chemical Bonding: Vibrant Colors and Determining the Unknown
12. Analyzing Food Dyes in Beverages
13. Investigating Polarized Light with a Student-Built LCD
14. Kinetics: Determine the Rate of a Reaction
15. Electrochemistry: Build Your Own Hand-held Battery
16. Electrochemistry Target Lab



Catalog No.	Description	Price/Each
AP9739	Wet/Dry Inquiry Labs for One Period AP Chemistry—16-Kit Bundle	$911.55

Save valuable lab and lecture time with Flinn's Wet/Dry Inquiry Labs for One Period AP Chemistry!
These kits are standards-based, tested inquiry labs with real sample data for your AP Chemistry course. Flinn offers 16 wet/dry inquiry lab kits that have been designed and developed to meet the most current AP Chemistry guidelines as well as the needs of the high school teacher and student.

Catalog No.	Inquiry Lab		Price/Each
AP8495	Acid–Base Titration Curves—Big Idea 6		$50.55
AP9591	Analysis of a Mixture Through Gas Laws and Titration—Big Ideas 1, 3 & 6		56.95
AP9730	Buffer Target Lab—Big Ideas 1, 2 & 3		52.65
AP9587	Distribution of Acetic Acid Between Water and 1-Octanol—Big Idea 2		57.45
AP9588	Investigating the Reaction of Nickel with Ethylenediamine—Big Ideas 1 & 3		51.70
AP9707	Flameless Ration Heater: Thermochemistry and Redox in Action—Big Ideas 1, 3 & 5		37.05
AP9715	Copper, Silver and Gold: Analysis of an Alloy—Big Ideas 1 & 2		29.25
AP9716	Activity-Station Exploration of Metals—Big Ideas 2 & 5		56.90
AP9592	Candy Chromatography—Big Idea 2		29.25
AP8498	Chemical Bonding: Vibrant Colors and Determining the Unknown—Big Idea 2		87.25
AP9665	Investigating Polarized Light with a Stud ent-Built LCD—Big Idea 2		143.75
AP9475	Kinetics: Determine the Rate of a Reaction—Big Idea 4		24.60
AP9729	Electrochemistry Target Lab—Big Idea 3		126.05
AP8496	Electrochemistry: Build Your Own Handheld Battery—Big Idea 3	Full-Size Kit	59.18
AP10116		Full-Size, Refill Kit	53.80
AP10194		Small-Size Kit	40.41



Distribution of Acetic Acid Between Water and 1-Octanol—Wet/Dry Inquiry Lab for One Period AP9587

Combined Classic and Inquiry Lab Kits

for AP® Chemistry—19-Kit Bundle

FLINN EXCLUSIVE

New standards, classic curriculum—here's the "best-of-the-best" from both! We have assembled 19 of the top-notch Flinn Classic and new Flinn Advanced Inquiry Lab Kits for AP Chemistry into one convenient, money-saving bundle. Save valuable planning and prep time and confidently prepare your students for success using these proven and tested labs. Each classic and inquiry kit is aligned with and covers the updated AP Chemistry standards and includes detailed background information, clear and concise student procedures, real sample data, answers to all questions and all necessary chemicals and specialized equipment for 24 students working in pairs. Still want to convert some of the classic labs to inquiry? Easy—since each classic kit also includes a detailed Flinn Inquiry Transition Guide!

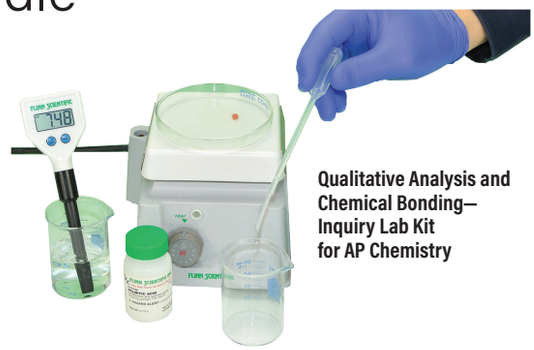
This 19-kit bundle has everything to give you the freedom and flexibility you need to teach AP Chemistry with confidence and prepare your students for success.

19-Kit Bundle for AP Chemistry Includes:

- Percent Copper in Brass—Inquiry Lab Kit
- Acidity of Beverages—Inquiry Lab Kit
- Qualitative Analysis and Chemical Bonding—Inquiry Lab Kit
- Analysis of Hydrogen Peroxide—Inquiry Lab Kit
- Kinetics of Crystal Violet Fading—Inquiry Lab Kit
- Designing a Hand Warmer—Inquiry Lab Kit
- Applications of Le Chatelier's Principle—Inquiry Lab Kit
- Properties of Buffer Solutions—Inquiry Lab Kit
- Separation of a Dye Mixture Using Chromatography—Inquiry Lab Kit
- Analysis of Aluminum Potassium Sulfate—Classic Lab Kit
- Determining the Molar Volume of a Gas—Classic Lab Kit
- Determining the Stoichiometry of Chemical Reactions—Classic Lab Kit
- Thermodynamics: Enthalpy of Reaction and Hess's Law—Classic Lab Kit
- An Activity Series—Classic Lab Kit
- Determination of K_{eq} for $FeSCN^{2+}$—Classic Lab Kit
- Selecting Indicators for Acid-Base Titrations—Classic Lab Kit
- Determination of K_a of Weak Acids—Classic Lab Kit
- Synthesis, Isolation and Purification of an Ester—Classic Lab Kit
- Gravimetric Analysis of a Metal Carbonate—Classic Lab Kit

Catalog No.	Description	Price/Each
AP7740	Combined Classic and Inquiry Lab Kits for AP Chemistry—19-Kit Bundle	$1100.00

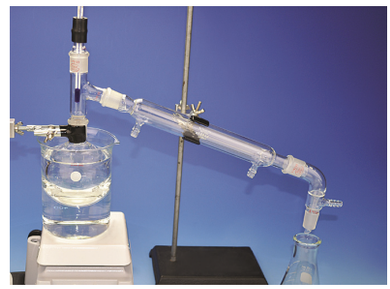
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Qualitative Analysis and Chemical Bonding—Inquiry Lab Kit for AP Chemistry



Percent Copper in Brass—Inquiry Lab Kit for AP Chemistry



Synthesis, Isolation and Purification of an Ester—Classic Lab Kit for AP Chemistry



The Determination of K_{eq} for $FeSCN^{2+}$—Classic Lab Kit for AP Chemistry



Selecting Indicators for Acid-Base Titrations—Classic Lab Kit for AP Chemistry

AP CHEMISTRY continued on next page.

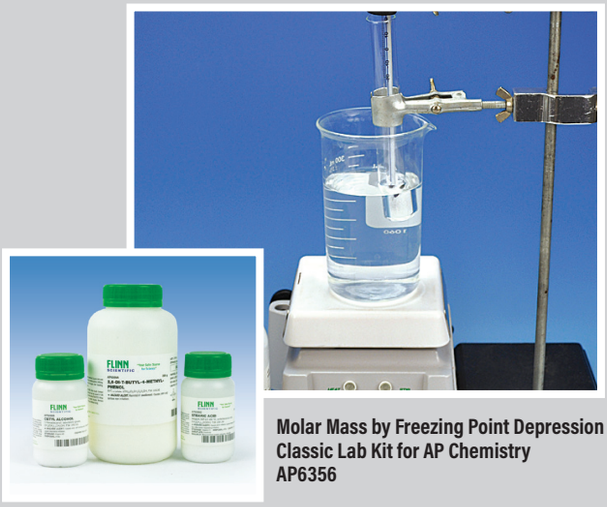
Classic Lab Kits
for AP® Chemistry

The standards may have changed, but some things never go out of style! Flinn's existing "classic" labs for AP Chemistry are still valid and may still be used in the updated curriculum! Only six labs in your curriculum must be inquiry-based to meet College Board requirements. If you have clear favorites among your existing labs, please continue to do them. If students learn from the activities and enjoy them, then they are winners and should remain in your lab.

Flinn Inquiry Transition Guides are available! These guides are 2–3 pages each and include an *Opportunities for Inquiry* section. This section describes several approaches that may be used to adapt the classic lab procedure to guided inquiry. The guides also show how each lab aligns with the Enduring Understandings, Essential Knowledge, Learning Objectives and Science Practices in the revised AP Chemistry Curriculum Framework. **Complete for 24 students working in pairs.**

For more information and to see a complete materials list, please give us a call or visit www.flinnsci.com.

FLINN EXCLUSIVE



Molar Mass by Freezing Point Depression Classic Lab Kit for AP Chemistry AP6356

Analysis of Aluminum Potassium Sulfate
Students analyze aluminum potassium sulfate (alum) using three techniques to determine its exact composition.

Formerly AP Requirement: #2

Catalog No.	Description	Price/Each
AP6354	Analysis of Aluminum Potassium Sulfate Classic Lab Kit for AP® Chemistry	$27.25

Determination of Molar Mass of Gases and Volatile Liquids
Students gain experience in handling gases, the analytical balance and microscale chemistry procedures.

Formerly AP Requirement: #3

Catalog No.	Description	Price/Each
AP8814	Determination of the Molar Mass of Gases and Volatile Liquids Classic Lab Kit for AP® Chemistry	$118.35

Molar Mass by Freezing Point Depression
Determine the molar mass of an unknown by measuring the freezing point depression of its solution with BHT (2,6-di-*tert*-butyl-4-methylphenol).

Formerly AP Requirement: #4

Catalog No.	Description	Price/Each
AP6356	Molar Mass by Freezing Point Depression Classic Lab Kit for AP® Chemistry	$36.65

Oxidation-Reduction Titrations
Students standardize a solution of potassium permanganate by redox titration with a standard solution of iron(II) ions.

Formerly AP Requirement: #8

Catalog No.	Description	Price/Each
AP8815	Oxidation–Reduction Titrations Classic Lab Kit for AP® Chemistry	$39.35

Determination of K_a of Weak Acids
Measure the K_a value for the ionization of two unknown weak acids. pH values are measured and used to calculate the pK_a value for each unknown weak acid.

Formerly AP Requirement: #10

Catalog No.	Description	Price/Each
AP6358	Determination of K_a of Weak Acids Classic Lab Kit for AP® Chemistry	$36.75

Selecting Indicators for Acid–Base Titrations
Select the appropriate indicators for two titrations—a weak acid solution titrated with a strong base solution and a weak base solution titrated with a strong acid solution.

Formerly AP Requirement: #11

Catalog No.	Description	Price/Each
AP6452	Selecting Indicators for Acid–Base Titrations Classic Lab Kit for AP® Chemistry	$61.30

Determination of the Empirical Formula of Silver Oxide
Students decompose silver oxide by heating a sample in a crucible. By using analytical techniques, the empirical formula of silver oxide is determined.

Formerly AP Requirement: #1

Catalog No.	Description	Price/Each
AP8813	Determination of the Empirical Formula of Silver Oxide Classic Lab Kit for AP® Chemistry	$102.85

Acid–Base Titrations
In this three-part laboratory, a basic solution is first standardized against a known solid acid (KHP). This standardized base solution is then titrated against an unknown acid solution to determine the acid solution's molarity. In the third part, the K_a of the solid acid KHP is calculated from the data of the titration curve obtained from plotting the pH of the solution versus the volume of NaOH solution added. The lab provides the recommended familiarity with the process of titration using indicators and pH meters.

Formerly AP Requirement: #6
Formerly AP Requirement: #7

Catalog No.	Description	Price/Each
AP9083	Acid–Base Titrations—Classic Lab Kit for AP® Chemistry	$33.00

Determining the Molar Volume of a Gas
Students determine the volume of one mole of hydrogen gas at standard temperature and pressure (STP). Hydrogen is generated by the reaction of a known mass of magnesium with an excess of hydrochloric acid in an inverted gas measuring tube filled with water. The volume of hydrogen collected by water displacement is measured and corrected for differences in temperature and pressure in order to calculate the molar volume of hydrogen at STP.

Formerly AP Requirement: #5

Catalog No.	Description	Price/Each
AP6450	Determining the Molar Volume of a Gas Classic Lab Kit for AP® Chemistry	$25.95

AP CHEMISTRY—CLASSIC LAB KITS continued on next page.

Advanced Placement®— Classic Lab Kits, continued

Determining the Stoichiometry of Chemical Reactions

Learn the method of continuous variation to determine the mole ratio of the reactants and predict the chemical formula of the product for specific chemical reactions. In Part 1, the students mix known amounts of iron(III) nitrate and sodium hydroxide in a series of reactions to form a precipitate. Each reaction contains a different mole ratio of reactants. The students extrapolate the data to determine the optimum ratio of reactants and predict the correct formula of the precipitated product. The experiment is repeated in Part 2 for copper(II) chloride and sodium phosphate.

Formerly AP Requirement: #9

Catalog No.	Description	Price/Each
AP6451	Determining the Stoichiometry of Chemical Reactions Classic Lab Kit for AP® Chemistry	$75.80

Kinetics of a Reaction

Students study the kinetics of a clock reaction involving the oxidation of iodide ion by bromate ion in the presence of an acid. First, students study the effect of concentration on the rate of reaction to determine the order of reaction for each reactant and the rate constant. Second, the activation energy is determined by varying the temperature, measuring the rate and calculating the rate constant at the different temperatures. Finally the effect of a catalyst on the reaction rate is studied.

Formerly AP Requirement: #12

Catalog No.	Description	Price/Each
AP5913	Kinetics of a Reaction Classic Lab Kit for AP® Chemistry	$60.40
AP1446	Reaction Strip, 12 Wells	2.35

Kinetics of a Redox Reaction

Students study the rate of the reaction of FD&C Red Dye #3 with sodium hypochlorite using a spectrophotometer. First, students create a calibration curve for the dye. Then they find the order of reaction for each of the reactants by varying the concentration of each reactant individually. Finally, a graphical analysis of the relationship of concentration versus time is used to calculate the rate constant. Includes optional FD&C Blue Dye #1 for better absorbance with some colorimeters.

Formerly AP Requirement: #12b

Catalog No.	Description	Price/Each
AP7511	Kinetics of a Redox Reaction Classic Lab Kit for AP® Chemistry	$55.40

Thermodynamics— Enthalpy of Reaction and Hess's Law

Students verify Hess's Law in this experiment. Three acid–base reactions, chosen so that the third reaction equation equals the first reaction minus the second, are measured for temperature change by calorimetry. The values of heat change and enthalpy of reaction are calculated for each of the three reactions. The reaction results are then compared to verify Hess's Law.

Formerly AP Requirement: #13

Catalog No.	Description	Price/Each
AP8832	Thermodynamics—Enthalpy of Reaction and Hess's Law Classic Lab Kit for AP® Chemistry	$76.32

Separation and Qualitative Determination of Cations and Anions

Students analyze two solution sets of four cations and four anions. For each set, a specific qualitative scheme is followed to separately detect each of the four ions present. Students are then given two unknown solution sets to analyze. By following the qualitative schemes, students determine which cations and anions are present and which are absent from the two samples. Four to five 50-minute lab sessions will be needed to complete all four sets of analyses.

Formerly AP Requirement: #14

Catalog No.	Description	Price/Each
AP6453	Separation and Qualitative Determination of Cations and Anions Classic Lab Kit for AP® Chemistry	$112.80

FLINN EXCLUSIVE

pH Properties of Buffer Solutions

In this laboratory, students investigate the properties of buffer solutions. The students make two ideal buffer solutions, one consisting of a weak acid and its conjugate base, and the other, a weak base and its conjugate acid. The initial pH of each solution is determined. Strong acid and strong base are then added to each buffer in a series of steps, with the pH determined after each addition. The resulting pH values after each addition are compared to calculated values for each buffer. A challenging lab to test students' understanding of pH and buffer chemistry.

Formerly AP Requirement: #19

Catalog No.	Description	Price/Each
AP6445	pH Properties of Buffer Solutions Classic Lab Kit for AP® Chemistry	$56.25

An Activity Series

Students study a series of metals and nonmetals to determine their relative reactivity, then rank them according to their reactivity in an activity series. First, the reactivity of the metals is determined by reacting a series of metals with metal salt solutions. Second, the reactivity of the halogens are determined by reacting each of the halogens with a halide solution. Based on the observed reactivity in each case, students develop a separate activity series for the metals and the halogens. Students understand why some metals can "replace" other metals and why some redox reactions are spontaneous while others require a battery. Students also learn that the reactivity for the halogens is opposite that for the other families in the periodic table.

Formerly AP Requirement: #20

Catalog No.	Description	Price/Each
AP5914	An Activity Series Classic Lab Kit for AP® Chemistry	$78.17

Synthesis, Isolation and Purification of an Ester

Students perform a quantitative esterification reaction to produce ethyl acetate. The lab consists of three parts—in Part 1, the ethyl acetate is prepared; in Part 2, the ethyl acetate is purified; and in Part 3, tests are performed to verify the identity of the ethyl acetate. The theoretical yield is then calculated and the percent yield is determined. Students receive hands-on experience with common organic chemistry techniques, such as refluxing, extractions and distillation.

Formerly AP Requirement: #22

Catalog No.	Description	Price/Each
AP9094	Synthesis, Isolation and Purification of an Ester Classic Lab Kit for AP® Chemistry	$48.50

The Flinn Classic Lab Kits for AP® Chemistry are available as a cost-saving bundle!

Comprehensive bundle includes a lab kit for each lab requirement. Save time and promote understanding with this 21-Kit Bundle for Classic AP® Chemistry!

Catalog No.	Description	Price/Each
AP7625	Flinn Classic Lab Kits for AP® Chemistry—21-Kit Bundle	$1175.00

Synthesis and Analysis of a Coordination Compound

Students synthesize the coordination compound potassium trioxalatoferrate(III) trihydrate, $K_3[Fe(C_2O_4)_3]\cdot 3H_2O$. Once produced, the product is identified by colorimetric methods and the percent yield of the product is determined. The absorbance of a solution of the product will be taken at three wavelengths. The ratios of these absorbances are used to identify the compound in solution as $K_3[Fe(C_2O_4)_3]\cdot 3H_2O$.

Formerly AP Requirement: #15

Catalog No.	Description	Price/Each
AP6454	Synthesis and Analysis of a Coordination Compound Classic Lab Kit for AP® Chemistry	$59.50

AP® CHEMISTRY—CLASSIC LAB KITS continued on next page.

Advanced Placement—Classic Lab Kits, continued

Gravimetric Analysis of a Metal Carbonate

In this laboratory, students determine the identity of a Group 1 metal carbonate by gravimetric analysis. The unknown is weighed, dissolved in water and precipitated as calcium carbonate. The precipitate is filtered, dried and weighed. From the data, the formula weight and the identity of the unknown metal carbonate are determined. Students gain valuable experience in the process of gravimetric analysis. The lab is free of heavy-metal waste typically generated with most gravimetric analysis labs.

Formerly AP Requirement: #16

Catalog No.	Description	Price/Each
AP6378	Gravimetric Analysis of a Metal Carbonate Classic Lab Kit for AP® Chemistry	$42.30

The Determination of K_{eq} for $FeSCN^{2+}$

In this two-part lab, students will determine the equilibrium constant for the reaction of iron(III) ions with thiocyanate ions (SCN^-). In Part 1, a series of reference solutions containing the product ion, iron(III) thiocyanate ($FeSCN^{2+}$), is prepared. Students then make up test solutions containing a fixed amount of iron(III) ions and different amounts of the SCN^- ion. These solutions are analyzed in Part 2 using a colorimeter. The first set of solutions is used to generate a calibration curve of absorbance versus the concentration of $FeSCN^{2+}$ ions. The second set of solutions is then analyzed and the $FeSCN^{2+}$ ion concentration of each solution is determined. The students use the data to calculate the equilibrium constant for the reaction of iron(III) ions with thiocyanate ions (SCN^-). Students gain valuable experience in the techniques of quantitative transfer, along with the process of colorimetric determination.

Formerly AP Requirement: #17

Catalog No.	Description	Price/Each
AP6352	The Determination of K_{eq} for $FeSCN^{2+}$ Classic Lab Kit for AP® Chemistry	$28.55

FLINN EXCLUSIVE



Liquid Chromatography Classic Lab Kit for AP® Chemistry AP9093

Liquid Chromatography

Separate different colored dyes found in grape Kool-Aid® using chromatography methods that mimic popular methods used in research and industry. Miniature liquid chromatography columns called Sep-Pak® C18 cartridges are used to separate the dyes and polar components of Kool-Aid. Students will understand the chromatographic process and relate the polarity of molecules to the separation process.

Formerly AP Requirement: #18

Catalog No.	Description	Price/Each
AP9093	Liquid Chromatography Classic Lab Kit for AP® Chemistry	$113.18

Review Demonstration Kits for AP® Chemistry

FLINN EXCLUSIVE

Help students prepare for the AP Chemistry Exam. Select these integrated, interactive activities to help students review principles and concepts for major areas on the AP Chemistry Exam. Choose from the following five products, containing three separate demonstrations per kit. Students observe and record data, perform calculations and analyze the results to answer AP-style essay questions. Kits include all consumable chemicals and equipment needed to perform all three demonstrations for two complete class sections.

Oxidation-Reduction

By: The Flinn Staff

Use this set of integrated, interactive demonstrations to help students review the major principles of oxidation–reduction. Set of two demonstrations includes:

- Reactions of Iron(II) and Iron(III) Ions—Investigate electron transfer reactions of Fe^{2+} and Fe^{3+} ions with a series of oxidizing and reducing agents, respectively. Students identify trends in the reduction of iron(III) ions as they review essential knowledge and skills, such as how to assign oxidation states and balance half-reactions for the AP Chemistry Exam.
- Colorful Oxidation States of Manganese—Demonstrate the wide range of colorful oxidation states of manganese, a continuous series from +7 to +2! Students observe and compare the sequence of projected colors arising from oxidation of manganese in its +2 form and corresponding reduction of its highest, +7 oxidation state. Excellent review of balancing redox equations!

Includes valuable Teacher Notes with helpful teaching tips, reproducible student worksheets and enough materials to perform each demonstration twice.

Catalog No.	Description	Price/Each
AP7436	Oxidation–Reduction—Review Demonstration Kit for AP Chemistry	$79.75



Oxidation–Reduction—Review Demonstration Kit for AP® Chemistry AP7436

AP® CHEMISTRY continued on next page.

Advanced Placement®—Review Demonstration Kits, continued

Acids and Bases

By: The Flinn Staff



Listed for acids and bases by the College Board are the concepts of Arrhenius, Brønsted–Lowry and Lewis, coordination complexes, amphoterism, pK_a and pH, buffers and hydrolysis. Use this set of three acid–base demonstrations to both engage students in a hands-on review and test their understanding.

- Weak Base–Weak Acid Titration—Start the review with a titration of a weak acid with a weak base. What is the pH at the endpoint? Students graph pH versus volume of base added. Based on the graph and their knowledge of endpoint pH calculations, students determine the relative strengths of the acid and the base.
- Acid Mixture, Concentration and K_a—A mixture of hydrochloric acid and maleic acid is titrated with sodium hydroxide. Students graph the titration curve and use the data to determine the concentration of each acid in the mixture and the K_a of maleic acid.
- Acid Strength and Electron-Withdrawing Groups—Show the trend for K_a of acetic acid and its mono- and tri-chloride substitutions. Students explain this trend based on these values and their knowledge of electron affinity.

Catalog No.	Description	Price/Each
AP7424	Acids and Bases—Review Demonstration Kit for AP Chemistry	$66.00
AP8673	Flinn pH Meter	53.56

Electrochemistry

By: The Flinn Staff

The course description for the College Board AP Chemistry lists the following topics for electrochemistry: electrolytic and galvanic cells, Faraday's law, standard half-cell potentials, Nernst equation and prediction of the direction of redox reactions. Use the following three demonstrations host a lively and informative review of this core topic.

- The Voltaic Cell—Use standard electrode potentials and the Nernst equation to predict the direction of current flow and the voltage when electrolyte concentrations are varied.
- Electrolysis—Measure the change in pH for the electrolysis of potassium iodide solution, and use Faraday's law to determine the average current flow.
- Concentration Cell—Voltage produced with different concentrations of ions forges a deeper understanding of the Nernst equation.

Catalog No.	Description	Price/Each
AP7325	Electrochemistry—Review Demonstration Kit for AP Chemistry	$82.35

Stoichiometry

By: The Flinn Staff



The course description for the College Board AP Chemistry lists the following topics for stoichiometry: net ionic equations, balancing equations and mass and volume relationships relating to the mole concept, empirical formulas and limiting reactants.
Use this set of three acid–base heat of neutralization demonstrations to both engage students in a hands-on review and test their understanding of this sometimes difficult yet fundamental topic.

- Acid–Base Neutralization of Acetic Acid—Start the review with mono-protic acetic acid. Use the method of continuous variations to mix the reactants. Students then graph the change in temperature versus the volume of acid to determine the mole ratio of two reactants.
- Di-Protic Acid Neutralization—Once students are comfortable with the continuous variations method, switch to equal molar volumes of sodium hydroxide and the di-protic weak acid, oxalic acid.
- Neutralization of Poly-protic Citric Acid—The mentioned stoichiometry topics all come together in this final demonstration.

Catalog No.	Description	Price/Each
AP7409	Stoichiometry—Review Demonstration Kit for AP Chemistry	$42.80

Thermodynamics

By: The Flinn Staff



Use this set of three thermodynamics demonstrations to both engage your students in a hands-on review and to test their understanding of this sometimes difficult yet fundamental topic.

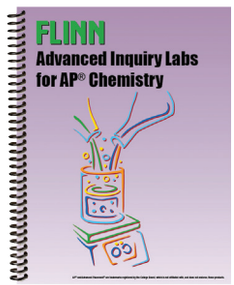
- Entropy and Free Energy—Exothermic crystallization of sodium acetate trihydrate sparks a lively debate on spontaneity, free energy, enthalpy and entropy.
- Hess's Law—Two-part calorimetry demonstration provides data for reviewing the properties of state functions and performing H°, ΔS° and ΔG° calculations.
- Free Energy and Redox Reactions—Solve the Nernst equation for a copper concentration cell to demonstrate the relationship between free energy and electrode potential.

Catalog No.	Description	Price/Each
AP7328	Thermodynamics—Review Demonstration Kit for AP Chemistry	$66.05

Advanced Placement®—Books and Review Materials

Flinn Scientific Advanced Inquiry Labs for AP Chemistry Lab Manual

FLINN EXCLUSIVE



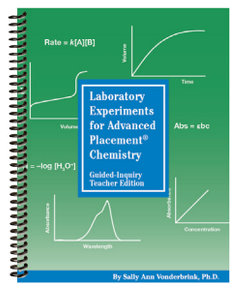
All 16 Flinn Advanced Inquiry Laboratory Experiments for AP Chemistry in one amazing book! Includes thoroughly tested and documented experiments for each of the new inquiry investigations in the AP Chemistry curriculum framework. Labs have been optimized for safety, effective inquiry and guaranteed student success, fully correlated to specific learning objectives and science practice skills. Book provides essential critical thinking and inquiry guidance for students along with exam-style AP Chemistry review questions and comprehensive teacher notes. Experiments begin with an Introductory Activity to prepare students for the Guided-Inquiry Design and Procedure portion of the lab in which they identify the conditions and variables for designing an effective laboratory experiment. 270 pages. Spiral-bound.

Catalog No.	Description	Price/Each
AP7671	Flinn Advanced Inquiry Labs for AP Chemistry Lab Manual	$160.10

Laboratory Experiments for Advanced Placement® Chemistry, Guided-Inquiry Edition

FLINN EXCLUSIVE

Author: Sally Ann Vonderbrink, Ph.D., Retired Chemistry Teacher
St. Xavier H.S., Cincinnati, OH



Recognized as the standard of AP Chemistry experiments used across the country, Laboratory Experiments for Advanced Placement Chemistry has been updated in its third edition to address the goals, recommendations and requirements of the AP Chemistry curriculum as specified by the College Board in 2013. The manual now includes one new and seven updated inquiry experiments. Other updated features include 26 college-level experiments adapted for high school time and material constraints, comprehensive teacher notes, experiments using microscale techniques and technology when practical, pre-lab assignments that ensure students are prepared for labs, and challenging experiments involving quantitative analysis techniques and the analysis of "unknowns." Author Dr. Sally Ann Vonderbrink is a recognized expert in AP Chemistry. Teacher and Student Editions available. Teacher edition is spiral-bound.

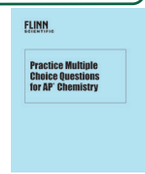
Catalog No.	Description	Price/Each
AP7706	Laboratory Experiments for Advanced Placement Chemistry, Guided-Inquiry—Teacher Edition	$53.75
AP7707	Laboratory Experiments for Advanced Placement Chemistry, Guided-Inquiry—Student Edition	27.65

AP® CHEMISTRY—BOOKS AND REVIEW MATERIALS continued on next page.

Advanced Placement®—Books and Review Materials, continued

Multiple Choice Test Booklet for AP Chemistry

FLINN EXCLUSIVE



Prepare students for success on the AP Chemistry exam! Give every one of your students this booklet, which contains 60 multiple choice questions designed specifically to mimic the types of questions they will see on the AP exam. Students can use the booklet as practice at their own pace or take the full set of questions at once to get a feel for test-day timing. We closely analyzed the types of questions on the most recent AP Chemistry exams, administered following the 2013 curriculum revision, to craft questions that will give your students an edge on exam day.

Classroom set includes 24 booklets as well as Teacher's Guide that includes answers for all questions.

Catalog No.	Description	Price/Set of 24
AP8491	Multiple Choice Test Booklet for AP Chemistry	$42.95

The Ultimate Chemical Equations Handbook

FLINN EXCLUSIVE

Authors: George R. Hague, Jr., St. Mark's School of Texas, Dallas, TX and Jane D. Smith, Centennial H.S., Frisco, TX



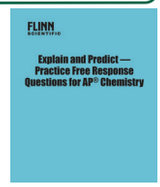
Revised second edition of the "bible of chemical equations!" This popular book is a must-have for every AP chemistry student. Written by two respected high school AP Chemistry teachers, the handbook is a compilation of years of experience and expertise. Thorough, comprehensive and in-depth examples and practice exercises provide continuous reinforcement to improve students' chemical literacy skills. Student edition contains 15 chapters, with exercises and practice equations.

8½" x 11". Student Edition, perfect-bound, 112 pages; Teacher Edition, spiral-bound, 214 pages.

Catalog No.	Description	Price/Each
AP7478	The Ultimate Chemical Equations Handbook—Student Edition	$14.25
AP7479	The Ultimate Chemical Equations Handbook—Teacher Edition	54.95

Explain and Predict—Practice Free Response Questions for AP Chemistry

FLINN EXCLUSIVE



Prepare students for success on the AP Chemistry exam! Updated curriculum requirements emphasize the importance of integrating chemistry content with reasoning. We have written ten multi-part sample questions using authentic data from GREAT experiments. Practice questions integrating all of the big ideas in AP Chemistry will ensure that students can "justify claims with evidence" (Science Practice 6.1). The updated curriculum challenges students not just to know chemistry, but do chemistry! Prepare your students by asking them to analyze, evaluate and design, predict, explain and apply.

Classroom set of 24 booklets is very affordable and includes a comprehensive Teacher's Guide that lists the specific learning objectives for each question.

Catalog No.	Description	Price/Set of 24
AP7711	Explain and Predict—Practice Free Response Questions for AP Chemistry	$49.45
AP8488	Explain and Predict—Practice Free Response Questions for AP Chemistry, Volume II	28.00

5 Steps to a 5—AP Chemistry

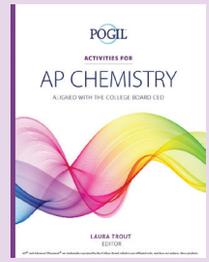
Authors: John T. Moore & Richard Langley

Three full-length practice tests that align with the latest College Board requirements. Hundreds of practice exercises with answer explanations. Comprehensive overview of all test topics. Proven strategies from seasoned AP educators. All instructional content in digital format (for both computers and mobile devices). Interactive practice tests with answer explanations. A self-guided, personalized study plan with daily goals, powerful analytics, flashcards, games, and more.

Catalog No.	Description	Price/Each
AP6966	5 Steps to a 5—AP Chemistry	$22.05

POGIL® Activities for AP® Chemistry, 2nd Edition, Digital plus Hard Copy

NEW!



Integrate scientific practices, reasoning and inquiry in the AP Chemistry curriculum with 46 interactive, guided-inquiry learning activities in 7 major topic areas: Chemical Reactions and Stoichiometry, Atomic Structure and the Periodic Table, Thermodynamics and Kinetics, Oxidation and Reduction, Bonding, Properties of Gases, and Equilibrium Systems.

New activities have been added for the second edition, other activities have been extensively revised, and a strong emphasis on process skills is woven through all activities. Each activity has a "Teacher Resources" section, with clear learning objectives, process skill goals, prerequisites, assessment questions, and teacher tips.

Catalog No.	Description	Price/Each
AP11683	POGIL® Activities for AP® Chemistry, 2nd Edition, Digital + Hard Copy	$97.00

Flash Cards for AP Chemistry

FLINN EXCLUSIVE

By: Richard Furlough, Nansemond-Suffolk High School, Suffolk, VA



Unique set of 100 updated flash cards reviews all the topics covered in AP Chemistry—from periodicity to spectroscopy. Students not only will perform better on the AP exam, but will also retain concepts for years to come when they use the flash cards to teach themselves. Purchase two or three sets so students can take them home for review and study. Updated 2013.

100 double-sided flash cards, 10.8 cm x 9.3 cm.

Catalog No.	Description	Price/Each
AP9272	Flash Cards for AP Chemistry	$13.75

Net Ionic Equations Flash Cards for AP Chemistry

FLINN EXCLUSIVE

By: Maureen Elliot, Eaglecrest High School, Aurora, CO



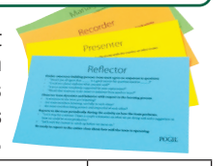
Each card has a sample exam question on the front and the reactants and products, in the form of a net ionic equation, on the back. These net ionic equation cards will be a valuable tool for you and a great confidence booster for your students. 87 double-sided flash cards, 10.8 cm x 9.3 cm.

Catalog No.	Description	Price/Each
AP6664	Net Ionic Equations Flash Cards for AP Chemistry	$10.35

POGIL® Role Cards

FLINN EXCLUSIVE

By: POGIL Project



Colorful role cards for use with POGIL activities. Each set contains cards for seven groups of four students. Each role is represented with a different color. The four roles are manager, presenter, recorder and reflector. The cards are 8.5" x 5.5", laminated and printed on sturdy cardstock.

Catalog No.	Description	Price/Each
AP9841	POGIL Role Cards	$11.35

AP® CHEMISTRY—BOOKS AND REVIEW MATERIALS continued on next page.

FLINN EXCLUSIVE

Drink Coffee Periodically Mug

We drink coffee periodically; why not have some chemistry fun, too? This mug is sure to be a favorite among teachers and students! Intended for nonlaboratory use.



Catalog No.	Description	Price/Each
AP9457	Drink Coffee Periodically Mug	$16.00

Advanced Placement®—Books and Review Materials, continued

Chemical Reactions Calculator

FLINN EXCLUSIVE

By: Greg Booth, Student, University of Chicago, Chicago, IL

Simply slide the correct reactant into the top opening and the products of the reaction will appear in the box next to the second reactant. The reactions are color-coded to determine the type of reaction. Over 100 reactions with answers. The slide-chart has a periodic table on the back and descriptions of reaction types on the front. Sold in packages of ten calculators.

Catalog No.	Description	Price/Pkg. of 10
AP6905	Chemical Reactions Calculator	$40.00

Student Laboratory Notebook

Perfect chemistry lab notebook conforms to ACS standards! Students permanently record all lab data on the sequentially numbered pages—just like in college or at a research lab. Carbonless duplicate sets of 50 or 100 pages produce clean and easy-to-read copies. Micro-perforations allow students to easily tear out pages for grading. Waterproof film lamination on front and back covers. Book also includes a lab safety tips page, info on keeping a lab notebook, table of contents page, tear-out periodic table, table of atomic number and average atomic weights, and additional reference charts. 8½" x 11". Available in top-bound and spiral-bound.

Catalog No.	Description	Binding	Number of Duplicate Sets	Price/Each	Price/Each in Quantities of 100 or more
AP6116	Student Laboratory Notebook	Spiral Bound	50	$20.41	$18.80
AP6117			100	25.80	24.26

Elements & the Periodic Table—NewPath Visual Learning Guide, Set of 10

NEW!



Elements & the Periodic Table Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11744	Elements & the Periodic Table—NewPath Visual Learning Guide, Set of 10	$43.32

Charts and Posters

Compound Interest Posters

By: Andy Brunning and Compound Interest, Cambridge, UK

All posters are laminated and 24" x 36". See flinnsci.com for full descriptions and images of each poster.

Catalog No.	Description	Price/Each
AP8985	Elements of a Smartphone Poster	$26.35
AP9024	The Mole Poster	27.26
AP9025	Atmospheres of the Solar System Poster	26.35
AP9097	Trends in the Periodic Table Poster	26.35
AP9763	The Chemical Structure of DNA Poster	27.25
AP9764	A Rough Guide to Spotting Bad Science Poster	27.25
AP9765	The Chemistry of Body Odors Poster	27.25
AP9766	The Chemistry of Colored Glass Poster	25.85
AP9900	The Chemistry of Firework Colors	26.15
AP9904	A History of the Atom: Theories and Models	27.05
AP9905	The Chemistry of Blood	27.05

Chemistry of Fruits Posters *By: James Kennedy*

Explore the chemistry of these all natural fruits. 24" x 36".

Catalog No.	Description	Price/Each
AP9759	All Natural Banana Poster	$26.73
AP9760	All Natural Strawberry Poster	25.85

Esters and Their Smells Poster *By: James Kennedy*

Catalog No.	Description	Price/Each
AP9761	Esters and Their Smells Poster, 24" x 36"	$26.35

Models of Molecules and Chart Set

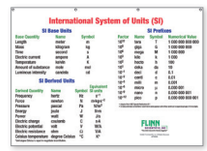
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Periodic Tables

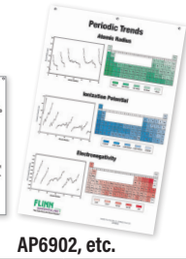
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Spectroscopy and Spectrum Charts

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AP6899, etc.



AP6902, etc.

FLINN EXCLUSIVE

See details at flinnsci.com.

Catalog No.	Description	Price/Each
AP7042	Acid–Base Strength Chart	$36.59
AP7229	Acid–Base Strength Chart, Notebook Size, Pad of 30	17.50
AP6897	Atomic Sizes and Radii Chart	36.59
AP7223	Atomic Sizes and Radii Chart, Notebook Size, Pad of 30	17.50
AP6899	Basic SI Units and Prefixes Chart	29.70
AP7225	Basic SI Units and Prefixes Chart, Notebook Size, Pad of 30	17.50
AP6898	Ion Names, Formulas and Charges Chart	36.50
AP6902	Periodic Trends Chart	49.00
AP7227	Periodic Trends Chart, Notebook Size, Pad of 30	17.50
AP6901	Solubility Rules Chart	35.95
AP7226	Solubility Rules Chart, Notebook Size, Pad of 30	17.50
AP7041	Standard Reduction Potential Chart	36.59
AP7228	Standard Reduction Potential Chart, Notebook Size, Pad of 30	13.13

NewPath Learning Guides and Flip Chart Sets for Chemistry



AP9945

The NewPath Learning Guides and Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description		Price/Each
AP9943	Properties & States of Matter	Flip Chart	$39.50
AP11505		Flip Chart with Online Lesson	14.95
AP11555		Flip Chart with Online Lesson, Set of 10	99.00
AP9944	Atoms & Chemical Bonding	Flip Chart	39.50
AP11506		Flip Chart with Online Lesson	14.95
AP11556		Flip Chart with Online Lesson, Set of 10	99.00
AP9945	Elements & the Periodic Table	Flip Chart	39.50
AP11507		Flip Chart with Online Lesson	14.95
AP11557		Flip Chart with Online Lesson, Set of 10	99.00
AP9946	Chemical Reactions	Flip Chart	39.50
AP11508		Flip Chart with Online Lesson	15.59
AP11558		Flip Chart with Online Lesson, Set of 10	99.00

Chemical Demonstration Kits

Are the "oohs" and the "aahs" from excitement and amazement missing in your chemistry classroom? Bring back some of the fun and thrills of chemistry by using a convenient, time-saving kit with these features:

- **Seven Times per Kit—**We have designed these exciting demonstrations specifically for your chemistry students, with enough materials to do each demonstration seven times.
- **Fast and Easy—**Chemicals and chemical solutions are already prepared. All you need to do is open the box, dispense and measure the quantity of chemical required and conduct the demonstration.
- **Guaranteed to Work—**Many times demonstration failures are the result of old, poor quality chemicals. We guarantee your success because you will always be using fresh, new chemicals.
- **Affordable—**No longer will you be required to purchase a large quantity of chemicals only to have to store them on your shelf for decades. We provide you with just the right amount of chemicals needed to conduct the demonstration seven times.*
- **Documented—**Each demonstration kit includes our "Teacher Demonstration Notes." Notes include the procedure to be followed, what reactions will occur, tips on how to present the demonstration and complete safety and disposal information.
- **Safe—**No longer will you have to be concerned with old chemicals, chemical storage problems or future chemical disposal problems. We provide you with just the right amount of chemicals.

Excite, energize and bring back the "magic" of chemistry using Flinn Chemical Demonstration Kits.

***No lab apparatus furnished with kits. Lab apparatus required is commonly available in most school science departments.**

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WWW.FLINNSCI.COM

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Chemical Demonstration Kits—Acid-Base Indicators

Battle of the Acids—Strong vs. Weak Acids



By: The Flinn Staff

Compare the "frothing and foaming" reaction of two different acids with calcium carbonate using our exclusive "rainbow acid" universal indicator.

Concepts: Strong acid, weak acid, conjugate base, pH.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6287	Battle of the Acids—Strong vs. Weak Acids—Chemical Demonstration Kit	$ 57.25
AP5429	Demonstration Tray, Large	104.00

Disappearing Ink



By: David A. Katz, Retired, Wilmington, DE

Write secret messages with disappearing ink and then use chemistry to develop and transmit the messages.

Concepts: Acids and bases, pH, indicators.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8894	Disappearing Ink—Chemical Demonstration Kit	$29.05

Disappearing Rainbow

By: The Flinn Staff



Your students will love this colorful demonstration that is always a teacher favorite at science conventions.

Concepts: Acid-base indicators.

Catalog No.	Description	Price/Each
AP8979	Disappearing Rainbow—Chemical Demonstration Kit	$47.60

Dry Ice Color Show



By: Lee Marek, Retired, Naperville North H.S., Naperville, IL

Add chunks of dry ice to various acid-base indicator solutions and observe the brilliant color changes.

Concepts: Sublimation, acid-base indicators.

Catalog No.	Description	Price/Each
AP6201	Dry Ice Color Show—Chemical Demonstration Kit	$28.95

FLINN EXCLUSIVE

Hydrolysis of Salts—Acidic, Basic or Neutral?

By: John Wass, Western Branch H.S., Chesapeake, VA



Using universal indicator in Petri dishes on overhead projector, show students a colorful pH rainbow.

Concepts: Acids and bases, pH, hydrolysis of salts.

Catalog No.	Description	Price/Each
AP6187	Hydrolysis of Salts—Acidic, Basic or Neutral? Chemical Demonstration Kit	$32.25

Goldenrod Paper



By: The Flinn Staff

Write hidden messages, splash fake blood or amaze your students with this great introduction to acids and bases.

Concepts: Acid-base indicators, equilibrium.

Catalog No.	Description	Price/Each
AP9868	Goldenrod Paper—Chemical Demonstration Kit	$19.95
AP9869	Goldenrod Paper, Ream of 500 Pieces	97.85

NEW!

Acids, Bases & Salts—NewPath Visual Learning Guide, Set of 10



Acids, Bases & Salts Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11733	Acids, Bases & Salts—NewPath Visual Learning Guide, Set of 10	$43.32

Indicator Sponge—A Discrepant Event



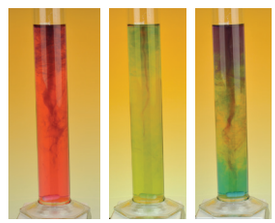
By: The Flinn Staff

Can Red + Red = Blue? Dip a red sponge into a red solution—watch it turn blue. Place the blue sponge into a blue solution—it turns back to red.

Concepts: Acid-base indicators.

Catalog No.	Description	Price/Each
AP6160	Indicator Sponge—A Discrepant Event Chemical Demonstration Kit	$29.65

Organic Rainbow



By: Penney Sconzo, Westminster Academy, Atlanta, GA

This demonstration uses universal indicator to vividly display the hydrolysis reaction of *tert*-butyl chloride.

Concepts: Organic chemistry, hydrolysis, indicators.

Catalog No.	Description	Price/Each
AP6433	Organic Rainbow—Chemical Demonstration Kit	$37.55
AP8599	Hydrometer Cylinder, Glass	57.00

CHEMICAL DEMONSTRATION KITS—ACID-BASE INDICATORS continued on next page.

Large Demonstration Tray

Fiberglass,
76 L x 51 W x 5 cm D.

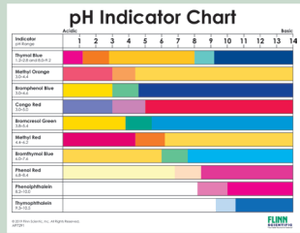


Catalog No.	Description	Price/Each
AP5429	Demonstration Tray	$104.00

FLINN EXCLUSIVE

pH Indicator Chart

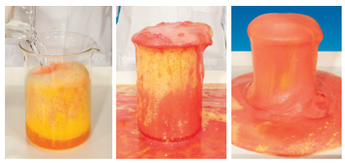
Laminated, 24" x 36".



Catalog No.	Description	Price/Each
AP7291	pH Indicator Chart	$20.05

Chemical Demonstration Kits—Acid-Base Indicators, continued

Orange Juice to Strawberry Float



By: The Flinn Staff

Change a beaker of "orange juice" into a big, foamy, messy strawberry float! Simply mix chemicals together in a beaker, add an acid-base indicator and a colorless solution, a mountain of foam will erupt out of the beaker.

Concepts: Acid-base indicators, neutralization.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP4778	Orange Juice to Strawberry Float—Chemical Demonstration Kit	$68.60

Acid-Base Titration with Conductivity



By: The Flinn Staff

At first, the clear pink solution lights up the light bulb on the conductivity tester. As sulfuric acid is added, the light gradually fades and the solution turns milky white.

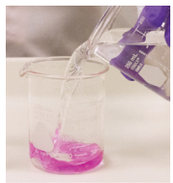
Concepts: Acid and bases, conductivity, precipitation.

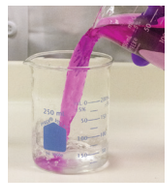
Catalog No.	Description	Price/Each
AP8482	Acid-Base Titration with Conductivity—Chemical Demonstration Kit	$35.10

Flinn's *Exploring Chemistry*™ Acids and Bases Package

See page 246.

Water to Grape Juice to Milk





By: The Flinn Staff

Pour water into an "empty" glass and watch as it turns into purple "grape" juice. Continue pouring from glass to glass and you'll serve up some "lemonade", a fizzy soda, then "milk" and finally Pepto-Bismol®.

Concepts: Acids and bases, solubility, precipitates.

See free video at flinnsci.com.

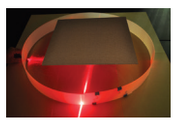
Catalog No.	Description	Price/Each
AP4867	Water to Grape Juice to Milk—Chemical Demonstration Kit	$32.10

Flinn's *Exploring Chemistry*™ Atomic and Electron Structure Package

See page 246.

Chemical Demonstration Kits—Atomic and Electron Structure

Indirect Observations and Inference



By: Jonathan McClintock, St. Albert High School, Council Bluffs, IA

In this demonstration, students are asked to mentally picture an object hidden beneath a cardboard blind and formulate hypotheses about its size, shape and composition.

Concepts: Indirect measurement, atomic structure, inference.

Catalog No.	Description	Price/Each
AP7425	Indirect Observations and Inference—Demonstration Kit	$59.10

Molecular Motion Demonstrator



By: The Flinn Staff

By varying the number of molecules and movement of the apparatus, you can illustrate the structure of substances in various states, such as solid, liquid or gas.

Concepts: Molecular motion, kinetic molecular theory.

Catalog No.	Description	Price/Each
AP6466	Molecular Motion Demonstrator—Demonstration Kit	$50.95

FLINN EXCLUSIVE

The Photoelectric Effect—Light Energy



By: The Flinn Staff

Simply charge the electroscope negatively using a rubber rod, and then shine short-wavelength UV light from the Sun or a lamp onto the zinc surface.

Concepts: Photoelectric effect, energy/wavelength of light, quantization of energy.

Catalog No.	Description	Price/Each
AP6627	The Photoelectric Effect—Light Energy Demonstration Kit	$ 58.85
AP6658	Ultraviolet Lamp, Short Wave	146.53

Drawing with Light—Photoelectric Effect



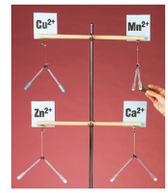
By: The Flinn Staff

Hold and slide the photoelectric board against the phosphorescent sheet and allow your students to make observations. Which color LED contains enough energy to produce a glow on the sheet?

Concepts: Photoelectric effect, light energy and wavelength.

Catalog No.	Description	Price/Each
AP9582	Drawing with Light—Photoelectric Effect Demonstration Kit	$147.45

Paramagnetic Metal Ions



By: Jeff Bracken, Westerville North H.S., Westerville, OH

Four different metal salts are placed in chambers and a strong magnet is used to move the chambers and show the differences in the magnetic forces of the four salts. Teacher Notes included.

Concepts: Magnetism, electron configuration, orbitals.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6309	Paramagnetic Metal Ions—Chemical Demonstration Kit	$61.05

Chemical Demonstration Kits—Chemical Reactions

Classifying Chemical Reactions



By: The Flinn Staff

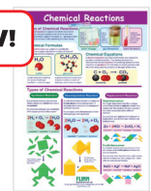
Use these ten targeted demonstrations to help students become proficient in identifying the five different types of chemical reactions.

Concepts: Combination, combustion, decomposition, electrolysis, exothermic, oxidation-reduction, precipitation, single and double replacement reactions.

Catalog No.	Description	Price/Each
AP6605	Classifying Chemical Reactions—Multi-Demonstration Kit	$170.00

Chemical Reactions—NewPath Visual Learning Guide, Set of 10

NEW!



Chemical Reactions Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11745	Chemical Reactions—NewPath Visual Learning Guide, Set of 10	$43.32

CHEMICAL DEMONSTRATION KITS—CHEMICAL REACTIONS continued on next page.

Chemical Demonstration Kits—Chemical Reactions, continued

Flinn's *Exploring Chemistry*™ Chemical Reactions Package See page 246.

Chemistry of Food Additives

By: The Flinn Staff

Can artificial be beneficial? This four-part demonstration lets students see the science behind some marketing.

Concepts: Consumer chemistry, food additives.



Catalog No.	Description	Price/Each
AP7288	Chemistry of Food Additives—Multi-Demonstration Kit	$75.75

Identifying Reactions—Multi-Demonstration Kit

By: The Flinn Staff

Recognizing chemical reactions and "translating" them into chemical equations are essential skills students need to be successful in chemistry.

Concepts: Combination, combustion, decomposition, electrolysis, exothermic, oxidation-reduction, precipitation, single and double replacement reaction.



Catalog No.	Description	Price/Each
AP6604	Identifying Reactions—Multi-Demonstration Kit	$90.95

Carbon Snake

By: The Flinn Staff

Watch how your students react as they see the carbon come out of the sand and simulate a snake; it grows and grows!

Concepts: Decomposition, exothermic reaction, chemical change.



Catalog No.	Description	Price/Each
AP9584	Carbon Snake—Chemical Demonstration Kit	$28.20

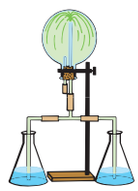
Chemical Demonstration Kits—Chemiluminescence

Chemiluminescent Ammonia Fountain

By: The Flinn Staff

An exciting demonstration showing the solubility of a gas in water and the conversion of chemical energy to light.

Concepts: Chemiluminescence, solubility.



Catalog No.	Description	Price/Each
AP8983	Chemiluminescent Ammonia Fountain—Chemical Demonstration Kit	$55.80

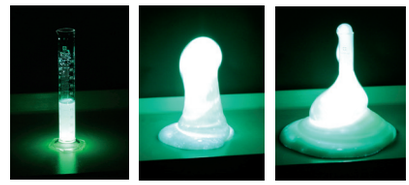
FLINN EXCLUSIVE

Chemiluminescent Elephant's Toothpaste

By: John J. Fortman, Retired, Wright State University, Dayton, OH

A new twist on an old favorite! It's even more wonderful when yeast is the catalyst and light stick chemicals are added, creating volumes of glowing foam.

Concepts: Chemiluminescence, decomposition reactions, catalysts.



Catalog No.	Description	Price/Each
AP7385	Chemiluminescent Elephant's Toothpaste—Chemical Demonstration Kit	$51.45
AP5429	Demonstration Tray, Large	104.00

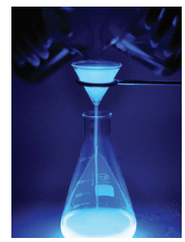
Cool Light

By: The Flinn Staff

You will prepare two solutions and pour them simultaneously into a flask. Voilà! A beautiful blue glow!

Concepts: Chemiluminescence, oxidation–reduction.

See free video at flinnsci.com.



Catalog No.	Description	Price/Each
AP8627	Cool Light—Chemical Demonstration Kit	$37.50

Energetic Light

By: Tom Russo, Chemistry Teacher, Milburn, NJ

Tired of chemiluminescent experiments that only last for a few seconds? Now you can demonstrate the conversion of chemical energy into light energy for nearly 10 minutes.

Concepts: Chemilumescence, oxidation-reduction.

See free video at flinnsci.com.



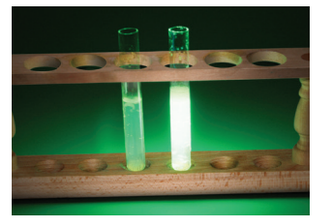
Catalog No.	Description	Price/Each
AP8978	Energetic Light—Chemical Demonstration Kit	$31.85

Exploring Light Sticks

By: Tom Kuntzleman, Spring Arbor University, Spring Arbor, MI

Compare the effervescent glow of light sticks with different chemical additives to demonstrate the nature of the chemical reaction, the role of a catalyst and the effect of pH on the ionization of the reactants.

Concepts: Chemiluminescence, pH optimization, acid–base chemistry, catalysts.



Catalog No.	Description	Price/Each
AP7378	Exploring Light Sticks—Chemical Demonstration Kit	$45.35

CHEMICAL DEMONSTRATION KITS—CHEMILUMINESCENCE continued on next page.



Chemventory™

SEE PAGE 576 FOR DETAILS!

Take your chemical inventory system to the next level with Flinn's enhanced Chemventory. Chemventory is a cloud-based system that allows multiple users to access a comprehensive and personalized database from any location or device.

For more information, visit us at **chemventory.flinnsci.com**

Chemical Demonstration Kits—Chemiluminescence, continued

Fountain of Light

By: The Flinn Staff



A mixture of solutions is prepared, the lights are dimmed, and hydrogen peroxide is added. The mixture first glows red and then, amidst vigorous frothing and evolution of heat, an eerie blue glow appears.

Concepts: Chemiluminescence, oxidation-reduction.

Catalog No.	Description	Price/Each
AP8926	Fountain of Light—Chemical Demonstration Kit	$ 50.25
AP5429	Demonstration Tray, Large	104.00

Instant Light

By: Rhonda Reist, Olathe High School, Olathe, KS



Add a few teaspoons of Instant Light crystals to water and watch as the solution immediately produces an eerie blue glow that will last for several minutes.

Concepts: Chemiluminescence, oxidation-reduction.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP9118	Instant Light—Chemical Demonstration Kit	$15.35

Let There Be Light! Chemiluminescence

By: The Flinn Staff







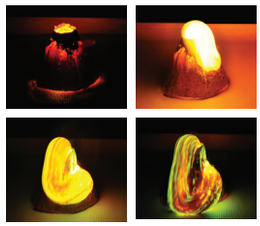
Captivate students' attention with four "enlightening" demonstrations about chemiluminescence!

Concepts: Chemiluminescence, oxidation-reduction, catalysts, fluorescence, absorbance, transmittance, emission, excited versus ground states, atomic emission.

Catalog No.	Description	Price/Each
AP7290	Let There Be Light! Chemiluminescence Demonstration Kit	$101.05

Chemiluminescent Chemical Reactions in a Model Volcano

By: The Flinn Staff



Construct a model volcano using polyurethane foam and then produce a fiery lava flow using the decomposition of hydrogen peroxide and light stick chemicals.

Concepts: Chemiluminescence, oxidation-reduction.

Catalog No.	Description	Price/Each
AP7421	Chemiluminescent Chemical Reactions in a Model Volcano—Chemical Demonstration Kit	$ 77.95
AP5429	Demonstration Tray, Large	104.00

Chemical Demonstration Kits—Chromatography

Kool Chromatography

By: The Flinn Staff



Separate different colored dyes found in grape Kool-Aid® using chromatography methods that mimic popular methods used in research and industry.

Concepts: Column chromatography, polar/non-polar interactions.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8950	Kool Chromatography—Chemical Demonstration Kit	$42.65

FLINN EXCLUSIVE

Chemical Demonstration Kits—Classifying Matter

Classifying Matter—"Nuts-and-Bolts"

By: The Flinn Staff



Use this "nuts-and-bolts" demonstration to help students visualize abstract concepts relating to the classification of matter.

Concepts: Elements, compounds, mixtures, classification of matter.

Catalog No.	Description	Price/Each
AP6291	Classifying Matter—"Nuts and Bolts" Demonstration Kit	$31.05

Creating Elements

By: The Flinn Staff



In this three-part demonstration use characteristic reactions to produce elements from compounds.

Concepts: Electrolysis, cathode, anode, oxidation-reduction, single replacement reaction, dehydration reaction, exothermic reactions.

Catalog No.	Description	Price/Each
AP7535	Creating Elements—Multi-Demonstration Kit	$105.00

What Is an Element?

By: The Flinn Staff



Kit includes 20 cards with examples of both elements and nonelements. Students identify elements using the "Yes" and "No" header cards included with the kit.

Concepts: Elements, atoms.

Catalog No.	Description	Price/Each
AP6850	What Is an Element? Demonstration Kit	$27.40
AP6842	Velcro® Dot Tape	11.85
AP4586	Magnetic Tape	4.85

Chemical Demonstration Kits—Complex Ions

Colorful Iron Complexes

By: The Flinn Staff



Easily distinguish solutions of iron(II) and iron(III) ions by performing redox reactions between iron's two oxidation states.

Concepts: Oxidation-reduction, oxidation numbers, complex ions, electron configuration, transition metals.

Catalog No.	Description	Price/Each
AP5946	Colorful Iron Complexes—Chemical Demonstration Kit	$28.75

Old Glory

By: The Flinn Staff



The vivid colors in this demonstration will leave a lasting impression as students learn about double replacement reactions and complex ion formation.

Concepts: Chemical reactions, double replacement, and complex ions.

Catalog No.	Description	Price/Each
AP8463	Old Glory—Chemical Demonstration Kit	$31.45

CHEMICAL DEMONSTRATION KITS continued on next page.

Chemical Demonstration Kits—Environmental Science

Acid Rain in a Bag



By: Sue Anne Berger, Colorado School of Mines, Evergreen, CO

Perform a safe, microscale simulation of acid rain formation in a plastic bag. Chemicals react to form a visible brown cloud of nitrogen dioxide which, in turn, acidifies water present in the system.

Concepts: Environmental chemistry, acid-base indicators.

Note: Perform this demonstration in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP9157	Acid Rain in a Bag—Demonstration Kit	$30.40

Enviro-Bond™ 403—An Oil Spill Cleanup



By: Steve Spangler, Regis University, Denver, CO

This oil-encapsulating polymer demonstration will undoubtedly capture your students' interest, stimulate scientific inquiry and heighten their awareness of the emerging environmental pollution issues facing our society.

Concepts: Latest technology in oil recovery.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
FB1025	Enviro-Bond™ 403—An Oil Spill Cleanup Demonstration Kit	$49.85
E0058	Enviro-Bond™ 403—Hydrocarbon Encapsulant, 100 g	13.50

Chemical Demonstration Kits—Equilibrium

Common Ion Effect



By: The Flinn Staff

In this set of demonstrations, students observe a series of dramatic changes when common ions are added to solutions at equilibrium.

Concepts: Common ion effect, equilibrium, Le Chatelier's principle.

Catalog No.	Description	Price/Each
AP7043	Common Ion Effect—Chemical Demonstration Kit	$66.90

Demonstrate Phase Changes of CO_2



By: Walter Rohr, Retired, Eastchester H.S., Eastchester, NY

Using a unique device called a Triple Point of CO_2 Apparatus, all three phases of CO_2 can now be easily and safely observed. The apparatus comes with a large pressure gauge to monitor the pressure changes in the apparatus.

Concepts: Equilibrium, phase diagrams, triple point, sublimation.

Note: Dry ice is required, but not provided.

Catalog No.	Description	Price/Each
AP4505	Demonstrate Phase Changes of CO_2—Demonstration Kit	$ 79.30
AP7484	Dry Ice Maker	675.00

FLINN EXCLUSIVE

Hot and Cold Equilibrium—Le Chatelier's Principle



By: Walter Rohr, Retired, Eastchester H.S., Eastchester, NY

Pour some violet-colored solution into three different test tubes. Place one tube in cold water—the solution turns pink. Place another tube in hot water—the solution turns a deep blue. Leave the third tube at room temperature—the solution remains violet.

Concepts: Equilibrium, Le Chatelier's Principle, density, absorption/transmission.

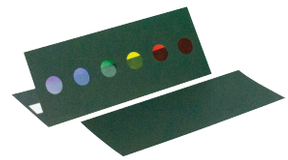
Catalog No.	Description	Price/Each
AP5938	Hot and Cold Equilibrium—Le Chatelier's Principle—Chemical Demonstration Kit	$25.15

Chemical Demonstration Kits—Fluorescence/Phosphorescence

Energy in Photons

By: Rhonda Reist, Olathe North H.S., Olathe, KS

In this teacher-developed kit, light is shined through a rainbow of filters onto a piece of phosphorescent material. The filters absorb some wavelengths of the light and transmit others.



Concepts: Phosphorescence, transmittance, absorption, emission.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP4576	Energy in Photons—Demonstration Kit	$35.50

Fluorescent Dye

By: The Flinn Staff

Under normal white light in the laboratory, these solutions appear colorless, yellow, orange and pink, but when the lights are turned off and a black light is shined on them, they glow—and with different colors!



Concepts: Fluorescence, absorption, emission, electronic structure, spectroscopy.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP4848	Fluorescent Dye—Chemical Demonstration Kit	$26.95
AP9030	Ultraviolet Lamp, 18"	53.85

The Glowing Germ Contamination



By: Rhonda Reist, Olathe North H.S., Olathe, KS

Place a small quantity of glowing lotion on an object in the lab. Turn off the lights and turn on an ultraviolet (black) light. Students will be amazed at the glowing contamination.

Concepts: Fluorescence, epidemiology, laboratory hygiene safety.

Note: Ultraviolet light and a completely dark room are necessary for demonstration.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP9080	The Glowing Germ Contamination—Demonstration Kit	$20.85
AP9030	Ultraviolet Lamp, 18"	53.85

CHEMICAL DEMONSTRATION KITS—ENVIROMENTAL SCIENCE continued on next page.

Chemical Demonstration Kits—Gas Laws/Properties of Gases

Flinn's *Exploring Chemistry*™ Gases and Gas Laws Package See page 246.

Diffusion of Gases—Kinetic Energy



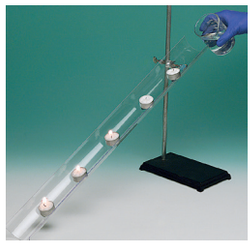
By: The Flinn Staff

Demonstrate the motion of invisible ammonia and hydrochloric acid gas molecules by their colorful reactions with acid–base indicators.

Concepts: Diffusion, kinetic-molecular theory.

Catalog No.	Description	Price/Each
AP6630	Diffusion of Gases—Kinetic Energy Demonstration Kit	$52.55

Seeing the Invisible



By: Jesse Bernstein, Miami Country Day School, Miami, FL

Is it possible to pour a gas? Set up the specially designed ramp with equally spaced candles. Add a clear liquid to the beaker, hold the beaker at the top of the ramp, and pour the invisible contents. One by one the candles are snuffed out!

Concepts: Buoyancy, gas density.

Catalog No.	Description	Price/Each
AP7046	Seeing the Invisible—Chemical Demonstration Kit	$41.85

Pressure vs. Temperature Gas Law Apparatus



Demonstrate the relationship between the pressure and temperature of a gas, and accurately determine the value of absolute zero, with this innovative gas law apparatus.

Note: A digital thermometer is required and available separately.

Catalog No.	Description	Price/Each
AP7159	Pressure vs. Temperature Gas Law Apparatus	$108.00
AP6049	Flinn Digital Pocket Thermometer, Economy Choice	31.62

Gas Laws Apparatus



PV = nRT. High-quality apparatus demonstrates the relationship between pressure, volume and temperature of a gas. A digital thermometer displays how the temperature changes. One AA battery is required and available separately. Heavy-duty metal base. 6¼" L x 4½" W x 8" H.

Catalog No.	Description	Price/Each
AP7822	Gas Laws Apparatus	$109.50

Generating and Detecting Ozone



By: The Flinn Staff

Investigate the formation and properties of ozone with this novel, small-scale gas-generating kit. A special modified transfer pipet serves as both the reaction vessel and delivery tube for the ozone.

Concepts: Electrolysis, oxidation–reduction, properties of ozone.

Catalog No.	Description	Price/Each
AP7249	Generating and Detecting Ozone—Chemical Demonstration Kit	$65.30

FLINN EXCLUSIVE

Chemical Demonstration Kits—Kinetics/Catalysts

A Flash of Blue



By: Jim and Julie Ealy, Retired, The Peddie School, Hightstown, NJ

In a flash, like magic, a colorless solution turns a dramatic dark blue color. You and your students will be amazed by this popular starch–iodine clock reaction.

Concepts: Clock reactions, kinetics, catalysts.

Catalog No.	Description	Price/Each
AP8657	A Flash of Blue—Chemical Demonstration Kit	$36.20

Iodine Clock Reaction



By: The Flinn Staff

Mix two colorless solutions and watch as, after a few seconds, they suddenly change from colorless to dark blue. The class records six sets of data comparing the effects of concentration, temperature and a catalyst on the measured rate.

Concepts: Kinetics, catalysts, clock reactions.

Catalog No.	Description	Price/Each
AP4601	Iodine Clock Reaction—Chemical Demonstration Kit	$60.27

"Magic Genie"



By: Jim and Julie Ealy, Retired, The Peddie School, Hightstown, NJ

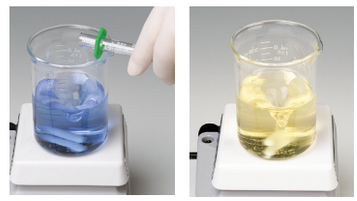
When potassium iodide is dropped into a flask containing 30% hydrogen peroxide, a "magical" genie appears in the form of water vapor and oxygen.

Concepts: Catalysts, gases, exothermic reactions.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP2092	"Magic Genie"—Chemical Demonstration Kit	$39.05

Kinetics of a First-Order Reaction



By: Lew Brubacher, University of Waterloo, Waterloo, ON

Students time how long it takes to neutralize each batch of base until all the *tert*-butyl chloride has reacted. Students use these time values to calculate the hydrolysis reaction order.

Concepts: First-order kinetics, hydrolysis, indicators.

Catalog No.	Description	Price/Each
AP6615	Kinetics of a First-Order Reaction—Chemical Demonstration Kit	$35.00

Old Foamey



By: Jim and Julie Ealy, Retired, The Peddie School, Hightstown, NJ

Mix a combination of chemicals together with dishwashing liquid in a tall borosilicate cylinder and stand back. Watch as a large amount of soapy foam erupts from the cylinder.

Concepts: Catalysts, exothermic reactions, gases, oxidation–reduction.

Note: A large demonstration tray is recommended.

Catalog No.	Description	Price/Each
AP2085	Old Foamey—Chemical Demonstration Kit	$ 33.00
AP5429	Demonstration Tray, Large	104.00

CHEMICAL DEMONSTRATION KITS—KINETICS/CATALYSTS continued on next page.

Chemical Demonstration Kits—Kinetics/Catalysts, continued

Sudsy Kinetics



By: Walter Rohr, Retired, Eastchester H.S., Eastchester, NY

Teach kinetics in a fun and sudsy way! This three-part demonstration provides an interesting twist on the traditional "Old Foamey" demonstration.

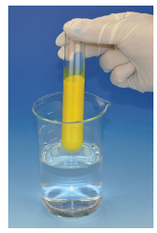
Concepts: Kinetics, catalysts, reaction intermediates.

Note: A large figerglass demonstration tray (AP5429) is recommended.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP4866	Sudsy Kinetics—Chemical Demonstration Kit	$ 78.40
AP5429	Demonstration Tray, Large	104.00

The Cinnamon Clock Reaction



By: Jim and Julie Ealy, Retired, The Peddie School, Hightstown, NJ

A clock reaction is conducted using cinnamaldehyde, the organic molecule extracted from cinnamon sticks. Color changes are fascinating.

Concepts: Kinetics, organic chemistry.

Catalog No.	Description	Price/Each
AP2086	The Cinnamon Clock Reaction—Chemical Demonstration Kit	$44.30

The Pink Catalyst



By: Jim and Julie Ealy, Retired, The Peddie School, Hightstown, NJ

Learn how a catalyst works by observing the color changes of pink cobalt ions. You'll see the catalyst as it gets swept up in the oxidation of tartrate by hydrogen peroxide, changes into a green intermediate, and then reappears again at the end.

Concepts: Kinetics, catalysts.

Catalog No.	Description	Price/Each
AP2084	The Pink Catalyst—Chemical Demonstration Kit	$32.45

The ROY G BIV Clock Reaction



By: Steve Spangler, Regis University, Denver, CO

Take seven different dry chemical mixtures and add each to a separate beaker. Pour a clear liquid into each beaker. In less than a minute, the large pH change at the end of this clock reaction causes the seven rainbow colors.

Concepts: Clock reactions, pH indicators, buffers.

Catalog No.	Description	Price/Each
AP6280	The ROY G BIV Clock Reaction—Chemical Demonstration Kit	$52.05

"Visualizing the Transition State" Demonstration Model



By: Jeff Fieberg, Centre College, Danville, KY

Demonstrate the properties of the transition state or activated complex with this unique, colorful demonstration device—a plastic ball that suddenly switches inside and out when tossed into the air with just the right amount of spin.

Concepts: Chemical kinetics, transition state theory, activated complex.

Catalog No.	Description	Price/Each
AP7104	"Visualizing the Transition State" Demonstration Model	$17.60

FLINN EXCLUSIVE

Chemical Demonstration Kits—Light-Activated Reactions

Thionin—The Two-Faced Solution



By: The Flinn Staff

"Elegant" best describes this wonderful demonstration. A large beaker containing a purple solution is placed on an overhead projector. Aluminum foil is placed under the beaker so only half the beaker will be exposed to direct light.

Concepts: Light-activated reactions, indicators.

Catalog No.	Description	Price/Each
AP8845	Thionin—The Two-Faced Solution—Chemical Demonstration Kit	$30.05

Chemical Demonstration Kits—Nanotechnology

Amazing Modern Materials—Multi-Demonstration Kit See page 391.

Commercial Ferrofluid



Your students will be fascinated as you demonstrate the unique properties of this nanoscience material and produce interesting 3-dimensional magnetic sculptures.

Concepts: Nanotechnology, magnetic properties, colloids vs. solutions.

Note: A magnet is required and available separately.

Catalog No.	Description	Price/Each
AP7432	Commercial Ferrofluid—Chemical Demonstration Kit	$48.30
AP5666	Neodymium Magnet	16.83

Ferrofluid Nanotechnology



By: The Flinn Staff

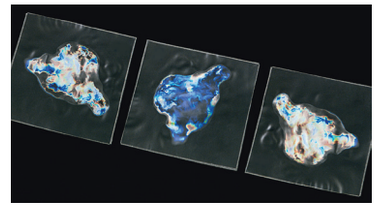
A magnetic liquid, also known as a ferrofluid, may seem like a space-age concept. That's because it is! Now you can prepare a ferrofluid and demonstrate the concept that was invented by NASA in the 1960s to control liquids in space.

Concepts: Ferrimagnetic substances and magnetic properties, colloids vs. solutions, nanotechnology.

Note: Perform this demonstration in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP7118	Ferrofluid Nanotechnology—Chemical Demonstration Kit	$58.75

Liquid Crystals—How Do They Do That?



By: The Flinn Staff

Combine two clear liquids and heat them, then watch as the mixture produces vivid color changes from red to green to blue as it cools.

Concepts: Liquid crystals, nanotechnology, phases of matter, light reflection and transmission.

Catalog No.	Description	Price/Each
AP7195	Liquid Crystals—How Do They Do That? Chemical Demonstration Kit	$43.85

CHEMICAL DEMONSTRATION KITS—NANOTECHNOLOGY continued on next page.

Chemical Demonstration Kits—Nanotechnology, continued

Ruby-Red Colloidal Gold Nanotechnology



By: The Flinn Staff

Reacting a very dilute solution of gold chloride in water with sodium citrate, a mild reducing agent, produces elemental gold. The gold particles are so small, 20 nanometers in diameter, that the "metallic" gold is uniformly dispersed in a stunning, transparent, ruby-red solution!

Concepts: Nanotechnology, colloids vs. solutions, measurements.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7117	Ruby-Red Colloidal Gold Nanotechnology—Chemical Demonstration Kit	$44.20

Chemical Demonstration Kits—Oscillating Reactions

Fantastic Four-Color Oscillator



By: The Flinn Staff

Simply measure out and pour together four solutions, wait about 10 seconds, and observe the solution flash to green and then to blue and to purple and to red. And if that's not enough—this four-color cycle will repeat itself for well over an hour!

Concepts: Oscillating reactions, equilibrium.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP4833	Fantastic Four-Color Oscillator—Chemical Demonstration Kit	$70.15

Fluorescent Oscillating Reaction



By: Rhonda Reist, Olathe North H.S., Olathe, KS

This unique adaptation of a classic oscillating reaction is due to rising and falling concentrations of ruthenium(II) and (III) complex ions. Use the beautiful, radiant color changes to illustrate oxidation states, then sit back and enjoy the show! Teacher Demonstration Notes, reproducible student worksheet and answers are included.

Concepts: Oscillating reactions, oxidation-reduction reactions, kinetics, catalysts.

Note: UV lamp or black light source is required and available separately.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7245	Fluorescent Oscillating Reaction—Chemical Demonstration Kit	$82.75
AP9030	Ultraviolet Lamp, 18"	53.85

Now You See It—Now You Don't: An Oscillating Chemical Reaction





By: The Flinn Staff

Simply add three white solids to a colorless solution and presto—the solution turns orange, then colorless and orange again. The color of the solution will oscillate approximately every 35 seconds for one-half hour or more.

Concepts: Oscillating reactions, reaction mechanisms.

Note: Perform this demonstration in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP4423	Now You See It—Now You Don't: An Oscillating Chemical Reaction—Chemical Demonstration Kit	$45.30

FLINN EXCLUSIVE

The Overhead Oscillating Clock



By: The Flinn Staff

Simply place a Petri dish on the overhead, add three solutions, and mix. In a short while, blue dots appear on an orange background. The blue dots expand, new dots appear, and the dish is filled with concentric blue rings.

Concepts: Oscillating reactions, oxidation-reduction, reaction mechanisms.

Catalog No.	Description	Price/Each
AP2089	The Overhead Oscillating Clock—Chemical Demonstration Kit	$36.45

The Yellow and Blue Switcheroo



By: Jim and Julie Ealy, Retired, The Peddie School, Hightstown, NJ

Three colorless solutions are mixed to produce a yellow solution and then suddenly the solution turns blue, then yellow again, etc. The solution will oscillate between yellow and blue for ten minutes.

Concepts: Oscillating reactions, kinetics.

Note: Perform this demonstration in a fume hood or well-ventilated lab.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8660	The Yellow and Blue Switcheroo—Chemical Demonstration Kit	$36.36

Chemical Demonstration Kits—Oxidation-Reduction

Foiled Again—Aluminum Loses to Copper





By: The Flinn Staff

Students observe color changes, production of a gas, formation of a solid and a drastic change in temperature. Students learn the crucial role of a catalyst with this visually dramatic demonstration—a true redox battle between aluminum and copper.

Concepts: Oxidation-reduction, catalysis, single replacement reactions.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5936	Foiled Again—Aluminum Loses to Copper—Chemical Demonstration Kit	$53.45

Rapid Oxidation



By: Jim and Julie Ealy, Retired, The Peddie School, Hightstown, NJ

When you add a small amount of glycerin to potassium permanganate, your students will witness the oxidation of glycerin by a permanganate. The reaction is very dramatic!

Concepts: Oxidation-reduction, exothermic reactions.

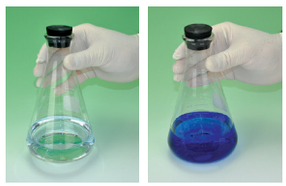
Note: Perform this demonstration in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP2087	Rapid Oxidation—Chemical Demonstration Kit	$23.90

CHEMICAL DEMONSTRATION KITS continued on next page.

Chemical Demonstration Kits—Oxidation-Reduction, continued

Feeling Blue



By: Jim and Julie Ealy, Retired, The Peddie School, Hightstown, NJ

Two colorless solutions and an indicator are mixed, producing a blue solution. Upon standing, the solution becomes colorless. The solution alternates between blue and colorless with shaking and standing, respectively.

Concepts: Oxidation-reduction, indicators, kinetics.

Catalog No.	Description	Price/Each
AP8653	Feeling Blue—Chemical Demonstration Kit	$35.95

Stop-'N-Go Light



By: Jim and Julie Ealy, Retired, The Peddie School, Hightstown, NJ

When you shake this flask of solution, the color of the solution will turn from a soft yellow to a bright red to a light, grassy green and then shift back to yellow again.

Concepts: Oxidation-reduction, indicators, kinetics.

Catalog No.	Description	Price/Each
AP2083	Stop-'N-Go Light—Chemical Demonstration Kit	$24.65

The Reversible Orange and Blue Reaction



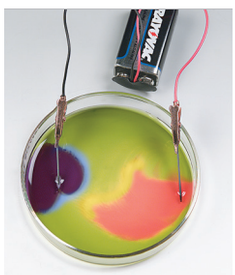
By: Marie Sherman and Dr. Deborah Weil, Ursuline Academy, St. Louis, MO

A warm, clear, blue solution starts to bubble, the temperature rises, the bubbling becomes vigorous and suddenly the solution becomes an opaque orange-gold color. Since the reaction is reversible, you can repeat it several times.

Concepts: Oxidation-reduction, complex ions.

Catalog No.	Description	Price/Each
AP8684	The Reversible Orange and Blue Reaction—Chemical Demonstration Kit	$40.35

Colorful Electrolysis



By: Mike Shaw, West Stokes High H.S., King, NC

A 9V battery supplies the power and universal indicator provides the color show. As electrolysis occurs in the Petri dish, the pH changes at the anode and cathode are different. The entire spectrum of universal color changes occurs, reflecting the pH continuum created in the Petri dish.

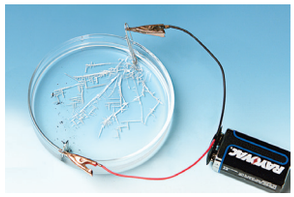
Concepts: Electrolysis, pH.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6467	Colorful Electrolysis—Chemical Demonstration Kit	$30.00

Electrolysis Apparatus, Brownlee See page 377.

Reversible Tin Man



By: The Flinn Staff

Students will enjoy watching tin crystals grow before their very eyes across a Petri dish and then quickly "reverse" as the cathode and anode are switched.

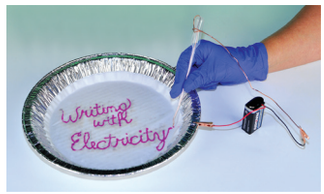
Concepts: Electrolysis, oxidation-reduction, anode, cathode.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6867	Reversible Tin Man—Chemical Demonstration Kit	$39.75

FLINN EXCLUSIVE

Writing with Electricity



By: Paul Price, Trinity Valley School, Fort Worth, Texas

Demonstrate the key concepts of electrochemistry, including anodic and cathodic reactions, by using a copper "pen" to follow the flow of electrons in the electrolysis of aqueous potassium iodide.

Concepts: Electrochemistry, acid-base indicators.

Catalog No.	Description	Price/Each
AP7312	Writing with Electricity—Chemical Demonstration Kit	$45.25

The Electrochemical Clock Kit—Orange Juice Clock



By: Irwin Talesnick, Chemistry Dept., Retired, Queens University, Kingston, Ontario, Canada

Arouse student curiosity. How does the clock work? How long will the clock run on orange juice? Can you use something other than orange juice?

Concepts: Electrolysis, oxidation-reduction, anode, cathode.

Note: A stiff piece of cardboard or wood for hanging the clock is required.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8718	The Electrochemical Clock Kit—Orange Juice Clock	$59.90

Colorful Oxidation States of Manganese



Project the image of a 6-well plate filled with solutions of manganese(II) ions and manganese (VII) ions. Students make observations of the color changes and test their skill at balancing redox reactions.

Concepts: Oxidation-reduction, oxidation states, half-reactions, oxidizing and reducing agents.

Catalog No.	Description	Price/Each
AP7499	Colorful Oxidation States of Manganese—Chemical Demonstration Kit	$44.15

Redox and the Goddess of Beauty



By: Jim and Julie Ealy, Retired, The Peddie School, Hightstown, NJ

In this demonstration, a yellow vanadate solution goes through a series of color changes when shaken together with granulated zinc.

Concepts: Oxidation-reduction, properties of vanadium.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8472	Redox and the Goddess of Beauty—Chemical Demonstration Kit	$54.70

The Gold Rush—Turning Pennies into Silver and Gold



By: David A. Katz, Retired, Wilmington, DE

Students will watch as you place pennies into a chemical solution which turns the pennies silver. Then, over heat, the silver penny will change into "gold."

Concepts: Oxidation-reduction, alloys.

Note: Shiny pennies are needed, but not provided.

Catalog No.	Description	Price/Each
AP8895	The Gold Rush—Turning Pennies into Silver and Gold—Chemical Demonstration Kit	$30.80

CHEMICAL DEMONSTRATION KITS—OXIDATION-REDUCTION continued on next page.

Chemical Demonstration Kits—Oxidation-Reduction, continued

The Silver Mirror Award



By: The Flinn Staff

Simply combine four solutions in the Florence flask provided with the kit, swirl and *voilà*—a thin, reflective silver coating "plates out" on the inside of the flask.

Concepts: Oxidation-reduction, reducing sugars.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6893	The Silver Mirror Award—Chemical Demonstration Kit	$55.85
GP3085	Flask, Florence, 250-mL	11.95

Chemical Demonstration Kits—Periodic Table

All in the Family—Periodic Trends



Dilute aqueous solutions of chlorine, bromine and iodine are prepared fresh and mixed pair-wise with chloride, bromide or iodide ions in a two-phase solvent system.

Concepts: Halogens, periodic table, groups or families.

Note: Halogen solutions should be worked with in a fume hood or well-ventilated lab.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7281	All in the Family—Periodic Trends Demonstration Kit	$61.80

Flinn's *Exploring Chemistry*™ Periodic Table Package

See page 246.

Periodic Activity of Metals

By: The Flinn Staff



Introduce the study of the periodic table and periodic trends with this exciting but safe, small-scale demonstration of the activity of metals.

Concepts: Alkali and alkaline earth metals, periodic table and trends, physical and chemical properties, metal activity.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7180	Periodic Activity of Metals—Chemical Demonstration Kit	$57.50

Safe Swimming with Sodium

By: The Flinn Staff



Safe Swimming with Sodium is a novel variation of alkali metals reacting with water that is much safer to perform than the standard sodium demonstration of simply dropping a small piece of alkali metal into a beaker of water.

Concepts: Alkali metals, density, immiscible liquids.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8916	Safe Swimming with Sodium—Chemical Demonstration Kit	$43.90

FLINN EXCLUSIVE

Chemical Demonstration Kits—Physical Properties

Boiling in a Syringe

By: The Flinn Staff



By decreasing the vapor pressure inside the syringe, hot water can be boiled at less than 100 °C. As the water boils, the vapor is pressurizing the area above the liquid.

Concepts: Vapor pressure, boiling, phase change.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7448	Boiling in a Syringe—Demonstration Kit	$23.75

Salting Out—Density Bottle Kit

By: Lynn Higgins, ACS Polymer, Ambassador, MO



Two layers of beads are suspended in the middle of a bottle. Give the bottle a shake, and the beads move to opposite ends. The beads then slowly move back to the starting position. How does this happen?

Concepts: Density, non-polar vs. polar, solutions, immiscibility.

Catalog No.	Description	Price/Each
AP7931	Salting Out—Density Bottle Kit	$32.10

Density Demonstration Bottles

By: Lee Marek, Retired, Naperville North H.S., Naperville, IL



Students will be mesmerized by watching the layers in these bottles move and separate as they are turned upside-down, swirled and shaken.

Concepts: Density, polar/nonpolar, immiscibility, hydrogen bonding.

Catalog No.	Description	Price/Each
AP6684	Density Demonstration Bottles	$44.60

Flinn's *Exploring Chemistry*™ Chemical Bonding Package

See page 246.

Intermolecular Attractions



By: Mark Langella, Mahopac H.S., Mahopac, NY

Molecules can't be seen, but we can see the forces between molecules: Use this set of four demonstrations to show students what happens when molecules attract each other—or don't!

Concepts: Surface tension, hydrogen bonding, dipole-dipole attractions, cohesive and adhesive forces, London dispersion forces.

Catalog No.	Description	Price/Each
AP6928	Intermolecular Attractions—Multi-Demonstration Kit	$62.75

Kinetic Molecular Theory

By: The Flinn Staff



These three demonstrations provide visual evidence for this important concept. Visualizing molecules in motion helps students understand and compare the kinetic and potential energy of molecules in the solid, liquid and gas phases. Includes:

Concepts: Conservation of mass, density, gas laws, kinetic molecular theory.

Catalog No.	Description	Price/Each
AP7359	Kinetic Molecular Theory—Multi-Demonstration Kit	$80.95

CHEMICAL DEMONSTRATION KITS continued on next page.

Chemical Demonstration Kits—Physical Properties, continued

FLINN EXCLUSIVE

Mass Is Conserved—Volume Is Not!

By: The Flinn Staff



Show students that adding two identical volumes does not always give twice the volume. Three different demonstrations are performed.

Concepts: Conservation of mass, intermolecular forces–hydrogen bonding, neutralization, density.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7445	Mass Is Conserved—Volume Is Not! Chemical Demonstration Kit	$21.90

Red, White and Blue Density Column

By: The Flinn Staff



The density column contains three liquid layers consisting of toluene, methyl alcohol and water. Methyl alcohol is "salted out" and separated from water by adding potassium carbonate.

Concepts: Solubility, density, miscible and immiscible liquids, salting-out effect.

Note: Perform this demonstration in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP7089	Red, White and Blue Density Column—Chemical Demonstration Kit	$37.20

Surface Tension Jar

By: Patrick Funk, Pickerington High H.S, Pickerington, OH



Place a laminated card over the screen-covered mouth of a jar. Flip the jar over and observe as the card stays in place. Remove the card and watch the water appear to "float" on air!

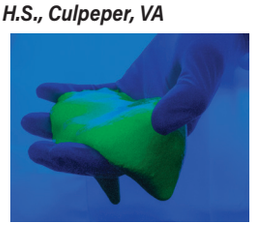
Concepts: Surface tension, air pressure, cohesion.

Catalog No.	Description	Price/Each
AP6648	Surface Tension Jar—Demonstration Kit	$10.65

Chemical Demonstration Kits—Polymers

Fluorescent Slime

By: Thomas T. Earles, Retired, Culpeper County H.S., Culpeper, VA



Slime is prepared in a solution of fluorescein and bromophenol blue. The resulting slime appears green in reflected light, red in transmitted light and bright fluorescent green in ultraviolet light.

Concepts: Polymers, fluorescence, light spectra.

Note: An ultraviolet light is required and available separately.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP9081	Fluorescent Slime—Chemical Demonstration Kit	$26.40
AP9030	Ultraviolet Light	53.85

For More Polymer Demonstrations...
See page 239.

360Science™: Physical Properties of Solid Materials



This kit presents the concepts of solid materials, volatility, conductivity, solubility, brittleness, melting point, and boiling point through hands-on activities designed to engage. Students will examine and compare the physical properties of five solid samples, including aluminum, silicon dioxide, sodium chloride, stearic acid, and sucrose. Students will observe and compare the color, appearance, volatility, solubility (in water and hexane), conductivity (as a solid and in aqueous solution), brittleness, and tendency to melt of these five solid samples.

Catalog No.	Description	Digital Access	Price/Each
AP11328	360Science: Physical Properties of Solid Materials	1-Year	$50.00
AP11428		3-Year	69.10

360Science™: Structures and Properties of Polymers



Students will observe the formation of calcium alginate and copper alginate gels when sodium alginate is mixed with aqueous solutions containing calcium ions and copper ions, respectively through this kit. The essential concepts of polymer, monomer, polymeric materials, sodium alginate, and polyvinyl acetate are explored.

Catalog No.	Description	Digital Access	Price/Each
AP11329	360Science: Structures and Properties of Polymers	1-Year	$52.00
AP11429		3-Year	65.00

Mystery Nylon Factory

By: Jim and Julie Ealy, Retired, The Peddie School, Hightstown, NJ



Two solutions are poured together in a beaker. A paper clip is lowered into the solution. As the paper clip is withdrawn, a very long strand of nylon is pulled from the beaker.

Concepts: Polymerization, organic chemistry.

Note: Perform this demonstration in a fume hood or well-ventilated lab.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP2088	Mystery Nylon Factory—Chemical Demonstration Kit	$35.80

Super-Duper Polymer Gel

By: Walter Rohr, Retired, Eastchester H.S., Eastchester, NY



When a small amount of a white powder is sprinkled into a liquid and water is added, it transforms into a thick, viscous gel. When poured back and forth between two beakers, the gel begins to take on a life of its own and literally defies gravity by crawling up and out of the beaker.

Concepts: Polymers, viscosity.

Note: Ethanol or methanol (25 mL per demo) and water are required and available separately. See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP4556	Super-Duper Polymer Gel—Chemical Demonstration Kit	$16.45

Polymers, Polymers, Polymers

Introduce your students to the fascinating world of polymer chemistry by making "slime," polyurethane foam and nylon and by demonstrating the super water-absorbent material found in disposable diapers.

Concepts: Uses and formation of polymers, specifically "slime," polyurethane foam, nylon and sodium polyacrylate; crosslinking.

Note: Perform this demonstration in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP4426	Polymers, Polymers, Polymers—Chemical Demonstration Kit	$68.65

CHEMICAL DEMONSTRATION KITS—POLYMERS continued on next page.

Chemical Demonstration Kits—Polymers, continued

Polyurethane Foam System



Try this amazing demonstration! Simply mix two viscous liquids together and watch as the mixture expands to about 30 times its original volume. The result is a hardened, lightweight polyurethane foam.

Concepts: Polymers, catalysis. See free video at flinnsci.com.

Catalog No.	Description	Size	Price/Each
C0335	Polyurethane Foam System—Chemical Demonstration Kit	500 mL	$ 39.15
C0442		4 L	297.35
V0003	Food Coloring Dyes, Set		7.75

Pour a Rainbow

FLINN EXCLUSIVE

By: Steve Spangler, Regis University, Denver, CO

Pour a rainbow of colors from beaker to beaker while students spontaneously erupt in a chorus of ooohs and aaahs!

Concepts: Polymers, acid–base indicators, hydrogen bonding.

Catalog No.	Description	Price/Each
AP5932	Pour a Rainbow—Chemical Demonstration Kit	$32.80

Sodium Alginate Polymer

By: The Flinn Staff

Reacting sodium alginate solution with calcium or copper ions produces a smooth, flexible, semisolid substance that precipitates from water in the form of—worms!

Concepts: Polymers, polymer gels, cross-linking, polysaccharides.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7087	Sodium Alginate Polymer—Chemical Demonstration Kit	$36.80

Fluorescent "Gummy Worm" Polymers

In this colorful demonstration, "gummy worm" polymers are synthesized from sodium alginate and three different dyes that fluoresce when exposed to ultraviolet light.

Concepts: Polymers, cross-linking, fluorescence.

Note: An ultraviolet lamp is required and available separately.

Catalog No.	Description	Price/Each
AP7513	Fluorescent "Gummy Worms" Polymers—Chemical Demonstration Kit	$37.90
AP9030	Ultraviolet Lamp, 18"	53.85

The Wacky World of Superabsorbent Polymers

By: Steve Spangler, Regis University, Denver, CO

Pour distilled water into an "empty" cup and the water solidifies into a gel. In another beaker add a small amount of powder, pour in distilled water and see an avalanche of fresh powdered "snow."

Concepts: Polymers, osmosis, cross-linking.

Catalog No.	Description	Price/Each
AP6303	The Wacky World of Superabsorbent Polymers—Chemical Demonstration Kit	$20.35

Water Marbles



By: The Flinn Staff

Amaze your students by "floating" a steel sphere on "water." Since the water marbles have essentially the same refractive index as water, the steel sphere will appear to float on the surface of the water.

Concepts: Superabsorbent polymers, index of refraction, discrepant event.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7429	Water Marbles—Chemical Demonstration Kit	$24.45

Chemical Demonstration Kits—Radioactivity

Radon Test

The short-term test kit (two- to four-day test period) allows you to "screen" the home for possible radon problems. Once the radon screening test kit is exposed, it is sent to the laboratory. An analysis of the kit is completed, and you are sent a detailed report.

Concepts: Radioactivity, decay series, alpha radiation.

Catalog No.	Description	Type	Price/Each
AP1830	Radon Test—Demonstration Kit	Short Term	$40.79

Chemical Demonstration Kits—Safety

Laboratory Safety Essentials

The most important lesson for students to learn in science is safety first! Engage students' interest in the essential rules of laboratory safety with this set of four persuasive demonstrations.

Concepts: Acid safety, combustion, fire safety, SDS, chemical properties.

Catalog No.	Description	Price/Each
AP7308	Laboratory Safety Essentials—Multi-Demonstration Kit	57.80

Flaming Vapor Ramp



By: Bob Becker, Kirkwood H.S., Kirkwood, MO

Are volatile, flammable liquid vapors heavier than air? Safely demonstrate to students that using flammable liquids indoors can create a fire hazard—even if you are quite far from an open flame.

Concepts: Combustion, flammable liquids, fire safety.

Catalog No.	Description	Price/Each
AP6154	Flaming Vapor Ramp—Chemical Demonstration Kit	$23.00

Chemical Demonstration Kits—Scientific Method

Larry's Lost Labels Luncheonette

By: The Flinn Staff

There are four white solids—they all look alike, but are they the same? Students must use the scientific method and their knowledge of physical and chemical properties to solve the mystery.

Concepts: Chemical reactions, solubility, acids and bases, density, melting point.

Catalog No.	Description	Price/Each
AP6874	Larry's Lost Labels Luncheonette—Chemical Demonstration Kit	$37.90

Mystery Light Block—Scientific Method



VISIT FLINNSCI.COM TO SEE FREE VIDEO ABOUT START OF THE YEAR ACTIVITIES!

By: The Flinn Staff

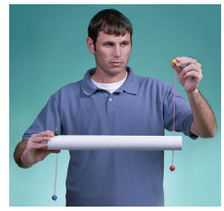
Everyone loves a mystery! A two-toned rectangular block of paraffin is displayed with the darker half on the bottom. Flip it over—the darker half is still on the bottom! Intriguing discrepant event demonstration shows that science is a process of discovery and helps students develop critical-thinking skills.

Concepts: Scientific method, discrepant events.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7341	Mystery Light Block—Scientific Method Demonstration Kit	$28.70

Think Tube



By: The Flinn Staff

What could it have been like to imagine the nature of an atom? How difficult is it to produce a model of something that can't be seen? The Think Tube allows students to appreciate the challenges associated with things that cannot be directly observed.

Concepts: Models, hypothesis.

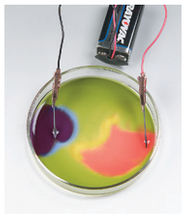
Catalog No.	Description	Price/Each
AP6149	Think Tube—Demonstration Kit	$16.70

CHEMICAL DEMONSTRATION KITS continued on next page.

Chemical Demonstration Kits—Seasonal

FLINN EXCLUSIVE

Opening Day



By: The Flinn Staff

Welcome your students to the "wonderful world of chemistry!" Five colorful and engaging demonstrations have been selected to help students develop observational and critical-thinking skills—and to get them excited about the amazing science that lies ahead.

Concepts: Hypothesis, models, pH indicators, acids and bases, electrolysis, decomposition reactions, oscillating reactions, reaction mechanisms.

Note: Common laboratory glassware and equipment are required but not provided.

Catalog No.	Description	Price/Each
AP7165	Opening Day—Multi-Demonstration Kit	$88.55

Vanishing Valentine

By: Mike Shaw, West Stokes H.S., King, NC



Shake a flask containing a colorless solution to introduce oxygen. The solution will change to a bright pink valentine color. Then allow the solution to sit undisturbed and observe as the solution fades back to colorless.

Concepts: Oxidation–reduction, indicators.

Catalog No.	Description	Price/Each
AP5929	Vanishing Valentine—Chemical Demonstration Kit	$24.35

April Fool's Day



By: The Flinn Staff

Celebrate April Fool's Day with the unexpected! Four discrepant event demonstrations engage students' curiosity using the element of surprise.

Concepts: Surface tension, air pressure, cohesion, polymers, cross-linking, density, pressure of fluids, observation, minimum energy state.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7327	April Fool's Day—Multi-Demonstration Kit	$55.90

End of Year Finale



By: The Flinn Staff

Put an exclamation point on your year-end review of chemistry concepts with this electric, entertaining, patriotic set of five demonstrations!

Concepts: Oxidation–reduction, electrolysis, pH indicators, acid–base neutralization, activation energy, exothermic reactions, buffers, solubility and equilibrium, clock reactions, catalyst, decomposition reactions.

Note: Common laboratory glassware and equipment are required but not provided.

Catalog No.	Description	Price/Each
AP7166	End of the Year Finale—Multi-Demonstration Kit	$122.30

Chemystery of Halloween

By: Diane Burnett, Retired, Purdue University, West Lafayette, IN



Demonstrate that "black magic" has a scientific basis with the seven demonstrations included in this kit.

Concepts: Catalysts, decomposition reactions, exothermic reactions, heat shrinking plastics, polyurethane foam, polymers, oxidation–reduction reactions, fluorescence, chemiluminescence, triboluminescence.

Note: Some common items and lab equipment are required but not provided.

Catalog No.	Description	Price/Each
AP2102	Chemystery of Halloween—Multi-Demonstration Kit	$145.90

Chemical Wizardry



By: The Flinn Staff

Mesmerize your students with three spell-binding demonstrations! As students observe the results of your wizardry, they learn important chemical concepts.

Concepts: Gels, atomic emission, polymers, cross-linking, fluorescence, complex ions, chemical reactions.

Catalog No.	Description	Price/Each
AP7503	Chemical Wizardry—Multi-Demonstration Kit	$63.00

The Reappearing Pumpkin



By: The Flinn Staff

A slight variation of the classic "Blue Bottle Experiment" allows a pumpkin face to disappear and then reappear over and over again.

Concepts: Oxidation–reduction.

Catalog No.	Description	Price/Each
AP6384	The Reappearing Pumpkin—Chemical Demonstration Kit	$28.95
GP3095	Florence Flask, 1000-mL, Flat Bottom	19.95

A Christmas of Chemistry



By: The Flinn Staff

Make the holiday season joyous with seven chemistry demonstrations guaranteed to amuse and enlighten the entire class.

Concepts: Solubility, precipitation, solvation, gels, crystal formation, atomic emission, oxidation–reduction, clock reaction, buffers, acids and bases, indicators.

Note: Some laboratory equipment is required but not provided.

Catalog No.	Description	Price/Each
AP6281	A Christmas of Chemistry—Multi-Demonstration Kit	$191.40

CHEMICAL DEMONSTRATION KITS—SEASONAL continued on next page.

Large Demonstration Tray



Perform your fun but messy demonstrations in our extra-large fiberglass tray. Rounded edges and 5-cm lip catch the overflow and make cleanup a breeze. Also useful for dispensing chemicals to minimize and contain spills. Fiberglass resists acids, bases, and most solvents—and it won't corrode or warp! Size 76 L x 51 W x 5 cm D.

▶ See free video at flinnsci.com.

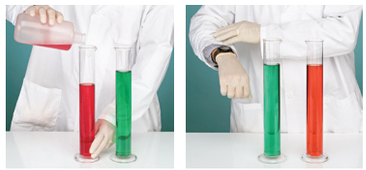
Catalog No.	Description	Price/Each
AP5429	Demonstration Tray, Large	$104.00

Chemical Demonstration Kits—Seasonal, continued

FLINN EXCLUSIVE

Blinking Holiday Colors

By: The Flinn Staff



Two solutions of holiday red and green are poured into separate tall form beakers and stirred. After 30 seconds, the beakers magically swap colors, red to green and green to red!

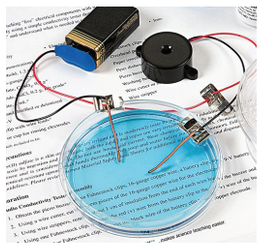
Concepts: Buffers, pH indicators, clock reactions.

Catalog No.	Description	Price/Each
AP6858	Blinking Holiday Colors—Chemical Demonstration Kit	$29.05

Chemical Demonstration Kits—Solutions/Solubility

Audio Conductivity Tester

By: Bob Becker, Kirkwood H.S., Kirkwood, MO



Students reading a "Caution: Keep away from water!" notice on an electrical appliance may assume all water conducts electricity. Clear up their misconception with this easy-to-assemble conductivity tester that uses a piezoelectric buzzer and emits an audible sound when a circuit is complete.

Concepts: Electrical conductivity, electrolytes vs. nonelectrolytes, ions.

Note: A 9 V battery is required and available separately.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7279	Audio Conductivity Tester—Multi-Demonstration Kit	$35.30
AP1430	Transistor Battery (Alkaline), 9-volt	6.32

Becker Bottles "One in a Million"

By: Bob Becker, Kirkwood H.S., Kirkwood, MO



These amazing bottles make molecular concentration and ppm contamination concepts more concrete for your students and offer many wonderful teaching opportunities.

Concepts: Solution concentration, parts per million.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP4559	Becker Bottle "One in a Million"	$83.00
AP4854	Becker Bottle "One in a Million Too"	59.25
AP4863	Becker Bottles, Set of Two	158.10

Air in a Bottle

By: Scott Newkirk, Front Range Community College, Fort Collins, CO



The 3-liter model contains one million different colored spheres. Each color represents a different gas found in the Earth's atmosphere. A great educational value that can be easily incorporated into your lessons for many years to come!

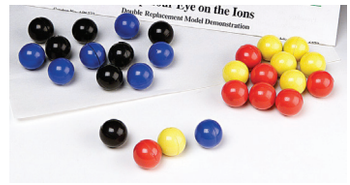
Catalog No.	Description	Price/Each
AP7558	Air in a Bottle—Demonstration Model	$105.00

Flinn's *Exploring Chemistry*™ Solids, Liquids and Solutions Package

See page 246.

Keep Your Eye on the Ions—Double Replacement Model

By: Patti Duncan, High Point Regional High School, Sussex, NJ



When the molecules are placed in water, the bonds break and "ionization" occurs. Some of the ions bond (magnetic attractions) and form insoluble molecules that precipitate (sink) to the bottom of the beaker. Other "soluble" ions (nonmagnetic) continue to float around in solution.

Concepts: Double replacement reaction, solubility.

Catalog No.	Description	Price/Each
AP6377	Keep Your Eye on the Ions—Double Replacement Model Demonstration Kit	$20.50

pH and Protein Solubility—Reversible Demonstration Kit

By: The Flinn Staff



When acids and bases are added to a protein solution, the solubility of the protein changes drastically. This demonstration looks at the acid-base and solubility properties of casein, the main protein in milk.

Concepts: Proteins, isoelectric point, solubility, pH.

Catalog No.	Description	Price/Each
AP6692	pH and Protein Solubility—Reversible Demonstration Kit	$26.85

Solutions, Colloids and Suspensions

By: The Flinn Staff



Through a series of four demonstrations, students will see and learn how to easily identify a mixture as one of these three types.

Concepts: Solution, colloid, semipermeable membrane, Tyndall effect.

Note: Perform this demonstration in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP6635	Solutions, Colloids and Suspensions—Chemical Demonstration Kit	$46.60

Sorting Out Solutions

By: The Flinn Staff



Two clear solutions are combined to form a homogeneous mixture. As a solid chemical is added, the two seemingly inseparable solutions begin to "sort" into two layers. As more solid is added, the two layers become more distinct.

Concepts: Solubility, bonding, polar and nonpolar solvents.

Catalog No.	Description	Price/Each
AP8902	Sorting Out Solutions—Chemical Demonstration Kit	$55.20

Supersaturation Flask

By: The Flinn Staff



Drop a seed crystal into a flask and watch the chain reaction as the supersaturated sodium acetate solution crystallizes and releases heat.

Concepts: Supersaturation, exothermic, crystallization.

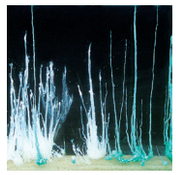
Catalog No.	Description	Price/Pkg.
AP8087	Supersaturation—Chemical Demonstration Kit	$50.70

CHEMICAL DEMONSTRATION KITS—SOLUTIONS/SOLUBILITY continued on next page.

Chemical Demonstration Kits—Solutions/Solubility, continued

FLINN EXCLUSIVE

The Colorful Silicate Garden



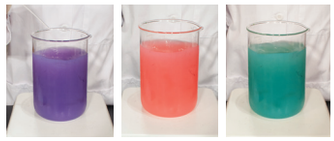
By: The Flinn Staff

In a matter of seconds, columns of various colors sprout up from the bottom of a beaker containing a clear liquid. The crystals form like stalagmites in a cave and will continue to grow for several days.

Concepts: Formation of insoluble silicates, osmosis, crystal structures.

Catalog No.	Description	Price/Each
AP4424	The Colorful Silicate Garden—Chemical Demonstration Kit	$52.95

Upset Tummy? MOM to the Rescue!



By: The Flinn Staff

Mix a suspension of milk of magnesia (MOM) with universal indicator, add simulated stomach acid, and observe the dramatic rainbow of colors as the antacid dissolves in the acid!

Concepts: Solubility, K_{sp}, acid–base neutralization, antacids.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5934	Upset Tummy? MOM to the Rescue! Chemical Demonstration Kit	$25.95

Chemical Demonstration Kits—Stoichiometry/Moles

Flinn's *Exploring Chemistry*™ Molar Relationships and Stoichiometry Package See page 246.

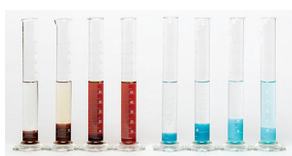
Mole Set



Avogadro's mole number, 6.02 x 10^{23}, is *huge*! Help clarify the concept of the mole by showing your students 6.02 x 10^{23} atoms of four different elements. Students will quickly grasp the ideas of mass, moles and molar mass when they compare these four specimens side by side. Element specimens are copper, iron, zinc and aluminum.

Catalog No.	Description	Price/Each
AP7124	Mole Set—Demonstration Model	$33.00

Stoichiometry and Solubility—Mole Ratios and Chemical Formulas



By: The Flinn Staff

Mix two solutions in various proportions and measure the volume of precipitate that forms in each mixture. Why do different ratios of liquids produce different amounts of precipitate? Which ratio will give the most precipitate?

Concepts: Stoichiometry, mole ratio, double replacement reaction, solubility rules.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6443	Stoichiometry and Solubility—Mole Ratios and Chemical Formulas—Chemical Demonstration Kit	$59.05

Chemical Demonstration Kits—Thermodynamics

Alcohol Cannon Apparatus Kit—Combustion of Isopropyl Alcohol



By: The Flinn Staff

When the vapor is ignited, the foam ball is propelled across the room. Cannon is constructed of PVC and can be reused for many years to come.

Concepts: Combustion, thermochemistry, exothermic reactions, gas laws.

Note: Isopropyl alcohol, 7" foam ball and safety lighter are required and available separately.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7410	Alcohol Cannon Apparatus Kit—Combustion of Isopropyl Alcohol	$57.25
AP7415	7" Foam Ball	23.10
AP8960	Butane Safety Lighter	10.45
I0019	Isopropyl Alcohol, 99% purity	9.86

Cool Reaction



By: The Flinn Staff

One of the most striking examples of endothermic reactions is when the solids barium hydroxide and ammonium thiocyanate are mixed together in a beaker.

Concepts: Endothermic reactions.

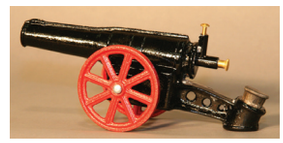
Note: A thermometer is required and available separately.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8896	Cool Reaction—Chemical Demonstration Kit	$35.05

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Carbide Toy Cannon



Safely demonstrate the production and combustion of acetylene gas with this fun vintage toy. Simply load the specially formulated calcium carbide ammunition, close the casing to add water, pull back on the igniter and give the plunger a good push. Cast iron. 9" L x 3½" W x 3½" H. Each cannon includes one tube of Bangsite® calcium carbide and spark plug that will produce about 100 shots. Extra Bangsite and spark plugs available separately.

Catalog No.	Description	Price/Each
AP7331	Carbide Toy Cannon	$121.15
AP7344	Bangsite® Calcium Carbide Tube	12.95

CHEMICAL DEMONSTRATION KITS—THERMODYNAMICS continued on next page.

Chemical Demonstration Kits—Thermodynamics, continued

Flaming Vapor Ramp

By: Bob Becker, Kirkwood H.S., Kirkwood, MO



Are volatile, flammable liquid vapors heavier than air? Safely demonstrate to students that using flammable liquids indoors can create a fire hazard—even far from an open flame.

Concepts: Combustion, flammable liquids, fire safety.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6154	Flaming Vapor Ramp—Chemical Demonstration Kit	$23.00

Knock Your Socks Off Apparatus Kit



Simple, safe and exciting "carbide cannon" will blow your students away! Fill the base of the apparatus with a few grains of calcium carbide and add water to produce flammable acetylene gas. Wait a minute, and then ignite. The projectile, a soft sock, will be propelled across the room!

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7311	Knock Your Socks Off Apparatus Kit—Reaction of Calcium Carbide	$32.20
C0346	Calcium Carbide, 100 g	12.60
AP8960	Butane Safety Lighter	10.45

Piezo Ping Pong Popper

By: The Flinn Staff



Safely demonstrate combustion by performing the "ping pong popper" micro-scaled explosion! Students will love the loud "pop" as a spark ignites alcohol in a popper and a ping pong ball launches 20 feet across the room.

Concepts: Combustion, piezoelectricity.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6265	Piezo Ping Pong Popper—Demonstration Kit	$33.65

Smashing Thermit Reaction

By: The Flinn Staff



Take two rusty iron balls, wrap one in aluminum foil, bang them together and watch the fireworks! Enjoy all the pyrotechnics of the thermit reaction without the elaborate preparation and cleanup.

Concepts: Oxidation-reduction, single replacement reaction, exothermic reaction, activation energy, thermit reaction.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6256	Smashing Thermit Reaction—Demonstration Kit	$36.65

Superheated Steam

By: The Flinn Staff



Vividly demonstrate the thermal energy content and potential skin burning hazards associated with steam.

Concepts: Phase changes, heat released by condensation, steam.

Note: A Meker burner, 250-mL Erlenmeyer flask, hot plate and support stand and clamp are required and available separately.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6158	Superheated Steam—Demonstration Kit	$18.00

The Carbon Soufflé

By: The Flinn Staff



Your students will be amazed as they watch a yellow solid-liquid mixture turn brown, then black, expand out the top of the beaker—and solidify.

Concepts: Exothermic reactions, dehydration reactions, neutralization reactions.

Note: Perform this demonstration in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP4422	The Carbon Soufflé—Chemical Demonstration Kit	$79.00

The Chef

By: The Flinn Staff



In an aluminum pan, add water to the "specially formulated" Flinn calcium oxide, and stir. Crack open an egg and pour it in the second pan. Place it over the solution and presto, now you're cooking!

Concepts: Exothermic reactions, heats of reaction.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6468	The Chef—Chemical Demonstration Kit	$55.30

The Mini Grain Elevator Explosion

By: Lee Marek, Retired, Naperville North H.S., Naperville, IL and Robert Lewis, Retired, Downers Grove North H.S., Downers Grove, IL



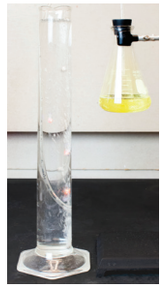
This demonstration will illustrate the explosive nature of a powder through the construction of a mini grain elevator explosion. A small paint can will be used to represent a grain elevator. Lycopodium powder will be used as the dust.

Concepts: Surface area, combustion.

Catalog No.	Description	Price/Each
AP8729	The Mini Grain Elevator Explosion—Chemical Demonstration Kit	$48.05

Underwater Fireworks

By: Bob Becker, Kirkwood H.S., Kirkwood, MO



Colliding bubbles of gas produce underwater explosions. This demonstration shows how chlorine and acetylene gas can spontaneously react at room temperature. Safely conducted under water.

Concepts: Gases, activation energy, combustion, electron affinity, hydrocarbons, halogens.

Note: Perform this demonstration in a fume hood or well-ventilated lab.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8728	Underwater Fireworks—Chemical Demonstration Kit	$29.95

Thermite Reaction

By: The Flinn Staff



Flames, sparks, temperatures exceeding 2200 °C and melted iron are all produced by this spectacular reaction. Simply light the igniting stick with a match, place it into a pile of thermite, and watch the reaction take place. It's just that easy and safe.

Concepts: Exothermic reactions, oxidation-reduction, thermite reaction.

Note: Please remember that any demonstration where the reaction exceeds temperatures of 2200 °C should always be done behind a safety shield and conducted in a fume hood or outside. If you want to demonstrate a thermite reaction, this Flinn kit is your best choice.

Catalog No.	Description	Price/Each
AP8984	Thermite Reaction—Chemical Demonstration Kit	$79.55

CHEMICAL DEMONSTRATION KITS—THERMODYNAMICS continued on next page.

Chemical Demonstration Kits—Thermodynamics, continued

Zinc Pyrotechnics

By: The Flinn Staff



Place a beaker with very small amounts of zinc dust, ammonium nitrate and a catalyst in a fume hood. Add two drops of water to the mixture and watch as sparks, smoke and excitement fill the air. Must be performed on a heat-resistant surface in a fume hood or outdoors.

Concepts: Exothermic reactions, catalysts.

Catalog No.	Description	Price/Each
AP9117	Zinc Pyrotechnics—Chemical Demonstration Kit	$28.25

Whoosh Bottle

By: John J. Fortman, Retired



Wow your students with a whoosh! Students just love to see the blue alcohol flame shoot out of the mouth of the bottle and watch yellow dancing flames pulsate in the jug as more air is drawn in.

Concepts: Thermodynamics, combustion, molar relationships.

Note: A safety shield and fire blanket are highly recommended when performing this demonstration.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5943	Whoosh Bottle—Chemical Demonstration Kit	$41.86

Chemical Demonstration Kits—Visible Spectra

Oooh! Aaah! Style Flame Tests

By: Rhonda Reist, Olathe North High School, Olathe, KS



Add a few milliliters of alcohol to several borosilicate glass Petri dishes, place a small scoop of metallic salt into each dish, then light the solutions and wait for the ooohs and aaahs!

Concepts: Visible spectra.

Note: Perform this demonstration in a fume hood or well-ventilated lab. A safety shield and fire blanket are also highly recommended. Borosilicate glass Petri dishes are required and available separately.

Catalog No.	Description	Price/Each
AP9303	Oooh! Aaah! Style Flame Tests—Chemical Demonstration Kit	$56.21
GP3019	Petri Dish, Borosilicate Glass, Pkg./6	54.00

Safety-First Flame Tests

By: The Flinn Staff



Put safety first with this unique flame test demonstration! Coloring flames with metallic salts is a great way to demonstrate the emission spectra of metal salts. By adding a pump of hand sanitizer to different salts, the flames will burn in a rainbow display. Borosilicate glass Petri dishes are required and available separately.

Concepts: Visible spectra.

Catalog No.	Description	Price/Each
AP8481	Safety-First Flame Tests—Chemical Demonstration Kit	$29.00
GP3019	Petri Dish, Borosilicate Glass, 100 x 15 mm, Pkg. of 6	54.00

Is There Sodium in Bananas? Flame Test

By: The Flinn Staff



Bananas are a good source of potassium—but do they also contain sodium? This flame test demonstration provides a safe method for observing excited-state emission colors of metal ions—no flammable solvents required!

Concepts: Properties of metals, atomic structure, emission spectra, nutrients in food.

Note: Borosilicate glass Petri dishes are required and available separately.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7334	Is There Sodium in Bananas? Flame Test Demonstration Kit	$36.00
GP3019	Petri Dish, Borosilicate Glass, Pkg./6	54.00

Color Flame Candles



Challenge students to identify the unknown element(s) in the candles by performing flame tests. Includes 3 candles of each color. Candles are 2¼" x ⅜". Package of 12.

Catalog No.	Description	Price/Each
AP7770	Color Flame Candles	$5.35

Flame Test/Emission Spectroscopy

By: The Flinn Staff



Each element emits a specific wavelength of light, thus a characteristic color, when excited by a flame. This unique flame test kit produces better results and is easier to perform than the expensive platinum wire procedure. The vivid colors last several minutes, allowing students plenty of time to view the colored flame through Flinn C-Spectra™.

Concepts: Absorption, emission, diffraction grating, flame tests, emission spectra.

Catalog No.	Description	Price/Each
AP1716	Flame Test/Emission Spectroscopy Kit—Chemical Demonstration Kit	$99.40



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Motivate your students—order the complete *Exploring Chemistry* 10-kit bundle! Comprehensive, cost-saving bundle includes all 10 of the Flinn *Exploring Chemistry* packages!

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AP7705	Flinn's Exploring Chemistry—10-Kit Bundle	$1750.00

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for *Exploring Chemistry*™

Set your students up for continued and lasting success! Flinn's *Exploring Chemistry* Packages include the best-of-the-best lab experiments, demonstrations and POGIL® activities. Utilizing inquiry, microscale, activity-stations and discovery learning, students will develop comprehension of essential concepts and science practices. Each *Exploring Chemistry* Package includes chemicals, specialized materials, complete instructions, POGIL activities and free online video resources. Enough materials are provided for 30 students working in pairs. Common laboratory equipment is required and available separately.

See free video at flinnsci.com.

FLINN EXCLUSIVE

Catalog No.	Inquiry Lab	Price/Each
AP8495	Introduction to Chemistry—Matter and Measurement Package	$ 50.55
AP7690	Atomic and Electron Structure Package	124.06
AP7677	Periodic Table Package	140.00
AP7691	Chemical Bonding Package	148.54
AP7629	Chemical Reactions Package	130.31
AP7630	Molar Relationships and Stoichiometry Package	187.65
AP7694	Gases and Gas Laws Package	144.78
AP7692	Thermochemistry Package	124.95
AP7702	Solids, Liquids and Solutions Package	54.75
AP7693	Acids and Bases Package	91.45

Flinn Chemistry Laboratory Kits



Save Time with Flinn's Chemistry Lab Kits! Chemistry lab kits are a great option for teachers who are looking to streamline lab setup and preparation. Flinn offers a wide variety of lab kits that cover all the major topic areas in a general chemistry class.

Kits plus Digital Lab Instructions Flinn's chemistry kits not only include all chemicals and supplies necessary to perform the experiment, but also access to customizable digital lab instructions in PAVO. PAVO is our award-winning gateway to thousands of labs and instructional materials. Customize lab instructions, assign to students and monitor their progress all with PAVO.

Flinn Exclusive Look for the Flinn Exclusive" symbol to find top quality student kits that have been designed, developed, and tested by our technical staff. Flinn kits include detailed teacher notes and reproducible student handouts as well as easy-to-follow lab instructions, sample data, answers to questions and in-depth background information.

Teacher-designed and teacher-tested kit too! Try a kit made for teachers by teachers! Look for the teacher's name, school and location below the kit title. These specially selected kits integrate the teacher's classroom experience with Flinn's safety and technical expertise resulting in an optimal teaching and learning experience.

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Chemistry Laboratory Kits—Acids, Bases and Buffers

FLINN360science™: Measure Acid Strength



This kit engages your students through hands-on science to teach the essential concepts of molarity, acid strength, base strength, pH, and equilibria. Students come to understand that the weak acid with the lowest pH is relatively the strongest acid, and the position of its equilibrium lies farthest to the right. Teachers can extend learning through guided inquiry into associated phenomena including, "Why do some processes happen much faster than others?"

Catalog No.	Description	Digital Access	Price/Each
AP10389	**360**Science: Measure Acid Strength	1-Year	$47.10
AP10489		3-Year	60.90

FLINN360science™: Quantitative Analysis of Acid Rain



This kit presents the essential concepts of acid rain, pH, pollution, strong and weak acids and titration through hands-on science activities designed to engage all your students. Students will apply scientific reasoning and successfully identify their unknowns by considering if the samples are weak or strong and mono or diprotic. Teachers can extend learning through guided inquiry into associated phenomena including, "How does acid rain impact the environment?"

Catalog No.	Description	Digital Access	Price/Each
AP10408	**360**Science: Quantitative Analysis of Acid Rain	1-Year	$35.30
AP10508		3-Year	53.00

FLINN360science™: Titrations—The Study of Acid-Base Chemistry



This kit presents the essential concepts of molarity, acid–base titration, and indicators through hands-on science activities designed to engage all your students, regardless of level. The titration technique is one of many essential tools for chemists and can help students appreciate the need for precision and the variety of data that can be obtained with it. Teachers can extend learning through guided inquiry into associated phenomena including, "How does acid rain impact the environment?"

Catalog No.	Description	Digital Access	Price/Each
AP10411	**360**Science: Titrations—The Study of Acid–Base Chemistry	1-Year	$58.00
AP10511		3-Year	75.03

FLINN360science™: Analysis of Buffer Solutions and Ranges



This kit presents the essential concepts of pH, buffer, neutralization, dissociation constant, and weak acid vs. conjugate base. This lab helps students see how buffers can resist changes in pH. A properly made buffer can even resist pH changes when concentrated acids or bases are added. Students will also come to understand that buffers are not completely resistant. Eventually they will reach their buffering capacity and any additional amount of acid or base added will have a large effect on pH. Teachers can extend learning through guided inquiry into associated phenomena including, "How does acid rain impact the environment?"

Catalog No.	Description	Digital Access	Price/Each
AP10412	**360**Science: Analysis of Buffer Solutions and Ranges	1-Year	$58.00
AP10512		3-Year	75.00

FLINN360science™: Design a Natural pH Indicator



This kit presents the concepts of acid–base, pH, and indicators. Through this investigation, students will find that natural indicators provide great substitutions for synthetic indicators. Students will be impressed how well their natural indicators work when measured against a synthetic one. Teachers can extend learning through guided inquiry into associated phenomena including, "How does acid rain impact the environment?"

Catalog No.	Description	Digital Access	Price/Each
AP10433	**360**Science: Design a Natural pH Indicator	1-Year	$88.30
AP10533		3-Year	99.65

FLINN360science™: Kinetics of Crystal Violet Fading



Hands-on science makes the essential concepts of kinetics, reaction rate, rate law, order of reaction, Beer's law, and spectroscopy come alive for students of all levels. Students will use a Beer's law plot of absorbance as a function of concentration to calculate the concentration of crystal violet reacting with sodium hydroxide, as a function of reaction time. They will figure out that the reaction is first-order with respect to both crystal violet and sodium hydroxide, and they will determine the expression for the rate law of the reaction. Teachers can extend learning through guided inquiry into associated phenomena including, "Fast and Slow Processes."

Catalog No.	Description	Digital Access	Price/Each
AP10686	**360**Science: Kinetics of Crystal Violet Fading	1-Year	$51.45
AP10786		3-Year	67.25

FLINN360science™: Liquid Crystals: The Fourth State of Matter



This kit presents the concepts of states of matter, liquid crystals, nanotechnology, and diffraction through hands-on science activities designed to engage all your students, regardless of level. Students will come to understand that liquid crystals are an odd substance. Teachers can extend learning through guided inquiry into associated phenomena including, "Product Design."

Catalog No.	Description	Digital Access	Price/Each
AP10691	**360**Science: Liquid Crystals: The Fourth State of Matter	1-Year	$151.30
AP10791		3-Year	161.25

FLINN360science™: Designing a Handwarmer



This kit presents the essential concepts of enthalpy change, calorimetry, heat of solution, specific heat, exothermic vs. endothermic, and system and surroundings through hands-on science activities designed to engage all your students, regardless of level. Through this investigation, students should discover that different ionic salts can cause different temperature changes when dissolved in water. In addition to recording temperature changes, students must analyze other properties of the salts that would make the salts a good or poor handwarmer. Students study calorimetry, molar heat of solution and more in this engaging activity. Teachers can extend learning through guided inquiry into associated phenomena including, "Hot and Cold Processes."

Catalog No.	Description	Digital Access	Price/Each
AP10698	**360**Science: Designing a Handwarmer	1-Year	$67.25
AP10798		3-Year	80.63

FLINN360science™: Light and Energy



This kit presents the concepts of Flame tests, absorption and emission, speed of light, wavelength and frequency through hands-on science activities designed to engage your students. Students will observe colors emitted by the metallic salts when heated. There are multiple real-world applications for this lab, including fireworks and colored flame candles. Teachers can extend learning through guided inquiry into associated phenomena such as various colors of fireworks.

Catalog No.	Description	Digital Access	Price/Each
AP10700	**360**Science: Light and Energy	1-Year	$57.15
AP10800		3-Year	73.00

CHEMISTRY LABORATORY KITS—ACIDS, BASES AND BUFFERS continued on next page.

Chemistry Laboratory Kits—Acids, Bases and Buffers, continued

FLINN360science™: Exploring Stoichiometry



This standards-aligned, Flinn's **360**Science™: Exploring Stoichiometry kit presents the essential concepts of stoichiometry, law of conservation of mass, limiting and excess reactants, chemical reactions, and gas laws through hands-on science activities designed to engage all your students, regardless of level. Students will better understand limiting and excess reactants through the law of conservation of mass and gas laws. Students analyze several states of reactants and products, such as solids, aqueous solutions and gases. Teachers can extend learning through guided inquiry into associated phenomena such as recipes.

Catalog No.	Description	Digital Access	Price/Each
AP10701	**360**Science: Exploring Stoichiometry	1-Year	$68.00
AP10801		3-Year	85.75

FLINN360science™: Measure pH with Indicators



Through hands-on science activities, this standards-aligned, Flinn's **360**Science™: Measure pH with Indicators kit presents the essential concepts of acids and bases, pH, and indicators. During this lab, students will successfully produce pH reference charts for their indicators. They will gain an understanding of how different indicators are better for specific situations.

Catalog No.	Description	Digital Access	Price/Each
AP10711	**360**Science: Measure pH with Indicators	1-Year	$64.00
AP10811		3-Year	72.85



Exploring a Chemical Reaction in a Toy—Student Laboratory Kit
AP7048

FLINN EXCLUSIVE

Acid-Base Indicator Strips



Using acid-base indicator strips is the simplest way to determine the pH of a solution. Litmus blue will turn red in the presence of acid while litmus red will turn blue in the presence of base. Includes an activity instructing students how to test the pH of common household solutions. Contains 100 strips each of litmus blue and litmus red.

Catalog No.	Description	Price/Each
AP7744	Acid-Base Indicator Strips	$4.15

Chemistry Laboratory Kits—Atomic Structure

FLINN360science™: Evaluate Atomic Structure with Flame Tests



These four labs will help you help your students understand atomic structure. Specifically, electron structure and how all elements have their own electron configuration similar to a human's fingerprint. When students witness the various colors emitted in the flame test lab, they will understand the unique electrons in each metallic salt. Furthermore, the dry portion of the lab safely utilizes bingo chips and filter papers to model the Bohr-type atom.

Catalog No.	Description	Digital Access	Price/Each
AP10348	**360**Science: Evaluate Atomic Structure with Flame Tests	1-Year	$76.55
AP10448		3-Year	93.00

CHEMISTRY LABORATORY KITS—ATOMIC STRUCTURE continued on next page.

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Catalog No.	Description	Price/Each
AP4567	Acid-Base Test Kit I—Properties of Acids and Bases—Student Laboratory Kit	$ 76.53
AP7602	Acid-Base Test Kit I—Properties of Acids and Bases—Super Value Laboratory Kit	159.29
AP4568	Acid-Base Test Kit II—Reactions of Acids and Bases—Student Laboratory Kit	72.00
AP7607	Acid-Base Test Kit II—Reactions of Acids and Bases—Super Value Laboratory Kit	151.50
AP2046	Introduction to Acid-Base Titration—Student Laboratory Kit	25.30
AP6121	Buffers Keep the Balance—Properties of Biological Buffers—Student Laboratory Kit	61.25
AP7018	"Chem"-eleon Indicators—Science and Art with Acids and Bases—Student Laboratory Kit	41.50
AP7048	Exploring a Chemical Reaction in a Toy—Student Laboratory Kit	58.50
AP7637	Introduction to the pH Scale and Measurement—Super Value Laboratory Kit	77.90
AP7444	Mystery Solutions with Acids and Bases—Guided-Inquiry Kit	48.85



"Chem"-eleon Indicators—Science and Art with Acids and Bases—Student Laboratory Kit
AP7018

Chemistry Laboratory Kits—Atomic Structure, continued

FLINN360science™: Elements, Compounds and Mixtures



This kit presents essential concepts of matter, elements, compounds, and mixtures through hands-on science activities designed to engage students. These four labs will help your students understand the fundamentals of matter. When students attempt to break down elements by physical means, such as cutting aluminum foil with scissors, they quickly discover that the element did not change or turn into something else, but rather its identity remained. A combination of substances in the form of a chemical reaction proved to the students that matter cannot be created or destroyed but can be combined to form new substances.

Catalog No.	Description	Digital Access	Price/Each
AP10349	**360**Science: Elements, Compounds and Mixtures	1-Year	$64.75
AP10449		3-Year	82.40

FLINN360science™: Bean Bag Isotopes



This kit presents essential concepts of Isotopes, atomic mass, and mass spectrometry through hands-on science activities designed to engage students. This lab involves modeling the structure of the atom; specifically modeling isotopes of an arbitrary element. Students should come to understand that not all atoms of an element are the same when they observe the bag of Bg element. The Bg element is made up of several different types of beans. Students identify the different beans as isotopes in the element Bg. Students should separate, count and weigh the different isotopes and have the opportunity to practice percent abundance calculations.

Catalog No.	Description	Digital Access	Price/Each
AP10350	**360**Science: Bean Bag Isotopes	1-Year	$58.85
AP10450		3-Year	75.05

FLINN360science™: Evaluate Atomic Spectra



This kit presents essential concepts of wave-particle duality of light, photoelectric effect, photons, and atomic spectra through hands-on science activities designed to engage students. Students make connections about the electrons in different substances when photons are emitted by viewing the substance with the diffraction grating and spectroscope. Each elemental gas in the spectrum tubes has a unique emission spectra, essentially a unique fingerprint that identifies the element. Completed data tables allow students to record their observations and compare and contrast the various colors of the emission lines and their wavelengths.

Catalog No.	Description	Digital Access	Price/Each
AP10351	**360**Science: Evaluate Atomic Spectra	1-Year	$117.75
AP10451		3-Year	134.90

FLINN360science™: Evaluate the Bohr Model of the Atom



This kit presents essential concepts of quantum mechanics, electron energy levels, Heisenberg's uncertainty principle, and orbital shapes through hands-on science activities designed to engage students. Students explore the difficulty of finding an electron around the nucleus and come to understand that we can only determine the probability of its location. Heisenberg's uncertainty principle states that there is a fundamental limitation as to just how precisely both the position and the momentum of a particle can be known at any given time.

Catalog No.	Description	Digital Access	Price/Each
AP10352	**360**Science: Evaluate the Bohr Model of the Atom	1-Year	$47.10
AP10452		3-Year	64.75

FLINN360science™: Model Electron Configuration



Students will master the electron filling order of the elements on the periodic table with this concert seating chart analogy. The concert floor plan clearly defines the orbitals and allowed electrons. Watch your students' engagement and fascination with this activity. Teachers can extend learning through guided inquiry into associated phenomena, "What causes the colors in a fireworks display?"

Catalog No.	Description	Digital Access	Price/Each
AP10353	**360**Science: Model Electron Configuration	1-Year	$47.10
AP10453		3-Year	65.00

FLINN360science™: Build a Spectroscope from Household Materials



In this activity, students are challenged to create a working spectroscope to observe the color spectrum of visible light from household materials. Within the teacher support document you will find a full example of one way that the challenge can be conducted, along with leveled suggestions on how to adjust and tailor the challenge for your classroom.

Catalog No.	Description	Digital Access	Price/Each
AP10422	**360**Science: Build a Spectroscope from Household Materials	1-Year	$53.00
AP10522		3-Year	69.25

FLINN360science™: Types of Chemical Bonds



This kit presents the essential concepts of chemical bonds, covalent bonding, ionic bonding, metallic bonding, physical and chemical properties, and electronegativity through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will correctly identify their unknowns based on the properties of the samples. Teachers can extend learning through guided inquiry into associated phenomena including, "Product Design." This kit also includes access to virtual reality (VR) technology to ensure students better understand the concepts and the lab they are about to conduct. Designed to enhance comprehension, this technology-based resource, in combination with the hands-on lab, will help your students achieve deeper understandings of complex processes.

Catalog No.	Description	Digital Access	Price/Each
AP10696	**360**Science: Types of Chemical Bonds	1-Year	$102.90
AP10796		3-Year	118.00

FLINN360science™: Relationships Between Gas Variables



Presenting the essential concepts of gases, properties of gases, Boyle's law, Charles's law, inverse and direct relationships, and pressure through hands-on activities, this kit is designed to engage all your students, regardless of level. Through this investigation, students determine that there is an inverse relationship between gas pressure and volume, and a direct relationship between gas temperature and volume. Teachers can extend learning through guided inquiry into associated phenomena including, "wind."

Catalog No.	Description	Digital Access	Price/Each
AP10676	**360**Science: Relationships Between Gas Variables	1-Year	$175.00
AP10776		3-Year	123.30

CHEMISTRY LABORATORY KITS—ATOMIC STRUCTURE continued on next page.

Chemistry Laboratory Kits—Atomic Structure, continued

FLINN EXCLUSIVE

AP6628

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM



Catalog No.	Description	Price/Each
AP6628	Atomic Coatings—The Size of an Atom—Student Laboratory Kit	$34.45
AP6496	Atomic Target Practice—Rutherford Scattering and the Nuclear Atom—Super Value Guided-Inquiry Kit	54.00
AP6608	Introduction to Electron Structure—Student Laboratory Kit	47.05
AP6440	Naming Atoms—Elements, Ions and Isotopes—Super Value Laboratory Kit	61.40

FLINNeverydayscience™

NEW!

Water-Fearing vs. Water-Loving



With this FlinnEverydayScience™ lab, students investigate hydrophobic and hydrophilic substances. In the introductory activity, students study how soap and water interact in a variety of activities. Then, in the challenge activity, students study the properties of shaving cream, food dye, and paper, to make their very own marbled notecards.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes cotton swabs, craft sticks, dish soap, food dye, 3" x 5" notecards, pepper, pie pans, pipettes, shaving cream, wax paper, and wood splints.

Complete for 30 students working in groups of three.

Catalog No.	Description	Price/Each
AP11815	Water-Fearing vs. Water-Loving	$90.25

Chemistry Laboratory Kits—Biochemistry

Chemicals of Life—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: David Brock, Roland Park Country School, Baltimore, MD



Give students their initial experience in the chemistry of living matter by having them identify the basic macromolecules of life. This teacher-designed activity can be used as an introduction to biochemistry or any cell unit and will also serve as an excellent first experience to the proper protocols for performing chemical tests. Students will learn and perform standard tests for carbohydrates, proteins, lipids and nucleic acids.

Super Value Kit is complete for 5 classes of 30 students working in pairs. Perform this experiment in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
FB1435	Chemicals of Life—Super Value Laboratory Kit	$80.88

Introduction to Carbohydrates—Structure and Properties—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Break the carbohydrate code in this engaging "mystery lab." The identities of five carbohydrates—starch, glucose, fructose, lactose and sucrose—have been scrambled. Students perform four classification tests in sequence to unscramble the code and identify the mystery carbohydrates. How are monosaccharides related to di- and polysaccharides? How do reducing and a nonreducing sugars differ? The classification tests address these questions and provide single clues that reveal the identity of an unknown. Includes reproducible student handouts, Teacher Notes with sample data and answers to all questions and all necessary chemicals and consumable supplies.

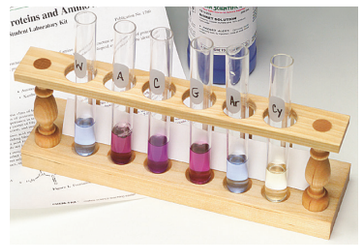
Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP1766	Introduction to Carbohydrates—Structure and Properties—Student Laboratory Kit	$66.25

Identifying Proteins and Amino Acids—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In this exploratory student activity, students first compare and contrast the behavior of three common proteins—albumin, casein and gelatin—using the biuret test to identify the general nature of the peptide linkage and its central role in protein structure. Students then perform a series of chemical tests to further explore the composition of these proteins with respect to the presence of three specific amino acids—arginine, cysteine and tyrosine. By studying the distribution of different amino acids in proteins, students learn how hydrophobic and hydrophilic amino acid side chains stabilize proteins and contribute to their special properties. Includes reproducible student handouts, background information, Teacher Notes with sample data and answers to all questions and all necessary chemicals and consumable supplies needed.

Complete for 30 students working in pairs. Perform this experiment in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP1769	Identifying Proteins and Amino Acids—Student Laboratory Kit	$91.35

Molecules of Life—Super Value Laboratory Kit



Have your students gain a clearer understanding of the basic structure and chemistry of the molecules essential for life. In a series of seven lab activities, students construct three-dimensional models of carbohydrates, lipids, and proteins. These activities start with the construction of monosaccharides and progress to the formation of representative amino acids. At each step, the models give students valuable insight into the formation and activity of these fundamental molecules. Kit contains over 1800 reusable molecular components, along with student worksheets and teacher's guide.

Super Value Kit is complete for 15 student groups. All materials are reusable.

Catalog No.	Description	Price/Each
AP6517	Molecules of Life Kit—Super Value Laboratory Kit	$154.20

CHEMISTRY LABORATORY KITS—BIOCHEMISTRY continued on next page.

Chemistry Laboratory Kits—Biochemistry, continued

Physical Properties of Proteins—Student Laboratory Kit

FLINN EXCLUSIVE



By: The Flinn Staff

In this hands-on kit, students examine the effects of acids and bases, inorganic salts, organic solvents and temperature on the physical properties of proteins. Students learn how these factors affect the interactions among amino acid side chains that are responsible for the stable three-dimensional structures of proteins—and thus change the actual shapes of proteins. Students observe that some changes are easily reversed and thus relatively harmless while other changes are essentially irreversible and lead to complete loss of protein function. The definition and applications of protein denaturation are also explored. Includes reproducible student handouts, detailed background information, Teacher Notes with sample data and answers to all questions and all necessary chemicals and consumable supplies needed. *Complete for 30 students working in pairs.*

Catalog No.	Description	Price/Each
AP1768	Physical Properties of Proteins—Student Laboratory Kit	$70.55

Properties of Lipids—Student Laboratory Kit

FLINN EXCLUSIVE



By: The Flinn Staff

In this three-part laboratory kit, students first examine the solubility of lipids and use Sudan III—a special "fat stain"—to identify lipids. Students then perform a test for unsaturation on a variety of seed oils to learn more about the vital role of saturated, unsaturated and polyunsaturated triglycerides in nutrition and health. Finally, students extract peanut oil from peanuts using hexane to determine the amount of fat in peanuts. Includes reproducible student handouts, detailed background information, Teacher Notes with sample data and answers to all questions and all necessary chemicals and consumable supplies. *Complete for 30 students working in pairs. Perform this experiment in a fume hood or well-ventilated lab.*

Catalog No.	Description	Price/Each
AP1773	Properties of Lipids—Student Laboratory Kit	$135.00

Chemistry Laboratory Kits—Chemical Bonding

FLINN360science™: Qualitative Analysis and Chemical Bonding



This kit presents the essential concepts of Chemical bonds, structure-property relationships, ionic bonds, covalent bonds, polar covalent bonds, nonpolar covalent bonds, and metallic bonds through hands-on science activities designed to engage all your students, regardless of level. Students will understand that a material's properties are linked to the material's structure and bonding. Teachers can extend learning through guided inquiry into associated phenomena including, "Why are some materials good for certain applications but not others?"

Catalog No.	Description	Digital Access	Price/Each
AP10358	360Science: Qualitative Analysis and Chemical Bonding	1-Year	$111.85
AP10458		3-Year	126.65

FLINN360science™: Characteristics of Ionic Bonds



This kit teaches the essential concepts of chemical bonds, structure-property relationships, ionic bonds, and physical properties of materials through hands-on science activities designed to engage all your students, regardless of level. Students will understand that a material's physical properties, such as melting point, are linked to the material's structure and bonding and ionic bonds tend to be strong. Teachers can extend learning through guided inquiry into associated phenomena including, "Why are some materials good for certain applications but not others?"

Catalog No.	Description	Digital Access	Price/Each
AP10359	360Science: Characteristics of Ionic Bonds	1-Year	$53.00
AP10459		3-Year	70.65

FLINN360science™: Investigate Metallic Compounds



This kit presents the essential concepts of chemical bonds, structure-property relationships, metals, physical properties of materials, and metallic compounds through hands-on science activities designed to engage all your students, regardless of level. Students come to understand that a material's properties are linked to the material's structure and bonding. Teachers can extend learning through guided inquiry into associated phenomena including, "Why are some materials good for certain applications but not others?

Catalog No.	Description	Digital Access	Price/Each
AP10360	360Science: Investigate Metallic Compounds	1-Year	$70.65
AP10460		3-Year	83.05

FLINN360science™: Investigate Covalent Bonds



This kit kit presents the essential concepts of chemical bonds, structure-property relationships, covalent bonds, and the physical properties of materials through hands-on science activities designed to engage all your students, regardless of level. Students come to understand that a material's physical properties, such as melting point, are linked to the material's structure and bonding. Moreover, the interparticle forces in covalent compounds tend to be relatively weak, and so covalent compounds tend to melt at relatively low temperatures. Teachers can extend learning through guided inquiry into associated phenomena including, "Why are some materials good for certain applications but not others?

Catalog No.	Description	Digital Access	Price/Each
AP10361	360Science: Investigate Covalent Bonds	1-Year	$53.00
AP10461		3-Year	70.65

FLINN360science™: Intermolecular Forces



This kit presents your students the essential concepts of intermolecular forces, structure-property relationships, and physical properties of materials through hands-on science activities. Students come to understand that a material's physical properties are linked to the material's structure and bonding. Teachers can extend learning through guided inquiry into associated phenomena including, "Why are some materials good for certain applications but not others?"

Catalog No.	Description	Digital Access	Price/Each
AP10362	360Science: Intermolecular Forces	1-Year	$70.65
AP10462		3-Year	87.00

FLINN360science™: Chemical Names and Formulas



This kit teaches students the concepts of chemical bonds, chemical names, and chemical formulas through hands-on science. During this lab, students can differentiate between ionic and covalent compounds and understand that ionic compounds must be charge balanced. Students recognize that there are different methods for naming and writing the formulas of ionic and covalent compounds.

Catalog No.	Description	Digital Access	Price/Each
AP10363	360Science: Chemical Names and Formulas	1-Year	$58.85
AP10463		3-Year	76.55

FLINN360science™: Evaluate Metals for a Commercial Application



This kit presents the concepts of chemical properties, metals, reactivity, material properties and chemical bonding. Students learn that some metals are more resistant to corrosion than others, and that as a category, metals are lustrous and malleable.

Catalog No.	Description	Digital Access	Price/Each
AP10424	360Science: Evaluate Metals for a Commercial Application	1-Year	$100.10
AP10524		3-Year	110.75

CHEMISTRY LABORATORY KITS continued on next page.

Chemistry Laboratory Kits—Chemical Bonding, continued

FLINN360science™: Separating a Synthetic Pain Relief Mixture



This kit presents the essential concepts of mixture vs. pure substance, over-the-counter drugs, physical and chemical changes, separation of a mixture, homogeneous vs. heterogeneous, and mass percent composition through hands-on activities designed to engage all your students. Through this investigation, students will become familiar with separating a mixture, based on the component's properties and will better understand percent recovery. Teachers can extend learning through guided inquiry into associated phenomena including, "pure elements."

Catalog No.	Description	Digital Access	Price/Each
AP10677	360Science: Separating a Synthetic Pain Relief Mixture	1-Year	$80.00
AP10777		3-Year	91.40

FLINN360science™: Rate of Decomposition of Metal Carbonates



Through this kit, students will observe that sodium carbonate and potassium carbonate do not decompose under the conditions of temperature applied in this experiment. Standards-aligned, Flinn's 360Science™: Rate of Decomposition of Metal Carbonates kit presents the essential concepts of metal carbonates, kinetics of decomposition, and rate of reaction through hands-on science activities designed to engage all your students, regardless of level. Teachers can extend learning through guided inquiry into associated phenomena including, "Fast and Slow Processes."

Catalog No.	Description	Digital Access	Price/Each
AP10678	360Science: Rate of Decomposition of Metal Carbonates	1-Year	$151.30
AP10778		3-Year	168.10

FLINN360science™: Bonding Basics with Graphite Circuits



This kit presents the essential concepts of chemical bonding, Ohm's law, network covalent solids, and properties of solids and promises to engage all your students. Throughout this investigation, students follow directions to draw a circuit with a pencil (graphite) to explore chemical bonding in this network covalent solid. Students will notice that the shaded pencil surface area causes a greater flow of electrons, thus brightening the LED in their optimized designs. Teachers can extend learning through guided inquiry into associated phenomena including, "What distinguishes one mineral from another?"

Catalog No.	Description	Digital Access	Price/Each
AP10683	360Science: Bonding Basics with Graphite Circuits	1-Year	$102.15
AP10783		3-Year	118.25

FLINN360science™: Exploring Kinetics with Galvanized Coatings



This kit presents the essential concepts of kinetics, reaction order, reaction rates, and single replacement reaction through hands-on science activities designed to engage your students. Students will find that despite using the same concentrations of two strong acids, the coating was not removed at equal rates. Students will see that it takes a pretty high concentration of acid to quickly remove a galvanized coating. This should help them understand the widespread industrial use of galvanized metals. Teachers can extend learning through guided inquiry into associated phenomena including, "Fast and Slow Processes."

Catalog No.	Description	Digital Access	Price/Each
AP10692	360Science: Exploring Kinetics with Galvanized Coatings	1-Year	$78.45
AP10792		3-Year	91.38

FLINN360science™: Make Your Own Tiny Battery



This kit presents the concepts of half-cell reaction, voltaic vs. electrolytic cell, and oxidation–reduction reaction standard-reduction potential through hands-on science. Students build a handheld voltaic cell in this lab and make connections to thermodynamically favored reactions. They then expand on their knowledge of these reactions by exploring the voltaic cell's various parts such as the cathode, anode and salt bridge. Students also apply their knowledge to electrolytic cells and make comparisons with the voltaic cell built in their experiment.

Catalog No.	Description	Digital Access	Price/Each
AP10684	360Science: Make Your Own Tiny Battery	1-Year	$ 91.40
AP10784		3-Year	112.05

Chemistry Laboratory Kits—Chemical Reactions

FLINN360science™: Identify Evidence of Chemical Reactions

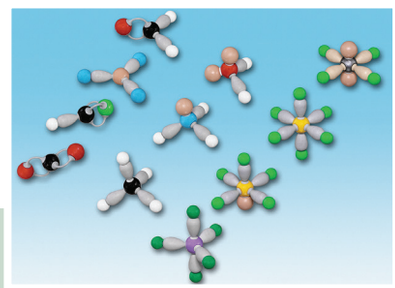


This kit presents the concepts of chemical reactions, reactants and products, and conservation of mass through hands-on activities. The four versions of this lab focus on evidence of a chemical reaction as students explore production of gas when they react acetic acid with a base. Watch your students have fun and learn great skills with these labs! Teachers can extend learning through guided inquiry into associated phenomena including, "How do fuel cells work?"

Catalog No.	Description	Digital Access	Price/Each
AP10376	360Science: Identify Evidence of Chemical Reactions	1-Year	$ 94.20
AP10476		3-Year	109.65



Chemical Bonding—Activity-Stations Kit
AP7437



Lewis Structures and Molecular Geometry—Super Value Guided-Inquiry Kit
AP6852

FLINN EXCLUSIVE

Catalog No.	Description	Price/Each
AP7036	Crystal Structure—Super Value Laboratory Kit	$86.70
AP4580	Lewis Electron Dot Models—Super Value Laboratory Kit	43.30
AP7289	Build Models of Molecules—Guided-Inquiry Kit	69.50
AP6852	Lewis Structures and Molecular Geometry—Super Value Guided-Inquiry Kit	68.72
AP7090	Models of Organic Compounds—Super Value Guided-Inquiry Kit	79.25
AP7437	Chemical Bonding—Activity-Stations Kit	73.46
AP7167	VSEPR Origami—Student Activity Kit	62.00

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

CHEMISTRY LABORATORY KITS—CHEMICAL REACTIONS continued on next page.

Chemistry Laboratory Kits—Chemical Reactions, continued

FLINN360science™: Evaluate Chemical Reactions



This kit presents the essential concepts of chemical reactions, Law of Conservation of Mass, and balancing equations through hands-on science activities that help students understand how scientists use scientific notation to represent chemical reactions. Witnessing chemical reactions with chemicals is eye opening to the students and aids them in getting a deeper understanding and appreciation for equation writing. Furthermore, modeling chemical reactions with bingo chips is a safe method to introduce a commonly tough topic in chemistry.

Catalog No.	Description	Digital Access	Price/Each
AP10377	**360**Science: Evaluate Chemical Reactions	1-Year	$100.10
AP10477		3-Year	117.75

FLINN360science™: Types of Chemical Reactions



This kit resents the essential concepts of chemical reactions, Reaction types, Evidence of a chemical reaction balancing equations, stoichiometry, and limiting reagents through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will observe that no matter how much sodium bicarbonate is added, at some point it becomes the excess reagent and there is not enough acetic acid to react. As a result, there is a limited amount of carbon dioxide gas that can be produced. When smaller amounts of sodium bicarbonate are added, it is the limiting reagent and the acetic acid is the excess. When the moles of sodium bicarbonate exceed the moles of acetic acid, the designations switch and acetic acid becomes the limiting reactant. Teachers can extend learning through guided inquiry into associated phenomena such as, "What can make a recipe fail?"

Catalog No.	Description	Digital Access	Price/Each
AP10378	**360**Science: Types of Chemical Reactions	1-Year	$175.00
AP10478		3-Year	180.00

FLINN360science™: Predict Chemical Reactions



This kit presents the essential concepts of reactants and products, chemical equations, solubility rules, and net ionic equations through hands-on science activities designed to engage all your students, regardless of level. The learning experience is dynamite in this lab! Expect the students to make corrections to their predicted equations after they perform the reactions in the lab and make observations. Mistakes in the written, predicted equation are welcome as it is the best learning experience for your students.

Catalog No.	Description	Digital Access	Price/Each
AP10379	**360**Science: Predict Chemical Reactions	1-Year	$123.45
AP10479		3-Year	140.00

FLINN360science™: Water Purification



This kit presents the essential concepts of contaminants, purification techniques, and heavy metals through hands-on science activities designed to engage students. Students will purify water samples with a cost limit and provided purification materials. Students test their water samples with a 0.02% sodium rhodizonate solution. Teachers can extend learning through guided inquiry into associated subjects such as, "How do fuel cells work?"

Catalog No.	Description	Digital Access	Price/Each
AP10428	**360**Science: Water Purification	1-Year	$ 88.30
AP10528		3-Year	104.00

FLINN360science™: Energy-Efficient Cookware



This kit presents essential concepts of energy conservation, energy transfer, thermal conduction, heat, metals, and material properties through hands-on science activities. Students will determine that different metals conduct heat at different rates. Students should determine that copper is the metal best suited for use in cookware owing to its ability to distribute heat from a source quickly.

Catalog No.	Description	Digital Access	Price/Each
AP10418	**360**Science: Energy Efficient Cookware	1-Year	$34.63
AP10518		3-Year	51.95

FLINN360science™: Measure Energy in Combustion Reactions



This kit presents concepts of Chemical reactions, combustion reactions, energy transfer in chemical reactions, and the law of conservation of mass, through hands-on science activities designed to engage students. Students should come to understand that different fuel sources have different chemical compositions and therefore different chemical structures. Through this investigation, students should recognize that despite evidence to the contrary (e.g., the charring of wood splints), mass is not destroyed in a chemical reaction, only transformed. Teachers can extend learning through guided inquiry into associated phenomena, "Why are forest fires difficult to extinguish?"

Catalog No.	Description	Digital Access	Price/Each
AP10334	**360**Science: Measure Energy in Combustion Reactions	1-Year	$ 88.30
AP10434		3-Year	103.90

FLINN360science™: Energy Densities of Organic Fuels



This kit presents essential concepts of chemical reactions, combustion reactions, energy transfer in chemical reactions, and the law of conservation of mass through hands-on science activities designed to engage students. Students should come to understand that different fuel sources have different chemical compositions and therefore different chemical structures. Teachers can extend learning through guided inquiry into associated phenomena, "Why are forest fires difficult to extinguish?"

Catalog No.	Description	Digital Access	Price/Each
AP10335	**360**Science: Energy Densities of Organic Fuels	1-Year	$23.55
AP10435		3-Year	41.20

FLINN360science™: Measure Energy Flow in Chemical Reactions



This kit presents essential concepts of chemical reactions, combustion reactions, energy transfer in chemical reactions, and the law of conservation of mass through hands-on science activities designed to engage students. Students observe how reacting CaO with H_2O will result in a transfer of energy from a system (the reaction) to the surroundings (the area in direct proximity to the reaction) that results in a measurable increase in temperature. Reacting NH_4SCN and $Ba(OH)_2 \cdot 8H_2O$ will result in a transfer of energy from the surroundings to the system that results in a measurable decrease in temperature. Teachers can extend learning through guided inquiry into associated phenomena, "Why are forest fires difficult to extinguish?"

Catalog No.	Description	Digital Access	Price/Each
AP10336	**360**Science: Measure Energy Flow in Chemical Reactions	1-Year	$35.30
AP10436		3-Year	51.95

FLINN360science™: Matter Transformation in Combustion



This kit presents essential concepts of chemical reactions, combustion reactions, energy transfer in chemical reactions, and the law of conservation of mass through hands-on science. Students observe that the precombustion mass of sugar samples are equal to, or negligibly different than, the post-combustion masses of the sugar samples. Students infer from this observation that mass is conserved throughout chemical reactions and that matter is not created or destroyed but transformed from one form to another. Teachers can extend learning through guided inquiry into associated phenomena, "Why are forest fires difficult to extinguish?"

Catalog No.	Description	Digital Access	Price/Each
AP10337	**360**Science: Matter Transformation in Combustion	1-Year	$51.95
AP10437		3-Year	70.65

CHEMISTRY LABORATORY KITS—CHEMICAL REACTIONS continued on next page.

Chemistry Laboratory Kits—Chemical Reactions, continued

FLINN360science™: Conservation of Mass in Chemical Reactions



This kit presents the essential concepts of chemical reactions, law of conservation of mass, and engineering design for all your students, regardless of level. Students will determine that despite evidence to the contrary, mass is conserved because the matter is changed from one form to another, not destroyed. Teachers can extend learning through guided inquiry into associated phenomena including, "Why are forest fires hard to extinguish?"

Catalog No.	Description	Digital Access	Price/Each
AP10419	360Science: Conservation of Mass in Chemical Reactions	1-Year	$40.40
AP10519		3-Year	58.85

FLINN360science™: Acidity of Beverages



This kit presents the essential concepts of acids and bases, titration, indicators, pH, equivalence point, and neutralization through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will analyze the citric acid concentration in their juice sample and graph a titration curve for their titration. In guided, open and advanced level lab formats, students will also determine which indicator is needed for their titration. Teachers can extend learning through guided inquiry into associated phenomena including, "Acid Rain."

Catalog No.	Description	Digital Access	Price/Each
AP10695	360Science: Acidity of Beverages	1-Year	$57.00
AP10795		3-Year	69.88

FLINN EXCLUSIVE



The Inorganic Chemistry of Painting—Guided-Inquiry Kit AP8486

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Catalog No.	Description	Price/Each
AP4860	Chemical Reactions—Super Value Laboratory Kit	$141.05
AP8914	Reactions, Predictions and Net Ionic Equations—Student Laboratory Kit	65.10
AP7418	Exploring Chemical Reactions with Food Dyes—Student Laboratory Kit	52.00
AP5605	Sequence of Chemical Reactions—Student Laboratory Kit	69.95
AP7404	Recycling Aluminum—Synthesis of Alum—Student Laboratory Kit	30.05
AP6882	Recycling Copper—A Four Reaction Copper Cycle—Student Laboratory Kit	68.30
AP8486	The Inorganic Chemistry of Painting	67.00
AP6269	What Is a Chemical Reaction?—Student Laboratory Kit	52.50

Chemistry Laboratory Kits—Chromatography

Introduction to Paper Chromatography—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Paper chromatography is fun! In this unique kit, students conduct two paper chromatography experiments. The first lab involves the separation of pigments from different inks (marking pens). Many inks are mixtures made up of several pigments. Each pigment has a different molecular structure and, usually, a different polarity. The second experiment involves the separation of pigments found in plants. Using fresh spinach leaves students separate out four to five different pigments responsible for photosynthesis. These pigments are identified by their colors and relative position on the chromatogram. Lab instructions include a detailed explanation of chromatography, student-friendly instructions and helpful teacher tips. Chromatography pens, paper and wood splints are included.

Complete for 24 students working in pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs.

Catalog No.	Description	Price/Each
AP4503	Introduction to Paper Chromatography—Student Laboratory Kit	$ 74.00
AP7605	Introduction to Paper Chromatography—Super Value Laboratory Kit	154.35

FLINNeverydayscience™

NEW!

Crazy About Chromatography



With this FlinnEverydayScience™ lab, students investigate the ink of three black markers or pens with chromatography. Then, in the challenge activity, students produce a radial paper chromatography image based on the results from the introductory activity.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

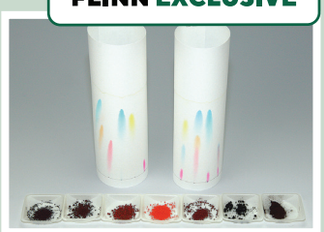
This kit includes chromatography challenge sample art, 40 30-mL plastic cups, 50 8 oz plastic cups, filter paper, various types of markers and pens, and 8 wood splints.

Complete for 30 students working in groups of three.

Catalog No.	Description	Price/Each
AP11816	Crazy About Chromatography	$90.25

FD&C Food Dyes

FLINN EXCLUSIVE



The entire palette of artificial food colors is derived from just seven dyes certified by the Food and Drug Administration for use in foods, drugs and cosmetics (FD&C). Use these pure, crystalline food dyes as color standards to identify compounds extracted from candy, beverages and other foods. Wonderful for chromatography and spectroscopy lab activities as well as acid–base indicator reactions and redox experiments! Seven dyes, 2 g each: FD&C Red 3, Red 40, Yellow 5, Yellow 6, Green 3, Blue 1 and Blue 2.

Catalog No.	Description	Price/Each
AP7375	FD&C Food Dyes, Set of 7	$48.95

CHEMISTRY LABORATORY KITS—CHROMATOGRAPHY continued on next page.

Chemistry Laboratory Kits—Chromatography, continued

Chromatography Challenge—Science, Inquiry and Art—Guided-Inquiry Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Black is the absence of color—or is it? The challenge in this inquiry-based activity is for students to reproduce beautiful multicolor art patterns created by the teacher using radial paper chromatography and a variety of black markers. Students are amazed at the unique art chromatograms that can be made, and teachers delight in the novel problem-solving strategies students use to recreate the designs. An excellent activity to teach compounds and mixtures, the separation of mixtures and the principles of chromatography. Includes detailed instructions with reproducible student handouts, valuable Teacher Notes and a page of beautiful color photos of sample art.

Complete for 90 radial chromatograms. Includes one set of eight markers. Additional sets of markers are available separately.

Catalog No.	Description	Price/Each
AP7174	Chromatography Challenge—Science, Inquiry and Art—Guided-Inquiry Kit	$52.80
AP6873	Black Markers, Assorted Set of 8	21.22

Food Dye Chromatography—Student Laboratory Kit

STEM INTEGRATED

By: The Flinn Staff



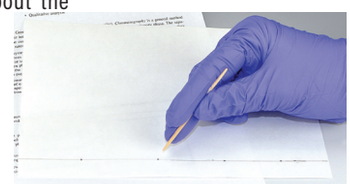
Food dyes have been used extensively for more than 100 years. Would you eat maraschino cherries if they were their natural color of beige instead of red? Explore the properties of the seven Food, Drug and Cosmetic (FD&C) artificial food dyes with this chromatography activity. Students determine the composition of an unknown solution utilizing paper chromatography and the seven referenced FD&C food dyes to learn more about polarity, food chemistry and chromatography. Includes reproducible student handouts, detailed background information, complete Teacher Notes with sample data and answers to all questions and all necessary chemicals and consumable supplies.

Complete for 30 students in pairs. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP7394	Food Dye Chromatography—Student Laboratory Kit	$57.05

Metal Ion Chromatography—Student Laboratory Kit

FLINN EXCLUSIVE



In this kit, students learn more about the basics of paper chromatography by developing and evaluating their own chromatograms. Students determine the components of an unknown solution through qualitative analysis of three different metal ions—copper, nickel and cobalt. A great activity to revitalize your chromatography unit. Includes complete instructions and all necessary chemicals, chromatography paper and foil along with background information and Teacher Notes with sample data and answers to all questions.

Complete for 30 students in pairs. Large beakers or bottles are recommended for chromatography chambers and available separately. Toothpicks are also required.

Catalog No.	Description	Price/Each
AP7524	Metal Ion Chromatography—Student Laboratory Kit	$99.00
GP1030	Beaker, Borosilicate Glass, 600-mL	6.25

Amino Acid Chromatography—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



The purpose of this student laboratory kit is to separate a mixture of eight amino acids and identify an unknown based on their rate of migration during paper chromatography. Colorless amino acids are detected by spraying with ninhydrin after elution with the special chromatography solvent. Students discover that all amino acids are different and identify the least polar and most polar amino acids. This activity adds a fresh biological perspective to traditional chromatography experiments. Includes reproducible student handouts, detailed background information, complete Teacher Notes with sample data and answers to all questions and all necessary chemicals and consumable supplies.

Complete for 30 students working in pairs. Perform this experiment in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP7199	Amino Acid Chromatography—Student Laboratory Kit	$104.90

Column Chromatography—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In this kit, students will extract pigments from tomato paste and spinach powder using column chromatography, an analytical separation method used by scientists to separate, isolate and purify organic and biological compounds. The order in which the pigments are extracted is based on their polarity. Reusable columns, alumina, solvents and instructions are provided so students can master the art of packing a column. Tomato paste and freeze-dried spinach powder are included. Detailed student instructions are clearly written and incorporate sections on chromatography theory, pigment structure and the role these pigments play in biochemistry.

Complete for 30 students working in pairs. Additional columns are available separately. Perform this experiment in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP4847	Column Chromatography—Student Laboratory Kit	$78.55
AP7613	Chromatography Columns, Polypropylene, Pkg./15	34.90

Introduction to Thin-Layer Chromatography—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Chromatograms are run on five different sample dye solutions and one of three unknowns. Students then compare and identify the components by calculating their rate of flow (R_f) value for each dye. Good technique is the key to successfully running a TLC experiment. Our lab instructions are clearly written and include a detailed explanation of TLC along with tips and hints to ensure student success and understanding. Dye samples, chromatography solvent, TLC plates, capillary tubes, and instructions are included.

Complete for 30 students working in pairs. Perform this experiment in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP4504	Introduction to Thin-Layer Chromatography—Student Laboratory Kit	$129.40

CHEMISTRY LABORATORY KITS—CHROMATOGRAPHY continued on next page.

Chemistry Laboratory Kits—Chromatography, continued

TLC of Fruit Juices—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Thin layer chromatography, or TLC, is a quick and inexpensive method to identify organic components in a mixture. Students spot TLC plates with standard mixtures of citric, tartaric and succinic acids, along with juice samples. Once the plates are developed, students measure and compare the distances traveled to determine the juice components. Includes all chemicals and consumable supplies needed to perform the lab.

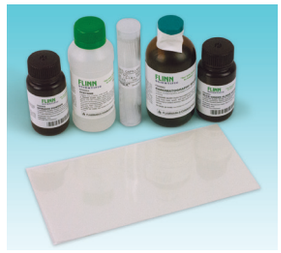
Complete for 30 students working in pairs. Perform this experiment in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP7405	TLC of Fruit Juices—Student Laboratory Kit	$94.25

Plant Pigment Chromatography—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Provide your students with an exciting method to study and compare plant pigments. Using thin-layer chromatography, students can separate and compare chlorophylls and accessory pigments found in two different plants. This kit makes it easy to set up, perform this interesting experiment and get terrific results in a single class period. Perfect for biology, botany and environmental science students.

Complete for 30 students working in pairs. Perform this experiment in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
FB0586	Plant Pigment Chromatography—Student Laboratory Kit	$85.20

Chromatography Centrifuge—Student Laboratory Kit

FLINN EXCLUSIVE

By: Jeff Bracken, Westerville North H.S., Westerville, OH



Perform chromatography separations using the chromatography centrifuge—it's fast, easy and fun! Simply spot the water-soluble inks on the absorbent paper, place the paper on the motor, and turn it on. Within seconds the spinning disk separates the various ink mixtures into brilliant patterns. Teach chromatography, separation of mixtures and physical properties with this unique kit! Includes two Bracken's Demonstration Spinners, 100 sheets of absorbent paper and 30 Beral-type pipets.

Complete 30 students to perform at least three separations each. Water-soluble pens are required and available separately. Additional spinners (Catalog No. AP6202) are also available.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5992	Chromatography Centrifuge—Student Laboratory Kit	$69.60
AP6202	Bracken's Demonstration Spinner	34.00
AP8466	Marking Pen Set, 8 Pens, Water Soluble	26.60
AP8467	Marking Pen, Black, Water Soluble	3.90

Radial Chromatography—Chemistry with an Artistic Flair! Super Value Laboratory Kit

FLINN EXCLUSIVE

By: Bob Becker, Kirkwood H.S., Kirkwood, MO



Black inks used in commercially available pens are often unique mixtures of several pigments. Paper chromatography can separate the ink mixtures. This kit incorporates a simple technique in which the solvent moves out radially from a central point producing beautiful circular chromatograms in just minutes. Through a series of hands-on activities, students can exercise their artistic creativity while learning the basics of chromatography. Includes all necessary materials and an assortment of eight water soluble black markers that each produce unique, colorful patterns.

Super Value Kit is complete with enough materials for 180 12.5-cm chromatograms, plus 10 extra-large, demonstration-sized (24-cm) chromatograms. Additional sets of black markers are available separately.

Catalog No.	Description	Price/Each
AP8687	Radial Chromatography—Chemistry with an Artistic Flair! Super Value Laboratory Kit	$73.55
AP6873	Black Markers, Assorted Set of 8	21.22

Chemistry Laboratory Kits—Consumer Science

FLINN360science™: How Sunscreen Protects Us From Radiation



This kit presents the essential concepts of UV radiation and molecular absorption through hands-on science activities designed to engage all your students, regardless of level. By completing this investigation students gain a better understanding of the dangers of ozone depletion and how the ingredients in sunscreen protect us from harmful ultraviolet radiation. Teachers can extend learning through guided inquiry into associated phenomena including, "How does climate change impact our health?"

Catalog No.	Description	Digital Access	Price/Each
AP10393	360Science: How Sunscreen Protects Us From Radiation	1-Year	$115.44
AP10493		3-Year	132.25

FLINN360science™: Making the Chemistry Lab Greener



Multiple activities are included in this standards-aligned kit that presents the essential concepts of green chemistry, precipitation reactions, redox reactions, and catalysis. They will discuss the benefits of using a catalyst to maximize the rate and output of a chemical reaction. Teachers can extend learning through guided inquiry into associated phenomena including, "green processes."

Catalog No.	Description	Digital Access	Price/Each
AP10725	360Science: Make the Chemistry Lab Greener	1-Year	$100.95
AP10825		3-Year	112.88

FLINN360science™: Toxicity of Road Deicers



This kit presents the essential concepts of green chemistry, ecotoxicity, and aqueous solution chemistry through hands-on activities. Teachers can extend learning through guided inquiry into associated phenomena including, "green processes."

Catalog No.	Description	Digital Access	Price/Each
AP10726	360Science: Toxic of Road Deicers	1-Year	$102.15
AP10826		3-Year	118.25

CHEMISTRY LABORATORY KITS—CONSUMER SCIENCE continued on next page.

Chemistry Laboratory Kits—Consumer Science, continued

FLINN360science™: Green Chemistry Analysis of a Reaction



This kit presents the essential concepts of green chemistry, stoichiometry, percent composition, and decomposition reaction) through hands-on science activities designed to engage all your students, regardless of level. Through this investigation, students working with metal bicarbonate/metal carbonate mixtures will determine a mass percent of potassium bicarbonate of 60–70 percent in the $KHCO_3/K_2CO_3$ sample and a mass percent of sodium bicarbonate of 40–50 percent in the $NaHCO_3/Na_2CO_3$ sample. If students were given pure $KHCO_3$ or $NaHCO_3$ samples, the mass percent of bicarbonate should be closer to 100 percent in the respective sample. Upon calculating the Atom Economy (AE) for $KHCO_3$ and $NaHCO_3$ thermal decomposition reactions, they will determine that $KHCO_3$ has a higher AE than $NaHCO_3$ and may conclude that using $KHCO_3$ is a greener choice. Teachers can extend learning through guided inquiry into associated phenomena including, "green processes."

Catalog No.	Description	Digital Access	Price/Each
AP10728	360Science: Green Chemistry Analysis of a Reaction	1-Year	$90.00
AP10828		3-Year	84.05

FLINN360science™: Uses and Production of Ash Water



This kit presents the essential concepts of green chemistry, renewable starting materials, acid–base reactions, and titration. Students will prepare an ash water solution and standardize it via titration against potassium hydrogen phthalate to determine that it has an equivalent base concentration between 0.01–0.02 M. They will also determine the amount of acetic acid solution needed to react with the ash water to produce the corresponding acetate salt solution.

Catalog No.	Description	Digital Access	Price/Each
AP10727	360Science: Uses and Production of Ash Water	1-Year	$ 67.25
AP10827		3-Year	102.13

FLINN360science™: How to Recycle Polylactic Acid Plastics



This kit presents the essential concepts of green chemistry, polymers, acid–base chemistry, and hydrolysis reactions through hands-on science activities designed to engage all your students, regardless of level. In the short version of this investigation, students will transform a waste cup made of polylactic acid (PLA) into a keychain or pendant by melting and depolymerizing the cup. In the guided, open, and advanced versions, students will conduct an experiment to depolymerize a PLA cup via hydrolysis. Teachers can extend learning through guided inquiry into associated phenomena including, "green processes."

Catalog No.	Description	Digital Access	Price/Each
AP10730	360Science: How to Recycle Polylactic Acid Plastics	1-Year	$ 51.45
AP10830		3-Year	100.85

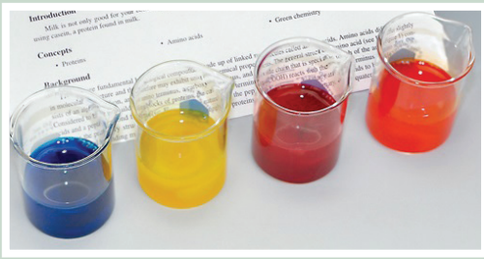
FLINN360science™: Plastic from Biowaste



This kit presents the essential concepts of green chemistry, bioplastics, recycling, and biodegradability through hands-on science activities designed to engage all your students, regardless of level. Students will develop a formulation to prepare a polymer using plant waste (orange, banana or potato peels or cornstarch), acetic acid, vegetable oil, glycerin and water. The resulting plastic will be flexible, relatively resistant (will hold at least 5 g of mass) and biodegradable (will decompose in compost within a few weeks). Teachers can extend learning through guided inquiry into associated phenomena including, "green processes."

Catalog No.	Description	Digital Access	Price/Each
AP10729	360Science: Plastic from Biowaste	1-Year	$84.50
AP10829		3-Year	68.60

FLINN EXCLUSIVE



Making Natural Paint—Student Laboratory Kit
AP7523



Aspirin Testing—Student Laboratory Kit
AP1742

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Catalog No.	Description	Price/Each
AP1742	Aspirin Testing—Student Laboratory Kit	$64.60
AP9091	Determination of the Hardness of Water—Student Laboratory Kit	34.35
FB0442	Cheese-Making—Student Laboratory Kit	64.80
AP7523	Making Natural Paint—Student Laboratory Kit	69.35
AP7248	Determination of Iron in Dietary Supplements—Student Laboratory Kit	52.75
AP7352	Water Softening—Guided-Inquiry Kit	49.95
AP1741	How Powerful Is Your Antacid?—Student Laboratory Kit	52.95
AP8973	Kitchen Chemistry Solids—Student Laboratory Kit	50.10
AP6120	Milk Is a Natural—Biology, Chemistry and Nutrition—Student Laboratory Kit	44.40
AP7582	Milk Is a Natural—Biology, Chemistry and Nutrition—Super Value Laboratory Kit	97.60
AP7154	Preparation and Properties of Biodiesel—Student Laboratory Kit	40.90
AP4512	Shampoo Test—Student Laboratory Kit	58.10
AP7924	Make Your Own Soap—Guided-Inquiry Kit	40.40
AP4856	Soap-Making—Student Laboratory Kit	66.25
AP4510	Toothpaste Test—Student Laboratory Kit	56.95
AP6690	Total Acidity—Titration of Fruit Juices	29.80
AP7506	Vitamin C Analysis	46.95

CHEMISTRY LABORATORY KITS—CONSUMER SCIENCE continued on next page.

Chemistry Laboratory Kits—Consumer Science, continued

FLINN EXCLUSIVE

Chemistry of Food Additives—Multi-Demonstration Kit



By: The Flinn Staff

This four-part demonstration lets students see the science behind some of the marketing.

- Extract iron from common breakfast cereal. Determine the form of iron present and compare the quantity present to the quantity specified on the Nutrition Facts label. It's elemental!
- Iodide is added to iodized salt to prevent thyroid and other diseases. Demonstrate the presence of this essential nutrient by oxidizing the iodide and doing a starch–iodine test.
- Do some simple measurements to illustrate how it's possible to claim that salt substitutes have less sodium than regular table salt.
- Reveal the nature of the "secret ingredient" added to freshly cut fruit to prevent it from turning brown.

This great series of demonstrations will build connections between science and real life. Teacher Demonstration Notes included.

Catalog No.	Description	Price/Each
AP7288	Chemistry of Food Additives—Multi-Demonstration Kit	$75.75

Chemistry Laboratory Kits—Classifying Matter

Elements, Compounds and Mixtures—Student Laboratory Kit



By: The Flinn Staff

A great, high-quality introductory kit—ideal for teaching the concepts of elements, compounds and mixtures. Four separate activities are provided. The first paper-and-pencil activity will familiarize students with common element symbols and names. In the second "classification of matter" activity, students use a flow chart to classify various materials as either an element, a compound or a mixture. Next is a laboratory activity in which students use physical separation techniques to separate a mixture consisting of sand, salt, zinc and iron filings. Then students chemically react aluminum with copper(II) chloride to produce and isolate a new element and compound. Detailed Teacher Notes and reproducible student handouts include easy-to-follow lab instructions, sample data, answers to questions and in-depth background information. All chemicals and specialized equipment are provided.

Complete for 30 students working in pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs. One magnetic wand is included with the kit—additional wands are available separately.

Catalog No.	Description	Price/Each
AP4579	Elements, Compounds and Mixtures—Student Laboratory Kit	$ 81.09
AP7586	Elements, Compounds and Mixtures—Super Value Laboratory Kit	121.21
AP4584	Magnetic Wand	5.25

Flinn's *Exploring Chemistry*™—Introduction to Chemistry—Matter and Measurement Package

See page 246.

Percent Water in a Hydrate—Student Laboratory Kit



By: The Flinn Staff

Hydrates are pure substances that contain water molecules embedded in their crystal structure. In this experiment, students heat a solid hydrate to remove the water and then calculate the percent water by measuring the mass of the solid before and after heating. From this percent water value, students identify the hydrate from a list of possible unknowns. A great introduction to gravimetric analysis. Includes Teacher Notes, extensive background material, reproducible student handouts and all necessary crystalline hydrate samples and specialized equipment.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP7032	Percent Water in a Hydrate—Student Laboratory Kit	$26.50

Separation of a Mixture by Filtration—Student Laboratory Kit



By: The Flinn Staff

Classifying matter into mixtures or pure substances hinges on a key question—how is the composition affected by a physical or chemical change? In this experiment, students use both physical and chemical changes to separate a mixture of iron oxide and salicylic acid. A sample of the mixture is weighed and added to sodium hydroxide solution. After the salicylic acid dissolves, the solution is filtered to isolate the insoluble iron oxide. Hydrochloric acid is then added to the solution to precipitate the remaining salicylic acid, and the solution is filtered again to separate out the salicylic acid. Students dry and weigh each component to determine its mass percent of the mixture. A great quantitative activity for developing student lab skills in filtration and other basic laboratory techniques.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP7034	Separation of a Mixture by Filtration—Student Laboratory Kit	$35.00

Separation of a Mixture—Guided-Inquiry Kit



By: The Flinn Staff

Can the components of a mixture be separated? Students discover how to separate certain mixtures in this two-part, guided-inquiry lab. A mixture is a combination of two or more pure substances. Each of these substances retains its separate chemical and physical properties. Students first examine the physical properties of salt, sand, iron and stearic acid. Then they use their collected data to design and carry out a procedure for separating a mixture of these substances. An engaging lab in which students apply concepts, such as solubility, magnetism and filtration. Teacher Notes, extensive background material and reproducible student handouts are included.

Full-size kits are complete for 30 students working in pairs. Small-size kits have materials for 10 students working in pairs. Refill kits contain materials only.

Catalog No.	Description	Type	Price/Each
AP7033	Separation of a Mixture—Guided-Inquiry Kit	Full-Size Kit	$71.44
AP10132		Full-Size, Refill Kit	66.25
AP10210		Small-Size Kit	39.85
AP10288		Small-Size, Refill Kit	31.78

CHEMISTRY LABORATORY KITS continued on next page.

Chemistry Laboratory Kits—Crystal Growing

Crystal Growing—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In this hands-on activity, students will grow crystals of alum, chrome alum, copper sulfate and nickel sulfate—each with its own distinct color and shape. Each crystal is grown from a single seed crystal in a supersaturated solution. Watch students take ownership of their crystal and nurture it as it grows over a period of several weeks. This activity is a great way to introduce the concepts of saturation, supersaturation and crystal structure. Includes thread, index cards, instructions and enough chemical starting material to grow three of each crystal mentioned, for a total of 15 crystals.

Complete for 30 students working in pairs. Fifteen glass jars for growing crystals are required and available separately.

Catalog No.	Description	Price/Each
AP4846	Crystal Growing—Student Laboratory Kit	$81.15
AP8447	Bottle, Ointment Jar Style, 16 oz	6.60

Giant Crystal Growing—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Captivate student interest by growing GIANT crystals! In this hands-on activity, students will cultivate and grow giant alum crystals in a supersaturated solution from a single seed crystal. They will be amazed at how quickly their alum crystal begins growing into its natural, cubic structure and how it continues to grow larger and larger over a period of weeks or months. Includes thread, enough aluminum potassium sulfate to grow 15 giant alum crystals and detailed instructions.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP4682	Giant Crystal Growing—Student Laboratory Kit	$36.25

Crystal Growing Rock—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Amazing! When a limestone rock is placed in a solution of acetic acid, beautiful popcorn-like crystals actually grow out of the rock. In this activity, students place a limestone rock in a weighing dish with acetic acid and allow the contents to sit undisturbed for a week. The result is a delicate, coral-like covering of white calcium acetate crystals on the exposed rock surface. Use this fun crystal-growing activity to teach students about chemical reactions and the properties of acids and bases. Includes student procedure and Teacher Notes, acetic acid solution, reusable limestone rocks and weighing dishes.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6612	Crystal Growing Rock—Student Laboratory Kit	$47.00

The Crystal Forest—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



A new twist on crystal growing! In this activity, students cut out and assemble miniature paper trees. The trees are placed in a solution of Prussian blue, sodium chloride, and ammonia. Overnight the trees become "snow-covered" in a thick, delicate envelope of salt crystals. This beautiful white forest is sure to be a classroom favorite. Includes detailed instructions and a reproducible student worksheet.

Complete for 30 students to each make one tree (150 trees). Super Value Kit is complete for 5 classes of 30 students.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6307	The Crystal Forest—Student Laboratory Kit	$ 43.65
AP6308	The Crystal Forest—Super Value Kit	104.50

Crystal Ornaments—A Holiday Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Add some sparkle to your next holiday celebration by making crystal ornaments. Students make a saturated solution of sodium borate, bend a chenille wire into the desired shape and suspend the wire in the solution. The next day students remove a beautiful crystal-covered ornament from the solution! Art and science combine as students learn about solutions and solubility and examine their ornaments under magnification to determine the crystal shape. Includes valuable Teacher Notes, detailed background information, a reproducible student worksheet and all necessary materials.

Complete for 30 students working individually. Additional chenille wires and sodium borate are available separately.

Catalog No.	Description	Price/Each
AP7413	Crystal Ornaments—A Holiday Student Laboratory Kit	$35.60

Chemistry Laboratory Kits—Electrochemistry

Build a Dry Cell Battery—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



By connecting their batteries in series and parallel and measuring the changes in voltage and current, students will learn about the properties of electric circuits. They may also test modifications of the battery to improve its performance. This hands-on laboratory covers a variety of topics in basic electricity and electrochemistry, and it has real-world applications. Plus, your students will love building their own working dry cell battery! Concepts covered include electrodes, oxidation–reduction reactions, voltaic cells, electric circuits and voltage and current. Includes complete instructions with sample data and answers to all questions.

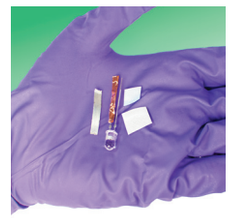
Complete for 30 students wroking in pairs. Multimeters are required for quantitative measurements, and DC motors are recommended for each lab group; both are available separately.

Catalog No.	Description	Price/Each
AP6925	Build a Dry Cell Battery—Student Laboratory Kit	$89.75
AP4639	Multimeter, Student	35.00
AP6041	Motor, DC	4.15

Create Your Very Own Simple Battery—Guided-Inquiry Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students learn about electrochemistry and galvanic and electrolytic cells in a fun and challenging way as they create their very own tiny, simple, handheld batteries. Students will be amazed when they successfully assemble a cell using a few simple materials and dilute sulfate solutions and then see proof of electric current when the LED lights up. The experiment is in two parts and can be completed in a single 50-minute lab period. First, an introductory procedure helps students prepare their own materials for the challenge. Then the guided-inquiry portion leads them through assembling the cell and identifying the different parts. A background section is included to provide a concise overview of electrolytic and galvanic cells while post-lab questions solidify the activity and promote student success.

Catalog No.	Description	Price/Each
AP9585	Create Your Very Own Simple Battery—Guided-Inquiry Kit	$62.70

CHEMISTRY LABORATORY KITS—ELECTROCHEMISTRY continued on next page.

Chemistry Laboratory Kits—Electrochemistry, continued

Introduction to Electrochemistry—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students build simple electrochemical cells using a Petri dish, pencil leads and a 9-volt battery and then investigate the chemical reaction that occurs when current is forced through water. By comparing the amount of gas and indicator color changes at each electrode, students identify individual reactions that occur and determine the overall chemical reaction. Includes reproducible student handouts, detailed background information and Teacher Notes with sample data and answers to all questions.

Complete for 30 students working in pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs. 9-V batteries are required and available separately.

Catalog No.	Description	Price/Each
AP6854	Introduction to Electrochemistry—Student Laboratory Kit	$ 53.20
AP7580	Introduction to Electrochemistry—Super Value Laboratory Kit	105.55
AP1430	9-Volt Battery	6.32

Producing Metals with Electricity—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students investigate the reactions of copper, zinc, and silver salt solutions in a partitioned Petri dish with mini-carbon electrodes. A simple 9-volt battery serves as a power source. The products are a beautiful metal coating at the negative electrode. Includes metal salt solutions, partitioned Petri dishes, battery caps with leads, pencil lead electrodes, reproducible student handouts, detailed background information and Teacher Notes with sample data and answers to all questions.

Complete for 30 students working in pairs. 9-V batteries are required and available separately.

Catalog No.	Description	Price/Each
AP6877	Producing Metals with Electricity—Student Laboratory Kit	$54.85
AP1430	9-V Battery	6.32

Build a Solar Cell—Student Activity Kit

STEM INTEGRATED

By: The Flinn Staff



The solar cell consists of conductive glass plates coated with nanocrystalline titanium oxide coated with a natural dye that absorbs visible light at the anode and graphite at the cathode. Light striking the dye surface promotes an electron to a photoexcited state, which transfers an electron into the conduction band of titanium oxide. Electrons migrate through the titanium oxide film and travel through the external circuit to the cathode. The cells may be prepared in assembly-line fashion—plan for about two hours to complete the setup and demonstration. There are two good stopping points if the entire procedure cannot be completed at one time.

Complete with enough materials to make four solar cells. A multimeter can be used to measure the voltage of the solar cell and is available separately. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP6916	Build a Solar Cell—Student Activity Kit	$73.87
AP9000	Multimeter	81.86

Electrolysis Reactions—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



When an electric current is passed through an aqueous solution containing sodium sulfate, an electrolyte, the water molecules decompose to give oxygen and hydrogen gas. The oxidation and reduction half-reactions are identified by comparing the indicator color changes, amount of gas and reactivity of the products generated at each electrode. Includes reproducible student handouts, detailed background information, complete Teacher Notes and all necessary chemicals and consumable supplies.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6894	Electrolysis Reactions—Student Laboratory Kit	$60.50
AP8954	Battery Clips with Alligator Clip Leads	6.15
AP1430	Transistor Battery (Alkaline), 9 Volt	6.32

Chemistry Laboratory Kits—Equilibrium

FLINN360science™: Atomic and Electron Structure with Light



This kit presents the concepts of atomic emission spectrum, electron transitions, structure of the atom, phosphorescence, electron energy levels, and chemiluminescence through hands-on activities. Students make connections about the electrons in different spectrum tubes when photons are emitted by viewing their emission spectra with the spectroscope in the 3D activity. In addition, phosphorescence and chemiluminescence activities solidify their understanding of atomic structure. Teachers can extend learning through guided inquiry into associated phenomena including, "Colors in Fireworks."

Catalog No.	Description	Digital Access	Price/Each
AP10681	360Science: Atomic and Electron Structure with Light	1-Year	$154.35
AP10781		3-Year	168.10

FLINN360science™: Percent Copper in Brass



This kit presents the concepts of spectroscopy, UV-visible spectrum, absorbance, transmittance, Beer's law, calibration curve, and electronic transition through hands-on science. Students will determine the concentration of copper in a sample of brass via UV-Visible spectrophotometry. In the guided, advanced, and open versions, they will prepare a calibration curve using copper(II) standard solutions of various concentrations; in the short version, the calibration curve will be provided to them.

Catalog No.	Description	Digital Access	Price/Each
AP10685	360Science: Percent Copper in Brass	1-Year	$59.15
AP10785		3-Year	75.25

FLINN360science™: Fun with Intermolecular Forces



This kit presents the concepts of intermolecular forces, density, surface tension, polar vs. nonpolar, consumer science, and chemical reactions through hands-on activities designed to engage all your students. Students successfully make their own lava lamp and identify products formed, which layer is denser, and the intermolecular forces present. Teachers can extend learning through guided inquiry into associated phenomena including, "Product Design?"

Catalog No.	Description	Digital Access	Price/Each
AP10682	360Science: Fun with Intermolecular Forces	1-Year	$114.30
AP10782		3-Year	131.45

CHEMISTRY LABORATORY KITS—EQUILIBRIUM continued on next page.

Chemistry Laboratory Kits—Equilibrium, continued

FLINN360science™: Uncooking an Egg



This kit presents the essential concepts of thermodynamics, biochemistry, food science, intramolecular forces, and intermolecular forces. Students will come to understand that cooking is a chemical reaction. They will also gain an appreciation for how reaction conditions influence the product of a reaction. Teachers can extend learning through guided inquiry into associated phenomena including, "What happens when food is cooked?"

Catalog No.	Description	Digital Access	Price/Each
AP10704	**360**Science: Uncooking an Egg	1-Year	$ 84.06
AP10804		3-Year	102.90

FLINN360science™: Chromatography of a Dye Mixture



This kit presents the concepts of chromatography, retention times, intermolecular forces, and food chemistry through hands-on activities. Students will conduct chromatography analyses of a food dye mixture using paper strips as the adsorbent substrate and solutions of sodium chloride or 2-propanol as the eluent or developing solvent and will then observe the separation of the coloring mixture into its original components. Students will observe that decreasing the concentration of sodium chloride in the eluent improves the separation resolution that is the distance between the dyes' spots on the chromatography paper. Teachers can extend learning through guided inquiry into associated phenomena including, "How do we know the components of a food coloring mixture?"

Catalog No.	Description	Digital Access	Price/Each
AP10688	**360**Science: Chromatography of a Dye Mixture	1-Year	$63.00
AP10788		3-Year	80.00

FLINN360science™: Reaction Rates and Equilibrium



This presents the essential concepts of reaction rates, equilibrium, and collision theory to engage all your students, regardless of level. Students should come to understand that as the concentration of hydrogen peroxide is decreased, the reaction rate decreases. Also, when the temperature of the sodium acetate solution increases, the rate of dissolution increases. Teachers can extend learning through guided inquiry into associated phenomena including, "Why do some processes happen much faster than others?"

Catalog No.	Description	Digital Access	Price/Each
AP10403	**360**Science: Reaction Rates and Equilibrium	1-Year	$64.75
AP10503		3-Year	80.80

FLINN360science™: Reaction Rates: Iodine Clock



This kit presents the essential concepts of kinetics, reaction rates, and concentration through hands-on science activities designed to engage all your students, regardless of level. With this reaction, students should come to understand that increasing the concentration of potassium iodate decreases the reaction time. Also, for the advanced version, increasing the temperature also decreases the reaction time. Teachers can extend learning through guided inquiry into associated phenomena including, "Why do some processes happen much faster than others?"

Catalog No.	Description	Digital Access	Price/Each
AP10404	**360**Science: Reaction Rates: Iodine Clock	1-Year	$82.40
AP10504		3-Year	98.00

FLINN360science™: Collision Theory



This kit presents the essential concepts of collision theory, chemical reactions and energy through hands-on science activities designed to engage all your students, regardless of level. Students should come to understand that increasing the concentration of particles increases the success rate of collisions. Also, they will also see that increasing the temperature of the particles increases the success rate of collisions. Teachers can extend learning through guided inquiry into associated phenomena including, "Why do some processes happen much faster than others?"

Catalog No.	Description	Digital Access	Price/Each
AP10405	**360**Science: Collision Theory	1-Year	$133.00
AP10505		3-Year	144.05

FLINN360science™: Explore Chemical Equilibrium



This kit presents the essential concepts of equilibrium, Le Chatelier's Principle, and reaction rate through hands-on science activities designed to engage all your students, regardless of level. Students should come to understand how changing temperature and changing the amount of reactants affects an equilibrium. Teachers can extend learning through guided inquiry into associated phenomena including, "Why do some processes happen much faster than others?"

Catalog No.	Description	Digital Access	Price/Each
AP10406	**360**Science: Explore Chemical Equilibrium	1-Year	$29.45
AP10506		3-Year	46.15

FLINN360science™: Use Equilibrium for a Commercial Application



This kit presents the essential concepts of equilibrium, acid–base chemistry, reversible reactions, and engineering design through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will discover that increasing pressure and cooling the solution causes a shift where more carbon dioxide can dissolve in the solution. For best results, pressure and cooling together, give the most color change. In the higher levels, students will also relate this phenomena to real-world problems and manufacturing. Teachers can extend learning through guided inquiry into associated phenomena such as, "Why do some process happen faster than others?"

Catalog No.	Description	Digital Access	Price/Each
AP10432	**360**Science: Use Equilibrium for a Commercial Application	1-Year	$ 86.57
AP10532		3-Year	105.95

FLINN EXCLUSIVE



Modeling Equilibrium—Super Value Kit
AP7217



Characteristics of Chemical Equilibrium—Activity-Stations Kit
AP7193

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Catalog No.	Description	Price/Each
AP7193	Characteristics of Chemical Equilibrium—Activity-Stations Kit	$91.95
AP7217	Modeling Equilibrium—Super Value Kit	42.00
AP6145	Restoring Balance—Le Chatelier's Principle and Equilibrium—Student Laboratory Kit	55.05
AP6619	The Equilibrium Constant—Student Laboratory Kit	51.40

CHEMISTRY LABORATORY KITS continued on next page.

Chemistry Laboratory Kits—Gases

FLINN360science™: What's in a Container?



This kit presents the essential concepts of gas pressure, properties of gases, and engineering design through hands-on science activities designed to engage all your students. Students can observe that standing on an unopened aluminum can is possible, but as soon as the can is opened and the internal pressure decreases the can loses stability. Teachers can extend learning through guided inquiry into associated phenomena including, "wind."

Catalog No.	Description	Digital Access	Price/Each
AP10708	360Science: What's in a Container?	1-Year	$149.00
AP10808		3-Year	64.50

FLINN360science™: Cartesian Divers



This kit presents the essential concepts of density and Boyle's Law through hands-on science activities designed to engage all your students, regardless of level. Through this investigation, students will successfully make several cartesian divers. Teachers can extend learning through guided inquiry into associated phenomena including, "How do submarines adjust their depth?"

Catalog No.	Description	Digital Access	Price/Each
AP10706	360Science: Cartesian Divers	1-Year	$72.85
AP10806		3-Year	86.00

FLINN360science™: The Gas Laws



This kit presents the essential concepts of gas laws and Charles's Law through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will discover the relationship between the volume and temperature of a gas (Charles's Law) by measuring the volume of air in a sealed syringe at four different temperatures. In the Guided, Open and Advanced versions of this lab, students will observe the effect of atmospheric pressure on a partially filled soda can subjected to a drastic temperature change. Once the water inside the can is brought to a boil, the open end of the can will be plunged into a room-temperature water bath, causing the can to collapse inward. This collapse will be the result of a sudden change in temperature and the pressure exerted by the atmospheric gases onto the can. Teachers can extend learning through guided inquiry into associated phenomena such as, "What causes winds? How are they impacted by climate change?"

Catalog No.	Description	Digital Access	Price/Each
AP10388	360Science: The Gas Laws	1-Year	$98.15
AP10488		3-Year	117.75

FLINN360science™: Manipulating Equilibria



This kit presents the essential concepts of equilibrium, reaction rates, solubility, acid–base reactions, and Le Chatelier's principle through hands-on science. During this lab, students will successfully manipulate the various equilibria within the grape juice sample and determine the amount of sulfites it contains.

Catalog No.	Description	Digital Access	Price/Each
AP10705	360Science: Manipulating Equilibria	1-Year	$39.25
AP10805		3-Year	56.05

FLINN360science™: Compressibility



This kit presents the essential concepts of gases, gas density, compressibility, and properties of gases through hands-on science activities. Through this investigation, students determine that gases are more compressible than solids and liquids owing to the fact that gas particles spread out in confined spaces and are separated by large interparticle distances. Teachers can extend learning through guided inquiry into associated phenomena including, "Wind."

Catalog No.	Description	Digital Access	Price/Each
AP10707	360Science: Compressibility	1-Year	$79.50
AP10807		3-Year	84.00

FLINN360science™: The Ideal Gas Law



This kit presents the essential concepts of gases, ideal gas law, properties of gases, inverse and direct relationships, and pressure through hands-on activities designed to engage all your students, regardless of level. Students come to understand how the variables present in the ideal gas law relate to each other. In particular, students see that as the amount of gas increases the other variables adjust accordingly to maintain a constant ratio, or value of R. Teachers can extend learning through guided inquiry into associated phenomena including, "Wind."

Catalog No.	Description	Digital Access	Price/Each
AP10709	360Science: The Ideal Gas Law	1-Year	$86.00
AP10809		3-Year	100.86

FLINN360science™: Gas Diffusion



This kit presents the essential concepts of gases, properties of gases, concentration gradients, gas diffusion, and gas movement through hands-on science activities designed to engage all your students, regardless of level. Through this investigation, students determine that as molecular mass increases, the diffusion speed of a gas decreases, and that gases diffuse faster through space when heated. Teachers can extend learning through guided inquiry into associated phenomena including, "Wind."

Catalog No.	Description	Digital Access	Price/Each
AP10710	360Science: Gas Diffusion	1-Year	$64.50
AP10810		3-Year	85.75



Common Gases—
Super Value Laboratory Kit
AP7584

FLINN EXCLUSIVE



Carbon Dioxide—What a Gas!
Student Laboratory Kit
AP5950

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Catalog No.	Description	Price/Each
AP7584	Common Gases—Super Value Laboratory Kit	$ 77.78
AP7358	Dissolved Oxygen and Temperature—Student Laboratory Kit	60.55
AP6855	Boyle's Law in a Bottle—Super Value Laboratory Kit	72.50
AP5950	Carbon Dioxide—What a Gas!—Student Laboratory Kit	29.85
AP5958	Hydrogen—What a Bang!—Student Laboratory Kit	32.65
AP5959	Oxygen—What a Flame!—Student Laboratory Kit	47.85
AP5951	Chemistry of Gases Classroom Equipment—Super Value Kit	92.95
AP7614	Gas Laws—Equipment Kit	130.30
AP6631	Molar Volume of Hydrogen—Combining the Gas Laws—Student Laboratory Kit	32.30
AP7348	Pop Rocks® Science—Determine the Volume of CO_2—Student Laboratory Kit	35.10
AP7092	Properties of Gases and the Gas Laws—Activity-Stations Kit	57.80

CHEMISTRY LABORATORY KITS continued on next page.

Chemistry Laboratory Kits—General Science

Cartesian Diver Construction—Super Value Kit

STEM INTEGRATED

By: Bob Becker, Kirkwood H.S., Kirkwood, MO



Students learn the relationship between pressure and air volume and how air volume acts to regulate buoyancy by constructing Cartesian divers made of simple equipment and materials. Procedures for constructing 11 different types of Cartesian divers are provided. *Super Value Kit is complete with 100 pipets and hex nuts. Requires water and two-liter soda bottles. Includes Flinn Exclusive STEM Integration Guide.*

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP9082	Cartesian Diver Construction—Super Value Kit	$37.30

Conservation of Mass and Buoyancy—Student Laboratory Kit

By: The Flinn Staff



Students first conduct an experiment to verify the law of conservation of mass in a chemical reaction. They then perform a second experiment in which the product gases are supported by buoyant forces in air. Air acts as a fluid and so the final mixture weighs less than the original. Because a balance actually weighs objects and converts this to mass readings, the apparent mass discrepancy really helps students understand the difference between "weighing" and "massing." Includes chemicals and equipment for 15 complete experimental setups along with reproducible student handouts, detailed background information and complete Teacher Notes with sample data and answers to all questions. *Complete for 30 students working in pairs. Requires a balance with sensitivity at least 0.01 g.*

Catalog No.	Description	Price/Each
AP6994	Conservation of Mass and Buoyancy—Student Laboratory Kit	$47.25

Discovering Density—Looking for Patterns and Trends—Super Value Laboratory Kit

By: The Flinn Staff



Using either "gold" or "silver" metal shot, students collect mass and volume data, plot the data on a graph to identify the resulting pattern and trend and then analyze the relationship. By comparing their results with known quantities, students identify their metal and determine the accuracy of their method. Includes complete instructions with reproducible student handouts and valuable Teacher Notes. *Super Value Kit is complete for 15 student groups. All materials are reusable. Balances with 0.01-g precision are recommended.*

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7169	Discovering Density—Looking for Patterns and Trends—Super Value Laboratory Kit	$62.15

It's All About Density—An Introductory Super Value Activity-Stations Kit

By: The Flinn Staff



Students determine the mass and volume of seven different materials—two regularly shaped rectangular solids, a spherical solid, a cylindrical solid, an irregularly shaped solid and two liquids. Students practice measuring volume using both a ruler and the water displacement method. This kit is designed to have student groups move from station to station and determine the density of a different material—allowing for a very cost-conscious yet effective lab. Lab station instruction card masters, a prelab activity, background information, post-lab questions and all necessary materials (except 100 mL of distilled water) are provided in the kit. *Super Value Kit is complete for seven lab stations with two setups at each station—enough for 28 students working in pairs. All materials are reusable.*

Catalog No.	Description	Price/Each
AP6153	It's All About Density—An Introductory Super Value Activity-Stations Kit	$38.80

FLINN EXCLUSIVE

Make Your Own Colorful Goggles—Super Value Laboratory Kit

By: The Flinn Staff



With this colorful goggle-dyeing kit, students can choose their favorite colors, school colors or multiple colors and turn a standard pair of chemical-splash goggles into a pair with unique design. Students will have fun and be more likely to wear their goggles! This lab can help teach the chemistry of dyes and the dyeing process at the same time that it stresses an important safety rule—wearing goggles is critical in laboratory situations! Five colored dyes—red, blue, purple, gold and black—are included in the kit. Teacher tips and a reproducible student handout are included.

Super Value Kit is complete with enough dye for 5 classes of 30 students working individually. Chemical-splash goggles and large beakers or pots are needed but not provided in the kit.

Catalog No.	Description	Price/Each
AP5947	Make Your Own Colorful Goggles—Super Value Laboratory Kit	$35.95

Measurement Challenge—A Density Super Value Guided-Inquiry Kit

By: Jeff Bracken, Westerville North H.S., Westerville, OH



Give your students a challenge—the measurement challenge! With this innovative teacher-designed kit, students learn to make accurate measurements, estimate to the proper level of certainty and apply rules for significant figures in calculations. Hands-on, prelab measurement activity allows students to begin with length and area and progress to volume and density—a sequence in which students advance from one-dimensional measurements to two- and three-dimensional calculations. Three laboratory experiments serve both introductory and honors science students. First, there is a traditional density experiment—students measure the mass and volume of a block and determine the density. The second lab is a higher level authentic assessment activity—students are challenged to predict the mass of a block without the use of a balance! A third optional lab further challenges students as it is a completely open-ended version of the second lab—no hint of a procedure is provided. Numerous helpful teaching ideas as well as reproducible student masters are included. Comes with 30 different density blocks—6 different sizes each of 5 types of plastic material. A very worthwhile purchase—use the high-quality blocks for this lab and many other purposes throughout the school year! *Super Value Kit is complete for 30 students working individually and all materials are reusable—the best one-time purchase you'll make all year!*

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5939	Measurement Challenge—A Density Super Value Guided-Inquiry Kit	$103.08
AP5387	Ruler, Metric/English, Clear, Flexible	1.25

How Scientists Measure—Activity-Stations Kit

By: The Flinn Staff



The ability to make accurate measurements has many applications and is an essential skill for every science laboratory. In this activity-stations lab, students practice measuring mass, length, volume, temperature and time. Five easy-to-set-up activity stations allow groups of students to work independently as they rotate from one station to the next. Includes detailed instructions with reproducible student handouts and valuable Teacher Notes. *Complete for 30 students working in pairs. Standard laboratory equipment, such as balances, beakers and thermometers, are required and available separately.*

Catalog No.	Description	Price/Each
AP7025	How Scientists Measure—Activity-Stations Kit	$95.50

CHEMISTRY LABORATORY KITS—GENERAL SCIENCE continued on next page.

Chemistry Laboratory Kits—General Science, continued

FLINNeverydayscience™

NEW!

Is It Chemistry?



With this FlinnEverydayScience™ lab, students conduct experiments in the laboratory to observe some of the most common signs that characterize chemical reactions. They will learn to recognize these signs to distinguish between chemical and physical transformations.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 500 mL 2.0 M calcium chloride solution, 140 mL 10% hydrogen peroxide, 500 mL 1.0 M sodium carbonate solution, 40 plastic pipet, 500 g sodium chloride, 10 pads steel wool, and 400 mL vinegar.

Complete for 30 students working in groups of 3, or for 10 groups of students.

Catalog No.	Description	Price/Each
AP11818	Is It Chemistry?	$66.15

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WWW.FLINNSCI.COM

Flinn's *Exploring Chemistry*™ Introduction to Chemistry—Matter and Measurement Package

See page 246.

FLINN EXCLUSIVE

Problem-Solving on the Wildlife Refuge—Introduction to Unit Factoring—Super Value Kit

By: Sue Bober, Schaumburg High School, Schaumburg, IL



Students will have no fear as they enter the wildlife "unit-factoring" refuge! Students often forget to include units when solving problems or recording measurements, yet numbers without units are often meaningless. Take the confusion out of dimensional analysis or factor labeling with this engaging activity. Students develop the habit of using proper problem-solving techniques as they use specially designed wildlife ratio cards to solve a set of puzzles and determine how many animals of a particular species are on the refuge. Six different puzzles present challenges of varying levels. Includes complete instructions with reproducible student handouts and valuable Teacher Notes. *Super Value Kit is complete for 15 groups of students. All materials are reusable.*

Catalog No.	Description	Price/Each
AP7364	Problem-Solving on the Wildlife Refuge—Introduction to Unit Factoring—Super Value Kit	$48.65

Shrink Plastic Measurement—Student Laboratory Kit



By: The Flinn Staff

Measurement is a basic and essential component in many science laboratory investigations. In this unique activity, students practice and perfect their measurement skills using an incredible shrinking material known as shrink plastic. Students calculate the area, volume and density of the shrink plastic pieces before and after they are heated and shrunk. The results are then compared and contrasted. Includes Teacher Notes and reproducible student handouts. *Complete for 30 students working in pairs.*

Catalog No.	Description	Price/Each
AP7252	Shrink Plastic Measurement—Student Laboratory Kit	$66.50

Chemistry Laboratory Kits—Guided-Inquiry Kits

Guided-Inquiry Chemistry Laboratory Kits

Help your students improve their logical, scientific reasoning skills and also increase their laboratory proficiency with our new Flinn-exclusive guided-inquiry labs. Flinn guided-inquiry experiments offer you a range of flexibility, from structured approaches with well-defined goals to more open-ended labs where students must analyze the goals of the experiment and design their own procedure. Comprehensive background information and carefully designed prelab questions allow you to check student understanding and help guide students to be successful. Teacher notes with sample data and all chemicals and consumable supplies needed to perform the guided-inquiry labs are included.

Catalog No.	Description	Topic	Page No.	Price/Each
AP7444	Mystery Solutions with Acids and Bases—Guided-Inquiry Kit	Acids, Bases and Buffers	250	$ 48.85
AP6496	Atomic Target Practice—Rutherford Scattering and the Nuclear Atom—Super Value Guided-Inquiry Kit	Atomic Structure	252	54.00
AP6852	Lewis Structures and Molecular Geometry—Super Value Guided-Inquiry Kit	Chemical Bonding	254	68.72
AP8486	The Inorganic Chemistry of Painting—Guided-Inquiry Kit	Chemical Reactions	256	67.00
AP7174	Chromatography Challenge—Science, Inquiry and Art—Guided-Inquiry Kit	Chromatography	257	52.80
AP7033	Separation of a Mixture—Guided-Inquiry Kit	Classifying Matter	260	72.85
AP7352	Water Softening—Guided-Inquiry Kit	Consumer Science	259	49.95
AP9585	Create Your Very Own Simple Battery—Guided-Inquiry Kit	Electrochemistry	261	62.70
AP5939	Measurement Challenge—A Density Super Value Guided-Inquiry Kit	General Science	265	103.08
AP7356	Iodine Clock Challenge—Guided-Inquiry Kit	Kinetics	267	53.20

Catalog No.	Description	Topic	Page No.	Price/Each
AP6455	Rate of Reactions—Guided-Inquiry Kit	Kinetics	268	$48.35
AP6289	It's in the Cards—Periodic Table Super Value Guided-Inquiry Kit	Periodicity	272	33.15
AP5937	Gluep Production—Guided-Inquiry Kit	Polymers	272	55.00
AP6885	Qualitative Analysis—Guided-Inquiry Kit	Qualitative Analysis	275	67.95
AP6167	Observation and Experiment—Introduction to the Scientific Method—Guided-Inquiry Kit	Scientific Method	276	51.85
AP7209	Color Change Challenge—Problem-Solving Guided-Inquiry Kit	Scientific Method	276	48.91
AP7575	Solubility Races—Super Value Guided-Inquiry Kit	Scientific Method	277	65.00
AP7323	Match the Mystery Solutions—Guided-Inquiry Kit	Scientific Method	277	43.30
AP4865	Factors Affecting Solubility—Guided-Inquiry Kit	Solutions and Solubility	279	26.45
AP8555	The Colorful Chemistry of Sugar, Water and Density—Guided-Inquiry Kit	Solutions and Solubility	280	35.60
AP6375	Discovering Instant Cold Packs—Guided-Inquiry Kit	Thermodynamics	285	31.85

Chemistry Laboratory Kits—Ions and Formulas

Up, Up and Away—Hot Air Balloon Student Activity Kit

STEM INTEGRATED

By: Mike Roadruck, Ottawa Hills High School, Toledo, OH



Fill the sky with colorful hot air balloons! Each student group will construct and launch their own giant hot air balloon. Students will learn how hot air balloons lift from the ground, stay afloat and eventually descend. A unique balloon launcher apparatus is included for safe and successful balloon launches. Also includes easy-to-follow instructions and all the materials needed to construct fifteen 3' x 2' hot air balloons. A heat gun or propane torch is required and available separately. A tissue replacement pack is available for 15 additional hot air balloons. *Complete for 30 students in pairs. Includes Flinn Exclusive STEM Integration Guide.*

Catalog No.	Description	Price/Each
AP6310	Up, Up and Away—Hot Air Balloon Student Activity Kit	$85.30
AP6319	Heat Gun	88.65
AP6329	Hot Air Balloon Tissue Replacement Pack	35.85

Chemical Formulas—Student Laboratory Kit

By: The Flinn Staff



In each of the first two investigations, students combine various ratios of two solutions and observe which ratio produces the most precipitate. Students then determine the correct formula for the new compound. The third investigation provides an opportunity for higher-level, open-ended thinking in which students design their own experiment. Students first write reactions to decide which chemicals to combine and how much they need. Students predict possible results and then perform their own experiments. Detailed Teacher Notes and reproducible student handouts include easy-to-follow lab instructions, sample data, answers to questions and in-depth background information. All chemicals and specialized equipment are provided. Graph sheets, a common ion chart and a solubility rules chart are also included.

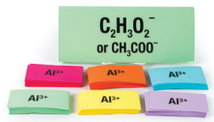
Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP4569	Chemical Formulas—Student Laboratory Kit	$62.70

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Chemical Ion Flash Cards—Super Value Game

By: Robert K. Weiss, Port Huron H.S., Port Huron, MI



Your students will benefit from these colorful and compact flash cards that provide an easy and effective means for learning formulas, names and charges of common ions through drilling and visual memorization techniques. Repetition helps students as they learn to write chemical formulas and reactions. The front of each card has the name of a monatomic or polyatomic cation or anion, and the back gives the ion formula. The flash card set includes instructions with ample background information on ions and formulas as well as nine tips and suggested activities to help you get started. Be creative with these cards—use them for drills, quizzes, reviews, games—you decide! Each set contains six brightly colored, student-size 1¾" x 4¼" sets and one larger teacher-size 4¼" x 11" set of 50 chemical ion flash cards.

Super Value Game is complete for six student groups. All materials are reusable.

Catalog No.	Description	Price/Each
AP4574	Chemical Ion Flash Cards—Super Value Game	$34.10

FLINN EXCLUSIVE

The Chemistry of Complex Ions—Student Laboratory Kit

By: The Flinn Staff



In this two-part experiment, students investigate the properties of complex ions. In Part 1, students form four complexes of the copper(II) ion and the cobalt(II) ion. First, they must identify the chemical formula of each complex ion. They then use the color of the solution to determine the wavelength of light absorbed by each complex ion. Part 2 has students forming solutions of five different complexes of the copper(II) ion. A series of combinations of these solutions are made, and the students determine the relative stabilities of the five complexes based on the precipitates or complex ions formed by the reactions. Includes reproducible student handouts, detailed background information, Teacher Notes with sample data and answers to questions and all necessary chemicals and consumable supplies.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP1758	The Chemistry of Complex Ions—Student Laboratory Kit	$60.80

Chemistry Laboratory Kits—Kinetics

Factors Affecting Reaction Rates—Student Laboratory Kit

By: The Flinn Staff



What factors affect the rate of a chemical reaction? In this laboratory activity, students will perform the classic iodine–starch clock reaction to quantitatively investigate the effects of concentration, temperature and a catalyst on the rate of reaction. Includes reproducible student handouts, detailed background information and complete Teacher Notes with sample data, calculations and answers to questions, plus all necessary chemicals and specialized equipment.

Complete for 30 students working in pairs. Fifteen reusable, six-well reaction plates are required and available separately.

Catalog No.	Description	Price/Each
AP4861	Factors Affecting Reaction Rates—Student Laboratory Kit	$48.80
AP1725	Reaction Plate, 6-well	6.41

Introduction to Reaction Rates—The "Blue Bottle" Reaction—Student Laboratory Kit

By: The Flinn Staff



Students investigate the "blue bottle" reaction of methylene blue, varying the temperature and the concentration of reactant. With reagents sealed in small plastic pipets, the reactions are simple to set up and even quicker to run. You will be surprised at how easy kinetics can be—perfect for a hands-on introduction to a difficult topic! Includes reproducible student handouts, detailed background information, complete Teacher Notes with sample data and answers to questions, and all necessary chemicals and consumable supplies.

Complete for 30 students working in pairs.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6446	Introduction to Reaction Rates—The "Blue Bottle" Reaction—Student Laboratory Kit	$47.45

Iodine Clock Challenge—Guided-Inquiry Kit

By: The Flinn Staff



Give students a challenge, and they will eagerly compete to meet the goal! Promote inquiry with the classic iodine clock reaction. Students record reaction times for three concentrations of potassium iodate, then analyze and graph the results to predict the concentration needed to make the clock "ring" in exactly 25 seconds. After several trial runs to refine their graphs and test their predictions, students are ready for the final test, against the clock!

Complete for 30 students working in groups of three.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7356	Iodine Clock Challenge—Guided-Inquiry Kit	$53.20

CHEMISTRY LABORATORY KITS—KINETICS continued on next page.

Chemistry Laboratory Kits—Kinetics, continued

Kinetics and Reaction Rates—Activity-Stations Kit



By: Patricia Mason, Retired, Delphi Community H.S., Delphi, IN, and Kathy Kitzmann, Mercy H.S., Farmington Hills, MI

Five independent mini-lab activities are set up around the classroom. Each activity is designed to take about 10 minutes to complete, and students may rotate through the five stations in any order. Students study the effects of surface area, reactant concentration, temperature, nature of reactants and catalysts on reaction rates. Includes Teacher Notes with complete sample data, comprehensive background information, reproducible student handouts and all necessary chemicals and consumable supplies. Do twice the labs in half the time!

Complete for 30 students working in groups of three.

Catalog No.	Description	Price/Each
AP7192	Kinetics and Reaction Rates—Activity-Stations Kit	$74.55

Kinetics and Catalyst Kits

Look for our large selection of kinetics and catalyst chemical demonstration kits. Each kit contains enough materials to perform the demonstration seven times. See pages 231–232.

Rate of Reactions—Guided-Inquiry Kit



By: The Flinn Staff

Students learn how reaction rates are measured and how temperature affects the rate of a reaction as they design kinetics experiments for the reaction of magnesium with hydrochloric acid. Prelab preparation built into the activity ensures students will be well-prepared and successful. Comprehensive teacher's notes ensure that teachers will know what to expect so they can properly guide their students. If you have avoided inquiry experiments because of the uncertainty involved in planning a lab, try this kit! We guarantee you will like it. Includes reproducible student handouts, preparation guide, Teacher Notes with sample procedure, sample data and answers to all questions and all necessary chemicals and consumable supplies.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6455	Rate of Reactions—Guided-Inquiry Kit	$48.35

Reaction Order and Rate Laws—Student Laboratory Kit



By: The Flinn Staff

In this laboratory activity, students will perform the reaction between hydrochloric acid and sodium thiosulfate solutions at various reactant concentrations. By monitoring the appearance of the solid product sulfur, the effect of each reactant on the rate will be determined. The data will then be used to determine the order of each reactant and the rate law. Includes reproducible student handouts, detailed background information and complete Teacher Notes with sample data, calculations and answers to questions, plus all necessary chemicals and specialized equipment.

Complete for 30 students working in pairs. Fifteen reusable, six-well reaction plates are required and available separately.

Catalog No.	Description	Price/Each
AP4864	Reaction Order and Rate Laws—Student Laboratory Kit	$31.55
AP1725	Reaction Plate, 6-well	6.41

FLINN EXCLUSIVE

The Rate of Chemical Reactions—Student Laboratory Kit



By: Brother Carmen Ciardullo, Retired, St. Joseph's Prep Seminary, Princeton, NJ

This microscale version of the iodine clock challange will surely spark inquiry-based questions in your lab! Students run and time eight trials simultaneously! The effects of concentration, temperature and a catalyst on the rate of an iodine clock reaction are tested. A starch solution acts as an indicator and produces a dark blue reaction endpoint. All chemicals and specialized equipment are provided.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP4361	The Rate of Chemical Reactions—Student Laboratory Kit	$61.60

Chemistry Laboratory Kits—Nanotechnology

What's So Big About Nanotechnology? Activity-Stations Kit



By: The Flinn Staff

Simply set up the four mini-lab activities around the classroom and allow students to rotate through the stations that include:

- Placing objects in order of relative size from the astronomical to the atomic level.
- Exploring the properties of a magnetic fluid.
- Simulating a method of using nanoparticles to deliver medicine to targeted cells.
- Investigating water-repellent sand.

Includes Teacher Notes with sample data, extensive background information, reproducible student handouts and all necessary supplies.

Complete for 24 students working in groups of three.

Catalog No.	Description	Price/Each
AP7395	What's So Big About Nanotechnology? Activity-Stations Kit	$64.65

Modeling Nanotechnology—Encapsulation by Sodium Alginate—Student Laboratory Kit



By: Brett Criswell, Central Columbia H.S., Bloomsburg, PA

An exciting new breakthrough in nanotechnology involves the delivery and transport of medicines to treatment areas in the body by encapsulating drugs in molecular "cages" consisting of nanoparticles. In this modern, hands-on lab activity, students will model this technology on a larger scale using sodium alginate, a natural polymer from seaweed. When sodium alginate is added to a solution containing calcium ions, calcium alginate precipitates out as micro-spheres. These "capsules" can be used to trap and also release indicator dye molecules.

Complete for 30 students working in pairs. Reusable 6-well reaction plates are recommended and available separately.

Catalog No.	Description	Price/Each
AP7361	Modeling Nanotechnology—Encapsulation by Sodium Alginate—Student Laboratory Kit	$43.05
AP1725	Reaction Plate, 6-well	6.41

Chemistry Laboratory Kits—Nuclear Science

See page 390.

CHEMISTRY LABORATORY KITS continued on next page.

Chemistry Laboratory Kits—Organic Chemistry

FLINN360science™: Prepare and Characterize Biodiesel



This kit presents the essential concepts of esterification, heat of combustion, calorimetry, and alternative energy through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will successfully produce a sample of biodiesel and record a heat of combustion. Teachers can extend learning through guided inquiry into associated phenomena including, "How efficient are alternate energy sources?"

Catalog No.	Description	Digital Access	Price/Each
AP10716	360Science: Prepare and Characterize Biodiesel	1-Year	$57.15
AP10816		3-Year	69.88

FLINN360science™: Investigate Different Hydrocarbons



This kit engages students of all levels through hands-on science that presents the essential concepts of organic chemistry, hydrocarbons, and structure property relationship. During this lab, students will come to realize that hydrocarbons are an important and diverse class of chemicals. Teachers can extend learning through guided inquiry into associated phenomena including, "Why do we mine crude oil?"

Catalog No.	Description	Digital Access	Price/Each
AP10717	360Science: Investigate Different Hydrocarbons	1-Year	$ 85.75
AP10817		3-Year	100.85

FLINN360science™: Ester Synthesis



This kit presents the essential concepts of organic chemistry, functional groups and equilibrium through hands-on science activities. During this lab, students will successfully produce various esters and observe their aromas. Teachers can extend learning through guided inquiry into associated phenomena such as, "What gives fruit its flavor?"

Catalog No.	Description	Digital Access	Price/Each
AP10719	360Science: Ester Synthesis	1-Year	$79.75
AP10819		3-Year	85.00

FLINN360science™: Polymers: Bouncy Balls



This kit presents the concepts of organic chemistry and polymers through hands-on activities. Dunking a mixture of cornstarch and white glue into a sodium borate solution enables the mixture to be worked into a bouncy ball. Food coloring can be added for aesthetic purposes. Students may struggle with the ball deforming over time. Teachers can extend learning through guided inquiry into associated phenomena such as, "Plastics."

Catalog No.	Description	Digital Access	Price/Each
AP10718	360Science: Polymers: Bouncy Balls	1-Year	$102.90
AP10818		3-Year	112.88

Green Chemistry Labs 4-Kit Bundle

FLINN EXCLUSIVE



Incorporate Green Chemistry into your curriculum with these four, unique experiments developed in partnership with Beyond Benign, Inc. Your students will love making a household surface cleaner from a plastic cup, designing a blackberry solar, conducting an acid–base titration using wood ash leftover from a pizza oven and investigating the chemistry of road deicers. Purchase all four kits as a cost-saving bundle!

Catalog No.	Description	Price/Each
AP9740	Green Chemistry Labs—4-Kit Bundle	$211.50

FLINN360science™: Protein and Amino Acid Tests



Through this investigation, students will be able to successfully identify proteins and amino acids. Teachers can extend learning through guided inquiry into associated phenomena including, "What are proteins made of?" This standards-aligned, Flinn's 360Science™: Protein and Amino Acid Tests kit presents the essential concepts of proteins, amino acids, and organic chemistry through hands-on science activities designed to engage all your students, regardless of level.

Catalog No.	Description	Digital Access	Price/Each
AP10720	360Science: Protein and Amino Acid Tests	1-Year	$100.95
AP10820		3-Year	112.88

FLINN EXCLUSIVE





Catalog No.	Description	Price/Each
AP6166	Dyeing with Indigo —Student Laboratory Kit	$ 56.85
AP7501	Extraction and Isolation of Caffeine —Student Laboratory Kit	79.85
AP4362	Preparation of Esters—Student Laboratory Kit	57.10
AP7608	Preparation of Esters—Super Value Laboratory Kit	104.50
AP1566	Organic Smell Identification—Super Value Kit	122.35
AP7380	Organic Chemistry Activity Booklets	43.90
AP7096	Synthesis of Aspirin —Student Laboratory Kit	65.00
AP6632	The Color of Chemistry—Dyes, Dyeing and Chemical Bonding —Student Laboratory Kit	80.95
AP6853	Analysis of Hydrogen Peroxide —Student Laboratory Kit	41.05
AP5608	Corrosion of Iron—Student Laboratory Kit	52.85

Analysis of Hydrogen Peroxide—Student Laboratory Kit AP6853



Preparation of Esters AP4362 and AP7608

Corrosion of Iron—Student Laboratory Kit AP5608

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

CHEMISTRY LABORATORY KITS—ORGANIC CHEMISTRY continued on next page.

Chemistry Laboratory Kits—Organic Chemistry, continued

Vial Organic™ Kits



Each kit contains all the chemicals, specialized equipment, and instruction for a class of 12 lab groups working in pairs. Instructions include detailed procedures, background information, safety and disposal procedures and teacher's notes. Common laboratory equipment (e.g., beakers, balances, filters) are not included in the kits. Immersion heaters are required for all labs and need to be purchased separately (four to six will suffice).

Cis to Trans Isomerization Lab

FLINN EXCLUSIVE

Maleic acid (cis) is converted into fumaric acid (trans) using heat and an acid catalyst. After isolating the fumaric acid, its pH, solubility and melting point are compared to maleic acid to demonstrate how two geometric isomers can be quite different. Great lab to introduce isomers, organic acids and the use of physical properties to identify organic compounds.

- Requires immersion heaters or hot plates.
- Includes reaction vials, Beral-type pipets, maleic acid, hydrochloric acid, cresol red, capillary tubes and instructions.

Catalog No.	Description	Price/Each
AP4690	Cis to Trans Isomerization Lab—Vial Organic Kit	$55.45
AP9107	Heating Coil, Immersion-Type	14.00

Ester Lab

FLINN EXCLUSIVE

Rated #1 by chemistry students as their favorite organic chemistry lab. Students prepare and isolate n-propyl acetate (banana oil) from acetic acid and n-propyl alcohol in this fast, safe and easy ester synthesis. Odors are reduced using the sealed vials in this Vial Organic kit.

- Requires 2 mL of concentrated sulfuric acid and immersion heaters or hot plates.
- Includes reaction vials, Beral-type pipets, test tubes, acetic acid, n-propyl alcohol, sodium carbonate solution and instructions.

Catalog No.	Description	Price/Each
AP9309	Ester Lab—Vial Organic Kit	$77.10
AP9107	Heating Coil, Immersion-Type	14.00

Indigo Dye Lab

FLINN EXCLUSIVE

Demonstrate the importance of organic chemistry in the apparel industry by synthesizing indigo, the dye used in blue jeans. Indigo is prepared by a base-catalyzed reaction between acetone and o-nitrobenzaldehyde using vial organic procedures. After synthesizing indigo, students use it to dye fabric swatches with vat dye techniques.

- Requires immersion heaters or hot plates.
- Includes reaction vials, test tubes, six types of fabric, o-nitrobenzaldehyde, acetone, sodium hydroxide, sodium dithionite and instructions.

Catalog No.	Description	Price/Each
AP9319	Indigo Dye Lab—Vial Organic Kit	$74.35
AP6135	Multi-Fiber Test Fabric, 1 yard	15.30
AP9107	Heating Coil, Immersion-Type	14.00

Vial Organic Accessories

Catalog No.	Description	Price/Each
AP9103	Reaction Vials, 1-Dram, PTFE-Lined Caps, Case of 144	$148.60
AP9104	Reaction Vials, 1-Dram, PTFE-Lined Caps, Pkg. of 12	18.80
AP9105	Reaction Vials, 2-Dram, PTFE-Lined Caps, Case of 144	188.60
AP9106	Reaction Vials, 2-Dram, PTFE-Lined Caps, Pkg. of 12	22.05
AP9107	Heating Coil, Immersion-Type	14.00
GP7047	Capillary Tubes, Melting Point, Pkg. of 100	14.09
AP9095	Chromatography, Thin Layer, 8 x 8" Sheet	24.45
GP7042	Pasteur Pipets, Disposable, 5¾" Overall Length, Pkg. of 200	17.05
AP1719	Pipets, Beral-Type, Micro Type, Pkg. of 20	3.00

Chemistry Laboratory Kits—Oxidation-Reduction

FLINN360science™: Buffers in Household Products



This kit presents the essential concepts of buffer, weak acids and bases, conjugate acid–base pair, dissociation constant, neutralization, and titration through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will become familiar with buffers and titration curves. They will better understand what components are needed in a buffer system. Teachers can extend learning through guided inquiry into associated phenomena including, "Buffers, Acids and Bases."

Catalog No.	Description	Digital Access	Price/Each
AP10679	360Science: Buffers in Household Products	1-Year	$62.00
AP10779		3-Year	78.45

FLINN360science™: Acid-Base Titrations



This kit presents the essential concepts of strong and weak acids/bases, equilibrium constant, titration, indicators, and equivalence point through hands-on science activities designed to engage all your students, regardless of level. This lab has students refine their titration technique and take careful measurements to produce titration curves. Teachers can extend learning through guided inquiry into associated phenomena including, "Acid Rain."

Catalog No.	Description	Digital Access	Price/Each
AP10690	360Science: Acid–Base Titrations	1-Year	$45.00
AP10790		3-Year	62.85

FLINN360science™: Polymers and Conductivity



This kit presents the essential concepts of polymers, acid–base, conductivity, oxidation–reduction, and chemical sensors through hands-on science activities designed to engage all your students, regardless of level. Students will discover how electrochromic polymers work and observe the effect acid and base vapors have on the polymer's conductivity. Teachers can extend learning through guided inquiry into associated phenomena including, "Fast and Slow Processes."

Catalog No.	Description	Digital Access	Price/Each
AP10693	360Science: Polymers and Conductivity	1-Year	$78.50
AP10793		3-Year	91.38

CHEMISTRY LABORATORY KITS—OXIDATION-REDUCTION continued on next page.



Chemventory™

SEE PAGE 576 FOR DETAILS!

Take your chemical inventory system to the next level with Flinn's enhanced Chemventory. Chemventory is a cloud-based system that allows multiple users to access a comprehensive and personalized database from any location or device.

For more information, visit us at **chemventory.flinnsci.com**

Chemistry Laboratory Kits—Oxidation-Reduction, continued

FLINN360science™: Battery Challenge



This kit presents the essential concepts of batteries, oxidation–reduction, voltage, and current through hands-on activities. Students build voltaic cells in this lab and identify that a voltaic cell is a battery. Students carry out an investigation to determine which combinations of metals and their aqueous solutions produce the highest voltage in their voltaic cells, then they determine which battery produces the highest voltage. Teachers can extend learning through guided inquiry into associated phenomena including, "batteries."

Catalog No.	Description	Digital Access	Price/Each
AP10712	360Science: Battery Challenge	1-Year	$134.00
AP10812		3-Year	128.90

FLINN360science™: Explore Redox with Iron Corrosion



Thisn kit presents the concepts of oxidation numbers, oxidation–reduction, and identification of redox vs. non-redox reactions through hands-on activities. Students explore corrosion of an iron nail by using an indicating agar mixture to determine the presence of products in the corrosion process and should witness that copper metal does not protect the nail from corrosion while zinc protects the nail from corrosion very well based on redox properties. Teachers can extend learning through guided inquiry into associated phenomena including, "batteries and battery challenge."

Catalog No.	Description	Digital Access	Price/Each
AP10713	360Science: Explore Redox with Iron Corrosion	1-Year	$62.00
AP10813		3-Year	75.25

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Catalog No.	Description	Price/Each
AP6892	Iron(II) and Iron(III) Reactions—Student Laboratory Kit	$69.75
AP8981	Make Your Own Silver Mirror—A Microscale—Super Value Laboratory Kit	49.55
AP5606	Ornament-Making—Student Laboratory Kit	63.30
AP10113		58.60
AP10191		41.00
AP10269		33.55
AP1753	Oxidation-Reduction Basics—Student Laboratory Kit	67.10
AP7189	Silver Holiday Ornaments—Student Laboratory Kit	85.00
AP10097		75.00
AP10175		57.71
AP10253		50.50
AP4357	The Activity Series of the Elements—Student Laboratory Kit	57.80
AP4359	Electrolysis of Water—Student Laboratory Kit	65.10
AP6132	Electroplating with Copper—Student Laboratory Kit	69.30

FLINN360science™: Metal Activity



This kit presents the essential concepts of oxidation–reduction reaction, activity series of metals, and balancing redox reactions through hands-on science activities designed to engage all your students. Students carry out a small-scale investigation to determine metal activity in reaction well plates with small quantities of chemicals.

Catalog No.	Description	Digital Access	Price/Each
AP10714	360Science: Metal Activity	1-Year	$61.65
AP10814		3-Year	75.25

FLINN360science™: Build a Micro Battery



This kit presents the concepts of half-cell reaction, oxidation–reduction reactions, voltaic cell vs. electrolytic cell, and standard reduction potential through hands-on activities. Students carry out an investigation to build a handheld battery from a few simple materials while gaining a wealth of knowledge about batteries in our everyday lives. Teachers can extend learning through guided inquiry into associated phenomena such as "batteries."

Catalog No.	Description	Digital Access	Price/Each
AP10715	360Science: Build a Micro Battery	1-Year	$68.60
AP10815		3-Year	84.05

Chemistry Laboratory Kits—Organic Chemistry

FLINN360science™: Gravimetric Analysis of Periodic Trends



This kit presents the concepts of periodicity, solubility, and gravimetric analysis through hands-on science activities designed to engage students. Students should come to understand that periodic trends can be used to make predictions about the behavior of a material. This empowers researchers to be more efficient when developing new compounds or procedures. Teachers can extend learning through guided inquiry into associated phenomena including, "Why are pure elements so rare?"

Catalog No.	Description	Digital Access	Price/Each
AP10354	360Science: Gravimetric Analysis of Periodic Trends	1-Year	$100.10
AP10454		3-Year	110.75

FLINN360science™: Develop a Periodic Table



Thise kit presents the essential concept of periodicity through hands-on science activities designed to engage all your students, regardless of level. Students will understand that periodic trends can be used to make predictions about the behavior of a material. This empowers researchers to be more efficient when developing new compounds or procedures. Teachers can extend learning through guided inquiry into associated phenomena including, "Why are pure elements so rare?"

Catalog No.	Description	Digital Access	Price/Each
AP10355	360Science: Develop a Periodic Table	1-Year	$ 105.95
AP10455		3-Year	121.05

FLINN360science™: Elemental Metals, Nonmetals and Metalloids



This kit presents the essential concepts of periodicity, and structure property relationships through hands-on science activities. Students will conclude that moving down a group on the periodic table correlates with an increase in metallic character, and that moving across a period correlates to a decrease in metallic character. Teachers can extend learning through guided inquiry into associated phenomena including, "Why are pure elements so rare?"

Catalog No.	Description	Digital Access	Price/Each
AP10356	360Science: Elemental Metals, Nonmetals and Metalloids	1-Year	$ 94.20
AP10456		3-Year	111.85

CHEMISTRY LABORATORY KITS—ORGANIC CHEMISTRY continued on next page.

Chemistry Laboratory Kits—Organic Chemistry, continued

FLINN360science™: Periodic Trends and Properties



Thiss kit presents the essential concepts of alkaline earth metals, periodicity, and structure property relationships. Students will identify that, for the metals and salts provided, moving down the group increases activity and decreases solubility. They will also identify that moving across a period decreases activity. Teachers can extend learning through guided inquiry into associated phenomena including, "Why are pure elements so rare?"

Catalog No.	Description	Digital Access	Price/Each
AP10357	360Science: Periodic Trends and Properties	1-Year	$53.00
AP10457		3-Year	72.00

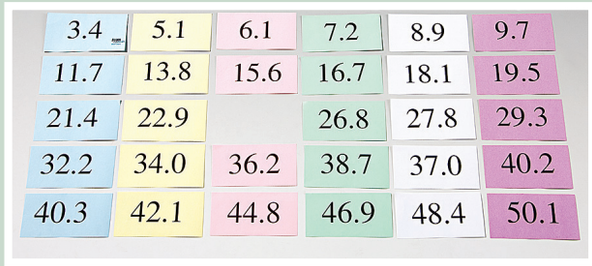
FLINN360science™: Growing Crystals in Gel



This kit presents the essential concept of periodicity through hands-on science activities designed to engage all your students, regardless of level. Through this investigation, students will identify that their ability to successfully grow crystals is linked to the element's position on the periodic table. Teachers can extend learning through guided inquiry into associated phenomena including, "Why are pure elements so rare?"

Catalog No.	Description	Digital Access	Price/Each
AP10423	360Science: Growing Crystals in Gel	1-Year	$76.55
AP10523		3-Year	94.20

FLINN EXCLUSIVE



Periodic Table Analogy—A Card Puzzle—Super Value Kit AP7264

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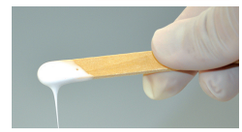
Catalog No.	Description	Price/Each
AP4358	Chlorides, Bromides and Iodides—Student Laboratory Kit	$ 64.30
AP6268	Density Is a Periodic Property—Super Value Kit	88.65
AP6156	Families of Elements—Alkaline Earth Metals & Halides—Student Laboratory Kit	62.95
AP6289	It's in the Cards—Periodic Table—Super Value Guided-Inquiry Kit	33.15
AP7264	Periodic Table Analogy—A Card Puzzle—Super Value Kit	29.35
AP4511	Periodic Table Basics—Student Laboratory Kit	71.85
AP7578	Periodic Trends and the Properties of Elements—Super Value Laboratory Kit	126.64
AP6290	Plotting Trends—A Periodic Table—Student Laboratory Kit	42.50

Chemistry Laboratory Kits—Polymers

Gluep Production—Guided-Inquiry Kit

STEM INTEGRATED

By: Laura Trout, Lancaster Country Day School, Lancaster, PA



The Gluep Production Lab is a real-life, open-ended, discovery activity with an element of corporate competition. Student research teams are challenged to use the scientific method to improve a polymer recipe and make a bouncier Gluep ball—all while staying on a fixed budget. Students design and conduct their own mini-research project as they try to win the contract to manufacture Gluep. A fantastic opportunity for students to learn about the scientific method and polymers while having fun at the same time! Includes Teacher Notes, reproducible student handouts and all necessary equipment and chemicals.

Complete for 30 students working in pairs. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP5937	Gluep Production—Guided-Inquiry Kit	$55.00
G0049	Glue, 1 L	15.35

Grow-Dino Measurement—Student Laboratory Kit

FLINN EXCLUSIVE

By: Ira Hickman



Do Grow-Dinos really grow more than 600% when placed in water? Your students will find out as they investigate the growth of a polymer dinosaur over a period of five days. Physical measurements—length, height, thickness, perimeter, area, volume, mass and density—will be taken daily as the dino is soaked in water each night. Changes in the dinosaur measurements will be graphed and analyzed. A great lab activity to provide practice in measuring, graphing and making calculations; fun for all levels. Includes Teacher Notes, reproducible student handouts with Dino data tables and Dino graph sheets, 15 Grow-Dinos, metric rulers, storage bags and measuring string.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6127	Grow-Dino Measurement—Student Laboratory Kit	$39.45

Modeling Nanotechnology—Encapsulation by Sodium Alginate—Student Laboratory Kit

FLINN EXCLUSIVE

By: Brett Criswell, Central Columbia H.S., Bloomsburg, PA



An exciting breakthrough in nanotechnology involves the delivery and transport of medicines to treatment areas in the body by encapsulating drugs in molecular "cages" consisting of nanoparticles. In this modern, hands-on lab activity, students will model this technology on a larger scale using sodium alginate, a natural polymer from seaweed. When sodium alginate is added to a solution containing calcium ions, calcium alginate precipitates out as micro-spheres. These "capsules" can be used to trap and also release indicator dye molecules.

Complete for 30 students working in pairs. Reusable 6-well reaction plates are recommended and available separately.

Catalog No.	Description	Price/Each
AP7361	Modeling Nanotechnology—Encapsulation by Sodium Alginate—Student Laboratory Kit	$43.05
AP1725	Reaction Plate, 6-well	6.41

CHEMISTRY LABORATORY KITS—POLYMERS continued on next page.

Chemistry Laboratory Kits—Polymers, continued

Polyurethane Foam Hearts—Student Laboratory Kit



Make valentine hearts for that special someone! In this lab, students create a heart out of polyurethane foam by mixing equal amounts of polyurethane parts A and B. This lightweight foam expands to about 30 times its original liquid volume and will become rigid in about 5 minutes. The hearts can be shaped or colored to suit individual, student preference, combining art and chemistry in a way that will develop your students scientific reasoning skills.

Complete for 24 students working in groups of 2.

Catalog No.	Description	Price/Each
AP8369	Polyurethane Foam Hearts—Student Laboratory Kit	$87.30

One-Pot Plastic Synthesis—Student Laboratory Kit



By: The Flinn Staff

Plastic is a basic component of cars, houses, cell phones, clothing and computers, to name just a small handful of its applications. In this experiment, students design and synthesize their own plastics from a simple, one-pot, three-component process. The lab introduces polymers, aqueous reaction chemistry, experimental design and materials chemistry. The plastic can be shaped or colored to suit individual student preference and students can experiment with the reaction parameters to adjust color, hardness and flexibility. Includes reproducible student handouts, Teacher Notes and all necessary chemicals.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP8487	One-Pot Plastic Synthesis—Student Laboratory Kit	$56.05

Recycling Plastics by Density—Student Laboratory Kit



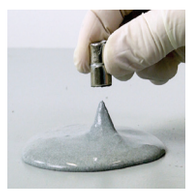
By: The Flinn Staff

Recycling plastics is a special challenge because of the variety of plastics in everyday use. In this student lab kit, students investigate the composition and properties of plastics and their recycling codes. Students determine the densities of "unknown" plastic samples, identify the unknowns and learn why sorting and separating discarded plastics helps make recycling more effective. The density range for each type of plastic (PETE, HDPE, PVC, LDPE, PP and PS) is estimated using a "sink or swim" method in a series of liquids. In order of increasing density, the liquids tested are corn oil, 35% ethyl alcohol, water, 10% sodium chloride solution and glycerin. Includes reproducible student handouts, detailed background information, complete Teacher Notes with sample data and answers to all questions and all necessary chemicals and consumable supplies.

Complete for 30 students working in groups of three.

Catalog No.	Description	Price/Each
AP7103	Recycling Plastics by Density—Student Laboratory Kit	$64.15

Magnetic Polymer Slime—Student Laboratory Kit



By: The Flinn Staff

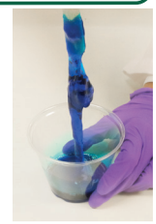
Making slime out of glue and borax is a popular polymer experiment in many science classrooms. With a simple addition of glue, borax and iron filings, students can make slime that is attracted to a magnetic field! Students will have fun observing how their polymer reacts to a magnet. Includes reproducible student hand-outs, Teacher Notes, magnets and all necessary chemicals.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP8364	Magnetic Polymer Slime—Student Laboratory Kit	$85.65

FLINN EXCLUSIVE

Slime for Everyone! Student Laboratory Kit



By: The Flinn Staff

With this economical kit, you'll have enough materials for every student in your class to make a batch of slime. Instruction sheet provides background information, easy-to-follow procedure and observation/analysis activities. Kit contains polyvinyl alcohol solution, sodium borate solution, plastic cups and wood sticks!

Full-size kits complete for 30 students. Small-size kits complete for 10 students. Refill kits contain materials only. Food coloring is optional and available separately.

Catalog No.	Description	Type	Price/Each
AP5393	Slime for Everyone! Student Laboratory Kit	Full-Size Kit	$39.05
AP10114		Full-Size, Refill Kit	29.65
AP10192		Small-Size Kit	18.50
V0003	Vegetable Dyes, Set of 4		7.75

Structures and Properties of Polymers—Activity-Stations Kit



By: The Flinn Staff

Simply set up the four mini-lab activities around the classroom, and allow students to rotate through the stations in any order. Each activity takes about ten minutes to complete. The polymers and their properties are: Sodium Alginate—A Natural Polymer, Molding Glue—An Amorphous Polymer, Polystyrene and Polyethylene—Birefringence and Polarized Light, and PTFE Tape—The Long and Short of It.

Complete for 24 students working in groups of three.

Catalog No.	Description	Price/Each
AP7172	Structure and Properties of Polymers—Activity-Stations Kit	$66.15

Small-Scale Synthesis of Polymers—Activity-Stations Kit



By: The Flinn Staff

Three independent "mini-lab" activities are included. Each activity takes about 10–15 minutes to complete, and students may rotate through the activity stations in any order. Students will synthesize three common polymers—nylon, polyurethane and polyester—and compare and contrast the methods of preparing them and their properties. All procedures have been microscaled and simplified to make them suitable for the high school laboratory.

Complete for 27 students working in groups of three. Perform this experiment in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP7371	Small-Scale Synthesis of Polymers—Activity-Stations Kit	$70.35

Golf Ball Design—Chemistry of Sports Student Laboratory Kit



By: The Flinn Staff

The relationship between science and sports is undeniable. Tennis racquets and bicycles are made lighter and stronger by nanotechnology; footballs are inflated to the appropriate pressure (we hope) in accordance with the ideal and simple gas laws; sports drinks are carefully made and studied using analytical chemistry to improve athletic performance; and breathable, comfortable apparel is designed by applying the principles of materials chemistry. In this lab, students design the best inner core of a golf ball possible by varying the composition of a reaction mixture to take advantage of the principles of polymer chemistry.

Complete for 24 students working in pairs.

Catalog No.	Description	Price/Each
AP8499	Golf Ball Design—Chemistry of Sports Student Laboratory Kit	$47.75

CHEMISTRY LABORATORY KITS continued on next page.

Chemistry Laboratory Kits—Qualitative Analysis

FLINN360science™: Human Activity and Carbon Emissions



This kit presents the essential concepts of greenhouse gases, climate change, carbon dioxide emissions, anthropogenic and carbon emissions through engaging hands-on science activities. In Part A, students combust a hydrocarbon (a candle) and observe that the CO_2 produced is absorbed by a solution of basic water and phenolphthalein, because the solution turns from pink to colorless as the H_2CO_3 produced lowers the pH. In Part B, students see that an Elodea sprig in water exposed to light reduces the concentration of dissolved CO_2 and thus raises the pH. Students use bromthymol blue to observe indirectly the conversion of dissolved CO_2 to glucose. In Part C, students heat a metal carbonate to its decomposition temperature to simulate the curing of concrete. When students heat the metal carbonate they observe indirectly the production of CO_2 because it changes the color of an aqueous acid-base indicator owing to the formation of H_2CO_3. Teachers can extend learning through guided inquiry into associated phenomena including, "What are the causes of and possible solutions to climate change?"

Catalog No.	Description	Digital Access	Price/Each
AP10399	**360**Science: Human Activity and Carbon Emissions	1-Year	$134.90
AP10499		3-Year	150.15

FLINN360science™: Solar Cell Technology



This kit presents the essential concepts of green chemistry, solar energy, electrochemistry, and photovoltaic cells through hands-on science activities designed to engage all your students, regardless of level. Students will become familiar with the dye-sensitized solar cell technology. Teachers can extend learning through guided inquiry into associated phenomena including, "What are the causes of and possible solutions to climate change?"

Catalog No.	Description	Digital Access	Price/Each
AP10402	**360**Science: Solar Cell Technology	1-Year	$104.85
AP10502		3-Year	116.10

FLINN360science™: Carbon Dioxide Capture



This kit presents the essential concepts of greenhouse gases, climate change, and carbon dioxide capture through hands-on science activities designed to engage all your students, regardless of level. Carbon dioxide gas emitted by a burning candle. Light diffuses into an aqueous solution of sodium hydroxide. Phenolphthalein indicator is added to the solution from the beginning so the solution changes color (from pink to colorless) as it gets acidified by the carbon dioxide that diffuses and reacts with the base in solution. Teachers can extend learning through guided inquiry into associated phenomena including, "What are the causes of and possible solutions to climate change?"

Catalog No.	Description	Digital Access	Price/Each
AP10396	**360**Science™: Carbon Dioxide Capture	1-Year	$126.65
AP10496		3-Year	147.45

FLINN360science™: Model Climate Change with Melting Ice



This kit presents the essential concepts of phase changes, solid and liquid states, and melting/freezing point through hands-on science activities designed to engage all your students, regardless of level. Teachers can extend learning through guided inquiry into associated phenomena including, "What are the causes of and possible solutions to climate change?"

Catalog No.	Description	Digital Access	Price/Each
AP10400	**360**Science: Model Climate Change with Melting Ice	1-Year	$83.00
AP10500		3-Year	98.00

FLINN360science™: Carbon Dioxide Levels in Water



This kit presents essential concepts of ocean acidification, carbon dioxide levels, pH, temperature and salinity through hands-on science. Students will observe that the hot water fizzes the carbon dioxide source more vigorously than the cool water sample. Therefore, the increasing temps in the water more readily release carbon dioxide. Their graphical plot should clearly identify this trend.

Catalog No.	Description	Digital Access	Price/Each
AP10415	**360**Science: Carbon Dioxide Levels in Water	1-Year	$103.90
AP10515		3-Year	121.50

FLINN360science™: The Fate of Carbonate in Acidifying Oceans



This kits presents the essential concepts of ocean acidification, carbon dioxide uptake, and seawater chemistry through hands-on science activities designed to engage all your students, regardless of level. Mixing calcium chloride ($CaCl_2$) and sodium carbonate ($Na2CO_3$) in a sodium chloride (NaCl) solution will cause the precipitation of calcium carbonate ($CaCO_3$), a white solid. Upon mixing of $CaCl_2$ and sodium bicarbonate ($NaHCO_3$), also in a NaCl solution, an amount of $CaCO_3$ will precipitate, but not as much as in the reaction with Na_2CO_3. Adding HCl to $CaCO_3$ will cause partial solubilization of the solid. Students will correlate these chemical processes with the effect of ocean acidification on $CaCO_3$ formation by marine organisms.

Catalog No.	Description	Digital Access	Price/Each
AP10417	**360**Science: The Fate of Carbonate in Acidifying Oceans	1-Year	$47.10
AP10517		3-Year	64.75

FLINN360science™: Calcium Carbonate and Shell Production



Students explore the essential concepts of acid and bases, neutralization and environmental chemistry through hands-on science activities. Designed to engage all your students, regardless of level. Ocean acidification and its impact on the human population can be difficult for students to understand since it happens on such a large scale and over an extended period of time. Students will see that higher concentrations of acid have a stronger effect on shell material and will be able to understand the effects this has on the ocean's buffering system and the organisms living within.

Catalog No.	Description	Digital Access	Price/Each
AP10413	**360**Science: Calcium Carbonate and Shell Production	1-Year	$129.15
AP10513		3-Year	147.45

FLINN360science™: The pH of Seawater



This kit presents the essential concepts of ocean water pH, carbon dioxide uptake, and seawater chemistry through hands-on science activities designed to engage all your students, regardless of level. Students will observe that the dissolution of carbon dioxide gas into a saline solution that resembles seawater causes a decrease in the pH of the solution. This change in pH will be measured directly with a pH meter. Also, the change in pH will cause the change in color of the solution due to the presence of an acid-base indicator. Teachers can extend learning through guided inquiry into associated phenomena including, "How does ocean acidification affect coral reefs?"

Catalog No.	Description	Digital Access	Price/Each
AP10414	**360**Science: The pH of Seawater	1-Year	$46.20
AP10514		3-Year	63.50

CHEMISTRY LABORATORY KITS—QUALITATIVE ANALYSIS continued on next page.

Chemistry Laboratory Kits—Qualitative Analysis, continued



Make Your Own Ozone Test Paper—Student Laboratory Kit
FB1619

FLINN EXCLUSIVE

Chemical Pollution in Water—A Qualitative Ion Test Super Value Kit
AP5905



Catalog No.	Description	Price/Each
AP5905	Chemical Pollution in Water—A Qualitative Ion Test—Super Value Kit	$103.30
AP6257	Lead Testing—Super Value Laboratory Kit	29.25
FB1619	Make Your Own Ozone Test Paper— Student Laboratory Kit	36.75
AP6885	Qualitative Analysis—Guided-Inquiry Kit	67.95
AP4855	Qualitative Analysis of 11 Unknowns—Super Value Laboratory Kit	100.35
AP4858	Qualitative Ion Test —Super Value Kit	83.65

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Chemistry Laboratory Kits—Radioactivity

FLINN360science™: Natural Radiation



This kit presents the concepts of radioactivity, half-life, and nuclear decay through engaging hands-on science activities. Students will find the amount of potassium chloride used for their measurements. This will help them understand that the radioactivity of an element does not depend on the chemical nature or form of the element. Teachers can extend learning through guided inquiry into associated phenomena including, "nuclear medicine."

Catalog No.	Description	Digital Access	Price/Each
AP10721	360Science: Natural Radiation	1-Year	$68.60
AP10821		3-Year	80.65

FLINN360science™: Radioactive Decay



Through this investigation, students will learn that Radon-222 is a naturally occurring radioactive gas that is generated as part of the uranium decay series. Unlike the other products in this decay chain, radon is a gas that can seep from the ground into homes. When radon decays it produces heavy metal solids that can attach to lung tissue causing metal toxicity, which can lead to cancer. This kit presents the essential concepts of radioactive decay, alpha particle, beta particle, and half-life through hands-on activities designed to engage all your students, regardless of level. Students will be able to better understand why radon is considered a health hazard, and how its half-life plays a role.

Catalog No.	Description	Digital Access	Price/Each
AP10722	360Science: Radioactive Decay	1-Year	$63.00
AP10822		3-Year	75.25

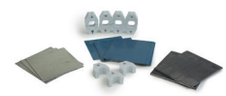
FLINN360science™: Nuclear Energy



This kit presents the concepts of nuclear fission, chain reaction, and nuclear energy through hands-on activities designed to engage all your students. Students will find the fission process for uranium-235 produces more neutrons than are needed to start the process. These additional neutrons can then react with other atoms of uranium-235, creating a chain reaction. Students will find that a supercritical reaction proceeds faster than a critical process. When control rods are added, the fission of uranium-235 is a self-sustaining reaction that can now be safely controlled. Teachers can extend learning through guided inquiry into associated phenomena including, "nuclear medicine."

Catalog No.	Description	Digital Access	Price/Each
AP10723	360Science: Nuclear Energy	1-Year	$ 84.05
AP10823		3-Year	102.90

FLINN360science™: Nuclear Radiation and Shielding



This kit presents the concepts of alpha/beta/gamma radiation, ionizing radiation, penetrating power, and shielding through hands-on activities designed to engage all your students, regardless of level. Different types of nuclear radiation require different types of shielding. The amount of "shielding" required to absorb nuclear radiation is proportional to the penetrating power. The ability of a material to absorb nuclear radiation depends on the density and the thickness of the material. The more electrons and nuclei there are in the path of the incoming radiation, the more effective the material will be in "stopping" the radiation. Teachers can extend learning through guided inquiry into associated phenomena such as, "Nuclear Medicine."

Catalog No.	Description	Digital Access	Price/Each
AP10724	360Science: Nuclear Radiation and Shielding	1-Year	$ 97.15
AP10824		3-Year	112.05

Radioactive Sources



Completely safe for use in the science laboratory! Each source is mounted in a one-inch diameter sealed disc and is completely safe for student use. Three radioactive sources are available: Alpha, Beta and Gamma. Perfect for showing the different properties of all types of radiation. For instance, students will be able to see that alpha particles can be blocked very easily yet gamma rays are nearly impossible to block. The isotope name, type of radiation, activity in microcuries and half life are written on each sealed disc. Cobalt-60, Polonium-210 and Strontium-90 are included in the Radioactive Source Kit AP8796.

Nuclide	Activity	Half Life	Type of Radiation
Polonium-210	0.1 µCi	138 days	Alpha
Thallium-204	1.0 µCi	3.78 years	Beta
Cobalt-60	1.0 µCi	5.27 years	Gamma
Strontium-90	0.1 µCi	28.6 years	Beta

You may purchase three types of radioactive sources separately.

Catalog No.	Description	Price/Each
AP8796	Radioactive Source Kit, Set of Three	$369.77
AP8794	Alpha Source, Polonium-210	161.95
AP8797	Beta Source, Thallium-204	160.44
AP8795	Gamma Source, Cobalt-60	160.44

Allow three weeks for delivery.

CHEMISTRY LABORATORY KITS—RADIOACTIVITY continued on next page.

Chemistry Laboratory Kits—Radioactivity, continued

Catalog No.	Description	Price/Each
AP7198	Artifact Ages—Radiometric Dating Simulation—Super Value Kit	$ 35.50
AP7185	Carbon Dating Activity—Super Value Puzzle	55.40
AP7366	Nuclear Chemistry—Activity Booklets	41.45
AP8977	Introduction to Radioactivity and Half-Life—Experiment Kit	143.55
AP6895	Nuclear Shielding—Super Value Kit	61.45
AP6721	Radioactivity Half-Life Simulation—Super Value Laboratory Kit	90.55
AP4555	Radioactive Decay Cards— Super Value Game	21.50

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Chemistry Laboratory Kits—Scientific Method

Observation and Experiment—Introduction to the Scientific Method—Guided-Inquiry Kit

FLINN EXCLUSIVE

By: Lee Marek, Retired, Naperville North H.S., Naperville, IL



Students mix two solids and a liquid in a closed container and observe a dramatic series of changes—temperature changes, color changes and changes in state. What interactions are responsible for each observation? In this open-ended, inquiry-based introduction to the scientific method, students first make observations and then design controlled experiments to identify the substances responsible for each change. Includes reproducible student handouts, detailed background information, complete Teacher Notes with sample data and answers to all questions and all necessary chemicals and consumable supplies.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6167	Observation and Experiment—Introduction to the Scientific Method—Guided-Inquiry Kit	$51.85

Scientific Method—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students use key elements of the scientific method to perform two laboratory investigations: a consumer product testing lab and a solubility lab. Students have the option of performing either a student-designed, open-ended procedure or a standard step-by-step procedure. Either option will provide students with the experience of using scientific thinking. Detailed Teacher Notes and reproducible student handouts include easy-to-follow lab instructions, pre-lab activities, sample data and in-depth background information. All chemicals and specialized equipment are provided.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP4509	Scientific Method—Student Laboratory Kit	$55.45

Measurement and Accuracy—Super Value Lab Practical Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students measure out and add or transfer different colored solutions one step at a time. If the directions are followed correctly, each demonstration tube will contain the same amount of solution and a rainbow sequence of colors will be displayed. A great activity to perform at the beginning of the year or during a measurement discussion! Includes demonstration tubes, durable transparent rack, dye solutions, detailed instructions and a student worksheet.

Super Value Kit is complete with 5 tubes, 1 rack and enough dye solutions to perform the activity at least 12 times. Additional tubes and racks are available separately. Tubes and rack are completely reusable.

Catalog No.	Description	Price/Each
AP7514	Measurement and Accuracy—Super Value Lab Practical Kit	$45.05
AP7518	Mini Soda Bottle Tubes and Rack	30.36

Color Change Challenge—Problem-Solving Guided-Inquiry Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students must discover a sequence of chemical changes—using four unknown colorless solutions—that will result in a series of specific color changes. As students design and then carry out their "action plan," they learn that scientific problem solving is not a random process and that trial and error is really a series of logical steps leading toward a solution. Includes all necessary chemicals, disposable pipets, labels and pipet holders. Includes Teacher Notes and reproducible student handouts.

Complete for 30 students working in pairs. Reusable spot plates are recommended and available separately.

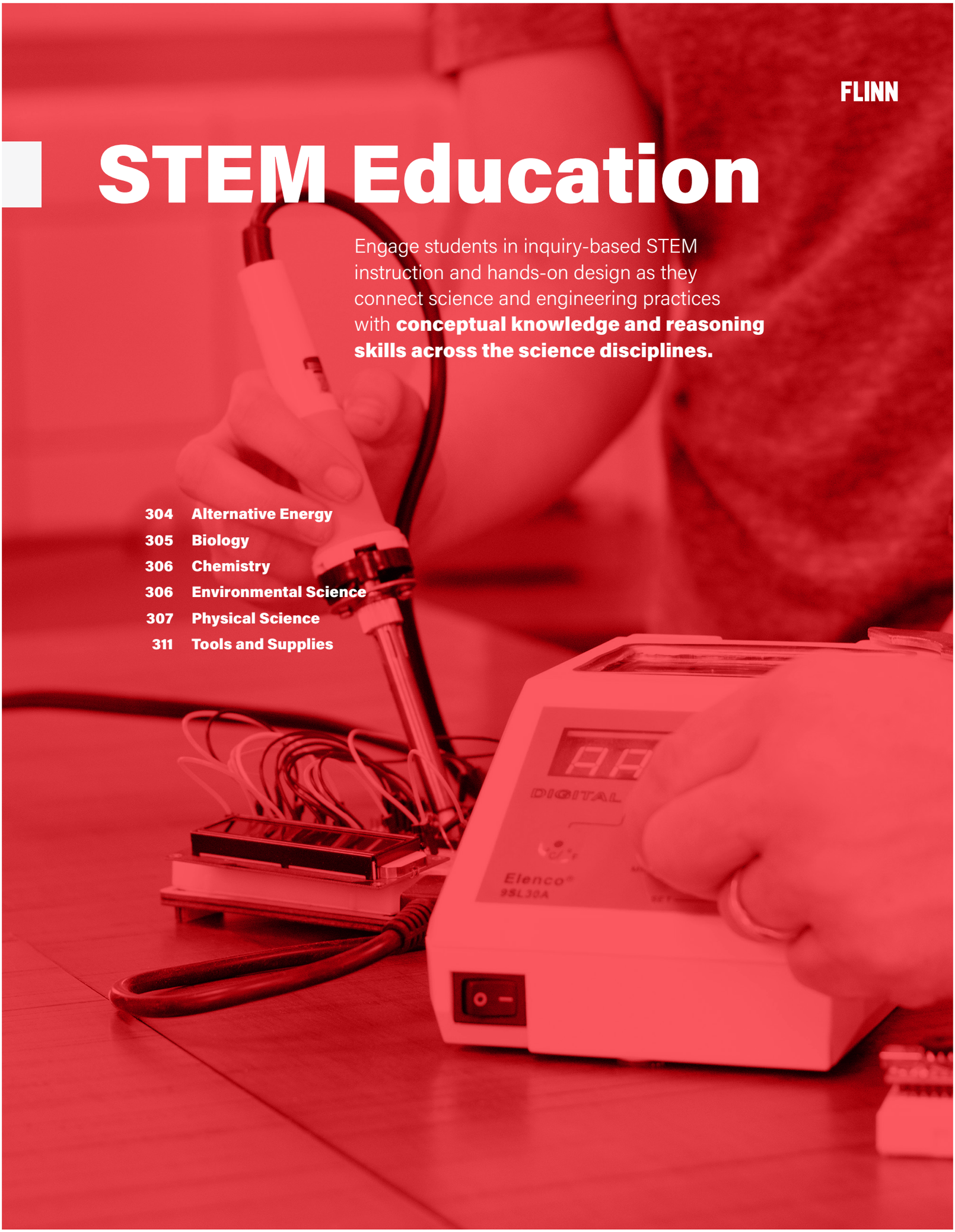
Catalog No.	Description	Price/Each
AP7209	Color Change Challenge—Problem-Solving Guided-Inquiry Kit	$48.91
AP6399	Spot Plate Polystyrene, 12-well, Pkg. of 12	11.52

CHEMISTRY LABORATORY KITS—RADIOACTIVITY continued on next page.

STEM Education

Engage students in inquiry-based STEM instruction and hands-on design as they connect science and engineering practices with **conceptual knowledge and reasoning skills across the science disciplines.**

304 **Alternative Energy**
305 **Biology**
306 **Chemistry**
306 **Environmental Science**
307 **Physical Science**
311 **Tools and Supplies**



Alternative Energy

Cooking with Solar Energy—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff

In the first part of this activity, students make a basic box-type solar oven and then investigate how high the internal temperature reaches in a given amount of time. Once the data are collected and analyzed, students then apply their knowledge of science concepts, such as heat transfer, reflection, absorption and the greenhouse effect, to design and implement improvements for a more efficient oven.

Complete for eight student groups, including boxes. Thermometers are required and available separately.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8048	Cooking with Solar Energy—Flinn STEM Design Challenge™	$62.93
AP1452	Spirit-Filled Thermometer	7.15

Biofuels—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff



First, students conduct a controlled experiment to investigate the amount of carbon dioxide produced through the fermentation reaction of yeast with two different types of carbohydrates. Students observe the amount of carbon dioxide produced and determine the most productive carbohydrate food source. Then students design and implement a method to collect and quantify the amount of carbon dioxide produced.

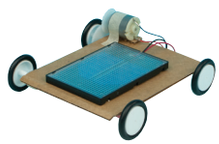
Complete for 30 students working in groups of three.

Catalog No.	Description	Price/Each
AP8052	Biofuels—Flinn STEM Design Challenge™	$56.70

Solar-Powered Cars—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff



In the first part of this activity, students learn how a solar car works and build a model prototype. Next they investigate different variables to determine their effect on the car's performance. Based on the data collected and their observations, students create an optimal design solution for a faster moving car.

Full-size kits are complete for eight student groups. Small-size kits are complete for 4 student groups. Refill kits contain materials only.

Catalog No.	Description	Type	Price/Each
AP8049	Solar-Powered Cars—Flinn STEM Design Challenge™	Full-Size Kit	$186.66
AP10098		Full-Size, Refill Kit	168.30
AP10176		Small-Size Kit	129.15
AP10254		Small-Size, Refill Kit	121.15

Build a Solar Cell—Student Laboratory Kit

STEM INTEGRATED

By: The Flinn Staff



Students build a DSC and learn about the principles behind its operation. Light striking the dye surface is absorbed and promotes an electron to a photoexcited state. Electrons migrate through the titanium oxide film and travel through the external circuit to the cathode.

Complete with enough materials to make four solar cells. A multimeter may be used to measure the voltage of the solar cell and is available separately. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP6916	Build a Solar Cell—Student Laboratory Kit	$73.87
AP9000	Multimeter	81.86

Build a Water Wheel—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff



In the first part of this activity, students build an eight-bucket water wheel, choosing from the materials provided. Each group then tests its wheel, collecting data and making observations. Next, students brainstorm and decide how to make improvements to their design. Variables, such as the size, shape and number of buckets, are considered. The improved water wheels are given a final test to determine maximum power generated.

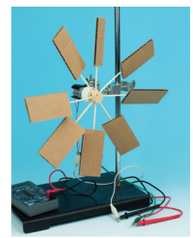
Complete for 30 students working in groups of three and two testing stations. A source of running or falling water is required for each testing station.

Catalog No.	Description	Price/Each
AP8050	Build a Water Wheel—Flinn STEM Design Challenge™	$61.45

Generating Electricity with Wind—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff



In the first part of this activity, students build a rotor and blade assembly from the materials provided. Each group's prototype is tested by attaching it to a DC motor (acting in reverse as a generator) connected to a multimeter. A fan provides the wind. The highest readings of volts and amps are recorded and the maximum power output is calculated.

Complete for 30 students working in pairs and two testing stations. Multimeters and support stands with clamps are required for each testing station and are available separately.

Catalog No.	Description	Price/Each
AP8051	Generating Electricity with Wind—Flinn STEM Design Challenge™	$60.18
AP4639	Multimeter, Student	35.00
AP4550	Support Stand, Economy Choice	27.50
AP1034	Single Buret Clamp, Plastic-Coated Jaw	13.25

Wind Energy—Student Laboratory Kit

STEM INTEGRATED

By: The Flinn Staff



Each student group constructs a windmill with two interchangeable fans of three and four blades, respectively. Expose each windmill to a portable fan to measure the time required for the torque of the windmill shaft to lift a weight a given distance. From the data, students are able to determine the power produced from the two different blade designs and calculate which is more efficient.

Complete for 30 students working in pairs. Small portable fans are required but not included. Fans may be shared among student groups. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP7512	Wind Energy—Student Laboratory Kit	$52.30

Alternative Energy—Flinn STEM Design Challenge™ 5-Kit Bundle

STEM INTEGRATED

Cost-saving bundle includes five Flinn STEM Design Challenge™ Alternative Energy kits! Help students connect renewable energy concepts and engineering design with confidence.

- AP8048 Cooking with Solar Energy
- AP8049 Solar-Powered Cars
- AP8050 Build a Water Wheel
- AP8052 Biofuels
- AP8051 Generating Electricity with Wind

Catalog No.	Description	Price/Each
AP8085	Alternative Energy—Flinn STEM Design Challenge™ 5-Kit Bundle	$398.75

Biology

Beaks—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff

In this activity, students use predetermined beak designs and put into action a custom beak design to discover which perform better with a variety of different food sources and changing environmental conditions. Students then analyze the data to create a custom beak that will survive through several generations.

Complete for 30 students working independently.

Catalog No.	Description	Price/Each
FB2130	Beaks—Flinn STEM Design Challenge™	$98.15

Broken Bones—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff

In this activity, students observe X-rays of femoral fractures in order to determine what type of break has occurred. Using biomedical engineering tactics, students design and construct a medical device to repair the break and then perform "surgery" to repair a model broken femur with their device.



Full-size kits are complete for eight student groups. Small-size kits are complete for 4 student groups. Refill kits contain materials only.

Catalog No.	Description	Type	Price/Each
FB2131	Broken Bones— Flinn STEM Design Challenge™	Full-Size Kit	$117.30
AP10103		Full-Size, Refill Kit	101.00
AP10181		Small-Size Kit	69.12

Biomimicry—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff

It is said that imitation is the sincerest form of flattery, and our world is no exception. Flinn's Biomimicry Kit explores how form and function of many human products are modeled from attributes observed in the natural world. First, students investigate one example of biomimicry—insulation that is based on how some animals stay warm in a cold environment. Then students make observations of their own, finding either current examples or new possibilities of biomimicry in the natural kingdom. Finally students use these concepts to create a practical application of the natural phenomenon they observed!



Complete for 10 student groups.

Catalog No.	Description	Price/Each
FB2132	Biomimicry—Flinn STEM Design Challenge™	$99.00



Digestion Connection—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff

Incorporate STEM into your biology curriculum with the Flinn STEM Design Challenge™ Digestion Connection! Students begin by discovering the inner workings of the stomach and its digestive capabilities. Then your students will love the challenge of designing a pill coating that can withstand the stomach's harsh acidic environment, with a pH so low it can dissolve iron nails! By applying relevant concerns, such as medicine degradation, students engage in a fun activity that integrates biological and engineering skills.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB2122	Digestion Connection—Flinn STEM Design Challenge™	$47.00

Fish Fitness—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff

In the cut-throat world beneath the sea, it's eat or be eaten! Fish need to be in the best shape possible in order to outrun predators as well as catch up to prey. Fish Fitness takes cross-fit to a whole new level by allowing your students to craft the ultimate underwater specimen. Using concepts, such as adaptations and survival of the fittest, students learn why body shape influences survival!



Complete for 30 students working in pairs. An aquarium or other clear container is required and available separately.

Catalog No.	Description	Price/Each
FB2129	Fish Fitness—Flinn STEM Design Challenge™	$ 34.40
FB0211	Aquarium, All-Glass®, 10-gallon	103.21

Life Science—Flinn STEM Design Challenge™ 5-Kit Bundle

STEM INTEGRATED

Cost-saving bundle includes five Flinn STEM Design Challenge™ Life Science kits! Integrate biology and engineering design with these engaging activities. Save money by purchasing the kits as a bundle rather than individually.

- FB2122 Digestion Connection—Create a pill coating that lasts in a simulated stomach.
- FB2129 Fish Fitness—Craft a model fish to efficiently "swim" through the water.
- FB2130 Beaks—Construct a beak that is fit to survive environmental changes.



- FB2131 Broken Bones—Examine real X-rays and design a medical device to repair a model broken femur.
- FB2132 Biomimicry—Design a practical application based on a structural phenomenon found in the natural world.

Catalog No.	Description	Price/Each
AP8086	Life Science—Flinn STEM Design Challenge™ 5-Kit Bundle	$321.90

Chemistry

Make Your Own Soap—Guided-Inquiry Kit

STEM INTEGRATED

By: The Flinn Staff

Use the ancient craft of soap-making to show students a real-world application of chemistry! The investigation begins with an introductory activity to make a bar of soap using a combination of natural fat and oil that is heated with a sodium hydroxide solution. The properties of the soap will then be investigated—its pH, texture and emulsifying action. The results provide a model for guided-inquiry design of an experiment to prepare soap with different oils or fats using a student-personalized recipe.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Pkg.
AP7924	Make Your Own Soap—Guided-Inquiry Kit	$40.40

Gluep Production—Guided-Inquiry Kit

STEM INTEGRATED

By: Laura Trout
Lancaster Country Day School, Lancaster, PA

The Gluep Production Lab is a real-life, open-ended, discovery activity with an element of corporate competition. Student research teams are challenged to use the scientific method to improve a polymer recipe and make a bouncier Gluep ball—all while staying on a fixed budget. Students design and conduct their own mini-research project as they try to win the contract to manufacture Gluep. A fantastic opportunity for students to learn about the scientific method and polymers while having fun at the same time! Includes Teacher Notes, reproducible student handouts and all necessary equipment and chemicals.

Complete for 30 students working in pairs. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP5937	Gluep Production—Guided-Inquiry Kit	$55.00
G0049	Glue, 1 L	15.35

Food Dye Chromatography—Student Laboratory Kit

STEM INTEGRATED

By: The Flinn Staff



Explore the properties of the seven Food, Drug and Cosmetic (FD&C) artificial food dyes with this chromatography activity. Students determine the composition of an unknown solution utilizing paper chromatography and the seven referenced FD&C food dyes to learn more about polarity, food chemistry and chromatography. Includes reproducible student handouts, detailed background information, complete Teacher Notes with sample data and answers to all questions and all necessary chemicals and consumable supplies.

Complete for 30 students working in pairs. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP7394	Food Dye Chromatography—Student Laboratory Kit	$57.05

FLINNSCI.COM
VISIT US ONLINE

Environmental Science

Paper-Making—Student Laboratory Kit

STEM INTEGRATED

By: The Flinn Staff

Learn the "science" behind making recycled paper. Every student will make his or her own recycled pulp and press it into a 3" x 5" piece of paper. Once the paper is made, students will test it for writeability and strength. The process utilized in this activity simulates the major steps involved in the real manufacturing of recycled paper. Includes deckle frames, screen filters, couching felts and linters. Recycled paper will need to be provided locally.

Complete for eight student groups.

Catalog No.	Description	Price/Each
FB1486	Paper-Making—Student Laboratory Kit	$185.00

Enviro-Bond™ 403—An Oil Spill Cleanup Demonstration Kit

STEM INTEGRATED

By: Steve Spangler, Regis University, Denver, CO



An oil-stabilizing polymer, Enviro-Bond™ 403 is specially formulated to bond quickly and safely to many types of liquid hydrocarbons, including crude oil, diesel fuel and gasoline. The bonding is so complete that it literally encapsulates the liquid hydrocarbons in just seconds. Includes teacher Demonstration Notes and a STEM Integration Guide. The encapsulant is also available separately. Enviro-Bond™ 403 is a product of Petroleum Environmental Technologies, Inc., Williamsburg, MI.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
FB1025	Enviro-Bond™ 403—An Oil Spill Cleanup Demonstration Kit	$49.85
E0058	Enviro-Bond™ 403 Hydrocarbon Encapsulant, 100 g	13.50



Oil Spill Containment—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff

Crude oil is a valued resource for transportation fuels, fuel oils for generating heat and electricity, plastic production and countless synthetic materials. As useful as this fossil fuel is, extracting it from the environment includes some risk, and disastrous oil spills have occurred. In this activity, students learn how oil spills are contained and remediated. Then students practice employing containment options on a small scale. Using observations from introductory activity, students design a method to contain a larger volume of oil and to minimize contamination of the ecosystem.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP8329	Oil Spill Containment—Flinn STEM Design Challenge™	$57.00

Physical Science

FLINNeverydayscience™

NEW!

Hovercraft Forces



With this FlinnEverydayScience™ lab, students build their own mini hovercraft. They then use their hovercraft to model the resulting motions of both balanced and unbalanced forces. They must identify the forces acting on their hovercraft. They must also describe the motion of their hovercraft and make connections to Newton's 1st law of motion.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 30 balloons, 15 pushpins, 15 cardboard squares, box of 100 paperclips, and 15 bottle caps. Additional materials required (for each lab group): tape or hot glue, scissors, markers or colored pencils (optional).

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP11797	Hovercraft Forces	$55.85

FLINNeverydayscience™

NEW!

Hot and Cold



With this FlinnEverydayScience™ lab, students dissolve ionic solids in water and observe the temperature changes that result from the dissolutions. This process is relied on for designing cold and hot packs. Students will be given several solids and must design an experimental procedure to determine the best material for a handwarmer. This requires them to consider experimental data as well as cost information, much like scientists and engineers do when designing products for specific applications. Students learn about thermal energy, energy transfer, solutions, experimental design, and product design.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 120 g reagent ammonium chloride, 120 g anhydrous calcium chloride, 120 g lithium chloride, 120 g lab grade sodium acetate, 125 g sodium carbonate, 120 g sodium chloride, and 25 8 oz polystyrene cups. Additional Materials Required (for each lab group): Deionized or distilled water, 0.01-g precision balance (shared), beaker, graduated cylinder, hot plate (shared), magnetic stirrer and stir bar or stirring rod, paper towels, thermometer, timer or stopwatch.

Complete for 24 students working in pairs.

Catalog No.	Description	Price/Each
AP11798	Hot and Cold	$71.25

FLINNeverydayscience™

NEW!

Fingerprint Identification



With this FlinnEverydayScience™ lab, students investigate their own fingerprints and fingerprints of their classmates in the introductory activity. Loops, arches, and whorls are studied and observed. Then, in the challenge activity, students are given a crime scene fingerprint to analyze. Using several fingerprint cards, students must identify their crime scene fingerprint.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes one set (to be shared) of crime scene fingerprints, fingerprint card sets, and 10 ink stamp pads.

Complete for 30 students working in groups of three.

Catalog No.	Description	Price/Each
AP11799	Fingerprint Identification	$91.15

FLINNeverydayscience™

NEW!

Density Quest



With this FlinnEverydayScience™ lab, students learn about the physical property of matter known as density, and how to measure the density of solid materials in the laboratory. Then, they apply this knowledge to determine the density of various unknown metal samples. Based on their experimental results, students determine the identity of each metal sample, and select the metal sample with the appropriate density that could be used in the manufacturing of metallic orthopedic implants.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 500 g aluminum shot, 500 g brass shot, 375 g tin shot, 10 weighing dishes, 10 glass marbles, and 10 spoons.

Complete for 30 students working in groups of 3, or for 10 groups of students.

Catalog No.	Description	Price/Each
AP11800	Density Quest	$130.25

FLINNeverydayscience™

NEW!

Atoms, Molecules, Compounds are Everywhere



With this FlinnEverydayScience™ lab, students build models of molecules to learn why and how atoms bond with other atoms. They build molecular compounds observed in their environments like carbon dioxide, water, and isopropyl alcohol. They also build ionic compounds like sodium chloride. Students learn about the scale of atoms and molecules and how materials' structures influence their properties. In the challenge part of the lab, students exercise their experimental design skills by coming up with a procedure to determine which of two liquids' constituent particles are held together by stronger forces.

All materials are reuseable so that students can build models, take them apart, and rebuild to better understand why single, double, and triple bonds form based on the bonding atoms. Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes molecule model set, 14 18" cloth stem wire, 18-gauge, 84 2" diameter green Styrofoam ball, 78 1" diameter white Styrofoam ball, and 250 mL 70% isopropyl alcohol.

Complete for 24 students working in pairs. All materials, excepting isopropyl alcohol, are reuseable.

Catalog No.	Description	Price/Each
AP11801	Atoms, Molecules, Compounds are Everywhere	$129.15

FLINNeverydayscience™

NEW!

Cellular Respiration and Exercise



With this FlinnEverydayScience™ lab, students observe a color change of bromothymol blue as they breathe through a straw into the indicator. They then are challenged to determine how exercise can affect the rate of cellular respiration by timing how long the bromothymol blue changes color before and after exercising.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 50 mL ammonia water, 25 mL 0.04 % bromothymol blue solution, package of 50 straws, and 24 safety valves.

Complete for 24 students working in pairs.

Catalog No.	Description	Price/Each
AP11802	Cellular Respiration and Exercise	$58.75

PHYSICAL SCIENCE continued on next page.

Physical Science, continued

FLINNeverydayscience™

Build Your Own Spinning Pyramid

NEW!



With this FlinnEverydayScience™ lab, students build their own candle-powered spinning pyramid. Using the materials included in this kit, each student group assembles a model spinning pyramid that works on the principle of air convection. Students will learn about air convection, energy conversion, forces, and motion while tweaking the design of their spinning pyramid to ensure a fast and continuous spin!

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 20 aluminum pie pans, 1 roll double-sided tape, 10 dowel rods, 8 oz modeling clay, 100 pushpins, and 60 tea candles.

Complete for 30 students working in groups of 3, or for 10 groups of students.

Catalog No.	Description	Price/Each
AP11803	Build Your Own Spinning Pyramid	$68.35

FLINNeverydayscience™

Red Cabbage Indicator Bird

NEW!



With this FlinnEverydayScience™ lab, students will become more familiar with acids, bases, and the pH scale! Acids and bases are all around us—in the foods we eat and soaps and clears we use. In this lab, students create colorful pH-sensitive birds using household items. Watch your students' creativity take flight! Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes baking soda (sodium bicarbonate), blotting paper with bird outlines, cotton swabs, dish detergent, lemon juice, 2 g red cabbage indicator extract, 15 red cabbage indicator charts, and vinegar.

Complete for each student to create their own colorful bird. Students can work in groups of two, to share indicator charts.

Catalog No.	Description	Price/Each
AP11804	Red Cabbage Indicator Bird	$67.75

FLINNeverydayscience™

Blood Types and Inheritance Patterns

NEW!



With this FlinnEverydayScience™ lab, students create models of red blood cells, and the possible antigens present on the surface for the eight blood types (Type O+, O-, A+, A-, B+, B-, AB+, and AB-). They then identify the possible genotypes for each blood type. Using Punnett squares they determine the probability of a child having a certain blood type based on the blood types of the parents. Lastly, they will use their understanding of blood types and inheritance patterns to determine the possible father of a child based on the child's and parents' blood types.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 48 Styrofoam balls and 400 pushpins.

Complete for 24 students working in pairs.

Catalog No.	Description	Price/Each
AP11805	Blood Types and Inheritance Patterns	$52.35

FLINNeverydayscience™

Investigating Lenses and Images

NEW!



With this FlinnEverydayScience™ lab, students investigate how double-convex (or biconvex) lenses work to produce sharp, focused images of real objects. Then, they set up a model to explore the function of an eye's lens in the formation of the images we perceive of the outside world.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 3 acetate sheets, 15 cardboard sheets, 30 double-convex lenses, and 60 plastic supports.

Complete for 30 students working in groups of 3, or for 10 groups of students.

Catalog No.	Description	Price/Each
AP11806	Investigating Lenses and Images	$98.50

FLINNeverydayscience™

Discover Newton's Second Law

NEW!



With this FlinnEverydayScience™ lab, students are presented with a modified Atwood's machine consisting of a Hall's carriage connected to a hanging mass. Students learn to use this equipment to calculate the acceleration of a system from time and distance data. Once the introductory activity is completed, students design and carry out a simple procedure to understand why there is an inverse relationship between the mass of a system and its acceleration.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 8 Hall's carriages, 8 1⅛" x 3⁄16" x 3" pine boards, 8 4" x 6" standard duty plastic bags, 8 pulley with table clamp, 331 m ball of ⅛ lb thin string, 150 ⅜" i.d. x 1" o.d. x 5⁄64" washers.

Complete for 24 students working in groups of three. Timers are required and available separately. All materials are reusable.

Catalog No.	Description	Price/Each
AP11808	Discover Newton's Second Law	$115.35

FLINNeverydayscience™

Matter is Conserved

NEW!



With this FlinnEverydayScience™ lab, students will use bingo chips to observe how the total number of atoms does not change in a chemical reaction and thus matter is conserved. In Part II, students will develop their own models and balance chemical equations.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 250 blue bingo chips, 250 green bingo chips, 250 red bingo chips, 250 yellow bingo chips, clay, and toothpicks.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP11807	Matter is Conserved	$68.45

PHYSICAL SCIENCE continued on next page.

Physical Science

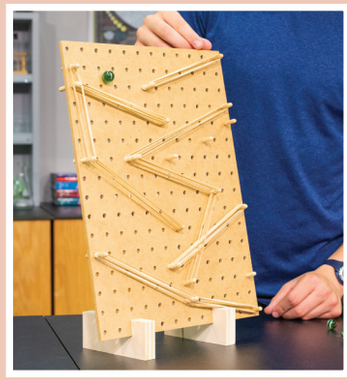
STEM Design Challenge™

Multiple sizes available for some kits. Refill kits available for some kits.

STEM INTEGRATED

Flinn's STEM Design Challenge™ Kits

Catalog No.	Inquiry Lab	Price/Each
AP8318	**Introducing STEM with Electricity**	$59.40
AP8315	**Marble Down—Flinn STEM**	89.95
AP8053	**Investigate a Twirling Toy**	21.15
AP8056	**Create a Mobile**	58.10
AP8061	**Paper Airplanes**	30.00
AP7991	**Build an Electronic Quiz Board**	69.55
AP7936	**Build a Simple Motor**	65.60
AP8054	**Build a Model Catapult**	56.80
AP8347	**Trebuchet**	178.35
AP7992	**Make a Wire Maze Game**	76.70
AP8055	**Roller Coasters**	80.72
AP8058	**Egg Elimination**	42.75
AP8059	**Drop Zone**	44.60
AP8060	**Egg-streme Parachuting**	31.10
AP8062	**Building Bridges**	119.91



Marble Down—Flinn STEM Design Challenge™ AP8315



Build an Electronic Quiz Board—Flinn STEM Design Challenge™ AP7991

Accessories

Catalog No.	Description	Price/Each
AP1425	Batteries, D (Alkaline), 1.5 V	$ 4.50
AP9275	Battery Holder, D-cell, Double	3.75
AP4550	Support Stand, Economy Choice	27.50
AP8230	Support Ring, 2", with Clamp	9.97
AP6323	Tape Measure, WInd-Up Type, Metric, 30 m	29.99
AP8325	Egg Elimination Apparatus	59.40
AP4665	Spring Scale, Pull Type, 1 kg/10 N	10.00

Physical Science—Flinn STEM Design Challenge™ 9-Kit Bundle

Cost-saving bundle includes 9 Flinn STEM Design Challenge™ Physical Science kits! Bring engineering design into your class with confidence and save money by purchasing the kits as a bundle rather than individually.

- AP8053 Investigate a Twirling Toy
- AP8054 Build a Model Catapult
- AP8055 Roller Coasters
- AP8056 Create a Mobile
- AP8058 Egg Elimination
- AP8059 Drop Zone
- AP8060 Egg-streme Parachuting
- AP8061 Paper Airplanes
- AP8062 Building Bridges

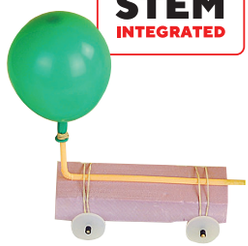
Catalog No.	Description	Price/Each
AP8084	Physical Science—Flinn STEM Design Challenge™ 9-Kit Bundle	$459.00

PHYSICAL SCIENCE continued on next page.

Physical Science, continued

Balloon Cars Challenge—Guided-Inquiry Kit

STEM INTEGRATED



By: The Flinn Staff

Each group constructs and tests an easy-to-assemble balloon-powered car prototype. Next students use their knowledge of forces and Newton's laws to identify variables that may affect the car's performance. Modifications are then made to the basic design in order to investigate one or more variables. Finally the redesigned cars are put to the test—who will win the challenge? A fun and memorable activity to engage students in science and engineering practices!

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP7922	Balloon Cars Challenge—Guided-Inquiry Kit	$63.90

Balloon Rockets—Guided-Inquiry Kit

STEM INTEGRATED

By: The Flinn Staff

Students investigate Newton's laws of motion and rocket thrust. Students tether a balloon to fishing line stretched across the room and then must find a successful combination of orientation, drag, and thrust that will launch the balloon across the room. The task requires students to run various trials and then modify their balloon rockets based on what they learn in each trial. A fun and stimulating lab that your students will never forget! Includes detailed background information, instructions and valuable Teacher Notes with teaching tips and answers to pre- and post-lab questions.

Complete for 30 students working in pairs. A balloon refill package is available separately.

Catalog No.	Description	Price/Each
AP6927	Balloon Rockets—Guided-Inquiry Kit	$47.80

Cartesian Diver Construction—Super Value Kit

STEM INTEGRATED

By: Bob Becker
Kirkwood H.S., Kirkwood, MO

Students learn the relationship between pressure and air volume and how air volume acts to regulate buoyancy by constructing cartesian divers made of simple equipment and materials. Procedures for constructing 11 different types of cartesian divers are provided.

Super Value Kit is complete with 100 pipets and hex nuts. Requires water and two-liter soda bottles. Includes Flinn Exclusive STEM Integration Guide.

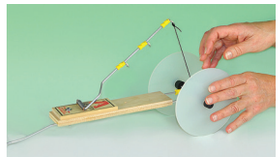
See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP9082	Cartesian Diver Construction—Super Value Kit	$37.30

Mousetrap Cars—Super Value Guided-Inquiry Kit

STEM INTEGRATED

By: Brad Christensen,
Illinois State University, Normal, IL



It's off to the races! Students become real-world engineers as they investigate the various parts of a mousetrap car to determine each part's effect on the car's performance. With this exclusive kit, students plan and carry out investigations to test variables of wheel diameter, hub diameter and length of the lever arm. Kit includes enough materials for six cars! Students analyze the quantitative data they collect in order to design a solution to a problem with particular specifications.

Super Value Kit is resuable and complete for six student groups.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7667	Mousetrap Cars—Super Value Guided-Inquiry Kit	$270.30

Cartesian Diver Design Challenge—Guided-Inquiry Kit

STEM INTEGRATED

By: The Flinn Staff

After testing a basic diver, students are challenged to create divers that retrieve, descend in a particular order and even spin! This STEM activity helps students practice critical thinking and incorporates engineering design. Choose one challenge or do all three! Connect engineering design to density, Boyle's law and pressure. Enough materials are included for each group to design and test ten Cartesian divers. Reproducible student handouts and valuable Teacher Notes complete the kit.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP7926	Cartesian Diver Design Challenge—Guided-Inquiry Kit	$85.00

Up, Up and Away—Hot Air Balloon Laboratory Kit

STEM INTEGRATED

By: The Flinn Staff



Groups construct and launch their own giant hot air balloon. Students will learn how hot air balloons lift, stay afloat and eventually descend. A unique balloon launcher apparatus is included for safe and successful launches. Includes instructions and materials needed to construct fifteen 3' x 2' hot air balloons! A heat gun or propane torch is required and sold separately.

Complete for 30 students working in pairs. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP6310	Up, Up and Away—Hot Air Balloon Laboratory Kit	$85.30
AP6319	Heat Gun	88.65
AP6329	Hot Air Balloon Tissue Replacement Pack	35.85

Science of Sailing—Newton's Third Law Laboratory Kit

STEM INTEGRATED

By: The Flinn Staff

During their experiments, students discover the advantages and disadvantages of both a triangular sail and a square sail—only one will provide forward motion into the wind. An educational way to learn the basics of sailing, without getting your feet wet! Kit includes complete reproducible student handouts and instructions with sample data and answers to all questions.

Complete for eight student groups. All materials are reusable. Minimal assembly is required. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP6933	Science of Sailing—Newton's Third Law Laboratory Kit	$71.80

Discovering the Speed of Sound in Air—Student Laboratory Kit

STEM INTEGRATED

By: The Flinn Staff



Students slowly lift the tube and tuning fork out of the water until they "hear" the resonance then measure the length of the tube above the water's surface and use this value to calculate the wavelength and speed of sound. Simple activity is easy to do and yields great results—average error is less than 2%. Kit comes complete with student activity sheets, detailed Teacher Notes and sample data. The experiment requires a tuning fork set ranging from 256 Hz to 512 Hz, which can be shared.

Complete for one student group. Classroom Set is complete for 8 student groups. Support stand and two extension clamps are also required and available separately. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP7259	Discovering the Speed of Sound in Air—Individual Kit	$ 32.30
AP7260	Discovering the Speed of Sound in Air—Classroom Set	177.20
AP9242	Tuning Forks, Set of 8	102.86

PHYSICAL SCIENCE continued on next page.

Physical Science, continued

Discovering STEM—Newton's Laws



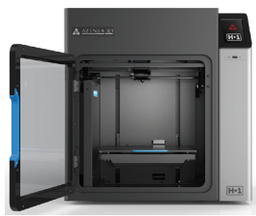
Learn all about Sir Isaac Newton's laws of motion. Observe the effects of kinetic and potential energy and see firsthand how energy is transformed from one form to another. Build 8 working models, including a ballistic catapult, gravity fan, collision car, moving cabin, balloon-powered plane and dragster. Booklet provides building instructions and detailed explanations of the different scientific principles applied as well as innovative experimental activities for hands-on learning. A quiz section is available to challenge newly acquired knowledge!

Catalog No.	Description	Price/Each
AP10540	Discovering STEM—Newton's Laws	$42.75

Robotics See pages 348–349.

Tools and Supplies

Afinia 3D Printers



Start 3D printing in no time! Afinia 3D printers are shipped fully assembled, ready to use and with all the materials you'll need, so you can start printing in minutes. A HEPA air filtration system reduces 3D printing air emissions for a safer 3D printing environment. Includes a one-year limited warranty.

Catalog No.	Description	Type	Price/Each
WAP-P4	3D Printer	Afinia H+1	$2850.00
WAPABSBLA	ABS Premium Filament	Black	67.76
WAPABSBLU		Blue	67.76
WAPABSGRN		Green	67.76
WAPABSNAT		White	67.76
WAPABSRED		Red	67.76
WAPABSYLW		Yellow	67.76
WAPPLAAL	PLA Specialty Filament	Aluminum	29.98
WAPPLACPR		Copper	29.98

3Doodler® DoodlePad

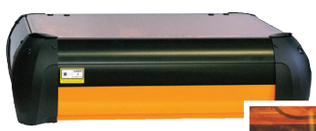
With the 3Doodler® DoodlePad, you can doodle over stencils or other items. The DoodlePad also helps you keep your doodles in place and peel them off with ease.

Catalog No.	Description	Price/Each
AP9425	3Doodler® DoodlePad	$11.45

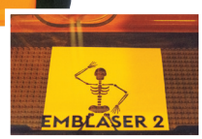
3Doodler® Foot Pedal

3Doodler® Foot Pedal gives you the freedom to doodle from various angles and for longer periods of time without holding down the pen's extrusion buttons. The pedal connects to the control port on the 3Doodler pen and allows you to use your foot to control extrusion.

Catalog No.	Description	Price/Each
AP9424	3Doodler® Foot Pedal	$12.40



Emblaser 2 Laser Cutter and Engraver



Emblaser 2 is specifically designed to be a safe, hassle-free laser cutter and engraver that supports your creative process. See full details at flinnsci.com.

Catalog No.	Description	Price/Each
AP9914	Emblaser 2 Laser Cutter and Engraver	$3413.53

databot™ 2.0 – Single



Meet databot 2.0, an unstoppable STEMachine! Packed with high-tech, science exploration fun and weighing in at just 1.2 oz while standing only ¾" high. Collects information from 16 sensors, including motion, altitude, external temperature, velocity, and so much more!

Update product details to: Meet databot 2.0, an unstoppable STEMachine! Packed with high-tech, science exploration fun and weighing in at just 1.2 oz while standing only ¾" high. Collects information from 16 sensors, including motion, altitude, external temperature, velocity, and so much more! The data is streamed instantly to provide engaging experiments in science, coding, and technology in every learning environment imaginable! The databot kit includes everything you need to get started—just add a computer or tablet! Databot even comes with a soft case for storage and transportation.

Includes databot 2.0, protective storage case, external temperature probe, micro USB charging/coding cable, lanyard, curriculum library, and Vizeey™ smart app.

Catalog No.	Description	Price/Each
AP10217	databot 2.0, Single	$ 223.30
AP10218	databot 2.0, Twin Pack	425.35
AP10219	databot 2.0, Class Pack 10	2020.35

Electric Circuit Components See pages 367–369.

Rockets and Flight See pages 349–351.

Trays and Totes See pages 201–203.

WBL Complete STEM, 4 Yr

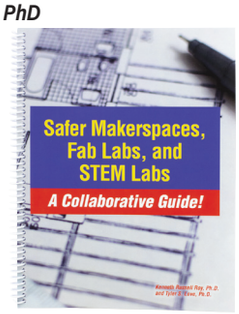


Multi-year, unlimited student access per teacher to a standards-based, Whitebox Learning. Students are guided through an engaging realistic design development process resulting in virtual simulations and competitions with other students throughout their class or district. Includes a fully integrated teacher LMS control center.

Catalog No.	Description	Price/Each
WL1067	WBL Complete STEM, 4 Yr	$13345.00

Safer Makerspaces, Fab Labs, and STEM Labs: A Collaborative Guide!

By: Kenneth Russell Roy, PhD, and Tyler S. Love, PhD



Safer hands-on STEM is essential for every instructor and student. Read the latest information about how to design and maintain safer makerspaces, Fab Labs and STEM labs in both formal and informal educational and community settings. The book is easy to read and provides practical recommendations and examples for instructors, administrators and media specialists. If your community or school system is looking to design or modify a facility to engage students in safer hands-on STEM activities, then this book is a must read! Includes the following topics:

- Federal safety standards
- Safer professional practices
- Safety controls
- General biological/biotechnology, chemical and physical hazards
- Facilities construction and renovations with floor plan examples
- Descriptions and pictures of exemplary makerspaces, Fab Labs and STEM labs
- Frequently asked safety questions

189 pages, 8½" x 11", spiral bound, soft cover.

Catalog No.	Description	Price/Each
AP9964	Safer Makerspaces, Fab Labs, and STEM Labs: A Collaborative Guide!	$81.00

Tools and Supplies



Balloons, Latex AP1900



Clay, 5 colors FB0600





Pencils, Prismacolor AP6400

Matches, Book AP1935

Matches, Wooden AP2037

Description	Catalog No.	Price/Each
Acetate sheets, 8½" x 11", 100 sheets	AP8464	$41.10
Bags, zipper-lock, 50/pkg		
4" x 8"	AB1003	$ 8.20
6" x 12"	AB1004	9.40
12" x 15"	AB1005	17.10
Balloons, 12" round, latex, 20/pkg	AP1900	$6.45
Batteries, alkaline, single		
AAA	AP9155	$2.60
AA	AP1423	2.75
C	AP1424	3.70
D	AP1425	4.50
Transistor, 9V	AP1430	6.32
Bucket/Pail, Utility		
13-liter	AP1708	$22.53
1-gallon	AP9913	6.30
Chenille wires, 1-ft., 10/pkg		
White	AP8910	$4.15
Red	AP8859	3.90
Green	AP8861	4.00
Black	AP8862	3.85
Clamps		
Mini Plastic, Set of 2, 3"	AP9829	$17.54
Spring, Steel, 2"	AP9830	2.53
Clay, 5 colors, 5 lbs.	FB0600	$26.60
Cotton		
Balls, 300/pkg	FB0680	$6.35
Swabs, 300/pkg	AP1737	8.10
Cups		
Paper, 5-oz, 100/pkg	AP9158	$18.00
Plastic, 10-oz, 50/pkg	AP7294	13.97
Plastic, 480-mL, 50/pkg	AP6543	18.60
Cutting board, plastic, 6" x 10" x ½"	AP9824	$8.82
Extension cords		
25-ft. length	AP9282	$11.49
50-ft. length	AP9283	23.36
Fishing line, 1425-ft.	AP6938	$9.10
Foil, aluminum, household 25-ft.	A0019	$3.70
Food coloring, set of 4	V0003	$7.75
Glue		
Duco® Cement, 1 oz.	AP6851	$9.50

Description	Catalog No.	Price/Each
Hole-punch, single	AP1816	$8.85
Knife, utility, hobby	AP9858	$9.35
Lighter, butane, safety, single	AP8960	$10.45
Matches		
Book, 50/pkg	AP1935	$4.97
Wooden, 32/box	AP2037	.91
Paper		
Construction, 9" x 12", Black, 50/pkg	AP1814	$7.25
Construction, 9" x 12", White, 50/pkg	AP1815	8.05
Pens, felt tip		
Black, single	AP1297	$3.20
Pencils		
Assorted colors, box of 12	FB0643	$10.50
Prismacolor®, box of 24	AP6400	42.70
Red, 12/pkg	AP5895	15.13
Wax, Black	AP8291	1.70
Wax, Red	AP8292	1.65
Wax, Blue	AP8469	1.65
Plastic wrap, 66 yds	AP1736	$7.75
Power strip	AP5403	$35.30
Push pins, 100/pkg	AP6402	$4.95
Rubber bands		
Medium, 750/pkg	AP1818	$10.25
Small, Pkg. of 300	AP2008	4.00
Sandpaper, 9" x 11" sheets, 4	S0165	$10.60
Saws		
Hobby Saw Set	AP9822	$23.95
Coping Saw	AP9853	15.95
Scissors, metal, office type	AP4396	$12.70
Scissors, heavy duty	AP8949	$10.10
Scissors, student	AP5394	$5.05
Soldering Tool Kit	AP7919	$21.25
Spoons		
Plastic, 24/pkg	AP9285	$3.35
Measuring, set of 4	AP9284	3.00

Description	Catalog No.	Price/Each
Square, 7" with ⅛" Graduations	AP9849	$12.55
Straws, plastic, 50/pkg	AP1819	$4.65
Straws, wrapped, 500/pkg	AP6025	$12.75
String, ball, 75 g	AP4823	$2.10
Tape		
Duct, 60-yds	AP9290	$12.25
Electrical, black, 60-ft	AP6011	3.30
Masking, 60-yds	AP1734	4.75
Timers, student	AP6396	$116.25
Tire foot pump with gauge	AP9899	$18.60
Tissues		
Kleenex	AP1144	$6.60
Kimwipes, 4½" x 8½", 280	AP1141	6.90
Tools		
Balsa Easy Cutter Tool	AP9823	$41.25
Bench Vice, Multi-Angle, 2⅞"	AP9855	85.07
Crimping Tool	AP5898	13.70
Glue gun	AP9011	25.50
Glue sticks, 24/pkg	AP9012	10.70
Hammer	AP4436	18.00
Hammer, Soft/Hard	AP9848	29.69
Metal Tubing Cutter	AP9827	32.64
Shaver Surform Tool, 7¼"	AP9854	14.28
Tape measure, 10-ft.	AP8400	9.75
Wrench, adjustable, 6"	AP1499	21.91
Tongue depressors		
Non-sterile, 500/pkg	AP4412	$26.25
Toothpicks		
Wood, flat, 750/pkg	AP6010	$4.45
Wood, round, 250/pkg	AP2016	2.96
Twine, 219-ft.	AP6014	$4.88
Wood splints		
100/pkg	AP4444	$2.35
1,000/pkg	AP4455	9.35
Velcro® dot tape, 2-ft., ¾"	AP6842	$11.85

Chemistry Laboratory Kits—Scientific Method, continued

The Natural Science of Fabric Dyeing—Guided-Inquiry Kit

FLINN EXCLUSIVE



By: The Flinn Staff

In this guided-inquiry activity, students select a variable in the dye process and design an experiment using a multifiber fabric to test the effect of their chosen variable. Variables include three different plant pigments, three possible additives and the temperature and duration of the dye bath. Includes complete instructions with reproducible student handouts, detailed background information, valuable Teacher Notes and enough fabric and chemicals for 10 groups of students to perform experiments. Additional multi-fiber test fabrics are available separately.

Complete for 30 students working in groups of three.

Catalog No.	Description	Price/Each
AP7263	The Natural Science of Fabric Dyeing—Guided-Inquiry Kit	$47.10
AP6135	Multi-Fiber Test Fabric	15.30

Match the Mystery Solutions—Guided-Inquiry Kit

FLINN EXCLUSIVE



By: Bob Becker, Kirkwood High School, Kirkwood, MO

Challenge students to solve the puzzle of the unknown solutions. Students brainstorm how to match three colorless mystery solutions with the same solutions a partner has. One catch—once a course of action has been determined, no visual comparisons are allowed! Good inquiry and communication skills are emphasized as students test the solutions and exchange information about the results. A great lab for the first day of class, with 100% participation guaranteed! *Complete for 30 students working in pairs.*

Catalog No.	Description	Price/Each
AP7323	Match the Mystery Solutions—Guided-Inquiry Kit	$43.30

Solubility Races—Super Value Guided-Inquiry Kit

FLINN EXCLUSIVE



By: The Flinn Staff

The best way to teach the scientific method is to actually use the scientific method! In this guided-inquiry lab, students determine how different factors will affect the rate at which a solid dissolves in a liquid by following the steps of the scientific method. Students devise experiments to measure the effects of each variable, conduct the necessary tests and analyze and graph the results. Supplementary information is provided in the teacher notes so the lab may be performed as either a student-designed experiment or as a more conventional experiment with step-by-step instructions. Includes reproducible student handouts, detailed background information, complete Teacher Notes with sample data questions and all necessary chemicals and consumable supplies. *Super Value Kit is complete for 5 classes of 30 students working in pairs.*

Catalog No.	Description	Price/Each
AP7575	Solubility Races—Super Value Guided-Inquiry Kit	$65.00

Ob-Scertainer Kit—A Better Black Box—Super Value Kit



Introduce students to the scientific method of problem solving and get them to start thinking "scientifically." By manipulating a black box and hearing and feeling how the steel ball rolls around inside the unopened box, students begin to make observations about what type of configuration is inside it. They collect data, develop a hypothesis and test their hypothesis. This fun and engaging lab activity gets students' minds working. The teacher's guide and lab activity sheets help students understand the process of the scientific method. Kit includes 24 black boxes—two each of the 12 different types. *Super Value Kit is complete for 24 students working individually. All materials are reusable.*

Catalog No.	Description	Price/Each
AP4549	Ob-Scertainer Kit—A Better Black Box—Super Value Kit	$112.59

Chemistry Laboratory Kits—Solids and Liquids

FLINN360science™: Road Deicers



This kit presents the essential concepts of Colligative properties, freezing/melting, and freezing point depression through hands-on science activities designed to engage all your students, regardless of level. Students should come to understand that the more species a compound dissociates into, the greater the effect it has on the melting point. Calcium chloride is found to be the most effective road deicer. However, at twice the price of sodium chloride students might not consider it to be cost effective. Teachers can extend learning through guided inquiry into associated phenomena including, "How do we design materials for specific functions?"

Catalog No.	Description	Digital Access	Price/Each
AP10364	360Science: Road Deicers	1-Year	$23.55
AP10464		3-Year	40.40

FLINN360science™: Correlate Material Properties and Bond Type



This kit presents the essential concepts of Matter, ionic bonding, and covalent bonding through hands-on science activities designed to engage all your students, regardless of level. Students come to understand that a material's physical properties are linked to the material's structure and bonding. Teachers can extend learning through guided inquiry into associated phenomena including, "How do we design materials for specific functions?

Catalog No.	Description	Digital Access	Price/Each
AP10365	360Science: Correlate Material Properties and Bond Type	1-Year	$70.65
AP10465		3-Year	88.30

FLINN360science™: Measure the Energy of a Phase Change



This kit presents the essential concepts of conservation of energy and the first law of thermodynamics through hands-on science activities designed to engage all your students, regardless of level. Students will conclude that evaporation and melting are endothermic processes, and that freezing is an exothermic process. Teachers can extend learning through guided inquiry into associated phenomena including, "How do we design materials for specific functions?"

Catalog No.	Description	Digital Access	Price/Each
AP10366	360Science: Measure the Energy of a Phase Change	1-Year	$53.00
AP10466		3-Year	70.65

FLINN360science™: Melt Ionic and Covalent Compounds



This kit , students will learn the essential concepts of bonding and intermolecular forces. Students will conclude that the more ionic in character a material is, the higher its melting point will be. Teachers can extend learning through guided inquiry into associated phenomena including, "How do we design materials for specific functions?"

Catalog No.	Description	Digital Access	Price/Each
AP10367	360Science: Melt Ionic and Covalent Compounds	1-Year	$47.10
AP10467		3-Year	64.75

CHEMISTRY LABORATORY KITS—SOLIDS AND LIQUIDS continued on next page.

Chemistry Laboratory Kits—Solids and Liquids, continued

FLINN360science™: Modeling Metals, Ceramics and Polymers



This kit presents the essential concepts of Material science and structure property relationships through hands-on science activities designed to engage all your students, regardless of level. Students will link the bulk properties of materials to the observations that they made when examining their atomic and molecular scale models. Teachers can extend learning through guided inquiry into associated phenomena including, "How do we design materials for specific functions?"

Catalog No.	Description	Digital Access	Price/Each
AP10368	360Science: Modeling Metals, Ceramics and Polymers	1-Year	$117.75
AP10468		3-Year	126.85

FLINN360science™: Investigate Surface Tension



This kit presents the essential concepts of Intermolecular forces, aqueous systems, and surface tension through hands-on science activities designed to engage all your students, regardless of level. Students learn that the intermolecular interactions between water molecules give rise to surface tension, and that disrupting these interactions by the introduction of a surfactant changes the surface tension. Teachers can extend learning through guided inquiry into associated phenomena including, "How do we design materials for specific functions?"

Catalog No.	Description	Digital Access	Price/Each
AP10369	360Science: Investigate Surface Tension	1-Year	$53.00
AP10469		3-Year	66.45

FLINN360science™: Aqueous Solutions



This kit presents the essential concepts of Solubility, solutions, and physical changes through hands-on science activities designed to engage all your students, regardless of level. Students learn that there is a relationship between the amount of solute dissolved in a solution and its properties. They also observe that there are limits to how much material can be dissolved. Teachers can extend learning through guided inquiry into associated phenomena including, "How do we design materials for specific functions?"

Catalog No.	Description	Digital Access	Price/Each
AP10370	360Science: Aqueous Solutions	1-Year	$35.30
AP10470		3-Year	49.85

FLINN360science™: Abrasive Compounds



This kit presents essential concepts of structure property relationships, manufacturing, and engineering through hands-on science activities designed to engage students. Students will find that there is a tradeoff between removal rate and the quality of the surface finish. Teachers can extend learning through guided inquiry into associated phenomena, "How do we design materials for specific functions?"

Catalog No.	Description	Digital Access	Price/Each
AP10425	360Science: Abrasive Compounds	1-Year	$70.65
AP10525		3-Year	86.55

FLINN360science™: Applications of Le Chatelier's Principle



This kit presents the essential concepts of chemical equilibrium, Le Chatelier's principle, acid–base reactions, solubility equilibria, and endothermic and exothermic reactions through hands-on science activities designed to engage all your students, regardless of level. Students will explore the equilibrium state of various reactions. The equilibrium of bromothymol blue, an acid–base indicator, will shift depending on the pH of the solution. Teachers can extend learning through guided inquiry into associated phenomena including, "What happens when food is cooked?"

Catalog No.	Description	Digital Access	Price/Each
AP10687	360Science: Applications of Le Chatelier's Principle	1-Year	$62.85
AP10787		3-Year	80.00

FLINN360science™: Analysis of Food Dyes in Beverages



This kit presents the essential concepts of Spectroscopy, Beer's law, chemical analysis, and analyte concentration determination through hands-on science activities designed to engage all your students, regardless of level. Students will obtain a Beer's calibration curve plotting absorbance versus concentration of dye in standard solutions, along with the linear equation that describes this plot. They will use this equation (Beer's law relationship) to determine the concentration of dye in a sports drink sample. In the advanced and open versions, students will measure the absorption spectrum of one of the FD&C dyes to determine its wavelength of maximum absorption, prior to preparing the Beer's calibration curve. Teachers can extend learning through guided inquiry into associated phenomena including, "What happens when food is cooked?"

Catalog No.	Description	Digital Access	Price/Each
AP10689	360Science: Analysis of Food Dyes in Beverages	1-Year	$62.00
AP10789		3-Year	78.45

FLINN360science™: Solutions, Suspensions and Nanoparticles



This kit presents the essential concepts of Solutions, intermolecular forces, consumer chemistry, and chemical engineering through hands-on science activities designed to engage all your students, regardless of level. Through this investigation, students come to understand how each component can contribute to the final properties of a manufactured good, and that the field of materials science is still advancing. Teachers can extend learning through guided inquiry into associated phenomena including, "How do manufacturers ensure their products have the desired properties?"

Catalog No.	Description	Digital Access	Price/Each
AP10409	360Science: Solutions, Suspensions and Nanoparticles	1-Year	$56.05
AP10509		3-Year	69.88



Properties of Solids—Super Value Laboratory Kit AP6731

FLINN EXCLUSIVE

Catalog No.	Description	Price/Each
AP6731	Properties of Solids—Super Value Laboratory Kit	$99.55
AP9114	Melting Point of a Pure Substance—Introductory Student Laboratory Kit	42.75

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

CHEMISTRY LABORATORY KITS continued on next page.

Chemistry Laboratory Kits—Solutions and Solubility

FLINN EXCLUSIVE

Chemical Mixtures and Solubility: Make Your Own Lava Lamp—Student Laboratory Kit



By: The Flinn Staff

Experience the hypnotizing lava lamp, with its modified colored bubbles sinking and rising. Your students will make their own version of a lava lamp and enjoy its colorful bubbles floating around! When students measure equal parts of water and oil, they will make conclusions about density and polarity. What better way for students to learn about chemistry than to experience something that captivates them?

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP9728	Chemical Mixtures and Solubility: Make Your Own Lava Lamp—Student Laboratory Kit	$99.00

Colligative Properties—Student Laboratory Kit



By: The Flinn Staff

In this three-part experiment, students first measure boiling points to determine how the concentration of a solution changes due to osmosis. Students then observe the freezing point changes of water when different chemicals are added. Finally, students use a microscale procedure to investigate the effect of sodium chloride concentration on the boiling point of the solution. Includes reproducible student handouts, detailed background information, Teacher Notes with sample data and answers to questions and all chemicals and consumable supplies needed to perform the lab.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP9090	Colligative Properties—Student Laboratory Kit	$185.00

Concentration and Molarity—Student Laboratory Kit



By: The Flinn Staff

First, students will determine the concentration of an unknown hydrochloric acid solution by titrating with a THAM solution they prepare from their own calculations. Then they will determine the concentration of an unknown sodium hydroxide solution by titrating with a known sulfuric acid solution. Six unknown solutions are included in the kit—three acid solutions and three base solutions. Kit also includes reproducible student handouts with detailed background section covering titration calculations and complete teacher notes with sample calculations and answers to questions, plus all chemicals needed to perform the lab.

Complete for 30 students working in pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs. Fifteen reusable, 24-well reaction plates are needed and available separately.

Catalog No.	Description	Price/Each
AP4868	Concentration and Molarity—Student Laboratory Kit	$ 50.43
AP7573	Concentration and Molarity—Super Value Laboratory Kit	148.90
AP1447	Reaction Plate, 24-well	4.75

Determination of the K_{sp} of $Ca(OH)_2$—Student Laboratory Kit



By: The Flinn Staff

Students prepare serial dilutions of calcium nitrate in separate wells of a reaction strip, and then combine these with equal volumes of a standard sodium hydroxide solution. Precipitation occurs in the wells where the K_{sp} of calcium hydroxide is exceeded. The first well with no precipitate is identified as saturated, and the concentrations of calcium and hydroxide ions in this well are used to calculate the K_{sp} value. Students repeat the process from the other direction, using serial dilutions of sodium hydroxide, in order to determine if the equilibrium constant is really a constant. Includes Teacher Notes with sample data and answers to all questions, extensive background material, reproducible student handouts and all necessary chemicals and consumable supplies.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP8833	Determination of the K_{sp} of $Ca(OH)_2$—Student Laboratory Kit	$48.00

Factors Affecting Solubility—Guided-Inquiry Kit



By: The Flinn Staff

In this laboratory activity, students will investigate the effects of stirring, temperature, surface area and the amount of solute already dissolved in solution on the rate of dissolving. This activity works well as an open-ended, inquiry-based lab, but may also be performed as a standard laboratory activity—instructions are included for both formats. Includes reproducible student handouts, background information and complete Teacher Notes with sample data and answers to questions, plus all chemicals needed to perform the lab.

Complete for 30 students working in pairs.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP4865	Factors Affecting Solubility—Guided-Inquiry Kit	$26.45

It's in Their Nature—Student Laboratory Kit



By: The Flinn Staff

"Oil and water do not mix." This old saying is often used to explain why relationships between opposites are difficult or almost impossible. In this experiment, students trace this saying back to its source—the nature of oil and water, solutes and solvents, and the interactions between them. By investigating the solubility patterns of ionic, polar and nonpolar compounds in a variety of solvents students learn to classify compounds and begin to understand the types of attractive forces that exist between molecules. Includes reproducible student handouts, detailed background information and Teacher Notes.

Complete for 30 students working in pairs. Perform this experiment in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP6637	It's in Their Nature—Student Laboratory Kit	$79.50

CHEMISTRY LABORATORY KITS—SOLUTIONS AND SOLUBILITY continued on next page.

Chemistry Laboratory Kits—Solutions and Solubility, continued

FLINN EXCLUSIVE

Precipitation Reactions and Solubility Rules—Super Value Kit



By: The Flinn Staff

Students perform 42 chemical reactions by combining sets of salt solutions. From their observations, students generate lists of soluble and insoluble substances. By analyzing patterns and making some generalizations, students develop solubility rules. Detailed Teacher Notes and reproducible student handouts include easy-to-follow lab instructions, data tables, helpful tips and sample data.

Super Value Kit is complete for 5 classes of 30 students working in pairs. Fifteen reusable 48-well reaction plates are recommended and available separately.

Catalog No.	Description	Price/Each
AP4862	Precipitation Reactions and Solubility Rules—Super Value Kit	$114.25
AP8822	Reaction Plate, 48-well	7.50

Solubility and Temperature—Student Laboratory Kit



By: The Flinn Staff

Students will measure saturation temperatures for six different concentrations of potassium nitrate and then make a solubility curve from the data. Graphical analysis of the data allows students to determine at a glance whether a solution is unsaturated, saturated or supersaturated. Includes reproducible student handouts, detailed background information, Teacher Notes with sample data and answers to questions and all necessary chemicals and consumable supplies.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6636	Solubility and Temperature—Student Laboratory Kit	$28.75

Solubility Matters—Measuring the K_{sp} of Calcium Iodate—Student Laboratory Kit



By: Bob Lewis, Retired, Downers Grove North H.S., Downers Grove, IL, and John Little, Retired, St. Mary's H.S., Stockton, CA

Sodium thiosulfate solution is added dropwise from a pre-weighed bottle to a saturated solution of calcium iodate that has been mixed with excess potassium iodide. The iodate/iodide reaction generates elemental iodine, which undergoes reduction when sodium thiosulfate is added. Starch is used as an indicator—the telltale blue color of the starch/iodine complex disappears instantly at the endpoint of the titration. Students calculate the concentration of iodate ion, the concentration of calcium ion and, finally, the solubility product constant—K_{sp} value—for calcium iodate. Includes reproducible student handouts, detailed background information, complete Teacher Notes with sample data and answers to all questions and all necessary chemicals and consumable supplies.

Complete for 30 students working in pairs. Fifteen reusable serological pipets and pipet bulbs are recommended and available separately.

Catalog No.	Description	Price/Each
AP6123	Solubility Matters—Measuring the K_{sp} of Calcium Iodate—Student Laboratory Kit	$57.80
GP7058	Serological Pipet, 5-mL Capacity	0.89
AP8607	Pipet Bulb, Rubber	5.05

The Colorful Chemistry of Sugar, Water and Density—Guided-Inquiry Kit



By: The Flinn Staff

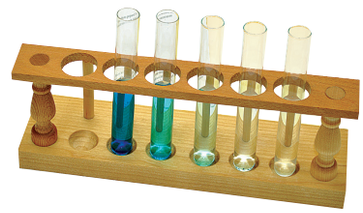
Challenge students to create a tower of color by using just three ingredients: water, food dye and sugar. Students must mix the ingredients in varying ratios to produce solutions of different density and color. When the solutions are added to a tall cylinder in the correct order, the different colored solutions separate into layers owing to their varying densities. The result is a beautiful tower with multiple layers of color. Students can be true to their school by using school colors or any colors of their choice. Instructions, sugar and food dye are included.

Complete for 24 students working in groups of 4. Separatory funnels and rubber tubing required and available separately.

Catalog No.	Description	Price/Each
AP8555	The Colorful Chemistry of Sugar, Water and Density—Guided-Inquiry Kit	$35.60

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WWW.FLINNSCI.COM

Preparing and Diluting Solutions—Super Value Laboratory Kit



By: The Flinn Staff

When should students learn how accurate concentrations of solutions are prepared? This year! This detailed laboratory procedure walks students step-by-step through the process of accurately preparing solutions of various concentrations. Students must calculate how to prepare several solutions before making them and also must calculate the resulting concentrations of solutions prepared according to given recipes. Laboratory procedure covers preparation of stock solutions, serial dilutions and dilutions of a given molarity. Additional practice calculations are included for student practice or as a post-test.

Super Value Kit is complete for five classes of 30 students working in pairs.

Catalog No.	Description	Price/Each
AP7574	Preparing and Diluting Solutions—Super Value Laboratory Kit	$72.45

Cool Light—Student Laboratory Kit



By: The Flinn Staff

Students will be amazed when they perform this chemiluminescence experiment. They will prepare two solutions and pour them simultaneously into a flask—producing a beautiful blue glow. An instruction sheet with a short history of chemiluminescence is provided.

Complete for 30 students working in pairs.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP9253	Cool Light—Student Laboratory Kit	$33.30

CHEMISTRY LABORATORY KITS continued on next page.

Chemistry Laboratory Kits—Spectroscopy/Light

FLINN EXCLUSIVE

Blueprint T-Shirts—Student Laboratory Kit



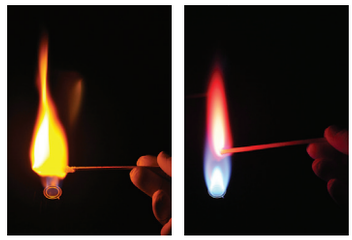
By: The Flinn Staff

Photosensitive T-shirts are prepared by soaking white T-shirts in a solution containing two iron salts, ferric ammonium citrate and potassium ferricyanide. The next day, when the shirts are dry, the students place opaque objects on the shirts and then expose them to direct sunlight for about 20 minutes. UV light striking the fabric causes a light-activated redox reaction to occur. Rinsing the T-shirt with water removes any unreacted salts and reveals the blueprint—a sharp white imprint of the object on a dark blue background. Includes reproducible student handouts, detailed background information and complete Teacher Notes with answers to all questions.

Complete for 30 students working individually. White, cotton T-shirts are required but not included.

Catalog No.	Description	Price/Each
AP6879	Blueprint T-Shirts—Student Laboratory Kit	$92.80

Flame Test—Student Laboratory Kit



By: The Flinn Staff

By simply dipping a moist wooden splint in the solid metallic salt then placing the wooden splint in the flame, students will be able to identify the color of light emitted for calcium, copper, lithium, potassium, sodium and strontium. The basic lab activity is ideal for physical science and introductory chemistry. Incorporate the optional data analysis section and extensions to challenge your higher level students. Includes reproducible student handouts, complete Teacher Notes with sample data, answers to questions and ideas for extensions, plus all materials needed to perform the lab.

Complete for 30 students working in pairs.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5607	Flame Test—Student Laboratory Kit	$39.00

Build a Polarimeter—Student Laboratory Kit



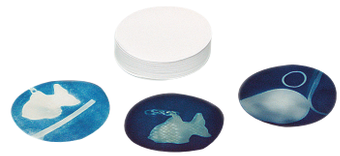
By: The Flinn Staff

Students get excited about studying organic compounds when they build their very own polarimeter. A wide range of chemicals are able to interact with and rotate polarized light. A polarimeter enables a chemist to investigate the extent of these interactions. This kit contains enough materials to build eight simple polarimeters, which can then be used to measure the rotation of polarized light by sugar solutions.

Complete for 24 students working in groups of three.

Catalog No.	Description	Price/Each
AP9589	Build a Polarimeter—Student Laboratory Kit	$120.35

Making UV-Sensitive Paper—Student Laboratory Kit



By: The Flinn Staff

Students will make their own sheets of photosensitive (also called blueprint) paper in the laboratory by dipping porous paper in two different iron salt solutions. Students will then develop images of their choice by exposing the treated paper to ultraviolet light from the sun. Background information, detailed procedure, and all necessary photographic chemicals to make 100 "photographs" or images are included in the kit.

Complete for 30 students working in pairs. Opaque or translucent "nonmetallic" objects are needed to make the images.

Catalog No.	Description	Price/Each
AP6155	Making UV-Sensitive Paper—Student Laboratory Kit	$31.40

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM

Quantitative Determination of Food Dyes—Student Laboratory Kit



By: The Flinn Staff

Students use a spectrophotometer to determine the optimal wavelength of absorbed light for each of three FD&C food dyes: Red 40, Yellow 5 and Blue 1. Students then develop standard absorption versus concentration curves for each of the dyes. Absorption data for fixed concentrations of drink mix solutions are generated at these three wavelengths. Students then use the data to determine the concentration of each food dye in the powdered drink mixes. Includes all chemicals and consumable supplies needed to perform the lab.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP7428	Quantitative Determination of Food Dyes—Student Laboratory Kit	$56.05

Chemistry Laboratory Kits—Stoichiometry/Moles

360Science™: Chemical Quantities



This kit presents the essential concepts of diffraction of chemical reactions, combustion reactions, energy transfer in chemical reactions, and law of conservation of mass through hands-on science activities. Students will determine the experimental mass percents of CO_2 and Cu in a sample of copper carbonate of unknown composition and compare their experimentally determined mass percents to the theoretical mass percents, calculated from two potential empirical formulas, to determine the true formula of the sample under investigation.

Catalog No.	Description	Digital Access	Price/Each
AP10371	360Science: Chemical Quantities	1-Year	$35.30
AP10471		3-Year	51.95

CHEMISTRY LABORATORY KITS—STOICHIOMETRY/MOLES continued on next page.

Chemistry Laboratory Kits—Stoichiometry/Moles, continued

FLINN360science™: Describe Small-Scale Matter Using the Mole



This kit presents the essential concepts of chemical quantities, counting by weighing, the mole, molar mass, and law of conservation of mass through hands-on science activities designed to engage all your students, regardless of level. Through this investigation, students come to understand the mole's utility as a counting number and come to understand just how small the atomic scale is. Also students are able to apply empirical error analyses to self-developed procedures. Teachers can extend learning through guided inquiry into associated phenomena including, "Why do we quantify matter in different ways?"

Catalog No.	Description	Digital Access	Price/Each
AP10372	**360**Science: Describe Small-Scale Matter Using the Mole	1-Year	$41.20
AP10472		3-Year	58.85

FLINN360science™: Mole Ratios



This kit presents the essential concepts of mole ratios, chemical reactions, stoichiometry, law of conservation of mass, and mole calculations through hands-on science activities designed to engage all your students, regardless of level. Students come to understand that the products of a chemical reaction can be related to the reactants by virtue of mole ratios, because chemical reactions must adhere to the law of conservation of mass.

Catalog No.	Description	Digital Access	Price/Each
AP10373	**360**Science: Mole Ratios	1-Year	$70.65
AP10473		3-Year	88.00

FLINN360science™: Determine an Empirical Formula



This kit presents the essential concepts of chemical bonds, structure-property relationships, ionic bonds, and physical properties of materials. Through this investigation, students will come to understand that the formula of a compound that can be decomposed into smaller elements by heating, is subject to empirical formula determination by mass loss methods. They understand this in the context of the law of conservation of mass. Students gain familiarity with calculations that involve the mole and mass percents. Teachers can extend learning through guided inquiry into associated phenomena including, "Why do we quantify matter in different ways?"

Catalog No.	Description	Digital Access	Price/Each
AP10374	**360**Science: Determine an Empirical Formula	1-Year	$23.55
AP10474		3-Year	40.50

FLINN360science™: Preparation of Solutions



Through this investigation, students come to understand that as the amount of solute dissolved in a fixed amount of solvent increases, solution concentration as described by the quantity, molarity, also increases. Students learn that in colorful solutions it is easy to differentiate based on concentration. Students learn about the mole-based calculation needed to prepare solutions, and also about the appropriate procedures and glassware for preparing solutions with accurate concentrations. Teachers can extend learning through guided inquiry into associated phenomena including, "Why do we quantify matter in different ways?"

Catalog No.	Description	Digital Access	Price/Each
AP10375	**360**Science: Preparation of Solutions	1-Year	$41.20
AP10475		3-Year	57.70

FLINN360science™: An Empirical Formula Challenge



Through this challenge students learn essential concepts of Law of Conservation of Mass, chemical quantities, empirical formulas, percent by mass, percent composition, and molar mass through hands-on science activities designed to engage students. Students use their knowledge of the law of conservation of mass and chemical quantities to determine the percent by mass of copper in a sample of copper chloride hydrate.

Catalog No.	Description	Digital Access	Price/Each
AP10427	**360**Science: An Empirical Formula Challenge	1-Year	$ 93.00
AP10527		3-Year	105.20

FLINN360science™: Build a Film Canister Rocket



This kit presents concepts of Stoichiometry, chemical reactions, and law of conservation of mass through hands-on science activities. This lab helps students understand the importance of stoichiometry calculations because they are given a finite amount of sodium bicarbonate to use for three launches. They must plan carefully so they do not use up their allotment too quickly.

Catalog No.	Description	Digital Access	Price/Each
AP10429	**360**Science: Build a Film Canister Rocket	1-Year	$58.85
AP10529		3-Year	76.55

FLINN360science™: The Stoichiometry of Filling a Balloon



This kit presents the essential concepts of balancing equations, stoichiometry, and limiting reagents through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will observe that no matter how much sodium bicarbonate is added, at some point it becomes the excess reagent and there is not enough acetic acid to react. As a result, there is a limited amount of carbon dioxide gas that can be produced. When smaller amounts of sodium bicarbonate are added, it is the limiting reagent and the acetic acid is the excess. When the moles of sodium bicarbonate exceed the moles of acetic acid, the designations switch and acetic acid becomes the limiting reactant. Teachers can extend learning through guided inquiry into associated phenomena such as, "What can make a recipe fail?"

Catalog No.	Description	Digital Access	Price/Each
AP10380	**360**Science: The Stoichiometry of Filling a Balloon	1-Year	$58.85
AP10480		3-Year	76.55

FLINN360science™: Identify Unknowns Through Stoichiometry



This kit presents the essential concepts of stoichiometry, ideal gas law, acid–base titrations, and limiting reagents through hands-on science activities designed to engage all your students, regardless of level. Students should become comfortable with stoichiometry calculations and how that information can be useful in determining the unknown identities of different compounds. Both techniques used in this lab help students understand the importance of being precise when making measurements. Teachers can extend learning through guided inquiry into associated phenomena including, "What can make a recipe fail?"

Catalog No.	Description	Digital Access	Price/Each
AP10381	**360**Science: Identify Unknowns Through Stoichiometry	1-Year	$53.00
AP10481		3-Year	69.95

CHEMISTRY LABORATORY KITS—STOICHIOMETRY/MOLES continued on next page.

Chemistry Laboratory Kits—Stoichiometry/Moles, continued

FLINN360science™: Determination of Reaction Output



This kit presents the essential concepts of stoichiometry, Balancing equations, molar mass, and solubility rules through hands-on science activities designed to engage all your students, regardless of level. This lab helps students practice stoichiometry calculations and understand the molar relationship between reactants and products. Teachers can extend learning through guided inquiry into associated phenomena including, "What can make a recipe fail?"

Catalog No.	Description	Digital Access	Price/Each
AP10382	**360**Science: Determination of Reaction Output	1-Year	$60.90
AP10482		3-Year	77.50

FLINN360science™: Formation of Barium Iodate



This kit presents the concepts of stoichiometry, balancing equations, and limiting reagents. The importance of stoichiometry calculations is the primary focus of this lab. This lab will also help students understand the difficulty in achieving perfect molar equality between the reactants. There is generally always an excess and limiting reactant. But with careful calculations that excess can be minimized.

Catalog No.	Description	Digital Access	Price/Each
AP10383	**360**Science: Formation of Barium Iodate	1-Year	$76.55
AP10483		3-Year	92.35

FLINN360science™: Properties of Buffers



Through this investigation, students will become more familiar with buffers and titration curves and will better understand what components are needed in a buffer system. This kit presents the essential concepts of pH, buffer, weak acids and bases, dissociation constant, neutralization, and conjugate acid–base pairs through hands-on science activities designed to engage all your students, regardless of level. Teachers can extend learning through guided inquiry into associated phenomena including, "acid rain."

Catalog No.	Description	Digital Access	Price/Each
AP10680	**360**Science: Properties of Buffers	1-Year	$61.64
AP10780		3-Year	78.45

FLINN360science™: Analysis of Hydrogen Peroxide



This kit presents the essential concepts of oxidation–reduction, half-reactions, titration, equivalence point, standardization, and percent composition through hands-on science activities designed to engage all your students, regardless of level. Students should determine the percent of hydrogen peroxide in a common "drug store" bottle. Students will better understand the redox titration that occurs between the analyte (sample) and titrant. Teachers can extend learning through guided inquiry into associated phenomena such as redox reactions and household chemicals.

Catalog No.	Description	Digital Access	Price/Each
AP10697	**360**Science: Analysis of Hydrogen Peroxide	1-Year	$57.15
AP10797		3-Year	72.85

FLINN360science™: Gravimetric Analysis



This kit presents the essential concepts of double replacement reactions, filtration technique, Gravimetric analysis, stoichiometry, precipitation reactions, and error analysis through hands-on science activities designed to engage all your students, regardless of level. Students come to understand how gravimetric analysis and precipitation reactions can be applied in the real world to answer questions and solve problems. Teachers can extend learning through guided inquiry into associated phenomena including, "How do we design materials for specific functions?"

Catalog No.	Description	Digital Access	Price/Each
AP10675	**360**Science: Gravimetric Analysis	1-Year	$37.63
AP10775		3-Year	56.05

FLINN EXCLUSIVE



Micro Mole Rockets—Hydrogen and Oxygen Mole Ratio—Student Laboratory Kit
AP6374



Mole Balloon™—Student Activity Kit
AP4587

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Catalog No.	Description	Price/Each
AP8554	Stoichiometry of the Self-Inflating Balloon—Student Laboratory Kit	$51.40
AP4678	Leftover Aluminum Wire—A Stoichiometry—Super Value Kit	33.50
AP6374	Micro Mole Rockets—Hydrogen and Oxygen Mole Ratio—Student Laboratory Kit	38.80
AP7310	Fuel Cell Football Apparatus—Demonstration Kit	68.70
AP7393	Determining a Balanced Chemical Equation—Student Laboratory Kit	52.65
AP7446	Mole Concept Puzzle—Student Activity Kit	26.20
AP8483	Target Stoichiometry—Student Laboratory Kit	35.55
AP7502	Percent Composition—Calcium Magnesium Acetate—Student Laboratory Kit	36.20
AP7579	Quantitative Determination of Barium—Super Value Laboratory Kit	57.25
AP4587	Mole Balloon™—Student Activity Kit	37.55

CHEMISTRY LABORATORY KITS continued on next page.

Chemistry Laboratory Kits—Thermodynamics

FLINN360science™: Enthalpy of a Neutralization Reaction



This kit presents the essential concepts of heat of reaction, thermodynamics, exothermic and endothermic reactions through hands-on science activities designed to engage all your students, regardless of level. Teachers can extend learning through guided inquiry into associated phenomena including, "Why does exercise heat us up"?

Catalog No.	Description	Digital Access	Price/Each
AP10384	360Science: Enthalpy of a Neutralization Reaction	1-Year	$47.10
AP10484		3-Year	60.90

FLINN360science™: The Thermodynamics of Hand Warmers



This kit presents the concepts of breaking ionic bonds, enthalpy change, heat of dissolution, exothermic versus endothermic reactions through hands-on science activities designed to engage all your students, regardless of level. Based on temperature measurement results, students will determine that dissolution of NaOH and $CaCl_2$ releases heat energy, whereas dissolution of NaCl and NH_4Cl absorbs heat from the surroundings. Then, they will explain the results, based on differences in the strength of ionic bonds in the solid compounds, intermolecular water forces, and the interactions between ions and water molecules in solution. Finally, students will propose the design of hand warmers using a solution of $CaCl_2$ or NaOH in water and instant cold packs using aqueous NH_4Cl. Teachers can extend learning through guided inquiry into associated phenomena including, "Why does exercise heat us up?"

Catalog No.	Description	Digital Access	Price/Each
AP10385	360Science: The Thermodynamics of Hand Warmers	1-Year	$58.85
AP10485		3-Year	71.95

FLINN360science™: Hess's Law and the Combustion of a Metal



This kit presents the essential concepts of enthalpy/heat of reaction, Hess's Law, and conservation of energy. The enthalpy of formation of MgO results from combining the enthalpies of reaction between Mg and HCl, and between MgO and HCl. The enthalpy of formation of MgO has a negative sign, indicating that this is an exothermic reaction. Teachers can extend learning through guided inquiry into associated phenomena such as, "Why does exercise heat us up?"

Catalog No.	Description	Digital Access	Price/Each
AP10386	360Science: Hess's Law and the Combustion of a Metal	1-Year	$47.10
AP10486		3-Year	64.00

FLINN360science™: Evaluate the Thermal Equilibrium of Metals



This kit includes hands-on science activities designed to engage students, regardless of level. Students will come to the understanding that some reactions are reliant on temperature to shift their equilibrium. Teachers can extend learning through guided inquiry into associated phenomena, "How can heat that is deep underground be used at the surface?"

Catalog No.	Description	Digital Access	Price/Each
AP10341	360Science: Evaluate the Thermal Equilibrium of Metals	1-Year	$35.00
AP10441		3-Year	49.83

FLINN360science™: The Heat of Melting Ice



The essential concepts of phase changes, solid and liquid states, and melting/freezing point are presented in this kit through hands-on science activities designed to engage all your students, regardless of level. The energy required to melt ice will be determined using a calorimeter, and its value will be close to the expected 334 J/g. Changes in temperature of water in a calorimeter will be used to determine the amount of heat absorbed by melting ice cubes. In the guided, open, and advanced versions the cooling curve of water will be used to determine that the freezing point of water is approximately 0 °C. In the open and advanced versions, students will observe that the dissolution of sodium chloride will lower the freezing temperature of water. Teachers can extend learning through guided inquiry into associated phenomena including, "Why does exercise heat us up"?

Catalog No.	Description	Digital Access	Price/Each
AP10387	360Science: The Heat of Melting Ice	1-Year	$40.50
AP10487		3-Year	57.70

FLINN360science™: Flameless Heating Systems



This kit presents the concepts of exothermic reactions, flameless heating systems, flameless ration heater (FRH) through hands-on science activities. Through this investigation, students will observe that adding water to calcium oxide will cause a chemical reaction to occur, which generates calcium hydroxide and a significant amount of heat. Students will tinker with the materials provided to design and build a device/system that they can use to heat up a liquid or semisolid food sample. Teachers can extend learning through guided inquiry into associated phenomena including, "Why does exercise heat us up?"

Catalog No.	Description	Digital Access	Price/Each
AP10430	360Science: Flameless Heating Systems	1-Year	$35.30
AP10530		3-Year	49.85

FLINN360science™: Supersaturation and Thermodynamics



This kit presents the essential concepts of entropy, free energy and supersaturation through hands-on science activities designed to engage all your students, regardless of level. Students should observe that disturbing a supersaturated solution of sodium acetate causes the solution to solidify and release heat. At the end of lab, students should have a better understanding of how enthalpy, free energy, and entropy relate to the supersaturated sodium acetate solution. Teachers can extend learning through guided inquiry into associated phenomena including, "Why do some processes happen much faster than others?"

Catalog No.	Description	Digital Access	Price/Each
AP10407	360Science: Supersaturation and Thermodynamics	1-Year	$46.20
AP10507		3-Year	60.90

FLINN360science™: The Hunt for Phlogiston



This kit presents the essential concepts of gases, combustion, scientific method and oxidation through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will use the scientific method to test a theory. They will observe how contradictory evidence can be used to invalidate a hypothesis. Teachers can extend learning through guided inquiry into associated phenomena including, "What happens when something burns?"

Catalog No.	Description	Digital Access	Price/Each
AP10703	360Science: The Hunt for Phlogiston	1-Year	$78.45

CHEMISTRY LABORATORY KITS—THERMODYNAMICS/MOLES continued on next page.

Chemistry Laboratory Kits—Thermodynamics, continued

FLINN360science℠: Thermal Energy and Heat Transfer



This kit presents essential concepts of thermal energy transfer, thermodynamics, and conservation of energy through hands-on science activities designed to engage students. As students investigate the thermal energy transfer of metals, they will find that while all metals can transfer heat, not all of them can do it efficiently. They will also discover that the efficiency of heat transfer relies, in part, on the starting temperature of each calorimeter. Students will also realize that the most efficient metal is not necessarily the best choice in the real world. They must consider the cost of each metal and how well it can withstand certain environmental factors. Teachers can extend learning through guided inquiry into associated phenomena, "How can heat that is deep underground be used at the surface?"

Catalog No.	Description	Digital Access	Price/Each
AP10342	360Science: Thermal Energy and Heat Transfer	1-Year	$70.65
AP10442		3-Year	87.00

FLINN360science℠: The Redox Chemistry of Iron



Through this investigation, students come to understand how the variables present in the ideal gas law relate to each other. Specifically as the amount of gas increases the other variables adjust accordingly to maintain a constant ratio, or value of R. it presents the concepts of complex ions, oxidation numbers, oxidation–reduction, transition metals, and reduction potentials through hands-on science activities designed to engage all your students, regardless of level. Teachers can extend learning through guided inquiry into associated phenomena including, "batteries."

Catalog No.	Description	Digital Access	Price/Each
AP10694	360Science: The Redox Chemistry of Iron	1-Year	$80.00
AP10794		3-Year	95.25

FLINN360science℠: Build an Efficient Calorimeter



This kit presents the concepts of calorimetry, heat capacity, and specific heat through hands-on science. This lab helps students appreciate the importance of a good design and minimizing heat loss to the environment and how this plays a role in their everyday lives, from insulated coffee cups to hot water in a home. Teachers can extend learning through guided inquiry into associated phenomena including, "Hot and Cold Processes."

Catalog No.	Description	Digital Access	Price/Each
AP10656	360Science: Build an Efficient Calorimeter	1-Year	$107.00
AP10756		3-Year	123.28

FLINN EXCLUSIVE

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM



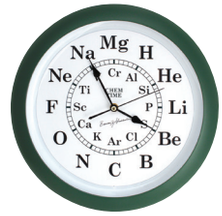
Calorimetry Basics—Specific Heat—Super Value Laboratory Kit AP5952

Catalog No.	Description	Price/Each
AP5952	Calorimetry Basics—Specific Heat—Super Value Laboratory Kit	$76.05
AP6375	Discovering Instant Cold Packs—Guided-Inquiry Kit	31.85

Chemistry Laboratory Kits—Water Investigation Kits See page 511.

Elements

Chem Time Clock



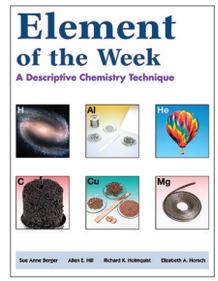
Our 24-hour Chem Time Clock replaces the usual numbers found on the face of a clock with symbols of elements having corresponding atomic numbers. 'H' replaces '1,' 'He' replaces '2,' etc. The idea for this clock came from Prof. Bassam Shakhashiri at the University of Wisconsin. It is the perfect addition to a science classroom. The face of the clock has black lettering and the outside trim is forest green.

Catalog No.	Description	Price/Each
AP9270	Chem Time Clock	$49.10

Element of the Week

FLINN EXCLUSIVE

Authors: Sue Berger, Allen Hill, Richard Holmquist and Elizabeth Horsch



Spark student interest by highlighting a different element each week! Throughout the week, one element's properties and reactions are explored through teacher demonstrations and hands-on student activities. The selection process can be systematic or random. Contains background information, procedures for demonstrations and student activities, safety and disposal for each activity and references. Also includes teaching tips that the authors found to be useful in their own classrooms. Fifteen elements are highlighted. 80 pages, 8½" x 11", spiral-bound.

Catalog No.	Description	Price/Each
AP1832	Element of the Week	$20.30

Element Set Contents

Aluminum (shot)	Calcium	Iodine*	Nickel
Antimony	Carbon (Charcoal)	Iron	Selenium*
Arsenic*	Carbon (Graphite)	Lead	Silicon
Bismuth	Chromium	Lithium	Sulfur
Bromine Water*	Copper	Magnesium	Tin
Cadmium	Germanium	Manganese	Zinc

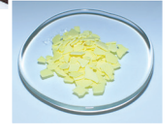
***Packaged in sealed ampules**

Flinn Chemical Element Set

FLINN EXCLUSIVE

By: The Flinn Staff





The Periodic Table of the Elements comes alive with the Flinn Chemical Element Set. Each element sample is packaged in a heavy-duty, plastic or glass vial measuring approximately 2" long x 1" in diameter. These durable vials allow for full viewing of each element. Four elements—arsenic, bromine, iodine, and selenium—are packaged in heat-sealed glass ampules to be viewed by students with teacher supervision.

Both the container and the container closure are labeled with the name of the contents. The entire element set is packaged in a durable, molded plastic case with foam rubber cushions for safer storage and transportation. Case dimensions are 13¾" L x 10" W x 3¾" D. Contains 24 element samples.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP1128	Flinn Chemical Element Set	$155.69

ELEMENTS continued on next page.

Elements, continued

Flinn Hands-On Chemical Element Set

FLINN EXCLUSIVE



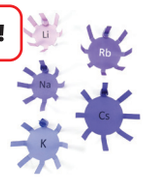
By: The Flinn Staff

This "hands-on" element set enables students to pick up and safely investigate properties of elements. Complete set includes 14 samples of 11 different elements and activity ideas. The elements provided are aluminum, carbon, copper, iron, magnesium, nickel, lead, sulfur, silicon, tin and zinc. Three forms of copper (shot, strip and wire) and two allotropic forms of carbon (graphite and charcoal) are included with the set to show students that elements may take on various appearances. Each element comes in a durable plastic zipper-lock bag labeled with the name, symbol and group number of the contents. Oversized storage tray allows extra space for your own creative additions to the set!

Catalog No.	Description	Price/Each
AP6876	Flinn Hands-On Chemical Element Set	$54.00

Group 1 Elements 3-D Model Kit

NEW!



Group 1 of the Periodic Table contains the reactive alkali metals. Your students will first build their easy to make paper models of atoms and electrons. They will then use the models to look at how the Group 1 elements react. The differently colored electrons make it easy to see how the bonds are formed and the models shows reactions with water, oxygen and chlorine.

The Model Making Kit includes enough materials for students to assemble up to 5 paper models working cooperatively. The comprehensive Teacher Resource Guide included provides illustrated readings, activities, key vocabulary and an assessment, along with teaching opportunities for students to Engage, Explore, Explain, Extend and Evaluate their understanding of the concepts presented.

Catalog No.	Description	Price/Each
AP11711	Group 1 Elements 3-D Model Kit	$34.95

Generating Electricity 3-D Model Kit

NEW!



Teach your students how electricity is generated with our interactive model of a power station. First, they will make their model using the colorful parts provided. They will then use it to look at how electricity is generated from non-renewable fossil fuels or renewable bio-fuels.

The models covers different types of fuel, the role of the boiler, what a steam turbine does and how the generator produces electricity. They can even turn the turbine! The model is a great starting point to consider different types of fuel and the pros and cons of generating electricity in different ways.

The Model Making Kit includes enough materials for students to assemble up to 5 paper models working cooperatively. The comprehensive Teacher Resource Guide included provides illustrated readings, activities, key vocabulary and an assessment, along with teaching opportunities for students to Engage, Explore, Explain, Extend and Evaluate their understanding of the concepts presented.

Catalog No.	Description	Price/Each
AP11712	Generating Electricity 3-D Model Kit	$34.95

Flame Test Kits See pages 245 and 249.

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Games and Puzzles

Atomic Structure Puzzle—Student Activity Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Atomic "puzzler" activity provides a fun way to review core atomic structure concepts! Kit consists of 15 unique puzzle sheets, each with 20 different atomic structure "clues" testing students' knowledge of atomic number, mass number, isotopes, ions, protons, neutrons and electrons. Students, working in pairs, answer the questions on their puzzle sheets in numerical order and then turn them over to reveal a letter or punctuation mark needed to decode a secret message about the nature of the atom. All student groups must enter their clues in the proper order, 300 total, to decipher the hidden message!

Complete for 15 groups of students.

Catalog No.	Description	Price/Each
AP7353	Atomic Structure Puzzle—Student Activity Kit	$25.90

Chemistry Bingo—Super Value Game

FLINN EXCLUSIVE

By: The Flinn Staff



Our chemistry bingo game combines two games in one—Element Bingo and Ion Bingo! The fronts of the bingo cards are designed with common element symbols while the backs contain cation and anion formulas. Game includes heaps of bingo chips, 42 different double-sided bingo cards, and sheets of 75 element and 75 ion call-out words to be cut into squares. Teacher notes and helpful tips provided.

Super Value Game is complete for a class of 30 students. All materials are reusable.

Catalog No.	Description	Price/Each
AP4578	Chemistry Bingo—Super Value Game	$28.00

Chemdeck Card Games

FLINN EXCLUSIVE

By: Ken Barker, Lenape Technical School, Ford City, PA

As students play familiar games, such as draw poker or gin, they try to form an ionic compound with the largest molar mass using one cation card, one anion card and two numbered "subscript" cards. Students must analyze their hands for all possible formulas and molar masses as they compete to have the winning hand. Since no two hands are ever the same, students must create and examine new compounds with each deal. Kit contains five decks of cards, each containing 26 common cation cards, 28 common anion cards and 54 numbered cards as well as 12 blank "wild" cards. Teacher Notes, reproducible game instructions for three separate games and one transparency sheet for teacher explanations are also included.

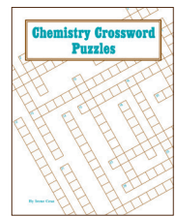
Complete for 30 students working in groups of six. All materials are reusable.

Catalog No.	Description	Price/Each
AP6616	Chemdeck Card Games	$56.35

Chemistry Crossword Puzzles

FLINN EXCLUSIVE

Author: Irene Cesa



The book contains 24 original crossword puzzles that span the entire high school chemistry curriculum. Puzzle clues range from straightforward definitions to more engaging or curious facts that will help students associate words with ideas and concepts. Solved puzzles are provided, along with alphabetical listings of answers for each puzzle—the latter are useful study guides! 24 puzzles, 68 pages, 8½" x 11", spiral bound. Copyright permission granted for the teacher to photocopy puzzles for classroom use by students.

Catalog No.	Description	Price/Each
AP7372	Chemistry Crossword Puzzles	$27.20

GAMES AND PUZZLES continued on next page.

Games and Puzzles, continued

Electron Configuration Bingo—Super Value Game

FLINN EXCLUSIVE

By: John Thompson, New Castle Crysler H.S., New Castle, IN

Each bingo card lists various electron configurations. As the teacher reads corresponding clues, students cover the correct electron configuration. By the end of play, students also learn about valence electron configurations, noble gas cores and ion configurations. Includes bingo chips, electron configuration bingo clues, electron order of filling diagram student master, periodic table student master, 24 bingo cards, Teacher Notes and helpful playing tips.



Super Value Game is complete for 24 students working individually. All materials are reusable.

Catalog No.	Description	Price/Each
AP6379	Electron Configuration Bingo—Super Value Game	$31.50

Element O® Game

Element O® will engage your students' attention without them realizing that they are learning about the periodic table. No prior knowledge of the periodic table or chemistry is needed. Students will travel along the periodic table receiving protons or paying them out to other players. Students will also collect cards with interesting facts about the elements. For 2–6 players or groups of players.



Catalog No.	Description	Price/Each
AP8932	Element O® Game	$42.05

Gas Laws Puzzle—Student Activity Kit

FLINN EXCLUSIVE

By: Fran Zakutansky, Pascack Valley H.S., Hillsdale, NJ

Puzzle clues explore the relationship among the pressures, volumes, temperatures, and number of moles of a gas. Take the sums of all the numerical answers to identify a piece of a colorful gas laws puzzle, then assemble the collage to view everyday applications of the gas laws.

Complete for 15 student groups. All materials are reusable.



Catalog No.	Description	Price/Each
AP7388	Gas Laws Puzzle—Student Activity Kit	$27.85

Nerd Words—A Science Words Game

NEW!

Nerd Words: Science has two teams competing to decipher one-word clues to find the correct science terms. Teams bet points as an indication of their confidence. Speed and accuracy are rewarded while incorrect answers cost you your wager. Prove your mastery of biology, chemistry, physics, and earth science by out scoring your rivals.



Catalog No.	Description	Price/Each
AP9441	Nerd Words—A Science Words Game	$29.99

Go Fish for an Ion—A Chemistry Super Value Card Game

FLINN EXCLUSIVE

By: Laura Spencer, Edmonds-Woodway H.S., Edmonds, WA

Points are scored for each correct ionic compound—a great way for students to learn chemical formulas, names and ionic charges. Students keep a score sheet with the cation, the anion, the chemical formula and the compound name. Two card game options are provided—Writing Formulas and Naming Compounds—depending on class goals and level of the students. Game includes four decks of 64 colored Go Fish playing cards (containing 10 different cations and 10 different anions), duplicating masters for ion cards, score sheets and game rules.



Super Value Game is complete for 20 students. All materials are reusable.

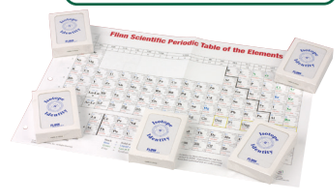
Catalog No.	Description	Price/Each
AP6131	Go Fish for an Ion—A Chemistry Super Value Card Game	$30.85

Isotope Identity Games

FLINN EXCLUSIVE

By: The Flinn Staff

With "Got Isotopes," students collect "books" of cards depicting four ways to represent isotopes of the same element. "It's a Match" reinforces the concepts of atomic structure and mass numbers as they relate to isotopes. Both games use the same deck of 52 cards illustrating isotopes of 13 different elements by name and by the number of protons and neutrons. Kit includes five decks of Isotope Identity cards, 15 notebook-size periodic tables, detailed instructions with reproducible student handouts and valuable Teacher Notes.



Complete for 30 students playing in groups of six. All materials are reusable.

Catalog No.	Description	Price/Each
AP7190	Isotope Identity Games	$49.20

Ion: A Compound Building Game

Ion: A Compound Building Game is a highly competitive card drafting game for chemistry. Each turn players select an atom or ion card to add to their collection. At the end of each round, points are scored for all neutral compounds, with bonus points awarded for completing special objective cards.



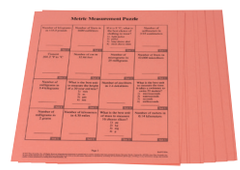
Catalog No.	Description	Price/Each
AP10534	Ion: A Compound Building Game	$23.50

Metric Measurement Puzzle—Student Activity Kit

FLINN EXCLUSIVE

By: The Flinn Staff

The metric system is used in science and throughout nearly every country in the world. In this cooperative class activity, students answer a series of metric measurement questions. Fifteen different puzzle sheets are solved and arranged in numerical order to reveal clues. The whole class joins together to enter their clues (240 in total) in the correct sequence to decode a secret metric measurement message. A great activity for introduction or review of the metric system!



Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP7530	Metric Measurement Puzzle—Student Activity Kit	$25.45

Games and Puzzles, continued

Metric Match Game

FLINN EXCLUSIVE

By: Fran Zakutansky, Pascack Valley H.S., Hillsdale, NJ



Introduce students to the metric system and common conversions while playing the Metric Match Game! Each student group receives a set of Metric Match cards containing various conversion units and numbers. As the correct conversions are matched up with one another, a complete four-card by four-card square will be formed. The first group to correctly match the cards wins! Kit contains two sets of cards—one introductory level conversion set and one advanced conversion set. Includes detailed teacher instructions and tips and suggestions for play.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6383	Metric Match Game	$25.60

Metric-ominoes Game

FLINN EXCLUSIVE

By: Jennifer Richey, Rosemary Camp, and Mary Coogan, Liberty High School, Liberty, MO



Metric-ominoes helps students learn and reinforces metric prefixes and their numerical values. Plays just like the classic dominoes game. A set of Metric-ominoes are given to each student group. Each domino has one of ten possible decimal prefixes on the left side and one of ten numerical values on the right. Plays are made by matching a prefix on one domino and its correct numerical value on another domino. The student who plays all the Metric-ominoes first in each group is the winner. Teacher Notes, along with six tile sets and reproducible game instructions, are included.

Complete for 30 students working in groups of five. All materials are reusable.

Catalog No.	Description	Price/Each
AP6610	Metric-ominoes Game	$26.35

Subatomic: An Atom Building Game



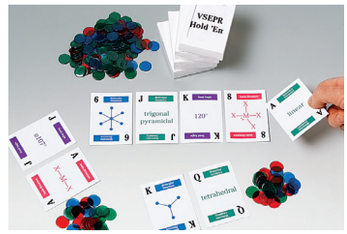
Subatomic is a deck building card game. Players use the cards in their hands to acquire new subatomic particles for their decks. They can then use their upgraded decks to start building elements, scoring points and recruiting famous scientists to assist them. Subatomic complies with NGSS standards and STEM principles. Gameplay takes up to an hour and accommodates 2–4 players.

Catalog No.	Description	Price/Each
AP10536	Subatomic: An Atom Building Game	$41.15

VSEPR Hold 'Em—Super Value Game

FLINN EXCLUSIVE

By: J. Flint Baumwirt, Granada Hills Charter School, Granada Hills, CA



The structure and shape of a molecule are important to its physical and chemical properties. Reinforce the rules behind VSEPR theory by having students play this variation on the popular card game Texas Hold 'Em. Teacher notes, extensive background material, and reproducible student handouts are included along with 5 decks of cards.

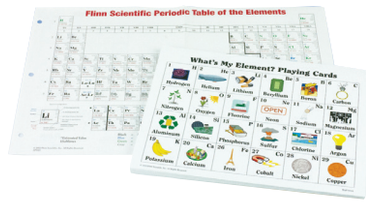
Super Value Kit is complete for 30 students working in groups of six. All materials are reusable.

Catalog No.	Description	Price/Each
AP7063	VSEPR Hold 'Em—Super Value Game	$49.55

What's My Element?—Chemistry Review Super Value Game

FLINN EXCLUSIVE

By: Ashley Spooner, Boynton Beach H.S., Boynton Beach, FL



Reviewing the elements and their positions on the periodic table will be enjoyable for your students with this fun game. Students play in pairs, with each student challenged to find out the mystery element of an opponent who is trying to do the same! The first one to discover the opponent's mystery element by careful deductive reasoning is the winner. Colorful element cards in each set of 24 depict the element name, symbol, atomic number and an illustration of a common use of the element. Includes valuable Teacher Notes, instructions for playing the game, reproducible student worksheet, 30 sets of custom playing cards and 15 periodic tables.

Super Value Game is complete for 15 student groups. All materials are reusable.

Catalog No.	Description	Price/Each
AP7414	What's My Element?—Chemistry Super Value Review Game	$39.05

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High School Chemistry Curriculum Mastery Game

NEW!



Features 25 individually packaged sets of 30 full-color, review cards per topic—a total of 750 curriculum-based questions! Also includes 12 laminated, double-sided game boards; comprehensive Teacher Planning & Resource Guide; and a 1 Year Premium Subscription to NewPath's Online Learning Platform featuring animated, narrated tutorials, virtual lab exercises, inactive activities, quizzes, games and more!

Complete curriculum coverage of the following standards-based topics:

- The Science of Chemistry
- Introduction to Matter
- States of Matter
- Atomic Structure I
- Atomic Structure II
- Elements I
- Elements II
- The Periodic Table I
- The Periodic Table II
- Chemical Names
- Chemical Equations
- Chemical Reactions
- Chemical Compounds I
- Chemical Compounds II
- The Mole- Solutions
- Compounds
- Gases
- Acids, Bases & Salts
- The Chemistry of Life
- Oxidation, Reduction & Electrochemistry
- Nuclear Chemistry
- Chemical Formulas & Bonding
- Measurements & Calculations
- Lab Investigations/Scientific Method

Catalog No.	Description	Price/Each
AP11716	High School Chemistry Curriculum Mastery Game	$119.95

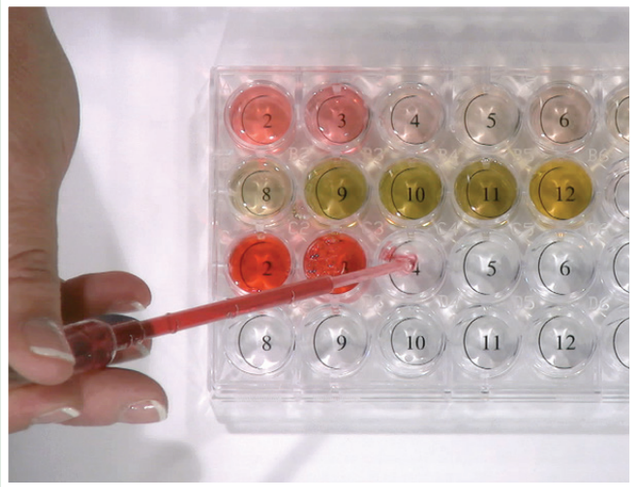
Microscale Chemistry

Microscale Chemistry—A Sustainable Way to Teach Chemistry

Many teachers have already adopted microscale techniques for their laboratory. It's economical, fast, and best of all, effective in the classroom. Students really learn chemistry using microscale techniques!

- Reduced science instructor preparation and cleanup time! One of the nicest aspects of microscaling is the speed at which a lab can be set up, accomplished and broken down. Often, multiple trials can be done in a single period by individual students. Prelab and post-lab discussions can take place on the same day as the lab.
- Time-consuming labs become possible with microscale techniques. A gravimetric determination of sulfate lab traditionally takes three to five laboratory periods. Using microscale techniques, this lab can be accomplished in one hour. A determination of acetic acid in vinegar lab can be repeated by each student four or five times in a single period using no more than 1 mL of vinegar and 10 mL of 0.10 M NaOH.
- Heating and drying samples takes less time. Heating 2 mL of a solution in a small test tube within a 50-mL beaker of hot water takes considerably less time than heating 250 mL. Drying 0.1 g of a solid in an oven can be accomplished in minutes rather than overnight.
- Less space is required for storage. Most of the materials can be stored as complete experiment sets, using very little space and reducing or eliminating setup time.
- It's safer! Hazardous materials are used in very small quantities and less glassware is needed.
- Microscale experiments costs less since entire classroom quantities are measured in a few grams rather than kilograms.
- Easy cleanup! Reaction plates can be easily cleaned by flooding them with water and shaking them dry. Use a little distilled water as a final rinse, and the plates dry sparkling clean.
- Great for crowded labs, microscale experiments require much less bench space per student.
- Lab waste is reduced simply as a result of drastically reduced chemical volume. This also benefits the environment.
- You can "microscale" experiments you already do from your existing lab manual, so a special lab manual isn't necessary.
- In general, students seem to show more care and attention when dealing with microscale volumes.

▶ See free video at flinnsci.com.

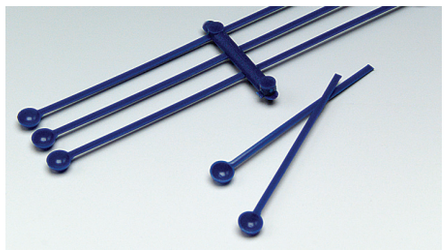


Microscale Demonstration and Laboratory Kits

Catalog No.	Description	Page No.	Price/Each
AP7444	Mystery Solutions with Acids and Bases—Guided-Inquiry Kit	250	$ 48.85
AP6269	What Is a Chemical Reaction? Student Laboratory Kit	256	52.50
AP5950	Carbon Dioxide—What a Gas! Student Laboratory Kit	264	29.85
AP5958	Hydrogen—What a Bang! Student Laboratory Kit	264	32.65
AP5959	Oxygen—What a Flame! Student Laboratory Kit	264	47.85
AP6631	Molar Volume of Hydrogen—Combining the Gas Laws—Student Laboratory Kit	264	32.30
AP6446	Introduction to Reaction Rates—The "Blue Bottle" Reaction—Student Laboratory Kit	267	47.45
AP4361	The Rate of Chemical Reactions—Student Laboratory Kit	268	61.60
AP7096	Synthesis of Aspirin—Student Laboratory Kit	269	65.00
AP6892	Iron(II) and Iron(III) Reactions—Student Laboratory Kit	271	69.75
AP8981	Make Your Own Silver Mirror—A Microscale Laboratory Kit	271	49.55
AP4357	The Activity Series of the Elements—Student Laboratory Kit	271	57.80
AP4358	Chlorides, Bromides and Iodides—Student Laboratory Kit	272	64.30
AP9090	Colligative Properties—Student Laboratory Kit	279	185.00
AP8833	Determination of K_{sp} of $Ca(OH)_2$—Student Laboratory Kit	279	48.00
AP4862	Precipitation Reactions and Solubility Rules—Super Value Kit	280	114.25
AP6374	Micro Mole Rockets—Hydrogen and Oxygen Mole Ratio—Student Laboratory Kit	283	38.80

Microscale Chemistry—Accessories

Microspatulas
AP9015



Description	Catalog No.	Price/Each
Battery Clips	AP1811	$1.65
With Alligator Clips	AP8954	6.15
Bell Jar and Vacuum Set, Microscale	AP5995	$69.14
Bottle, Round, Narrow Mouth		
30-mL	AP8431	$2.33
60-mL	AP8432	2.45
Bottle, Round, Wide Mouth		
30-mL	AP8412	$2.63
60-mL	AP8413	2.69
Bottle, Microchemistry Solution, Graduated, 20/pkg.		
50-mL	AP1449	$52.90
275-mL	AP1726	31.70
600-mL	AP1450	52.75
Construction Paper		
Black, 9" x 12", 50/pkg.	AP1814	$7.25
White, 9" x 12", 50/pkg.	AP1815	8.05
Cotton		
Balls, 300/pkg.	FB0680	$6.35
Swabs, 300/pkg.	AP1737	8.10
Cups, Polypropylene, 30-mL, 100/pkg.	AP5442	$4.15
Current Indicator	AP9018	$10.55
Dishes, Crystallizing		
80 x 40 mm	GP9171	$18.25
150 x 75 mm	GP9172	65.00
Film Canisters with Caps, 30/Pkg.	AP8151	$20.12
Labels, Adhesive, 24 mm, Roll of 1,000	AP1735	$45.78
Magnifier, ⅜" x 2½" Dia.	AP2017	$4.95
Masking Tape, 60-yds	AP1734	$4.75
Microburner, Alcohol Burner	AP9014	$9.05
Microspatulas, 8/pkg.	AP9015	$3.15
Paper Punch, Single	AP1816	$8.85
Pencil Leads, 15/Tube	AP1817	$3.20
Pipet, Beral-Type	See product listing on page 291.	

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Description	Catalog No.	Price/Each
Pipet, Pasteur, 200/pkg.		
5¾", 146 mm Overall Length, 51 mm Tip Length	GP7042	$17.05
9", 229 mm Overall Length, 127 mm Tip Length	GP7043	18.75
Pipet Bulb, Pasteur, 12/pkg.	AP9150	$8.60
Pipet Holder	AP1519	$1.13
Plastic Wrap, 66-yds	AP1736	$7.75
Reaction Plates, 6-well Approx. capacity of each well, 9.6 mL	AP1725	$6.41
Reaction Plates, 24-well Approx. capacity of each well, 2.8 mL	AP1447	$4.75
Reaction Plates, 48-well Approx. capacity of each well, 1.6 mL	AP8822	$7.50
Reaction Plates, 96-well Approx. capacity of each well, 0.3 mL	AP1448	$4.12
Combination Reaction Plate 48 small wells and 12 larger wells in one plate	AP8567	$3.80
Reaction Strips, 8-well Approx. capacity of each well, 9.6 mL	AP1724	$1.16
Reaction Strips, 12-well, Approx. capacity of each well, 9.6 mL	AP1446	$2.35



Pipet Holder
AP1519

Description	Catalog No.	Price/Each
Reaction Strip Holder	AP1514	$6.75
Reaction Strip Plugs, 8-well	AP9019	$1.95
Rubber Bands, Small, Pkg. of 300	AP2008	$4.00
Straws, Plastic, 20-cm Length, 50/pkg.	AP1819	$4.65
Syringes, Disposable, Graduated		
1-mL, Slip Tip	AP5389	$ .57
3-mL, Luer Lock Tip	AP1728	.82
5-mL, Luer Lock Tip	AP1729	.98
12-mL, Luer Lock Tip	AP1730	1.38
20-mL, Luer Lock Tip	AP1731	2.26
35-mL, Luer Lock Tip	AP1732	2.89
60-mL, Luer Lock Tip	AP8754	5.85
140-mL, Luer Lock Tip	AP6315	12.40
Syringe Tip Caps, 10/pkg.	AP8958	$3.25
Eppendorf Pipet Tips	AP1733	$ .22
Test Tubes, Microscale, Fits 96-well Plates, 0.5-mL		
Each	GP6060	$ .58
Disposable, 300/pkg.	GP9165	25.83
Thermometer, Microscale, 0–100 °C, 5° Graduations	AP8713	$4.60
Toothpicks		
Wood, Flat, 750/pkg.	AP6010	$4.45
Wood, Round, 250/pkg.	AP2016	2.96

MICROSCALE CHEMISTRY—ACCESSORIES continued on next page.

Flinn Microchemistry Starter Kit

Get started using microscale techniques! The Flinn Microchemistry Starter Kit includes the lab writeups and all the microscale equipment needed to conduct three lab experiments:

- Analysis of Vitamin C in Fruit Juices
- Hydrogen Ion Concentration and pH Indicators
- The Rate of Chemical Reactions

Each lab writeup includes a complete set of teacher instructions, microscale "Tips," student procedures, and reproducible data sheets. Equipment consists of 170 thin-stem pipettes, 15 24-well reaction plates, 15 12-well reaction strips, and 30 8-well reaction strips. All you need are the chemicals. Microchemistry is inexpensive, fast, and best of all, students learn chemistry. Give our starter kit a try. You'll really love it!

Catalog No.	Description	Price/Each
AP4517	Flinn Microchemistry Starter Kit	$93.30

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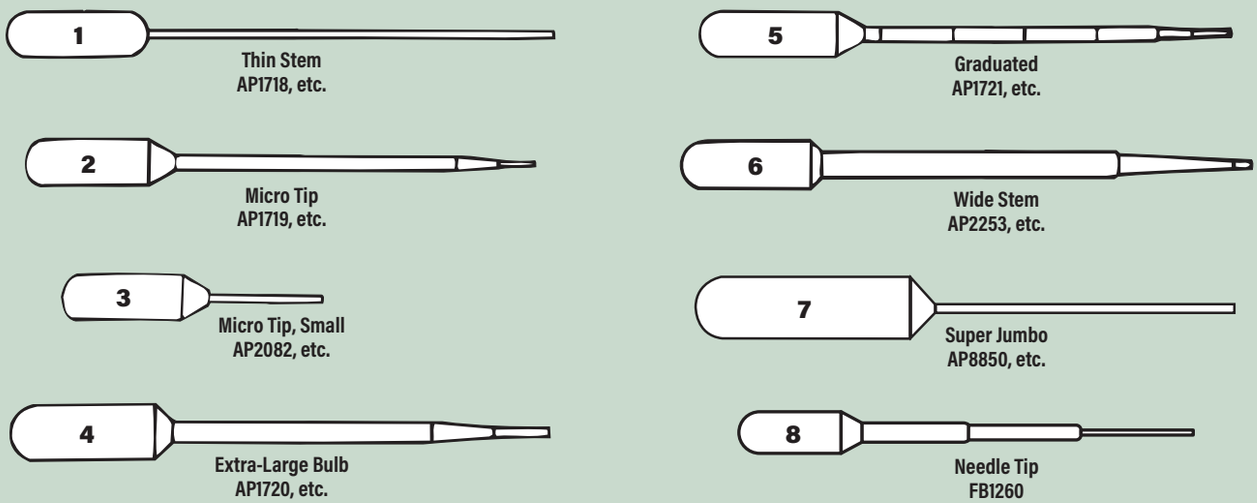


Microscale Chemistry—Accessories, continued

Pipet, Beral-Type

Polyethylene disposable droppers are available in seven assorted types for the specified uses listed below. Pipet material is non-wetting so the pipets are easily rinsed and reused. Pipets will store most liquids when in an upright position with little or no evaporation loss. The stem can be easily labeled for sample identification.

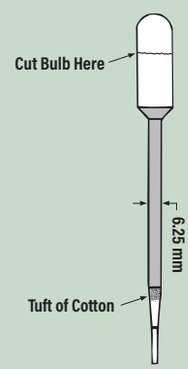
Type	Approx. Capacity (mL)	Bulb Draw Approx. (mL)	Stem Diameter (mm)	Overall Length (mm)	Delivers Drops Per mL	Catalog No.	Price/Pkg.
1 Thin Stem	4	3	2.5	153	20	**AP1718**	**$ 2.23 Pkg. of 20**
						AP1444	**32.50 Pkg. of 500**
2 Micro Tip	5	3.5	5	144	50	**AP1719**	**3.00 Pkg. of 20**
						AP1517	**55.78 Pkg. of 500**
3 Micro Tip, Small	1.75	1	1.25	50	43	**AP2082**	**3.04 Pkg. of 20**
						AP2032	**54.41 Pkg. of 500**
4 Extra-Large Bulb	8	6	6.25	150	22	**AP1720**	**2.63 Pkg. of 20**
						AP1445	**33.69 Pkg. of 400**
5 Graduated	5	3.5	5	153	25	**AP1721**	**2.23 Pkg. of 20**
						AP1516	**37.74 Pkg. of 500**
6 Wide Stem	7.5	3.5	7.8	153	22	**AP2253**	**2.65 Pkg. of 20**
						AP8480	**38.18 Pkg. of 500**
7 Super Jumbo	15	7.7	3	150	22	**AP8850**	**3.41 Pkg. of 20**
						AP8842	**37.98 Pkg. of 250**
8 Needle Tip	2	1	1	100	34	**FB1260**	**59.32 Pkg. of 400**



HOW TO

Convert a Beral-Type Pipet into a Micro Chromatography Column

- Simply cut the bulb in half.
- Force a tiny tuft of cotton into the pipet to retain the medium and then fill the stem with the medium.
- The top of the Beral-type pipet acts as a funnel.



Beral-Type Pipet Use Notes:

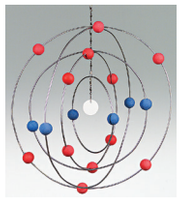
Beral-type pipets are slit, cut, heated, drawn, etc. to facilitate use by many innovative teachers utilizing "scaled down" chemistry. Consult available lab manuals for the fabrication of many devices using Beral-type pipets.

Models, Atomic

Atomic Mobile Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Increase students' knowledge of the elements by modeling the atomic structure of the first 18 elements. Use this model to explore the energy levels of electrons in the first three electron shells. This large mobile can be displayed and modified to reinforce the concept of atomic structure throughout the whole year. Kit includes two ceiling hangers, an erasable nucleus, five solid metal rings used as electron shells, 22 rubber spheres in two colors to represent electrons of *s* and *p* energy levels, a periodic table, and complete instructions.

Catalog No.	Description	Price/Each
AP9254	Atomic Mobile Kit	$85.20

Atom Model



This large, colorful, 3-D foam model is the perfect visual aid for your discussions about the atom. Removable pieces help illustrate the basic differences between electrons, protons and neutrons. This versatile model can be used to show how ions form, why electron energy orbitals exist, and even chemical bonding. More advanced classes can take advantage of the graphical images of quarks and the wave nature of subatomic particles. Includes 24-page instruction guide.

Catalog No.	Description	Price/Each
AP6711	Atom Model	$97.30

Atomic Orbital Model Set



Build 14 basic *s*, *p* and *d* atomic orbitals with this colorful, three-dimensional model set. Use the pink and purple pear-shaped models to represent the lobes of the *p* and *d* atomic orbitals. Represent atomic nuclei with opaque white spheres. Each model comes with its own colorless transparent base for display purposes. Set contains 14 easy-to-assemble atomic orbitals—one 1s, one 2s, three 2p, five 3d, one unit with one 2s plus three 2p orbitals as well as one each of an sp, sp^2 and sp^3 hybrid orbital. Components are of durable plastic for years of classroom demonstration and display. Approximate model heights including base range from 5–9 cm. Instruction sheet and a plastic storage case are included.

Catalog No.	Description	Price/Each
AP5457	Atomic Orbital Model Set	$83.00

FLINN EXCLUSIVE

Be sure to review our Atomic Structure sections for demonstrations, student laboratory kits and activities on the make up of the atom.

See pages 390–391.

BRIGHT Atom™ Model



Revolutionary, award-winning BRIGHT Atom gives every student the opportunity to "construct" their knowledge of the atom in an intuitive, hands-on, and self-evident manner! Each model contains two surfaces to build atoms, 30 protons, 30 neutrons, and 30 electrons. Students manipulate the components of the model to build atoms, isotopes, and ions. Stackable.

Catalog No.	Description	Price/Each
AP7299	BRIGHT Atom Model	$68.00

Elementary Atomic Model Set

FLINN EXCLUSIVE

By: The Flinn Staff



All parts are interchangeable—materials may be easily assembled to build models of the first ten elements, including ions and isotopes. Solid metal rings serve as electron shells that hold rubber "electrons." Red pom-pom "protons" and black pom-pom "neutrons" are held together in one of four clear plastic "nuclei" spheres. The model stands about 12" tall. Some assembly required. Additional nuclei can be created, if desired, using the AP6875 Atomic Model Nuclei Set, which includes enough spheres and pom-poms to make four nuclei (without metal rings and stand).

Catalog No.	Description	Price/Each
AP2094	Elementary Atomic Model Set	$92.00
AP6875	Atomic Model Nuclei Set	35.70

Happy Atoms Complete Set

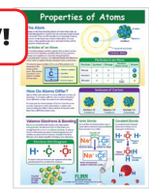


This physical and digital system lets you discover the world of molecules in an intuitive, hands-on way. Using a set of 50 atom models representing 16 different elements, you can assemble your own molecular models. The atoms connect easily with magnets: metal tips on the ends of rubbery arms, which represent free electrons, snap onto magnetic bonding sites on the atom spheres, which represent empty spots for electrons in the atom's outermost electron shell. You can snap together thousands of different molecules. Because the atoms already have the correct number of free electrons and empty bonding sites, it is difficult to build a molecule that doesn't actually exist.

Catalog No.	Description	Price/Each
AP11667	Happy Atoms Complete Set (50 Atoms)	$169.95
AP11668	Happy Atoms Educator's Bundle & Classroom Kit (250 Atoms)	849.95

Properties of Atoms—NewPath Visual Learning Guide, Set of 10

NEW!



Properties of Atoms Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11746	Properties of Atoms—NewPath Visual Learning Guide, Set of 10	$43.32

Magnetic Atom Model



Place the bright, color-coded magnetic protons, neutrons, and electrons in the correct place on the steel atom board to represent elements 1–10. Show students the relationship of protons and neutrons to atomic mass and atomic number. Demonstrate how electron levels fill as atomic number changes, and show how ions or isotopes form. Includes a 16" x 16" bright white steel atom board and 30 color-coded magnetic particles—10 red (+) protons, 10 blue (–) electrons, and 10 green neutrons. Set also contains teacher notes and giant reproducible element sheets. Two holes for mounting.

Catalog No.	Description	Price/Each
AP6023	Magnetic Atom Model	$97.00

Sublevel Orbitals of the Atom Models Kit



Students assemble their own three-dimensional model clearly showing the position and number of electrons in *s* and *p* orbitals. Assembling and identifying the number and position of electrons in various atoms and reviewing them for quantum numbers and Pauli's Exclusion Principle really helps students understand a very abstract concept, while showing the similarities in the electron configuration of different atoms. Color-coded components help distinguish *s* and *p* orbitals. A quantum numbers chart is provided on each student worksheet to help students assemble the models starting with the 1s orbitals. Detailed instructions provided.

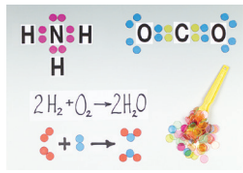
Complete for 24 students working in pairs.

Catalog No.	Description	Price/Each
AP4544	Sublevel Orbitals of the Atom Models Kit	$130.31

MODELS, ATOMIC continued on next page.

Models, Atomic, continued

Wire-Rimmed Counting Chips



These colorful, transparent discs make perfect, cost-effective models and can be used to represent atoms, molecules, ions, electrons...you name it! Teach the law of conservation of matter and balancing equations—the chips are a great atom-accounting mechanism. Teach bonding and Lewis dot structures—the chips are ideal representations of electrons. Great for overhead demonstrations! Clean up quickly with the magnetic wand (AP4584) which is the perfect companion for these chips. 100-piece bag; assorted colors.

Catalog No.	Description	Price/Each
AP4585	Wire-Rimmed Counting Chips	$11.30

Magnetic Wand



This sturdy plastic wand contains a powerful bar magnet that quickly and easily picks up iron filings or other magnetic materials. Use this magnetic wand to swipe up wire-rimmed chips when teaching about atoms and balancing equations or when exploring the topic of magnetism. Cleanup of metal filings has never been easier! Brightly colored.

Catalog No.	Description	Price/Each
AP4584	Magnetic Wand	$5.25

First Introduction to Molecular Models Kit



Molecular model building has never been made easier. First, students use two-dimensional color-coded atoms to understand electron structure. They then progress to understand how atoms gain, lose, and share electrons to form molecules. Once these concepts are mastered, students use three-dimensional atoms to build more realistic molecules. Detailed teacher's guide and student worksheets are provided.

Complete for 24 students working in pairs.

Catalog No.	Description	Price/Each
AP4542	First Introduction to Molecular Models Kit	$130.31

Structure of an Atom 3-D Model Kit

NEW!

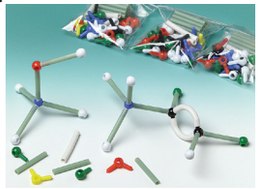


Properties of Atoms Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11710	Structure of an Atom 3-D Model Kit	$34.95

Models, Molecular, Plastic

Classroom Molecular Model Set



Twelve groups of students will be able to build their own molecular models. Color-coded atom centers are designed to accept bonds at the proper angle so students will gain an understanding of the three-dimensional character of molecules. The kit contains 12 packets, each of which includes:

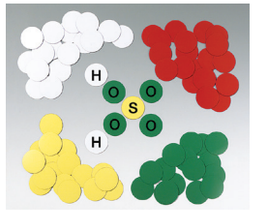
- 8 hydrogen (white)
- 20 plastic bond connectors
- 2 nitrogen (blue)
- 1 sulfur (yellow)
- 2 carbon (black)
- 6 chlorine (green)
- 4 oxygen (red)
- 4 flexible connectors

Teacher instructions and a student worksheet master are provided.

Catalog No.	Description	Price/Each
AP8903	Classroom Molecular Model Set	$84.85

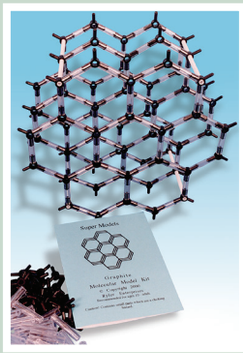
Magnetic Molecules

FLINN EXCLUSIVE

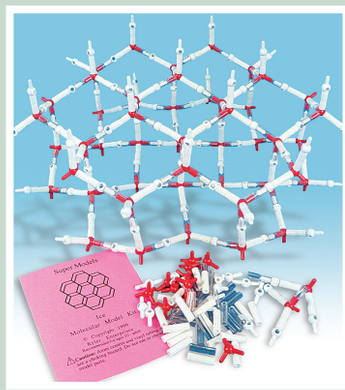


Chemistry teachers are going wild over these colorful, low-cost, magnetic molecules! These 2" disks attach to any magnetic surface and are perfect to depict molecules, atoms, electrons and ions. Demonstrate how equations are balanced, teach bonding or Lewis electron dot structures. Molecules may be placed and moved on any magnetic surface—perfect for classroom demonstrations. Molecules may be written on using dry erase marker and easily wiped clean. Comes in packages of 20. A must in all chemistry classrooms!

Catalog No.	Description	Color	Price/Pkg. of 20
AP6497	Magnetic Molecules	Red	$13.30
AP6498		White	13.30
AP6499		Yellow	13.30
AP6500		Green	13.35
AP6926		Blue	13.55



Graphite Model Kit
AP6175



Ice Model Kit
AP6178

Molecular Models

Kits include background information, detailed assembly instructions with diagrams, teaching activities and tips, and spare parts.

Graphite Model Kit

Contains 76 trigonal carbons and 92 vinyl tubes. Illustrates flat layered structure of graphite's six-carbon rings and the slippery feel of the molecule.

Diamond Model Kit

Contains 57 tetrahedral carbons and 82 vinyl tubes. Illustrates stability and hardness of diamond, network covalent bonding, and cleavage.

Buckyball (C_{60}) Model Kit

Contains 62 trigonal carbons and 92 vinyl tubes. Illustrates stability of the ball structure, ability to "bounce", ability to trap atoms within the cage, and the beautiful symmetry of the C_{60} Buckminsterfullerene molecule.

Ice Model Kit

Contains 50 red, 4-peg oxygens; 100 white, 2-peg hydrogens; and 174 vinyl tubes. Enables students to build a two-layered hexagonal ice crystal. Illustrates hydrogen bonding and the increase in volume of ice as compared to liquid water.

Sodium Chloride Model Kit

Contains 40 silver, 6-peg sodiums; 40 green, 6-peg chlorides; and 158 vinyl tubes. Exhibits 6:6 coordination and displays sodium chloride's (table salt) cubic crystal lattice.

Catalog No.	Description	Price/Each
AP6175	Graphite Model Kit	$34.50
AP6176	Diamond Model Kit	33.95
AP6177	Buckyball Model Kit	28.07
AP6178	Ice Model Kit	61.05
AP6179	Sodium Chloride Model Kit	45.28

MODELS, MOLECULAR, PLASTIC continued on next page.

Models, Molecular, Plastic, continued

Flinn Molecular **Model Sets**

FLINN EXCLUSIVE

These colorful, sturdy plastic atoms and connectors. The components are easy to assemble and can be easily separated and used again. Models are adaptable to student group use or classroom demonstration and display. Instruction sheet and plastic storage case or bag are included with each of the sets listed. Replacement atoms and bonds are available.

See free video at flinnsci.com.

Inorganic Individual Student Model Set

Construct all possible molecular geometries—linear, bent, trigonal planar, pyramidal, tetrahedral, square planar, trigonal bipyramidal, and octahedral. The 17-atom set includes:

- 4 hydrogen
- 1 carbon
- 3 oxygen
- 2 halogen
- 2 nitrogen
- 1 sulfur
- 1 phosphorus
- 2 metal (6-hole)
- 1 dsp^3 5-hole

Sixteen single (medium) bond connectors and six long flexible bond connectors are provided.

Organic Individual Student Model Set

Build molecules of water, ammonia, methane, carbon dioxide, alcohols, acids, esters, chloro-hydrocarbons, and many other substances. The 19-atom set includes:

- 10 hydrogen
- 4 carbon
- 2 oxygen
- 2 halogen
- 1 nitrogen

Twenty single (sigma) bond connectors and four double or triple (pi) bond connectors are provided.

Organic Small-Group Model Set

Build all the molecular models described in the individual set as well as additional larger molecules and isomers. The 30-atom set includes:

- 14 hydrogen
- 6 carbon
- 6 oxygen
- 2 halogen
- 2 nitrogen

Twenty single (sigma) bond connectors and four double or triple (pi) bond connectors are provided.

Catalog No.	Description	Price/Each
AP6242	Inorganic Individual Student Model Set	$ 27.64
AP6249	Inorganic Individual Student Model Set, 6-Pack	177.00
AP5452	Organic Individual Student Model Set	20.55
AP6250	Organic Individual Student Model Set, 6-Pack	101.97
AP5453	Organic Small-Group Model Set	34.90
AP5454	Organic Teacher Model Set	67.98
AP5455	Inorganic–Organic Teacher Model Set	76.00

Biochemistry Molecular Model Sets

Build a range of simple organic molecules, including carbohydrates, sugars, proteins, amino acids, lipids, fats and DNA/RNA. Details at flinnsci.com.

Catalog No.	Description	Price/Pkg.
AP10023	Fat Molecular Model Set	$50.00
AP10024	Glucose Molecular Model Set	18.00
AP10025	Sucrose Molecular Model Set	17.10
AP10029	Starch Molecular Model Set	22.53
AP10030	Biochemistry Molecular Model Set	129.00



Molecular Model Sets AP5453, etc.

Organic Teacher Model Set

Construct an endless variety of molecules—from alcohols to ketones and esters to amino acids. The 114-piece set includes 26 space-filling bonds, 26 open-model single bonds, 12 open-model double bonds and the following 50 atom centers:

- 20 hydrogen
- 12 carbon
- 6 oxygen
- 4 halogen
- 4 nitrogen
- 2 sulfur
- 1 phosphorus
- 1 metal

Inorganic–Organic Teacher Model Set

A model set that offers the best of both chemistry worlds—inorganic and organic! Not only can you make a whole array of organic models, this set allows you to make hydrides, halides, metal oxides and hydroxides, non-metal oxides, acids, and salts. The eight metal atoms are of four types—1-hole, 2-hole (105° angular), 3-hole (107° pyramidal), and 4-hole (109° tetrahedral). The 92-piece set includes the following 52 atom centers:

- 14 hydrogen
- 2 phosphorus
- 8 metal
- 3 sp^3, dsp^3, d^2sp^3
- 6 halogen
- 6 carbon
- 7 oxygen
- 1 boron
- 3 nitrogen
- 2 sulfur

Twenty-five single (sigma) bond connectors and twelve double or triple (pi) bond connectors are provided.

Replacement Atoms and Bonds for Flinn Molecular Model Sets

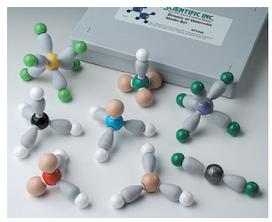
Catalog No.	Description	Pkg. Size	Price/Pkg.
AP6243	Hydrogen Atoms, 1-hole	10	$9.85
AP6244	Oxygen Atoms, 2-hole	10	9.40
AP6245	Carbon Atoms, 4-hole	10	9.40
AP6246	Single Bond Links	25	6.50
AP6247	Long Flexible Links	25	6.50

MODELS, MOLECULAR, PLASTIC continued on next page.

Models, Molecular, Plastic, continued

Shapes of Molecules Model Set

FLINN EXCLUSIVE



Help students visualize the shapes of molecules! There is no better way to demonstrate to your students the valence shell electron-pair repulsion theory. This eight-model collection set contains colorful, sturdy plastic atoms and pear-shaped bonds and lone pairs. Components are durable, easy to assemble, and are great for classroom demonstration and display. Set contains sufficient parts to make the eight atomic models listed.

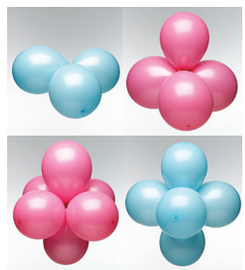
Coordination No.	Shape	Formula	Coordination No.	Shape	Formula
1	Linear	HCl	3	Pyramidal	NH_3
2	Linear	$BeCl_2$	4	Tetrahedral	CH_4
2	Bent	H_2O	5	Trigonal bipyramidal	PCl_5
3	Trigonal planar	BF_3	6	Octahedral	SF_6

Above models can also be modified to include additional shapes such as T-shaped, square planar, etc. Great for introductory through advanced chemistry classes. Instruction sheet and a plastic storage case are included.

Catalog No.	Description	Price/Each
AP5456	Shapes of Molecules Model Set	$62.00

Molecular Geometry, Bonding and Balloons—Demonstration Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Imagine! Use balloons to build amazing models of molecular shapes. Make a tetrahedron, an octagon or even a trigonal bipyramid. The models are very quickly interchanged so that all structures can be covered. The holder and balloons may also be used to illustrate hybrid orbitals and even sigma versus pi bonding in organic compounds. Includes all the parts needed to assemble the balloon holder and enough balloons to create 15 models, along with detailed procedures, background information and complete Teacher Notes.

Catalog No.	Description	Price/Each
AP6878	Molecular Geometry, Bonding and Balloons—Demonstration Kit	$43.25

Magnetic Water Molecules Kit



Each set includes 12 water molecules, one sodium, one chloride, one ethane and one hydroxyl group. The embedded magnets in the atoms reflect the correct positive or negative charges to give students hands-on experience in molecular attraction or repulsion. *Two sizes available.*

Catalog No.	Description	Price/Pkg.
AP8068	Magnetic Water Molecules Kit, 1-Cup Set	$ 57.10
AP8075	Magnetic Water Molecules Kit, 6-Cup Set	349.00

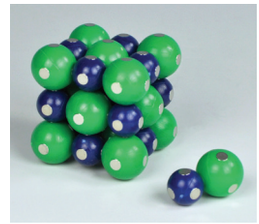
Design-Your-Own Custom Molecular Model Kit



A complete assortment of color-coded atoms and bonds allows you to construct complex molecular models. Over 480 atoms and 300 bonds are provided allowing you to construct both organic and inorganic models. Models are easy to assemble, will not fall apart, and are very well made.

Catalog No.	Description	Price/Each
AP4543	Design-Your-Own Custom Molecular Model Kit	$138.25

NaCl Lattice Model, Magnetic



Take your salt crystal lessons from 2-D to 3-D with this sodium chloride ion model set! Students will be able to discover the cubic nature of salt crystals, efficient lattice packing, high melting temperature and cleavage planes all with this 3 x 3 x 3 model. Each ion model contains six embedded magnets that allow 6:6 coordination and tight packing. Explore how the positive sodium and negative chloride ions form electrostatic bonds to create a strong crystal structure. Contains 27 ions, 13 of one type of ion and 14 of the other.

Catalog No.	Description	Price/Pkg.
AP8070	NaCl Lattice Model, Magnetic	$118.45

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM

Models, Molecular, Styrofoam®

Student Molecular Model Kit

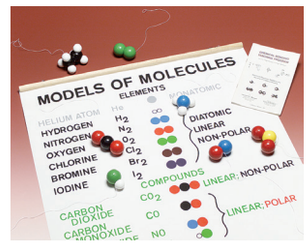


For individualized student use; kit includes student instructional manual. Your students will learn bonding capacity, molecular shape, reactivity, multiple bonding, and isomers. This very inexpensive but practical kit includes: 15 2"-diameter colored Styrofoam® balls, 15 1"-diameter white balls, toothpicks and pipe cleaners for single and multiple bonds, a jig for tetrahedral molecules, and a 14-page instruction booklet.

Catalog No.	Description	Price/Each
AP2096	Student Molecular Model Kit	$61.51

Styrofoam® balls and pipe cleaners make excellent low-cost molecular models. See flinnsci.com.

Models of Molecules and Chart Set



Eighteen miniature models and a 26" x 40" color poster constitute the ingredients in this set. The poster contains the 18 most commonly studied molecules including chemical name, formula, molecular geometry and polarity. Models are made of coated Styrofoam® and are ready to be suspended from the chemistry classroom wall. Full instructions are included.

Catalog No.	Description	Price/Each
AP2097	Models of Molecules and Chart Set	$156.60

Mole Activities

Make-A-Mole—Hands-On Student Activity Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Sample student-made moles shown.

Students have fun as they create and personalize their own stuffed mole—Mickey Mole, Pillsbury Mole Boy, Molechemist, Mole-a Lisa—the possibilities are limitless. Teachers have told us how surprised they were to see previously "uninterested" students win the "Most Unique Mole" or "Best Sewn Mole" contest and suddenly find an interest in chemistry. Includes mole pattern master; instructions; mole design ideas; black and brown fabric for a teacher demo mole; and eyes, noses, tails and fiberfill stuffing for 30 student moles.

Complete for a class of 30 students working individually. Fabric for student moles is required, but not included.

Catalog No.	Description	Price/Each
AP6159	Make-A-Mole—Hands-On Student Activity Kit	$31.65

Mole Box

FLINN EXCLUSIVE



Do your students get that puzzled look when you tell them the volume of a mole of gas at STP is 22.4 liters? Don't tell them, show them! When assembled, the box is an exact 22.4 liter cube. Each 11.2" square side contains helpful information, such as conversions, gas laws, and constants, large enough to be read from any place in the classroom.

Catalog No.	Description	Price/Each
AP6437	Mole Box	$11.35

Mole Balloon™—Student Activity Kit



Students of chemistry learn that one mole of any gas occupies 22.4 liters. Now you can show your students how much space one mole of gas actually fills by using specially designed mole balloons. The 30 mole balloons in this kit are color-coded to allow students to compare the number of atoms and molecules, the volume and the mass of one mole of various gases.

Complete for 30 groups of students. Includes instructions and activity guide.

Catalog No.	Description	Price/Each
AP4587	Mole Balloon—Student Activity Kit	$37.55

Mole Banner

FLINN EXCLUSIVE

By: Lynda Jones, Catlin Gabel School, Portland, OR



Holey Moley—what a huge number! Write 6.02 x 10^{23} on the board and students know the mole number is big. But hanging up this enormous banner with 21 zeros stretching across will surely drive home the sheer magnitude of this number for your students. Actual banner size measures 5 feet by 8½ inches for all to see!

Catalog No.	Description	Price/Each
AP6213	Mole Banner	$26.75

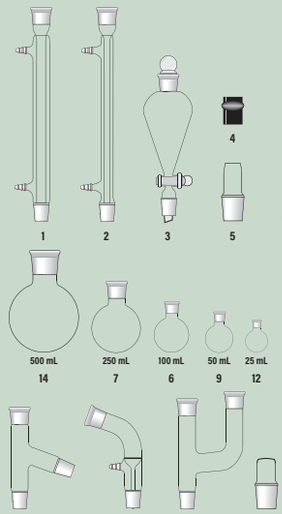
Mole, Plush



Every classroom needs a mole! Place the mole around the room for a mole scavenger hunt to celebrate Mole Day. Keep it on your desk as a mole reminder. Use as an ice-breaker to get the conversation started about moles and stoichiometry. Or hand out as a reward for correct answers or the best test score! 8½" in length.

Catalog No.	Description	Price/Each
AP7797	Mole, Plush	$29.40

Organic Chemistry, Glassware





Organic Chemistry Glassware Set AP1546

Organic Chemistry Glassware Set

This complete 15-piece borosilicate glassware set contains all necessary components to perform fundamental organic laboratory activities. Components are provided in standard taper 19/22 mm joint size. Ground glass joints allow pieces to be assembled, leak-free. Complete with use and care guide. Portable set comes in sturdy carrying/storage case with internal cushioning. All components of the set are available individually as replacement parts. Instructions and illustrations for setting up organic glassware for a variety of procedures, (e.g., reflux, simple vs. fractional distillation), may be obtained by requesting Flinn Scientific Publication #10876. Please call or e-mail us to obtain your complimentary copy today.

Catalog No.	Description	Price/Each
AP1546	Organic Chemistry Glassware Set	$825.00

Set contains one each of these pieces (individual replacements available):

Catalog No.	Picture Part Identification No.	Description	Price/Each
AP1632	1	Distilling column, 190 mm length	$151.00
AP1633	2	Condenser, West, 190 mm length	133.75
AP1644	12	Round bottom boiling flask, 25 mL	36.81
AP1641	9	Round bottom boiling flask, 50 mL	39.15
AP1638	6	Round bottom boiling flask, 100 mL	36.25
AP1639	7	Round bottom boiling flask, 250 mL	50.55
AP1646	14	Round bottom boiling flask, 500 mL	57.00
AP1634	3	Funnel, separatory, addition, pear-shaped, 125 mL, PTFE stopcock	153.15
AP1636	4	Thermometer holder, rubber	6.95
AP1637	5	Tube, adapter, straight with thermometer opening	25.00
AP1642	10	Tube, connecting, vacuum	106.60
AP1640	8	Tube, connecting, 3-way	88.40
AP1643	11	Tube, connecting, Claisen	107.00

Organic Distillation Set



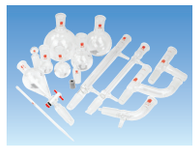
Finally, a low-cost, easy-to-assemble organic distillation set. Perform your favorite distillation activity using this highly specialized equipment. Includes a high-quality distillation head with standard 19/22 leak-free ground glass joints, heavy-duty 100-mL and 250-mL boiling flasks, and durable rubber thermometer holder. Hassle-free assembly and smooth operation. Simplicity at its finest!

Catalog No.	Description	Price/Each
AP6351	Organic Distillation Set	$305.00

ORGANIC CHEMISTRY, GLASSWARE continued on next page.

Organic Chemistry, Glassware, continued

Synthware® Complete Organic Chemistry Kit, 24/40

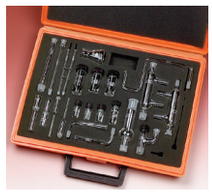


This kit contains every piece of organic chemistry glassware a student needs for the teaching lab.

- Claisen adapter
- Vacuum take-off adapter
- Round bottom flask, 25 mL
- Round bottom flask, 100 mL
- Round bottom flask, 500 mL
- Glass penny-head stopper
- West Condenser, 190 mm jacket
- Distillation adapter, 75° angle
- Inlet/Thermometer adapter
- Round bottom flask, 50 mL
- Round bottom flask, 250 mL
- Separatory funnel, 125 mL
- Bleed tube
- Distillation Column, 200 mm jacket

Catalog No.	Description	Price/Each
AP9769	Synthware Complete Organic Chemistry Kit, 24/40	$583.00

Micro Organic Chemistry Set



Distill, reflux, extract and recrystallize with this deluxe 23-piece borosilicate organic chemistry set. Set contains seven reaction vials in sizes from 0.1 mL to 5.0 mL. Glass components are provided in standard taper sizes 7/10 and 14/10 joint sizes. Complete with heavy-duty storage/carrying case.

Catalog No.	Description	Price/Each
AP2047	Micro Organic Chemistry Set	$775.00

Williamson Microscale Glassware Set



Perform accurate microscale organic chemistry experiments with this high-quality glassware set. Includes a connecting adapter, filter adapter, thermometer adapter, 15-mL centrifuge tube with cap, chromatography column, one-way stopcock, connector with support rod, distillation column and head, 5-mL short and long neck flasks, three 10-mL Erlenmeyer flasks, 25-mL filter flask, Hirsch funnel with disc, five 10 x 100 mm reaction tubes, stainless steel spatula, two sleeve stopper, polyethylene syringe, tubing, 1-mL pipet, and stir bars. Packaged in a foam insert to securely hold glassware in place. Durable plastic case protects glassware in storage.

Catalog No.	Description	Price/Each
AP7859	Williamson Microscale Glassware Set	$372.20

Synthware® Pressure Equalizing Funnels



High-quality glassware for use in the teaching or research lab.

Catalog No.	Description	Capacity	Joint Size	Price/Each
GP9316	Synthware Pressure Equalizing Funnel with 1:5 PTFE Stopcock	125 mL	19/22	$131.42
GP9317		125 mL	24/40	195.25

Synthware® Penny-Head, Glass, Hollow Stopper



Heavy wall design provides tight seal.

Catalog No.	Description	Size	Price/Each
GP9319	Synthware Penny-Head, Glass, Hollow Stopper	14/20	$15.07
GP9320		19/22	16.53
GP9321		24/40	16.86

Soxhlet Extractors

Soxhlet extractors permit the extraction of compounds with limited solubility while using only a minimal amount of solvent. Contains flat bottom boiling flask, Soxhlet extractor and Allihn condenser.

Catalog No.	Description	Capacity	Joint Size	Price/Each
AP9666	Soxhlet Extractors	125 mL	24/40 and 34/45	$301.41
AP9668		500 mL	24/40 and 55/50	296.40

Cellulose Extraction Thimbles

Cellulose extraction thimbles are used in conjunction with a Soxhlet extractor to extract compounds from solid materials. The thimbles are made from cellulose and have a 1.5 mm wall thickness. Package of 25.

Catalog No.	Description	Size	Price/Pkg.
AP9670	Cellulose Extraction Thimbles, Pkg. of 25	33 x 94 mm	$116.55
AP9671		43 x 123 mm	197.75

Organic Glassware Clips



No more rickety setups! Increase the safety of your organic labs with durable clamps that securely hold glassware together. Material is safe to 150 °C, noncorrosive, and will not scratch glass. Easy-to-use and affordable. Package of 10.

Catalog No.	Description	Joint Size	Price/Pkg.
AP7458	Organic Glassware Clips, Pkg. of 10	19/22 and 19/38	$49.95
AP9684		24/25 and 24/40	41.70

Vacuum Sublimation Apparatus



Convenient, small-scale apparatus for purification by sublimation of milligram quantities (1–500 mg) of volatile solids under vacuum. Perfect for organic chemistry labs such as isolation of caffeine and identification of unknowns. High-quality cylindrical flask with a water-cooled, finger-type condenser. Side hose connector for attachment to a vacuum source. Requires vacuum pump (recommended) or aspirator setup.

Catalog No.	Description	Price/Each
AP7911	Vacuum Sublimation Apparatus	$150.90

All-Glass Vacuum Filtration Set



Borosilicate glass. Includes a 300 mL funnel, 1 L flask, base and tubulated cap with a ground glass joint between the cap and flask. An anodized aluminum spring clamp holds the funnel in place. The fritted glass filter support has a filtration area of 9.6 cm^2. Replacement parts are available separately.

Catalog No.	Description	Price/Each
AP9673	All-Glass Vacuum Filtration Set	$312.19

Organic Chemistry, Laboratory Kits See pages 269–270.

Organic Fold-a-matic™

Organic Fold-a-matic

FLINN EXCLUSIVE

By: Bob Becker, Kirkwood High School, Kirkwood, MO

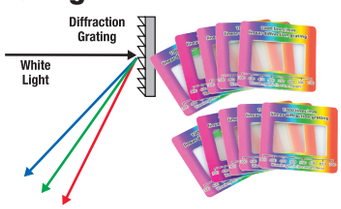


Over 1,300 compounds can be created! The Organic Fold-a-matic™ is a fun and easy way to learn organic nomenclature: just follow the instructions to learn how carbon chains, functional groups, and their names piece together to give you a huge variety of organic compounds. Twenty-four laminated sheets with instructions are provided.

Catalog No.	Description	Price/Each
AP9115	Organic Fold-a-matic	$26.00

Spectroscopy

Holographic Diffraction Grating Film

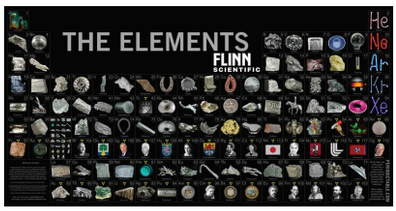


Diffraction grating film (holographic type). A diffraction grating is a plane surface which contains literally tens of thousands of microscopic lines or grooves. A phenomenon called "diffraction" causes white light to be split or diffracted into its component colors. These are replica gratings (copies) placed in 2" x 2" cardboard mounts. Each mount provides approximately one square inch of exposed film. Sold in packages of 10 mounts. 1,000 lines/mm.

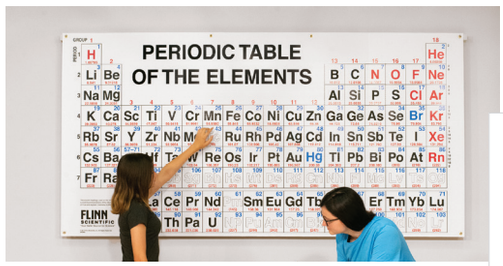
Catalog No.	Description	Price/Pkg.
AP1047	Holographic Diffraction Grating Film	$22.62

SPECTROSCOPY continued on next page.

Periodic Tables

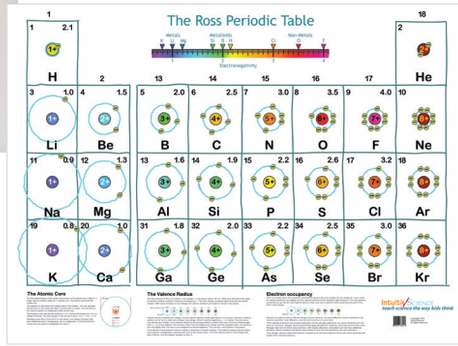


Flinn Scientific's The Elements Periodic Table
AP7156



Periodic Table, Giant
AP7156

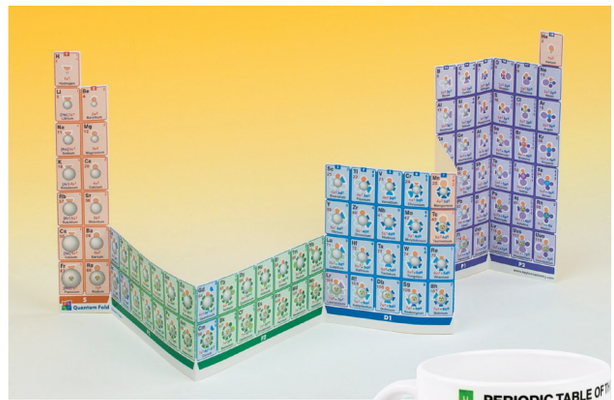
FLINN EXCLUSIVE



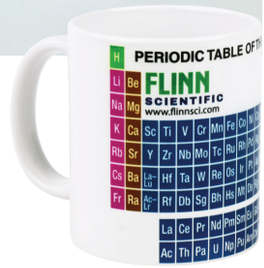
Ross Periodic Table
AP11075

FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

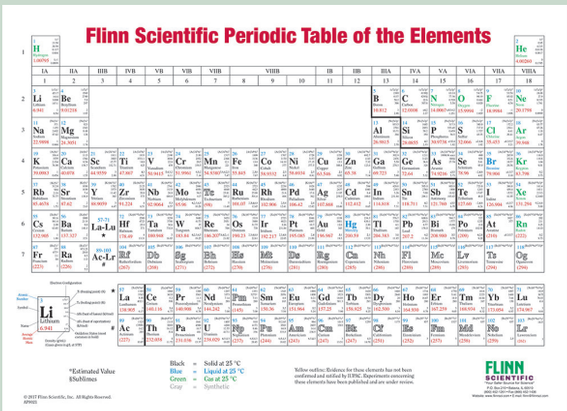
Catalog No.	Description	Price/Each
AP7156	Flinn Scientific's The Elements Periodic Table	$ 40.90
AP11075	Ross Periodic Table	24.08
AP8866	Periodic Table, Giant	224.40
AP8563	Periodic Table, Simplified, Wall Chart	110.16
AP5604	Periodic Table, Fill-In-Form	10.30
AP4240	Periodic Table, Notebook Size	10.98
AP6398	Periodic Table, Pocket Size	16.00
AP7581	Laminated Periodic Table, Notebook Size, Pad of 30	32.76
AP9021	Flinn Periodic Table , Two-Sided Hanging Wall Chart	105.06
AP4530	Flinn Periodic Table, One-Sided Roller-Mounted Chart	149.94
AP9020	Flinn Periodic Table, Notebook Size, Package of 50	32.54
AP6580	Periodic Table Labels	7.50
AP8093	Quantum Periodic Table, Foldable	36.85
AP8065	Periodic Table, Multicolored, Wall Chart	81.60
AP8066	Periodic Table, Multicolored, Wall Chart, with Spring Roller	155.04
AP9889	Flinn Periodic Table Magnet	2.58
AP9888	Flinn Periodic Table Mug	14.00
AP7540	The Elements Card Deck	32.25
AP7597	Periodic Table Jigsaw Puzzle	22.10
AP10651	Periodic: A Game of the Elements	47.05



Quantum Periodic Table, Foldable
AP8093



Flinn Periodic Table Mug
AP9888



- ***Colorful***
- ***Teacher-Developed***
- ***Vital Information***
- ***Historical Background***

Flinn Periodic Table
AP9021, etc.

FLINN EXCLUSIVE

Flinn Scientific Laboratory Techniques Guide

By: The Flinn Staff



What is the proper procedure for lighting a Bunsen burner? Is this a crucible or an evaporating dish? How do I filter this mixture?

This handy reference guide has beautiful color illustrations of lab glassware and equipment to help you teach more effectively and safely. Guide contains 16 "How To" boxes describing the most common lab techniques—lighting a lab burner, heating a crucible, filtering and decanting, using a buret and pipet, collecting a gas by water displacement and distilling liquids to name a few. A convenient Periodic Table is also provided on the back side with element names, symbols, atomic weights and color-coded families.

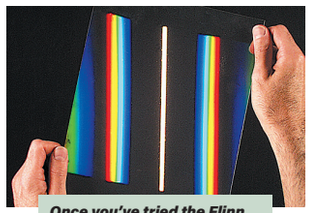
Designed for individual student use, the 11" x 17" guide is printed on durable, glossy paper and folds in half to easily fit into a binder or notebook. Reinforced, pre-punched left edge allows the guide to stand up to daily student use. Sold in packages of 30.

Catalog No.	Description	Price/Pkg.
AP6248	Flinn Scientific Laboratory Techniques Guide, Pkg. of 30	$21.55

Spectroscopy, continued

Flinn C-Spectra®—The Diffraction Grating Alternative

FLINN EXCLUSIVE



Once you've tried the Flinn C-Spectra® you'll never want to use a spectroscope again!

Wow! That's what students will say when they see the colors of the spectrum using the Flinn C-Spectra®. The vivid spectrum with distinct color separations helps students understand and enjoy the spectrum. The best feature of all is that you'll no longer need to strain your eyes using those old spectroscopes. No matter where you look through the C-Spectra, you will always easily see the spectrum. C-Spectra won't bust your budget either. One 8" x 10" sheet can be cut to provide 30 1½"-square pieces—enough for an entire class. 200 lines/mm.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP1714	Flinn C-Spectra®, 8" x 10" sheet	$15.30

Tie-Dyeing

Tie-Dyeing—Chemistry Fun Student Activity Kit

FLINN EXCLUSIVE

By: Penney Sconzo, Westminster School, Atlanta, GA, and Elenore Grow, Horizon H.S., Brighton, CO



Tie-dyeing is not only a lot of fun, but also a great way to teach chemistry concepts. Whether you teach beginning chemistry or AP® Chemistry, your students will find tie-dyeing a memorable learning experience. Includes 120 jumbo Beral-type pipets, 120 rubber bands, 45 grams each of yellow, red, blue and green reactive dyes, 500 grams of sodium carbonate activator, 650 grams of urea and complete instructions on how to tie-dye.

Complete for 30 students working individually. 100% cotton T-shirts are required, but not included.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8700	Tie-Dyeing—Chemistry Fun Student Activity Kit	$103.73

Rainbow Tie-Dyed Lab Coats

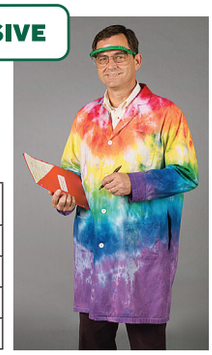
Show students your stylish side when you teach in your new tie-dyed lab coat!

Tie-Dying Supplies

Catalog No.	Description	Price/Each
AP8701	Pipets, Jumbo, Beral-type, pkg. of 120	$18.90
AP8702	Urea, 650 g	18.00
S0052	Sodium Carbonate, 500 g	10.25
AP8704	Reactive Dye, Yellow, 45 g	15.25
AP8705	Reactive Dye, Red, 45 g	14.75
AP8706	Reactive Dye, Blue, 45 g	17.90
AP8707	Reactive Dye, Green, 45 g	22.00
AP8882	Reactive Dye, Royal Purple, 45 g	17.95
AP8883	Reactive Dye, Orange, 45 g	15.70
AP8884	Reactive Dye, Hot Pink, 45 g	10.55
AP8885	Reactive Dye, Turquoise, 45 g	19.45
AP8886	Reactive Dye, Sky Blue, 45 g	19.45
AP8887	Reactive Dye, Black, 45 g	33.50

FLINN EXCLUSIVE

Rainbow Tie-Dyed Lab Coat



Knee-length coat features three roomy pockets and a button-down design. Sleeves are made slightly shorter for working with chemicals. Available in four sizes.

Catalog No.	Description	Size	Men's Coat Size	Price/Each
AP6304	Rainbow Tie-Dyed Lab Coat	S	36	$89.95
AP6293		M	40	89.95
AP6294		L	44	89.95
AP6295		XL	48	89.95

Chemistry of Toys—Balloons



Balloons, Helium Quality, Pkg. of 20 AP1900



Balloon Needle Demonstration Kit AP1969

Balloons

12" latex balloons, helium quality, assorted colors, sphere shaped.

Catalog No.	Description	Price/Pkg.
AP1900	Balloons, Helium Quality, Pkg. of 20	$6.45

Balloon Needle Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Have you ever seen someone put a needle through a balloon without the balloon popping? It can be done! We will tell you how and provide you with the proper type of needle and accessories to make you an expert. Detailed instructions and teaching tips are included. Balloons are required and available separately.

Catalog No.	Description	Price/Each
AP1969	Balloon Needle Demonstration Kit	$24.65

Fluorescent Magic Sand

NEW!



Magic Sand is regular sand that has been dyed and coated with a hydrophobic material—a substance that repels water. The coating on the outside of the magic sand repels water and keeps the sand dry. Simply remove the sand from the water with a spoon...it is perfectly dry. Available in three fluorescent colors. Comes in one pound packages.

Catalog No.	Description	Color	Price/Each
AP11842	Fluorescent Magic Sand	Blue	$15.00
AP11843		Pink	15.00
AP11844		Green	15.00

CHEMISTRY OF TOYS continued on next page.

Chemistry of Toys—Cartesian Divers

Cartesian Diver Construction—Super Value Kit

By: Bob Becker, Kirkwood H.S., Kirkwood, MO



Students learn the relationship between pressure and air volume and how air volume acts to regulate buoyancy by constructing Cartesian divers made of simple equipment and materials. Procedures for constructing 11 different types of Cartesian divers are provided.

Super Value Kit is complete with 100 pipets and hex nuts. Requires water and 2-liter soda bottles. Includes Flinn Exclusive STEM Integration Guide.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP9082	Cartesian Diver Construction—Super Value Kit	$37.30

Cartesian Diver Pump Cap "Fizz-Keeper"



Take the squeeze out of your cartesian divers with this easy-to-use pump cap, commonly known as the Fizz-Keeper. Simply screw the pump cap onto the 2-liter bottle, pump the cap a few times to change the pressure in the bottle, and watch as your Cartesian divers sink to the bottom of the bottle—no more squeezing needed.

Catalog No.	Description	Price/Each
AP4676	Cartesian Diver Pump Cap "Fizz-Keeper"	$5.20

Chemistry of Toys—Crystals

The Crystal Forest—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



A new twist on crystal growing! In this activity, students cut out and assemble miniature paper trees. The trees are placed in a solution of Prussian blue, sodium chloride, and ammonia. Overnight the trees become "snow-covered" in a thick, delicate envelope of salt crystals. This beautiful white forest is sure to be a classroom favorite. Includes detailed instructions and a reproducible student worksheet.

Complete for 30 students, each making one tree. Super Value Kit is complete for 5 classes of 30 students.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6307	The Crystal Forest—Student Laboratory Kit	$43.65
AP6308	The Crystal Forest—Super Value Kit	104.50

Magic® Tree



It is a miniature artificial tree that grows. Ornamental buds appear in 15 minutes and magically grow into an extraordinarily beautiful and delicate tree. Tree size is 2¼" tall. Wonderful crystal-growing lab.

Catalog No.	Description	Price/Each
AP1929	Magic Tree	$5.05

Laundry Bluing



Grow beautiful salt crystals using laundry bluing. Lots of fun for everyone! Recipe included. Other ingredients needed for this activity: charcoal blocks or other porous material, salt, ammonia and food coloring. 8-oz bottle.

Catalog No.	Description	Price/Each
B0220	Laundry Bluing	$10.05

Chemistry of Toys—Density

Steel Sphere Density Set



Boggle your students' minds with this fun density set! Both spheres weigh the same, but have different volumes. Which will sink? Which will float? Have fun discussing density, mass and volume with this density set!

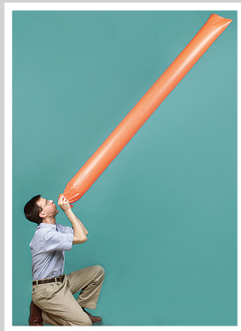
Catalog No.	Description	Price/Each
AP9910	Steel Sphere Density Set	$35.25

Chemistry of Toys—Energy

Hand Boiler See page 398.

Two-Potato Clock See page 398.

Chemistry of Toys—Forces



Wind Bag
AP8767



Drinking Bird
AP9292



Tornado Tube
AP1930

Wind Bag

The wind bag is an 8-foot plastic tube which with a little practice can be blown up with one breath.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8767	Wind Bag	$4.95

Drinking Bird

Truly a classic demonstration. Teach thermodynamics and pressure, and have fun at the same time. Instruction sheet provided.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP9292	Drinking Bird	$12.65

Tornado Tube

Create a tornado using two empty plastic soft drink bottles. This unique toy employs hydraulic principles to create the vortex of a tornado. The Tornado Tube can be used over and over again.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP1930	Tornado Tube	$5.75

Chemistry of Toys—Heat

The Heat Solution Instant Handwarmer



A vinyl pouch contains a supersaturated solution of sodium acetate. When pressure is applied to a metal activator, a seed crystal forms in the solution and triggers the entire solution to crystallize. As the solution changes physical state (liquid to solid), it increases in temperature to 130 °F. The heat will last for over 30 minutes. The vinyl pouch can be easily regenerated and used over and over again.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP1933	The Heat Solution Instant Handwarmer	$11.11

CHEMISTRY OF TOYS continued on next page.

Chemistry of Toys—Heat, continued

Mini Hand Warmers

Each Mini-Mini Hand Warmers packet contains iron, water, cellulose, vermiculite, activated carbon and salt. When taken out of its sealed pouch, the iron will immediately oxidize and generate heat. This "heat source" will last up to seven or more hours and may reach temperatures as high as 150 °F (60 °C). Teacher instructions provided.

Catalog No.	Description	Price/Pkg.
AP1931	Mini Hand Warmers, Pkg. of 2	$3.15

Flameless Ration Heater



The Flameless Ration Heater is most commonly used by the U.S. military to heat food pouches called Meals—Ready to Eat. This ration heater not only allows soldiers to eat a hot meal in the field but also aids in the relief of victims of natural disasters. Learn how the super-corrosion of magnesium produces enough heat to warm a meal in 15 minutes and keep it warm for up to an hour. Detailed teacher notes included. ▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8695	Flameless Ration Heater	$3.95

Magnesium Fire Starter

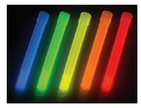


A demo your students will not soon forget! A quick and easy demonstration of how a substance at roomtemperature can reach 5400 °F when sparked. Can lead to discussions of the laws of thermodynamics and many other chemistry principles.

Catalog No.	Description	Price/Each
AP8740	Magnesium Fire Starter	$10.31

Chemistry of Toys—Light

Light Sticks



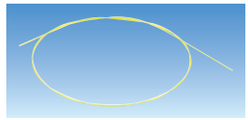
Create your own chemiluminescence! Each light stick will provide up to 12 hours of fun. Many interesting demonstrations are possible.

Catalog No.	Description	Price/Each
AP1443	Light Stick, Green	$4.05
AP2066	Light Stick, Red	4.00
AP2067	Light Stick, Blue	3.85
AP2068	Light Stick, Yellow	4.00
AP2069	Light Stick, Orange	3.85

Fiber Optics Strand

FLINN EXCLUSIVE

By: The Flinn Staff



Fiber-optic material that seems to glow on its own! It glows non-stop. Place your fingers over both ends, and it will still shine on your fingers! How does this "light pipe" work? Includes a 30" length of the fiber and instruction guide.

Catalog No.	Description	Price/Each
AP4558	Fiber Optics Strand	$14.50

Rainbow Glasses



Bright lights explode into crystal clear spectra after you put on Rainbow Glasses. Teach your students about color, light, refraction and line spectra with these simple, cardboard spectacles. Inexpensive, colorful and lots of fun. 531.5 lines/mm.

Catalog No.	Description	Price/Each
AP1949	Rainbow Glasses	$2.28

Chemistry of Toys—Magnets

Magnetic Activities See page 397.

FLINN EXCLUSIVE

Printable Magnetic Paper



Customize and print your own signs, directions, warnings, or symbols on this high quality, durable, magnetic 8½" x 11" paper. Runs through any inkjet printer. Easily trimmed with scissors to meet your needs. Package of 4 sheets.

Catalog No.	Description	Price/Pkg.
AP6568	Printable Magnetic Paper	$17.70

Chemistry of Toys—Polymers

Ghost Crystals

FLINN EXCLUSIVE



A vial appears to contain only water and a small string hanging down into it. When the string is lifted out, a large shiny crystal is found to be tied up in the noose. When the string is lowered back into the water, the crystal again becomes invisible! Instructions included.
▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
G0050	Ghost Crystals, 100 g	$10.50

Sodium Polyacrylate



Instantly absorbs more than 800 times its weight in water. Instructions included.
▶ See free video at fli nnsci.com.

Catalog No.	Description	Size	Price/Each
W0013	Sodium Polyacrylate, Synthetic, Powder	100 g	$12.38
W0014		500 g	32.91

Fortune Teller Fish



Made of a hygroscopic polymer, the red cellophane 3½" fish expands as it absorbs water. The moisture from your hand therefore determines the amount of curling or movement of the fish.

Catalog No.	Description	Price/Pkg.	Price/Pkg. 12 Pkg. or more
AP5449	Fortune Teller Fish	$2.95/12	$2.54/12

FLINN EXCLUSIVE

Enviro-Bond™, 403



Enviro-Bond™ 403 is a superabsorbent polymer used to clean up oil spills. It actually encapsulates the Marvel Mystery Oil, listed below, and floats to the surface. Instruction sheet provided.

Catalog No.	Description	Price/Each
E0058	Enviro-Bond™ 403	$13.50
AP8927	Marvel Mystery Oil®, 16 oz.	17.53

Super-Duper Polymer Gel—Chemical Demonstration Kit

FLINN EXCLUSIVE

By: Walter Rohr, Retired Chemistry Teacher



When a small amount of a white powder is sprinkled into a liquid and water is added, it transforms into a thick, viscous gel. When poured back and forth between two beakers, the gel begins to take on a life of its own and literally defies gravity by crawling up and out of the beaker. Teacher Demonstration Notes included. Ethanol or methanol (25 mL per demo) and water are required, but not provided.

Catalog No.	Description	Price/Each
AP4556	Super-Duper Polymer Gel—Chemical Demonstration Kit	$16.45

CHEMISTRY OF TOYS continued on next page.

Chemistry of Toys—Polymers, continued

Silly Putty®

Everyone knows what Silly Putty® looks like and what it can do. But do you know what gives Silly Putty its unique characteristics? We will discuss Silly Putty's unique properties and even provide you with the complete recipe to make your own.



Catalog No.	Description	Price/Each
AP1962	Silly Putty®	$5.60

Polyurethane Foam System—Chemical Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Try this amazing demonstration! Simply mix two viscous liquids together and watch as the mixture expands to about 30 times its original volume. The result is a hardened, lightweight polyurethane foam. Teacher Demonstration Notes included.

See free video at flinnsci.com.

Catalog No.	Description	Size	Price/Each
C0335	Polyurethane Foam System—Chemical Demonstration Kit	500 mL	$ 39.15
C0442		4 L	297.35
V0003	Food Coloring Dyes, Set		7.75

Polymer Bead—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



A gravity-defying demonstration that will stop students in their tracks! A beaker is filled with a 50-foot-long string of beads. With just a slight pull on one end of the chain, the beads will suddenly lift themselves out of and come tumbling over the side of the upright beaker. Demonstration Notes included.

Catalog No.	Description	Price/Each
AP6647	Polymer Bead—Demonstration Kit	$24.00

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM

FLINN EXCLUSIVE

Slime for Everyone! Student Laboratory Kit

By: The Flinn Staff



Slime, slime, and more slime—it stretches, it flows, it even picks up ink! Includes background information, easy-to-follow procedure, observation/analysis activities, polyvinyl alcohol solution, sodium borate solution, plastic cups, and wood sticks. Full-size kits complete for 30 students. Small-size kits complete for 10 students. Refill kits contain materials only.

Catalog No.	Description	Type	Price/Each
AP5393	Slime for Everyone! Student Laboratory Kit	Full-Size Kit	$39.05
AP10114		Full-Size, Refill Kit	29.65
AP10192		Small-Size Kit	18.50
V0003	Vegetable Dyes, Set of 4		7.75

Slime, Preparation Chemicals

FLINN EXCLUSIVE



One of the most entertaining and educational polymer experiments around is the making of "Slime." Everyone loves to make slime! Below are the necessary ingredients to make two types of slime, guar gum or polyvinyl alcohol slime. Both types of slime use sodium borate as the second ingredient.

Guar gum slime is the easiest and fastest to prepare and is an excellent choice for elementary and junior high school teachers. However, the consistency of this slime is not quite as good as the polyvinyl alcohol slime and may be clumpy if the guar gum powder is added too quickly to the water. Polyvinyl alcohol slime requires a bit more preparation time and may be touchy to make, especially if you are starting with the powders rather than the 4% solutions. However, it makes fantastic "slimey" slime. Teachers with a magnetic stirrer/hot plate may want to make polyvinyl alcohol slime. With either option you'll enjoy making slime with your students!

Catalog No.	Description	Size	Price/Each
G0040	Guar Gum, Powder	500 g	$31.45
P0154	Polyvinyl Alcohol, Powder	500 g	32.70
P0209	Polyvinyl Alcohol Solution, 4%	500 mL	11.47
P0210		1 liter	20.55
P0211		4 liters	59.75
S0363	Sodium Borate Solution, 4%	500 mL	7.75
S0364		1 liter	13.60

Shrink Plastic, Printable

Simply print your computer image on the sheet, follow the baking instructions, and the sheet will shrink to one-fourth its original size and become nine times thicker. Great for computer graphics, letters, and more. Also can be written on with markers. Sheet size is 8½" x 11".

Catalog No.	Description	Price/Each
AP5451	Shrink Plastic, Printable	$10.25

Water Marbles



Now you see them—now you don't! The refractive index of water marbles is so close to that of water that the marbles "disappear" when placed into water. The polyacrylamide polymer spheres are stored dry, but after soaking for several hours, they will absorb 200 times their weight in water. Instructions are included.

Catalog No.	Description	Price/Each
AP7497	Water Marbles, 100 g	$17.25

Chemistry of Toys—Solubility

Happy/Sad Balls

FLINN EXCLUSIVE

One large rubber ball will bounce very high; the other large rubber ball will hit the ground and not bounce. One Happy and one Sad Ball are included in each package.

Catalog No.	Description	Price/Pkg.
AP1971	Happy/Sad Balls	$16.05

Melting Mole Dollars

FLINN EXCLUSIVE

Learn about water soluble paper as you dissolve Avogadro's mole dollar. Sold in a package of 50.

Catalog No.	Description	Price/Pkg.
AP8678	Melting Mole Dollars	$17.15

Video Cameras



Document Camera

This high resolution document camera is an easy way to integrate technology into your classroom! See full specification details at flinnsci.com.

Catalog No.	Description	Price/Each
AP7641	Document Camera	$1459.50

Forensics

Flinn Scientific offers kits and supplies focusing on all aspects of the exciting world of forensic science **for students to explore ballistics, DNA evidence, fingerprinting and more.**

315 **Ballistics**
315 **Blood Evidence**
319 **Comprehensive Crime Scene**
321 **Crime Scene Supplies**
316 **DNA Evidence**
317 **Document Evidence**
317 **Drug Evidence**
318 **Entomology**
318 **Fibers**
318 **Fingerprinting**
314 **Flinn Forensic Files**
318 **Footwear & Print Casting**
321 **Forensic Books**
321 **Glass Analysis**

Flinn **Forensic Files™**

FLINN EXCLUSIVE

Can your students solve the mystery of the Flinn Forensic Files™? These student laboratory kits are a great introduction to a variety of forensic science investigative techniques. The wide array of topics include fingerprint analysis, ink chromatography, fiber analysis, footwear impressions, ballistics and DNA investigations.

Each kit contains a case background and a technical background. The detailed case backgrounds provide the interesting backstory of a fictional crime to give students an example of a type of case in which this specific lab analysis would be required. The story helps students relate the skills they are learning to actual crime scene analysis. The technical background explains the science behind the techniques used in the laboratory experiment. Students assume the role of investigative scientists and apply real-world techniques to solve the mystery.

Each kit in the series may be purchased individually or together as a convenient, cost-saving bundle. Your students may even discover that the crimes are connected... or are they? Find out and have fun while learning with the Flinn Forensic Files Student Laboratory Kits!

Flinn Forensic Files™

Catalog No.	Inquiry Lab	Price/Each
AP7750	**Flinn Forensic Files—Ballistics**	$ 49.20
AP7761	**Flinn Forensic Files—DNA Verification**	98.71
FB2096	**Flinn Forensic Files—Finding Evidence in Fibers**	37.00
FB2094	**Flinn Forensic Files—Fingerprint Exploration**	59.70
AP7752	**Flinn Forensic Files—Footwear Evidence**	187.97
AP7745	**Flinn Forensic Files—Ink Inspection**	75.79



Flinn Forensic Files—DNA Verification
AP7761



Flinn Forensic Files—Footwear Evidence
AP7752

Accessories

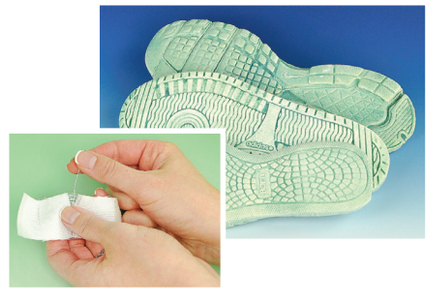
Catalog No.	Description	Price/Each
AP8400	Tape Measure, 10'	$ 9.75
FB0316	Dual Power Supply	297.65
AP7749	Footwear Evidence—Individual Kit	39.14

Flinn Forensic Files—6-Kit Bundle

Cost-saving, comprehensive bundle includes all 6 Flinn Forensic Files investigation labs! Solve the mystery with a set of kits that creates a consistent, widespread understanding of forensic science.

A six-gel eletrophoresis apparatus and dual power supply are required and available separately.

Catalog No.	Description	Price/Each
AP7917	Flinn Forensic Files—6-Kit Bundle	$350.00
FB0316	Dual Power Supply	297.65



Ballistics

Flinn Forensic Files—Ballistics See page 314.

Gunshot Residue—Forensics Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff

When a gun is fired, a series of chemical reactions occurs and chemicals are quickly dispersed into the surrounding environment. The chemicals are likely to be on the gun, in the gun, on the shooter, in the air, on nearby objects and on objects struck by the bullet. Learn the chemical tests used by forensic scientists as they track down gunshot residue. Revealing these unseen telltale chemical residues can be very significant at a crime scene and very motivating for your students.

Concepts: Firearm chemistry, nitrate testing, lead testing, false positive, false negative, presumptive test.

Time Required: 15 minutes

Materials Provided: Cotton swabs, Beral-type pipets, diphenylamine solution, sodium rhodizonate solution, lead nitrate solution, copper nitrate solution.

Catalog No.	Description	Price/Each
FB1645	Gunshot Residue—Forensics Demonstration Kit	$49.72



Understanding Bullets Set

FLINN EXCLUSIVE

By: The Flinn Staff

This set of seven bullets includes the following types: jacketed, semi-jacketed, hollowpoint, semi-jacketed softpoint, lead round nose, semi-wadcutter and wadcutter. These hands-on examples are sure to engage students in forensic studies! Includes information that details the physical characteristics each type of bullet. This school-safe set does not include cartridge case, primer or gunpowder.

Catalog No.	Description	Price/Each
AP7921	Understanding Bullets Set	$27.91

Blood Evidence

Bloodstains at the Crime Scene—Forensic Laboratory Kit

FLINN EXCLUSIVE

By: Gary Schiltz, Retired, Glenbard West H.S., Glen Ellyn, IL

Students will utilize simulated blood and blood typing sera to learn the principles of blood typing procedures. They will extract and type blood from items found at a mock crime scene and determine possible connections to potential suspects.

Complete for 30 students working in pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs. Refill Kit also available.

Catalog No.	Description	Price/Each
AP6502	Bloodstains at the Crime Scene—Forensic Laboratory Kit	$ 57.08
AP7610	Bloodstains at the Crime Scene—Super Value Laboratory Kit	116.58
AP9590	Bloodstains at the Crime Scene—Refill for Super Value Kit	74.85

Bloodstain Pattern Analysis—Forensic Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

In this lab, simulated blood is used to collect data in bloodstain patterns. Students drop simulated blood under controlled conditions in the laboratory. By controlling the height and angle of each drop, students can analyze spatter patterns and use the trends like a criminalist to analyze the origin of unknown bloodstains. Includes simulated blood, crime scene unknowns, pipets, rulers, protractors, student laboratory directions and teacher background information.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB1643	Bloodstain Pattern Analysis—Forensic Laboratory Kit	$44.26
FB1876	Simulated Blood, 500 mL	34.00

Presumptive Blood Test—Forensic Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff

For this activity, objects in your crime scene can be "seeded" to provide positive color tests for "simulated blood" when sprayed with the phenophthalein test solution. The test is fast and easy and is thus ideal for use in the first moments at a crime scene. Crime scene investigators like this test even if the results are only "presumptive" and not considered hard proof. Comes complete with teacher background and directions.



Catalog No.	Description	Price/Each
FB1646	Presumptive Blood Test—Forensic Demonstration Kit	$28.97

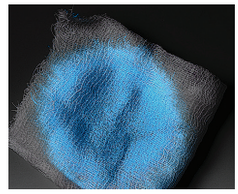
Blood Typing Kits See page 406.

Forensic Glow—Blood System Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff

A chemiluminescent blood detection solution similar to the type used by actual forensic scientists! As the blood detection solution comes in contact with simulated blood, a bright blue glow appears. Includes detailed instructions and enough materials to perform the activity over 50 times. No blood or blood products are used.



Catalog No.	Description	Price/Each
AP6292	Forensic Glow—Blood System Demonstration Kit	$25.44

Who Cheated in the Race? Red Blood Cell Volume Forensic Laboratory Kit

FLINN EXCLUSIVE

By: Diane Sweeney, Punahou School, Honolulu, HI

Students conduct a hematocrit of several simulated blood samples and compare their data with other groups' test results. Includes complete instructions with reproducible student handouts, detailed background information, and valuable Teacher Notes.

Complete for 15 groups of students. Activity is a chemical simulation and contains no actual blood or blood products.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
FB1998	Who Cheated in the Race? Red Blood Cell Volume Forensic Laboratory Kit	$34.90

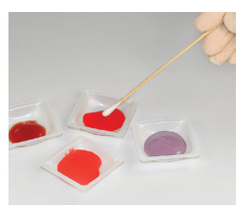
Kastle-Meyer Presumptive Blood Testing—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Four evidence samples, that may contain blood, are taken from a crime scene. Students perform the Kastle-Meyer test on each sample as a presumptive test to determine if further examination is needed.

Complete for 30 students working in pairs. Approximately 20 mL of real blood are required, but not included. This can be obtained from a local butcher.



Catalog No.	Description	Price/Each
AP7762	Kastle-Meyer Presumptive Blood Testing—Student Laboratory Kit	$36.30

DNA Evidence

Kastle-Meyer Reagent—Forensic Test



Simply wipe a presumptive bloodstain with a cotton swab, add a drop of the reagent, and then apply a drop of hydrogen peroxide. If the swab turns pink rapidly, it is positive for blood! For a terrific guided-inquiry forensic activity, use the Kastle-Meyer reagent to investigate substances that will interfere with the test to give false positives.

Catalog No.	Description	Price/Each
AP7555	Kastle-Meyer Reagent, 100 mL	$13.25

Who's the Daddy? DNA Profiling—Super Value Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students cut fragments to simulate restriction enzyme digestion and then separate the fragments by size in a simulated gel. Next the DNA fragments are "denatured" (cut into single strands), "blotted" (pattern copied onto a sheet of paper) and treated with simulated radioactive probes that combine with only specific base sequences. Includes black-line masters of simulated DNA segments, "radioactive probe" locators, electrophoresis gel blotter, magnetic tape and zipper-lock bags.

Super Value Kit is complete for 30 students in groups of 6. All materials are reusable.

Catalog No.	Description	Price/Each
FB1758	Who's the Daddy? DNA Profiling—Super Value Kit	$23.30

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

DNA Forensics—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Use this nonviolent scenario to teach your students about DNA electrophoresis and forensics! Includes student and teacher instructions, plus a crime report, and all the materials necessary to run six gels.

*Complete for 6 student groups. Super Value Kit is complete for 30 student groups. Requires electrophoresis apparatus and power supply. DNA source is Lambda phage.**

Catalog No.	Description	Price/Each
FB2054	DNA Forensics—Super Value Laboratory Kit	$275.50

DNA Paternity Testing—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students learn about restriction enzymes, DNA inheritance and important electrophoresis techniques with this engaged lab experience. This kit contains information about paternity testing and DNA analysis plus step-by-step procedures, questions and Teacher Notes.

*Complete with enough materials to run six gels. Requires electrophoresis apparatus and power supply. DNA source is Lambda phage.**

Catalog No.	Description	Price/Each
FB1799	DNA Paternity Testing—Student Laboratory Kit	$131.46

DNA Fingerprinting—Electrophoresis at Work—Super Value Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Students will interpret the evidence against a list of possible suspects and attempt to solve the mystery. The design of the activity affords the teacher the flexibility to alter case outcomes from class to class and even manipulate evidence. Kit includes in-depth background material, teacher preparation and instruction tips, student copies of case descriptions and investigation reports and reproductions of evidence and suspect electrophoresis gels.

Super Value Kit is complete for 30 students working in pairs. All materials are reusable.

Catalog No.	Description	Price/Each
AB1370	DNA Fingerprinting—Electrophoresis at Work—Super Value Kit	$67.79

A Murder Mystery—DNA Fingerprinting—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Students match "pop bead" DNA fingerprints of the suspects with samples collected at the scene of the crime. Students learn the basics of DNA fingerprinting, DNA structure and extraction, gel electrophoresis and autoradiography and the accuracy of DNA fingerprinting.

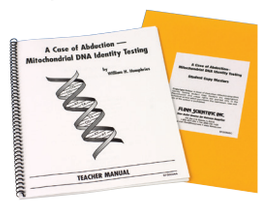
Full-size kits are complete for 30 students in groups teams of 10 students. Small-size kits are complete for 15 students in groups of 5. Refill kits contain materials only.

Catalog No.	Description	Type	Price/Each
FB1566	A Murder Mystery—DNA Fingerprinting—Super Value Laboratory Kit	Full-Size Kit	$147.45
AP10331		Full-Size, Refill Kit	134.50
AP10332		Small-Size Kit	100.10
AP10333		Small-Size, Refill Kit	92.00

A Case of Abduction—DNA Identity Testing Simulation

FLINN EXCLUSIVE

By: William Humphries, Richardson H.S., Richardson, TX



- "Digest" short, 60 base-pair sequences of mitochondrial DNA using Hae III restriction enzyme.
- Determine the sizes of the resulting "fragments" and use a standard curve to plot the migration distance for each fragment on a paper "gel."
- Label the separated fragments with a "radioactive probe sequence."
- Interpret the results to determine the true parentage of a child.

Includes extensive background information, objectives, reproducible student copy masters, detailed results, study and follow-up questions, glossary and extension ideas. The activity is designed to be conducted by cooperative teams and can be completed in two class periods.

Catalog No.	Description	Price/Each
FB0506	A Case of Abduction—DNA Identity Testing Simulation	$45.10

Dyeing for Forensics—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Six simulated DNA samples are analyzed using gel electrophoresis to determine which family described in the scenario is entitled to receive the mementos and money. This activity is a simulation of the type of analysis made using DNA fingerprinting with two special cases of relatedness testing—Y chromosome and mitochondrial DNA testing—newer methods often used on old or degraded DNA. Since simulated DNA is used, the dyeing step is not necessary. Colorful bands are visible after the gel has run for 15–20 minutes, and results are read during the same lab period.

Complete for 20 gels. Requires electrophoresis apparatus and power supply.

Catalog No.	Description	Price/Each
FB2023	Dyeing for Forensics—Super Value Laboratory Kit	$78.85

Document Analysis

Document Analysis—Forensic Investigation Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Your students will experience five investigative techniques as they collect evidence and establish standards for analyzing crime scene documents. Their analyses will establish the level of authenticity of crime scene documents. Pencils, pens, paper samples, chromatography paper and necessary chemicals are provided as well as detailed student and teacher materials.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP1777	Document Analysis—Forensic Investigation Laboratory Kit	$106.61

Counterfeit Money Detector Pen

Just place a mark anywhere on the suspect bill. If the mark stays amber, the bill is genuine U.S. currency; if the mark turns black, the money may be counterfeit. Ordinary paper contains starch, while U.S. currency paper does not. The pen "ink" contains an iodine-potassium iodide solution that when combined with starch, produces a characteristic blue complex.

Catalog No.	Description	Price/Each
AP6567	Counterfeit Money Detector Pen	$11.10

Drug Evidence

Analysis of Over-the-Counter Drugs—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Learn to analyze and identify over-the-counter (OTC) drugs and common antacids. Students test a variety of physical and chemical properties of actual OTC drug samples and then use their test results to analyze unknown pain reliever and antacid samples. Teacher Notes and reproducible student handouts included.

Complete for 30 students working in pairs. Fifteen 24-well reaction plates are needed and available separately.

Catalog No.	Description	Price/Each
AP5603	Analysis of Over-the-Counter Drugs—Student Laboratory Kit	$70.00
AP1447	Reaction Plate, 24-well	4.75

Identification of Unknown Substances I—Forensic Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

In this activity, students will assume the role of a crime lab chemist and create a set of standards for the identification of four simulated drugs. Students will perform chemical tests on an "unknown" simulated drug found at a crime scene. All simulated drugs and chemical test materials are provided as well as detailed teacher and student materials.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB1644	Identification of Unknown Substances I—Forensic Laboratory Kit	$109.00

Identification of Unknown Substances II—Forensic Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Your advanced students will enjoy using thin-layer chromatography and will marvel at the precision that can be achieved with this chemical separation technique. Kit includes TLC plates, development jars, microcapillary tubes, test solutions and developing chemicals.

Complete for 30 students working in pairs. A short-wave UV light source is required.

Catalog No.	Description	Price/Each
FB1648	Identification of Unknown Substances II—Forensic Laboratory Kit	$145.92
AP6658	Ultraviolet Lamp, Short Wave	146.53



Document Analysis—Forensic Investigation Laboratory Kit AP1777



Counterfeit Money Detector Pen AP6567



Analysis of Over-the-Counter Drugs—Student Laboratory Kit AP5603



Identification of Unknown Substances I—Forensic Laboratory Kit FB1644



Identification of Unknown Substances II—Forensic Laboratory Kit FB1648

Entomology

Of Maggots and Murder—Forensic Entomology Laboratory Kit

FLINN EXCLUSIVE

By: Lisa Carloye, Washington State University, Pullman WA

Was it murder? Students learn how to collect evidence and relevant data and use the information to solve the case. Simulated maggots will be used to determine the time and cause of death for four different simulated crime scenes.

Complete for 30 students working pairs.

Catalog No.	Description	Price/Each
AP7028	Of Maggots and Murder—Forensic Entomology Laboratory Kit	$79.79

Fibers

Flinn Forensic Files—Finding Evidence in Fibers

See page 314.

Forensics of Fibers—Student Laboratory Kit

Six different types of fibers are examined using a burn test and dye analysis to discover their unique physical and chemical properties and determine the identity of each. This kit includes all the necessary materials, complete Teacher Notes and an optional microscopy extension activity.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB2022	Forensics of Fibers—Student Laboratory Kit	$40.55

Footwear and Print Casting

Forensic Footwear Impression System

Press, spray, pour—three fun and easy steps to create permanent footwear castings! Press the footwear into the unique BioFoam® block, spray a thin coating of Dust and Dirt Hardener, and then mix and pour in the Shake-N-Cast™ ready-to-use casting material. You can also use the Shake-N-Cast™ and Dust and Dirt Hardener to cast prints from soil or sand.



Catalog No.	Description	Price/Each
AP7755	BioFoam® Footwear Impression	$18.36
AP7756	Aerosol Dust and Dirt Hardener	25.65
AP7754	Shake-N-Cast™ Impression Kit	28.92

Flinn Forensic Files—Footwear Evidence

See page 314.

Casting Frame

Making footwear and tire impressions in the field just got easier! Disposable casting frames hold the casting material in place until it hardens. Each frame consists of two strips of heavy-duty, moisture-resistant, corrugated material, which can be assembled in seconds using the adhesive tabs. The size of the frame can be adjusted to accommodate most shoe impressions by varying the position of the pieces.

Includes four disposable casting frames.

Catalog No.	Description	Price/Each
AP7816	Casting Frame, Package of 4	$15.95

Fingerprinting

Flinn Fingerprinting Kits

FLINN EXCLUSIVE

Catalog No.	Inquiry Lab	Type	Price/Each
FB1220	**Flinn Fingerprinting**	Activity-Stations Kit	$70.33
AP7061	**Inkless Fingerprinting**	Kit	58.66
AP7402	**Fuming Fingerprints Forensics**	Student Laboratory Kit	59.06
AP6736	**Amino Acid Fingerprints**	Demonstration Kit	43.50
FB1985	**Examining Evidence Using Fingerprint Analysis**	Forensic Laboratory Kit	45.40



Amino Acid Fingerprints—Demonstration Kit
AP6736

Accessories

Catalog No.	Description	Price/Each
AP7333	Inkless Fingerprinting Activator Pad	$ 6.35
AP7757	Fingerprint Powder	14.60
AP7758	Fingerprint Powder Brush	8.70
AP7763	Magnetic Fingerprint Powder, Regular Black, 1-oz Jar	15.80
AP7764	Standard Magnetic Powder Applicator	24.35
AP7814	Lansberry's Ridge Developer, Package of 100	39.20
AP7858	Fluorescent Invisible Detection Paste	32.45
AP9030	Ultraviolet Lamp, 18"	53.85



Fluorescent Invisible Detection Paste
AP7858

Comprehensive Crime Scene

Narc Lab: A Simulation

NEW!



This kit will allow students to simulate typical laboratory tests for narcotics in urine specimens. The drug test reagents, drugs themselves, urine specimens, positive and negative controls in this kit are simulated. There are no narcotics, human or animal urine or dangerous reagents used in these tests.

The tests themselves follow the same protocol that a police, forensic or hospital laboratory investigator would use to test for the presence of the following narcotics or controlled substances: THC – tetrahydracannibinol (the active ingredient in marijuana), cocaine – (benzoylecgonine metabolites) break down products of crack or cocaine in the urine.

A complete set of directions, notes, background material and answers are provided for the teacher. Directions for students are also provided.

Catalog No.	Description	Price/Each
AP11581	Narc Lab: A Simulation	$60.00

Crime Scene 4: Terror from Paradise

NEW!



The international flight from Franistan to the US is about the take off from Franistan and land in the USA. The problem is that Franistan has become a hotbed of terrorist activities. This has become a concern for the US Department of Homeland Security.You have been authorized to look in to the possibility that some or all of the passengers abord a flight might be harboring both chemical and biological agents which can cause death and destruction of not only the flight, but also the personnel at either end of the flight plan. Can you help determine which, if any, of the passengers can be terrorists? **All tests are simulations. There are no toxic chemicals or pathogenic lifeforms in the kit.*

Catalog No.	Description	Price/Each
AP11576	Crime Scene 4: Terror from Paradise	$82.00

Crime Scene 2: Kidnapped!

NEW!

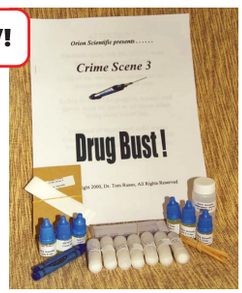


A kidnapping case for the ages. The son of a wealthy industrialist has been abducted. The whereabouts of Jason is unknown. A cursive note has been recovered by the parents and mansion employees and handed over to the police. Blood samples, handwriting, fiber, ink, finger prints and other forensics have been turned over to the crime lab by the investigation team upon collection at the scene of the crime. Can you put together a scientific trail to implicate and convict the kidnapper in.

Catalog No.	Description	Price/Each
AP11574	Crime Scene 2: Kidnapped!	$78.00

Crime Scene 3: Unknown Powder

NEW!



Drugs, sex and rock and roll are part of the underground life at Bellehomme School. While heralded as one of the most prestigious schools of the country, the Bellehomme school provides a fertile ground for distribution of the most novel illicit drug on the underground market. Tylorine is readily available via the underground connections from someone in the area. The drug has been confiscated from students in lockers, school bags and even in students clothing. Traces of the drug can be detected in urine samples collected under court order from students via parental cooperation. The key is to find out who and where the drug has leaked into the school or its premises. Can you put the pieces together for an arrest?

Catalog No.	Description	Price/Each
AP11575	Crime Scene 3: Unknown Powder	$78.00

Fast Food Frenzy

NEW!



"Do you want fries with that?" Well, do you? Do you really know what nutritional value your fast-food meal has to offer? Is it really the best choice for a breakfast, lunch or dinner? Is it the best choice? What exactly is contained in the galaxy of food you find in that paper bag? While the kit does not give the quantities of the major food groups, you can determine the nature of the contents of the meal.

Catalog No.	Description	Price/Each
AP11580	Fast Food Frenzy	$78.00

Environmental Analysis: Carter Creek

NEW!



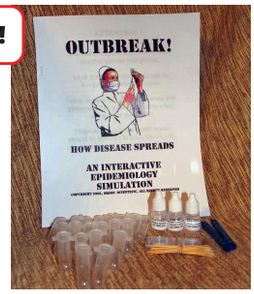
The thriving community of Carterville has been growing in leaps and bounds. After a long stretch of a bad economy, Carter Creek Paper and Plastics has doubled its business. This means more jobs, opportunities, and $$$ for the area! There is a dark cloud on the horizon for the Carterville area. The creek has been polluted! Your students have been hired by a local chemical testing laboratory to find the nature of the contamination and locate its source.

Contains no phthalates, mercury, or lead products or samples. For 24 students working in pairs.

Catalog No.	Description	Price/Each
AP11578	Environmental Analysis: Carter Creek	$90.00

Outbreak! Health Education

NEW!



It seems that communicable diseases spred faster than modern medicine can react to the distribution to the population. The net effect is that hundreds, thousands and sometimes millions of individuals are infected. Some are fatal. Some debilitating. How does this happen? How can an invisible invader cause so much sickness and death from a single infection?

This kit allows students to simulate the spread of communicable disease within the population of a class. No real bacteria or viruses are used for this lab. The effects can be easily traced using this kit. It is a truly eye-opening experience for all.

Catalog No.	Description	Price/Each
AP11579	Outbreak! Health Education	$76.00

The Mysterious Liquid from Area 51

NEW!



A subcontractor made his way into the darker areas of Area 51. Area 51 is reported to be a secretive base in the desert which is restricted to all except the special military and civilian contractors. The base has been rumored to contain alien artifacts and alien technology which is of great interest to military for obvious reasons. The subcontractor has not been heard from since a solitary fax was interrupted while being transmitted. A sample of an alien liquid has been smuggled out to interested parties. Your job is to characterize the "novel" liquid from Area 51!

Catalog No.	Description	Price/Each
AP11577	The Mysterious Liquid from Area 51	$78.00

COMPREHENSIVE CRIME SCENE continued on next page.

Comprehensive Crime Scene, continued

The Coroner's Report—Urine and Blood Analysis Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Use the test results and Pathology Evidence Chart to solve a mysterious death scenario. Kit includes detailed Teacher's Notes, extensive background information and reproducible student handouts.

Complete for 30 students working in pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7316	The Coroner's Report—Urine and Blood Analysis Laboratory Kit	$31.50
AP7571	The Coroner's Report—Urine and Blood Analysis Super Value Laboratory Kit	70.00

Crime Scene: A Forensic Investigation Kit

Students perform hair, blood, fiber, fingerprint and handwriting analysis to locate the culprit in the "murder" case. All blood samples are simulated. Students read background material, crime scene descriptions, motives and a victim's note. The kit provides hair, fiber and simulated blood samples, anti-serums, slides, marking crayons, pipets and stirrers.

Complete for two classes of 24 students working in pairs.

Catalog No.	Description	Price/Each
AP4677	Crime Scene: A Forensic Investigation Kit	$100.94

Food Analysis Mystery—Forensic Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Teach chemical test procedures for common foods—Vitamin C, starches, reducing sugars, fats and proteins! Students start by performing the chemical tests to establish the "standards" for positive identification. Once the standards are established, the stomach contents of the victims are tested for the presence of the foods.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6503	Food Analysis Mystery—Forensic Laboratory Kit	$76.24

Forensic Groundwater Contamination—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

A rancher drills a well on the outskirts of a rural community and submits a sample for analysis. A potentially serious pollutant is found. The assignment is to determine the extent of the pollutant's spread and to pinpoint its source so the community can assess and remedy the problem. In the process the students will select test well sites, "analyze" samples from the selected wells, and map the extent.

Complete for 30 students working in groups of three. Consumables are easily replaced for indefinite use.

Catalog No.	Description	Price/Each
FB0012	Forensic Groundwater Contamination—Student Laboratory Kit	$79.74

Mr. Mathematics Mysterious Murder—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

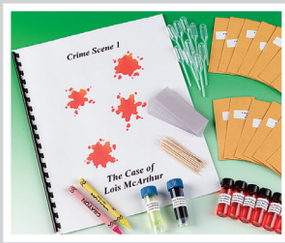
Matthew Mathematics, the math teacher at Mammals Middle School, was mysteriously murdered on Monday morning. Students gather evidence at the simulated crime scene set up by the teacher and return to the "Forensics Lab" to analyze the evidence. Forensic tests include fiber analysis, shoeprints, blood, stomach contents and fingerprints.

Complete for 30 students in pairs. Microscopes are needed for fiber analysis.

Catalog No.	Description	Price/Each
AP7060	Mr. Mathematics Mysterious Murder	$88.34



The Coroner's Report—AP7316, etc.



Crime Scene AP4677



Forensics Spill Mystery—AP7536



Who Is Littering? Forensics AP6866

Stream Contamination—Forensic Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

A massive fish kill has occurred in the town of Raymond. The townspeople are in an uproar, and extensive efforts are underway to determine why the fish are dying. Students take the role of forensic scientists and determine who is responsible, using interest and let them see how science is used in everyday life.

Full-size kits are complete for 30 students working in pairs. Small-size kits are complete for 10 students working in pairs. Refill kits contain materials only.

Catalog No.	Description	Type	Price/Each
AP6863	Stream Contamination—Forensic Laboratory Kit	Full-Size Kit	$73.45
AP10115		Full-Size, Refill Kit	66.80
AP10193		Small-Size Kit	45.55
AP10271		Small-Size, Refill Kit	38.30

Soil Contamination—Forensic Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

The soil in and around the Walker quarry has become contaminated! It is up to your students—as forensic scientists—to perform tests and use problem-solving skills to determine who is responsible for the contamination. Students will perform chlorine, iron and pH tests on samples from various locations of the quarry to solve the mystery.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6864	Soil Contamination—Forensic Laboratory Kit	$92.39

Detective's Casebook—Forensic Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Solve the case of Bobby Bedhead's missing prize-winning pooch, Priscilla.

- Blood Analysis—Students determine the ABO blood types of five different suspects.
- Chromatographic Ink Analysis—Students perform chromatography techniques of suspected ink used at the crime.
- Handwriting Analysis—Students examine and identify variations in five handwriting samples and match them to a document left at the crime scene.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6865	Detective's Casebook—Forensic Laboratory Kit	$95.24

COMPREHENSIVE CRIME SCENE continued on next page.

Comprehensive Crime Scene, continued

Who Is Littering? Forensics Super Value Kit

FLINN EXCLUSIVE

By: The Flinn Staff

The ditches of the town of Bradley have been recently polluted with litter. Local authorities have narrowed the list of suspects down to four individuals. Who is dumping their garbage on the streets of Bradley?

Super Value Kit is complete for 30 students working in pairs. All materials are reusable.

Catalog No.	Description	Price/Each
AP6866	Who Is Littering? Forensics Super Value Kit	$73.65

Soil Analysis—Forensic Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Examine soils microscopically, conduct pH and phosphate tests and then collect data from a soil density profile demonstration. No two soil samples are exactly alike.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP1779	Soil Analysis—Forensic Laboratory Kit	$157.23

Forensics Spill Mystery—Student Laboratory Kit

FLINN EXCLUSIVE

By: Gary Schiltz, retired Glenbard West High School, Glen Ellyn, IL

Sudents must identify which industrial site is responsible and quantify the amount of pollution. Students can qualitatively test the river water to pinpoint the source of the contamination. *Complete for 30 students working in pairs.*

Catalog No.	Description	Price/Each
AP7536	Forensics Spill Mystery—Student Laboratory Kit	$51.65

The Forensic Slide Set

Give students the opportunity to see what types of evidence scientists examine in a forensics lab! This intriguing set of slides allows students to view seven different samples containing different evidence specimens that would typically be found at a crime scene.

Catalog No.	Description	Price/Each
ML1439	The Forensic Slide Set	$57.43

Spy Labs: Forensic Investigation Kit



Students assume the role of forensic scientists and perform experiments on evidence in this large laboratory station using chemical and physical techniques. They will analyze solids and liquids, test for pH, make a fluorescent solution, inspect invisible ink, discover hidden secrets with the UV flashlight, lift fingerprints, look for counterfeit bills, and examine ink using chromatography. The experiments are accompanied by exciting stories of make-believe mysteries and crimes to solve. Plastic hold equipment or notes for hands-free access.

Catalog No.	Description	Price/Each
AP11663	Spy Labs: Forensic Investigation Kit	$34.95

Spy Labs: Invisible Ink Pen and UV Light



As a detective, you always need the right tools when you are on the hunt for evidence or reading secret messages. Ultraviolet light helps your students uncover many hidden clues. Exchange top secret info with their classmates and fellow agents using this high-tech device. The pen uses a special ink that only becomes visible under ultraviolet light, like the one emitted by the flashlight on its opposite end. This UV light can be used to find other objects and materials that glow in the presence of ultraviolet radiation.

Catalog No.	Description	Price/Each
AP11664	Spy Labs: Invisible Ink Pen and UV Light	$12.95

Glass Analysis

Glass Analysis Principles—Forensic Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Crime scenes often contain broken glass from windows, cars, vases and numerous other glass items. Matching glass pieces with other glass pieces can reveal patterns that can help explain a criminal sequence. This activity utilizes safe chemicals and simulated glass to safely teach the principles of glass density analysis, a key technique used by criminalists. The flotation technique utilized in this lab will provide the hands-on experience students need to crystallize their general understanding of density. Students will also appreciate the complexity of glass analysis in crime scene investigations.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6386	Glass Analysis Principles—Forensic Laboratory Kit	$45.59

Crime Scene Supplies

Forensic Supply Kit

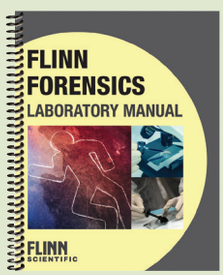
Contains 1000 ft of crime scene tape, 100 evidence labels, 50 evidence bags, 10 collection jars with screw-on lids, a set of 15 evidence numbers (1–15), 10 evidence seals, and 10 small collection envelopes. Some items available individually below.

See free video at flinnsci.com.

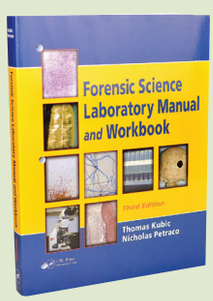
Catalog No.	Description	Price/Each
AP7197	Forensic Supply Kit	$128.85
AP7005	Crime Scene Tape, 1000 ft.	33.85
AP7083	Evidence Bags, 50	45.00
AP7084	Evidence Labels, 100	16.55
AP7008	Evidence Number Cards, 1–15	29.95
AP7202	Evidence Tape, 250 seals	26.68

Forensic **Books**

Catalog No.	Inquiry Lab	Price/Each
AP8343	Flinn Forensics Laboratory Manual	$50.80
AP5980	Crime Scene Investigation	41.29
AP6533	Crime Scene Investigations: Real-Life Science Labs for Grades 6–12	43.90
AP6730	Flinn Forensic Files—Fingerprint Exploration	35.80
AP7752	Top Shelf Forensics	187.97
AP8722	Forensic Laboratory Science and Detective Mystery Writing	25.97
AP8723	Student Forensic Laboratory Journal— Individual Use	16.04
AP8909	Student Forensic Laboratory Journal—Site License	82.18
AP7543	Forensic Science Laboratory Manual and Workbook	67.20



Flinn Forensics Laboratory Manual AP8343



Forensic Science Laboratory Manual and Workbook AP7543



Quality Equipment to Enhance Lab Experiences

- Rigorously tested and designed, high-performance equipment
- In-house and expertly made chemicals and solutions
- The supplies selection you need to set up your lab

Science Experts and Customer Care Support

- Expert, one-on-one answers to your questions
- Personalized curriculum advice
- Custom orders organized for easy distribution to classes
- Rapid quotes, order consolidation, and staff wish list assistance

Innovative Instruction Solutions

- Real-world, practical lab solutions
- Curricula-supporting programs aligned to state and national standards
- Strategic partnerships with renowned publishers and their curriculum
- Free resources (i.e., classroom activities, videos, digital learning, etc.)

Connect with Every Student

As educators ourselves, we know no two students are the same. Our science kits, multimedia learning resources, and adaptable lab solutions let you adapt content to meet the needs of every student.

Don't Leave it to Chance

Contact Us With ALL Your Safety Questions

Physics & Physical Science

Engage students in the motion of objects in the world around us. Find all the activities, laboratory kits and equipment you need to **help you succeed in putting your students on the right trajectory.**

324 Advanced Placement® Physics
392 Alternative Energy
358 Electricity & Magnetism
377 Electrochemistry
396 Electronics Equipment
340 Energy and Work
330 Flinn *PSworks*™
353 Fluids
335 Forces & Equilibrium
354 Heat & Thermodynamics
348 K'NEX
389 Lasers
331 Measurement and Density
345 Mechanics Equipment
333 Mechanics & Motion
390 Modern Atomic and Nuclear Science
391 Modern Materials
339 Momentum & Collisions
383 Optics & Light
397 Physics of Toys
351 Pressure & Gases
348 Robotics
350 Rockets & Flight
344 Rotational
342 Simple Machines
378 Waves & Sound

FLINNprep™ has you covered for AP® Physics

Prepare Your Students for Success

As scientists and educators, we know that properly aligning lessons and labs to test requirements is essential to raising students' AP test scores. Carefully following the College Board guidelines for AP, we have developed a variety of solutions in accordance with the guidelines as well as the new Unit Breakouts.

FLINNprep

FLINNprep is a complete learning solution that helps prepare and support students as they interact with the fast pace and rigor of Advanced Academic science courses. Using a combination of online courses and inquiry labs, FLINNprep is built to cover the full AP® Curriculum, from the hands-on to the conceptual, all the way to the exam.

FLINNprep is found within PAVO. PAVO is our award-winning gateway to comprehensive digital content. Educators can customize content, assign students work and monitor progress.

FLINNprep Courses: Textbook Alternatives:

These online digital courses walk students through BIG IDEAS and UNITS, one by one. Complete with content, supporting videos, assessments and practice exams, these courses can be used individually or together to fully teach your AP program.

FLINNprep Lab Solutions:

Comprehensive Courses Plus Inquiry Labs: These unique blended labs enable a flipped classroom model by offering a combination of lab videos and simulations in addition to the physical, inquiry-based labs themselves.





Inquiry Lab Kits

These engaging inquiry lab activities are aligned to the latest AP curriculum standards. Each lab kit contains all the specialized equipment and instructions needed for a class of 24 students. Instructions include valuable background information and detailed procedures for students to engage in an introductory activity. This activity is then followed by a "Guided-Inquiry Design and Procedure" section with leading questions to guide students to effectively conduct their own investigations and analyze results. Comprehensive review questions integrate inquiry, content and reasoning to help students connect lab experiences to the real world. Kits include teacher notes with real sample data, valuable teaching tips and lab hints, alignment to curriculum framework and answers to pre- and post-lab questions to give teachers the confidence they need to run successful AP® Physics courses.

Advanced Demonstration Apparatus

Demonstrate physics concepts with advanced apparatus from Flinn! From Foucault's Pendulum and Nuclear Magnetic Resonance Apparatus to Force Between Conductors and Laser Optics Demonstrators, review our selection at www.flinnsci.com

Flinn Classic Laboratory Kits

The standards may have changed, but some things never go out of style! Flinn's tried-and-true Classic Labs provide necessary and valid lessons for AP Physics Students. Only six labs in your curriculum must be inquiry-based to meet College Board requirements. If you have clear favorites among your existing labs, continue to do them.

Advanced Placement®—FLINNprep™

FLINNprep™ for AP® Physics 1 and 2

FLINNprep courses and inquiry labs use a blended approach that saves time, increases student engagement and comprehension and leads to better exam scores.



FLINN EXCLUSIVE

FLINNprep is the only AP Solution that offers inquiry labs that connect the labs back to course content and the AP Exam.

Whether you want to use FLINNprep for a single discipline with your class or you want to adopt it for multiple disciplines across your school or district, we can create a custom solution for you. You can purchase the online course or inquiry labs or both for each discipline. Accompanying physical lab kits are available.

Lab Solution	Blended Bundle Lab Kits & 2 Year Access to Digital Content
Digital student and teacher lab instructions	✓
Introductory videos	✓
Technique videos	✓
Apply what you learned on the exam videos	✓
Sample inquiry procedures and data	✓
AP® style practice exam questions	✓
Reteach videos	✓
Virtual reality simulations	✓
Downloadable lab instructions	✓
Physical lab materials for hands-on practice	✓
Inquiry Labs for AP® Physics: 6 Labs	✓

6 Investigations

- Uniform Circular Motion
- Conservation of Linear Momentum
- Torque
- Mechanical Waves
- Speed of Sound
- Electrical Circuits

Visit flinnpavo.com—Online Course for AP Physics 1 and 2

AP® Physics 1 and 2

FLINNprep Course for AP Physics 1 is a complete review of foundational Physics 1 with additional units of advanced Physics 1 topics. Units include:

- Kinematics
- Dynamics
- Circular Motion
- Energy
- Momentum
- Rotational Motion
- Simple Harmonic Motion
- Mechanical Waves
- Electrostatics
- DC Circuits

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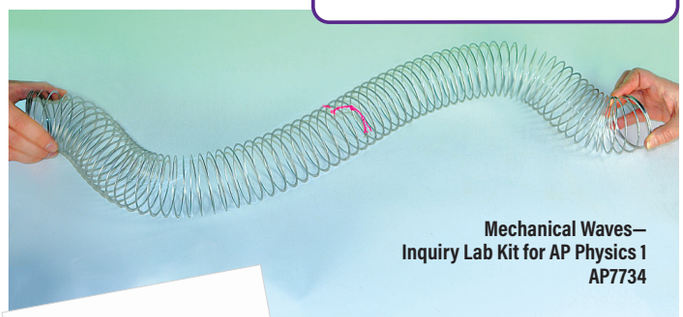
FLINNprep™ Inquiry Kits for AP® Physics 1

Flinn has enhanced the AP learning experience with Inquiry Labs for AP Physics 1! The FLINNprep™ approach maximizes class and lab time while giving students extra support to help them succeed on the exam.

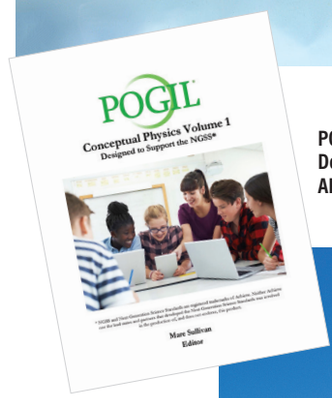
- New blending learning options combine the benefits of classroom, laboratory and digital learning.
- Your students can watch, pause, rewind and rewatch prelab concept, technique and procedure videos tied directly to each AP Physics 1 experiment. Access anytime from any digital device!
- Each lab ends with a summary video that relates the experiment to the AP exam by showing sample exam questions based on that specific experiment.
- Each lab includes a unique set of online problems that relate the experiment to the exam, and each problem has its own reteach video students can watch if they get stuck.
- Adaptable to you and how you teach. Choose to run experiments in multiple ways with access to digital procedures that are both inquiry-based and step-by-step.
- Built-in student lab safety training with assessments as the introductory unit.
- AP Physics 1

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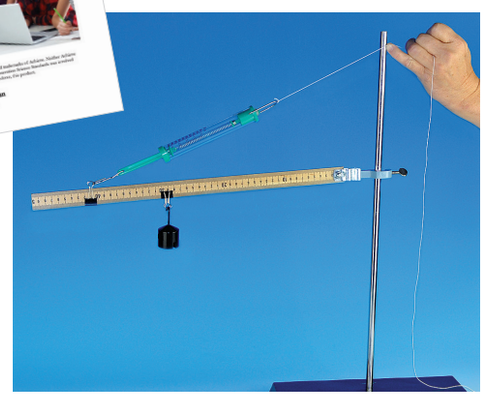
FLINN EXCLUSIVE



Mechanical Waves—
Inquiry Lab Kit for AP Physics 1
AP7734



POGIL® Activities for Conceptual Physics—
Designed to Support the NGSS
AP11571, etc.



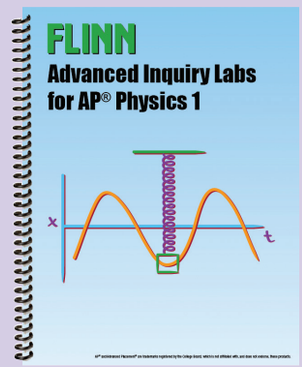
Torque—Inquiry Lab Kit
for AP Physics 1
AP7733



Coefficient of Friction—Inquiry Lab Kit for AP Physics 1
AP7725

FLINNprep™ Inquiry Lab Kits for AP® Physics 1

Catalog No.	Flinn Inquiry Kits for AP® Physics 1	Description	Price/Each
AP11571	**POGIL Activities for Conceptual Physics—Designed to Support the NGSS**	Volume 1	$39.95
AP11572		Volume 2	38.75
AP7722	**Measuring *g*: Exploring Free-Fall**		54.43
AP7724	**Newton's Second Law**		241.17
AP7725	**Coefficient of Friction**		123.38
AP7726	**Uniform Circular Motion**		87.50
AP7727	**Conservation of Energy on an Inclined Plane**		113.91
AP7728	**Conservation of Elastic Potential Energy**		184.31
AP7729	**Conservation of Linear Momentum**		142.94



Flinn Advanced Inquiry Labs for AP Physics 1 Lab Manual

This Flinn lab manual includes thoroughly tested and documented experiments for each of the new inquiry investigations in the AP Physics 1 curriculum framework.

Catalog No.	Description	Price/Each
AP7930	Flinn Advanced Inquiry Labs for AP Physics 1 Lab Manual	$160.35

FLINNprep™ Inquiry Kits for AP Physics 1, continued

Demonstrate Advanced Physics Concepts

Demonstrate physics concepts with advanced apparatus from Flinn! Visit flinnsci.com for detailed product information.

Catalog No.	Description	Price/Each
AP7862	Foucault's Pendulum	$2588.80
AP8094	Cavendish Gravitational Balance	1011.65
AP8124	Thermoelectric Effects Apparatus	1475.00
AP8125	Laser Optics Demonstrator	3200.00
AP8162	Michelson and Farby-Perot Interferometer	3400.00
AP8163	Photoelectric Effect Apparatus	2364.65
AP8164	Planck's Constant Apparatus	3348.63
AP8165	Force Between Conductors Demonstators	180.44
AP8154	Complete Zeeman Effect Apparatus	10848.25
AP8167	Ultrasonic Grating Apparatus	3391.63
AP8135	Precision Fresnel Biprism Interference Apparatus	2241.38
AP8168	Intermediate Spectometer with 30mm Optics	1900.00

FLINNprep Inquiry Lab Kits for AP Physics 1—16-Kit Bundle!

Save money by purchasing the kits as a bundle rather than individually.

Catalog No.	Description	Price/Each
AP7738	FLINNprep Inquiry Lab Kits for AP Physics 1—16 Kit Bundle	$1782.00



Equipment Set for FLINNprep Inquiry Lab Kits for AP Physics 1

By: The Flinn Staff

All the lab equipment your students need to conduct Flinn's 16 Inquiry Lab Kits for AP Physics 1 in a convenient package! No need to pull together lab equipment piecemeal because of budget constraints—this cost-savings set includes enough equipment for a class of 24 students!

- Batteries, 6-V
- Clamps and clamp holders
- Digital multimeters
- Digital thermometers
- Fishing line and string
- Hooked weight sets
- Masking tape
- Protractors
- Rubber mallets for tuning forks
- Rulers
- Spring scales, 10-N, 2.5-N
- Tape measure
- Timers

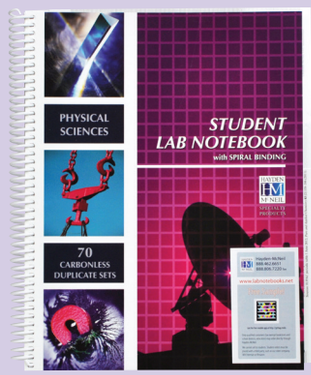
Meter sticks and support stands are required and available separately.

Catalog No.	Description	Price/Each
AP7739	Equipment Set for FLINNprep Inquiry Lab Kits for AP Physics 1	$2350.00

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FLINNprep Inquiry Lab Kits for AP Physics 1, continued

Catalog No.	Flinn Inquiry Kits for AP® Physics 1	Price/Each
AP7730	**Hooke's Law and Simple Harmonic Motion for Elastic Materials**	$ 58.11
AP7731	**Simple Pendulums**	45.40
AP7732	**Rotational Motion and Angular Momentum**	224.42
AP7733	**Torque**	166.22
AP7734	**Mechanical Waves**	78.06
AP7735	**Speed of Sound**	223.35
AP7736	**Electrical Circuits**	119.91
AP7737	**Resistance and Resistivity**	118.18



Physical Science Lab Notebook

Seventy pages of carbonless duplicate sets with fully laminated front and back covers. Cover contains the most up-to-date periodic table.

Catalog No.	Description	Price/Each
AP8069	Physical Science Lab Notebook	$19.25

Flinn Inquiry Kits for AP® Physics 2

FLINN EXCLUSIVE

The new Flinn Scientific Advanced Inquiry Laboratory Kits for AP Physics 2 are designed and developed to meet the most current AP Physics 2 guidelines as well as the needs of the high school teacher and student.

Each lab kit contains all the specialized equipment and instructions needed for a class of 24 students. Common laboratory equipment is required and available separately. Instructions include valuable background information and detailed procedures for students to engage in an introductory activity. This activity is then followed by a "Guided-Inquiry Design and Procedure" section with leading questions to guide students to effectively conduct their own investigations and analyze results. Comprehensive review questions integrate inquiry, content and reasoning to help students connect lab experiences to the real world. Kits include teacher notes with real sample data, valuable teaching tips and lab hints, alignment to curriculum framework and answers to pre- and post-lab questions to give teachers the confidence they need to run successful AP Physics courses.

- AP Physics 2

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Reflection and Mirrors—Inquiry Lab Kit for AP Physics 2
AP8006



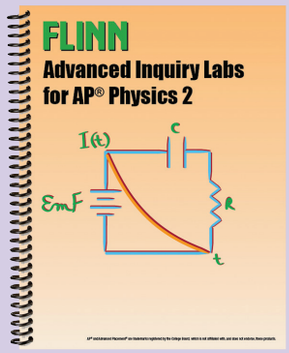
Refraction and Lenses—Inquiry Lab Kit for AP Physics 2
AP8007



Capacitance and RC Circuits—Inquiry Lab Kit for AP Physics 2
AP8002

Flinn Inquiry Lab Kit for AP Physics 2

Catalog No.	Flinn Inquiry Kits for AP Physics 2	Price/Each
AP7995	**Archimedes' Principle and Buoyancy**	$48.00
AP7996	**Fluid Dynamics**	44.05
AP7997	**Boyle's Law**	78.00
AP7999	**Thermal Conductivity**	124.95
AP8000	**Investigating Electric Charge**	63.75
AP8001	**Electric Field Mapping**	151.50
AP8002	**Capacitance and RC Circuits**	152.60
AP8003	**Kirchoff's Rules**	148.20



Flinn Advanced Inquiry Labs for AP Physics 2 Lab Manual

By: The Flinn Staff

All 15 Flinn Inquiry Lab Kits for AP Physics 2 in one amazing book! This Flinn lab manual includes thoroughly tested and documented experiments for each of the new inquiry investigations in the AP Physics 2 curriculum framework.

Catalog No.	Description	Price/Each
AP8072	Flinn Advanced Inquiry Labs for AP Physics 2 Lab Manual	$156.60

Flinn Inquiry Kits for AP® Physics 2, continued



Bundle Options for Flinn Inquiry Labs for AP Physics

The Flinn Inquiry Labs for AP Physics are available in time and cost-saving bundles! AP Physics 1 bundle being newly enhanced with FLINNprep™ digital content.

Catalog No.	Description	Price/Each
AP7738	FLINNprep Inquiry Lab Kits for AP Physics 1—16 Kit Bundle	$1782.00
AP8012	Inquiry Labs for AP Physics 2, 15 Kits Bundle	1355.77

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Flinn Inquiry Lab Kits for AP Physics 2—15-Kit Bundle!

Save money by purchasing the kits as a bundle rather than individually.

Catalog No.	Description	Price/Each
AP8012	Inquiry Lab Kits for AP Physics 2—15-Kit Bundle	$1355.77



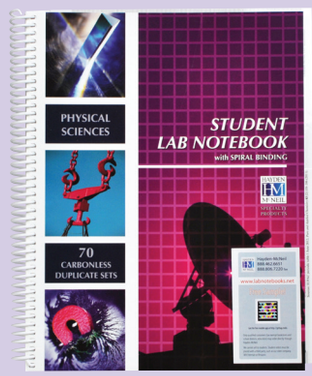
A Magnetism Investigation—Inquiry Lab Kit for AP Physics 2
AP8004



Diffraction—Inquiry Lab Kit for AP Physics 2
AP8008

Flinn Inquiry Lab Kit for AP Physics 2, continued

Catalog No.	Flinn Inquiry Kits for AP Physics 2	Price/Each
AP8004	A Magnetism Investigation	$122.75
AP8005	Electromagnetic Induction	142.65
AP8006	Reflection and Mirrors	50.20
AP8007	Refraction and Lenses	78.50
AP8008	Diffraction	54.65
AP8010	The Photoelectric Effect	130.00
AP8009	Modern Topics	171.40



Physical Science Lab Notebook

Seventy pages of carbonless duplicate sets with fully laminated front and back covers. Cover contains the most up-to-date periodic table.

Catalog No.	Description	Price/Each
AP8069	Physical Science Lab Notebook	$19.25

FLINN *PS*WORKS™

Experiments that work to teach the core physical science curriculum!

DURABLE PHYSICAL SCIENCE EQUIPMENT AT AN AFFORDABLE PRICE!

Features:

- Hands-on labs that engage students and improve their critical-thinking skills.
- Detailed laboratory instructions with student worksheets, questions and Teacher's Notes that will help you and your students understand the important principles in physical science.
- Teach topics on Newton's laws of motion, mechanical advantage, inclined planes, levers, kinetic and potential energy, projectile motion, acceleration due to gravity and simple harmonic motion.
- Made of durable hardwood that will withstand years of student use.
- High-quality equipment at an incredible value, allowing more students to experience the lab activities and successfully learn physical science concepts.

Getting Started:

- Flinn *PS*WORKS Support Stand—Essential for all the Flinn *PS*WORKS apparatus. Purchase one stand for each student lab station.
- Flinn *PS*WORKS Photogate Timer for more advanced timing experiments—Designed for the student in mind. Easy to operate and provides accurate timing measurements.
- Hooked Weight Set, Economy Choice (OB2066)—Rugged, accurate weights to be used with the Flinn *PS*WORKS Carriage and Ramp and Lever Arm.

See free video at flinnsci.com.



***PS*WORKS Parabola**
AP7208



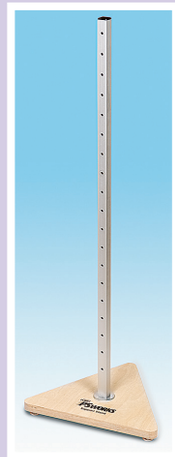
***PS*WORKS Conservation of Energy Tracks**
AP7069



***PS*WORKS Lever Arm**
AP7001

FLINN EXCLUSIVE

Catalog No.	Flinn *PS*WORKS	Price/Each
AP6998	***PS*WORKS Photogate Timer**	$418.20
AP6999	***PS*WORKS Support Stand**	120.36
AP7003	***PS*WORKS Carriage and Ramp**	207.70
AP7069	***PS*WORKS Conservation of Energy Tracks**	143.55
AP7001	***PS*WORKS Lever Arm**	59.60
AP7071	***PS*WORKS Marble Ramp**	126.48
AP7208	***PS*WORKS Parabola**	149.00
AP7000	***PS*WORKS Pendulum**	57.15



***PS*WORKS**
Support Stand
AP6999

Measurement and Density

FLINN360science™: Motion Plots



This kit presents the concepts of motion, position, displacement, speed and velocity through hands-on activities that engage students, regardless of level. In this lab, students construct plots to describe their own walking. They examine their own walking motion and learn how to use graphs to track their position and speed as a function of time. Teacher can extend learning through associated phenomena including, "What does a fitness tracker measure?"

Catalog No.	Description	Digital Access	Price/Each
AP11300	360Science: Motion Plots	1-Year	$39.35

FLINN360science™: Free Fall Acceleration



This kit presents the concepts of freefall, acceleration, and gravitational acceleration through hands-on activities designed to engage all your students, regardless of level. Students determine the value of the gravitational acceleration constant, g, by examining the free fall of steel balls of different size and mass and will come to understand that gravity drives all objects to fall toward Earth's surface with the same acceleration, independent of the object's mass and size. Teachers can extend learning through associated phenomena including, "How does a self-driving car determine stopping time?"

Catalog No.	Description	Digital Access	Price/Each
AP11301	360Science: Free Fall Acceleration	1-Year	$70.00

FLINN360science™: Model Projectile Motion



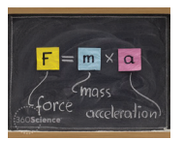
This kit presents the concepts of projectile motion, potential gravitational energy and kinetic energy through hands-on activities designed to engage students. In this lab experience, students determine the horizontal speed of a steel ball describing a projectile motion. Teachers can extend learning through investigation into associated phenomena including, "How does the motion of a Ferris wheel compare to the motion of a 'flying swing' ride at an amusement park?"

Catalog No.	Description	Digital Access	Price/Each
AP11302	360Science: Model Projectile Motion	1-Year	$119.90

FLINN EXCLUSIVE

Catalog No.	Kit Description	Price/Each
AP6380	Archimedes' Principle—Student Laboratory Kit	$ 50.00
AP7627	Discovering Buoyancy—Super Value Guided-Inquiry Kit	76.15
AP6994	Conservation of Mass and Buoyancy—Student Laboratory Kit	47.25
AP6148	Density of Solids—Student Laboratory Kit	165.90
AP5939	Measurement Challenge—A Density Super Value Guided-Inquiry Kit	103.08
AP4636	Equal Mass—Student Laboratory Kit	17.00
AP6147	Equal Mass—Classroom Set	182.00

FLINN360science™: Forces and Motion



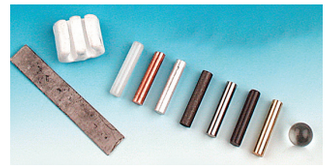
Through hands-on science, this kit presents the essential concepts of Newton's Second Law, force, and acceleration through hands-on science activities designed to engage all your students, regardless of level. In this lab experience, students assemble a cart-hanging mass system and perform measurements to determine the relationship between force and acceleration of the system. Teachers can extend learning through associated phenomena including, "What happens when a net force acts on an object?"

Catalog No.	Description	Digital Access	Price/Each
AP11305	360Science: Forces and Motion	1-Year	$155.35

Specific Gravity Specimens, Set of 10

FLINN EXCLUSIVE

By: The Flinn Staff



Determine the specific gravity of ten different materials and then use the density values to identify each material. Set of 10 specimens includes aluminum, brass, copper, glass, graphite, lead, polyvinyl chloride, polyethylene, steel and polystyrene. Four-page handout includes background, lab activity procedure and reproducible student data table, calculations and questions.

Catalog No.	Description	Price/Each
AP9235	Specific Gravity Specimens, Set of 10	$19.00

Glass Density Forensics Kits See page 321.

Measuring with Laser Light Student Laboratory Kit See page 385.

More Density Laboratory Kits See page 238.

How Scientists Measure Activity-Stations Kit See page 265.

Density Identification Set



In the Density Identification Set for physical science and physics, determine the composition of 12 different-sized rods, each one made of a different material.

Challenge students to determine the composition of 12 different-sized rods, each one made of a different material. Students exercise their measurement skills with mass, length and volume determinations as they problem-solve to identify each material. Durable rods are made of various familiar woods, metals and plastics and are designed to withstand years of student use. The large size ensures more accurate measurements. Set contains a sturdy storage base.

Catalog No.	Description	Price/Each
AP7204	Density Identification Set	$78.54

Density Demonstration Bottles See page 238.

Density Box Demonstration See page 256.

Density Cube Set



Here's a handy, low-cost set of 10 one-inch cubes cut from modern materials. Use these precision cubes to perform a variety of density experiments. The set contains one cube each of aluminum, steel, brass, copper, acrylic, nylon, poplar, oak, willow and polyethylene.

Catalog No.	Description	Price/Each
AP6058	Density Cube Set	$63.25

MEASUREMENT AND DENSITY continued on next page.

Measurement and Density, continued

NEW!

Solids, Liquids & Gases—NewPath Visual Learning Guide, Set of 10



Solids, Liquids & Gases Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11727	Solids, Liquids & Gases—NewPath Visual Learning Guide, Set of 10	$43.32

NEW!

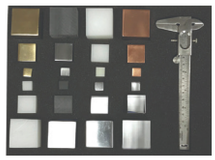
Math Rush—A Fast Paced Math Card Game



Math Rush: Addition & Subtraction is a quick-paced card game where players must work as a team to sequence the solutions of their addition and subtraction equations, all the while racing against the clock! The equations might be simple, but the strategy and challenge involved with working together to complete the required goals under the pressure of time makes this game enjoyable for all audiences.

Catalog No.	Description	Price/Each
AP9461	Math Rush—A Fast Paced Math Card Game	$12.99

Density Cube Set of 24



Use this density cube set, comes in various samples of the same material ranging in sizes from small to large, for density experiments. Available in eight different materials: acrylic, aluminum, brass, copper, nylon, polypropylene, PVC, and steel. Each material is represented by a ½", 1" and 1½" cube.

Catalog No.	Description	Price/Each
AP10223	Density Cube Set of 24	$151.60

High School Physics Curriculum Mastery Game

NEW!



Features 25 individually packaged sets of 30 full-color, review cards per topic—a total of 750 curriculum-based questions! Also includes 12 laminated, double-sided game boards; comprehensive Teacher Planning & Resource Guide; and a 1 Year Premium Subscription to NewPath's Online Learning Platform featuring animated, narrated tutorials, virtual lab exercises, inactive activities, quizzes, games and more!

Complete curriculum coverage of the following standards-based topics:

- The Science of Physics
- Laws of Motion I
- Laws of Motion II
- Forces I
- Forces II
- Heat
- Work & Energy Thermodynamics
- Fluid Mechanics
- Momentum & Collisions
- Vibrations & Waves
- Sound
- Properties of Matter
- Light
- Optics
- Electric Circuits
- Electricity & Electrical Energy I
- Magnetism
- Electricity & Electrical Energy II
- Modern Electronics
- Electromagnetism
- Atomic & Nuclear Physics
- Rotational Motion/Universal Gravitation
- Measurements & Calculations
- Lab Investigations/Scientific Method

Catalog No.	Description	Price/Each
AP11715	High School Physics Curriculum Mastery Game	$119.95

Metal Density Cube Set, Economy Choice



Students measure the densities of the four metal blocks and then determine their composition. The four cubes in the set are aluminum, steel, copper and brass. Instructions are provided.

Catalog No.	Description	Price/Each
AP6489	Metal Density Cube Set, Economy Choice	$30.50

Steel Sphere Density Set



Boggle your students' minds with this fun density set! Both spheres weigh the same, but have different volumes. Which will sink? Which will float? Have fun discussing density, mass and volume with this density set!

Catalog No.	Description	Price/Each
AP9910	Steel Sphere Density Set	$35.25

Density Rod



Simple device with a multitude of demonstration possibilities. The rod responds to changes in density of a liquid by sinking or rising in the liquid. As the density of the liquid is changed, the rod moves up or down accordingly. It sinks in warm water but floats in cold water. A temperature gradient in a column of water will find the rod held in suspension somewhere in the middle. Put the rod in alcohol and it will sink. Add different amounts of salt to water and the rod will rise or sink as the density changes. Comes with instructions and detailed explanation of density theory. 6.5 cm long, 1.9 cm diameter.

Catalog No.	Description	Price/Each
AP4632	Density Rod	$18.05

Overflow Can



The large sizes of our overflow cans make them especially useful for student experiments with density cylinders and Archimedes' Principle devices. The standard can measures 7.5 cm in diameter, 12.5 cm high, with a capacity of 470 mL. The large capacity can measures 10.5 cm in diameter, 12 cm high, with a capacity of 850 mL.

Catalog No.	Description	Price/Each
AP4627	Overflow Can	$16.25
AP7222	Overflow Can Large Capacity	15.90

Catch Bucket



Seamless aluminum catch bucket to accompany our overflow cans. Overall dimensions are 7.5 cm in diameter, 7.0 cm high, with a capacity of 270 mL.

Catalog No.	Description	Price/Each
AP4626	Catch Bucket	$11.99

Specific Gravity Block Set



Precision-machined metal blocks with removable heavy-duty hook on one face. Ideal for measurement and density exercises. Each block measures 3.1 cm on a side. Set of four includes one block each of aluminum, brass, steel and copper. Also available individually.

Catalog No.	Description	Price/Each
AP5714	Specific Gravity Block Set, Set of 4	$49.65
AP5731	Aluminum Block	12.30
AP5732	Lead Block	19.28
AP5733	Steel Block	11.10
AP7863	Copper Block	19.25

MEASUREMENT AND DENSITY continued on next page.

Measurement and Density, continued

Specific Gravity Metal Specimen Set



Four different metal cylinders for use in measurement and density experiments. Their small size (5 cm long x 1.3 cm diameter) makes them perfect for use in a graduated cylinder. Includes copper, brass, aluminum and steel.

Catalog No.	Description	Price/Each
AP9234	Specific Gravity Metal Specimen Set	$22.30

Galileo Thermometer



Each bulb in the thermometer is partially filled with a different colored fluid and a metal tag beneath it with a printed Fahrenheit temperature. The bulbs are in continual motion up and down the column as the temperature changes. The current actual temperature is indicated by the lowest floating sphere in the upper part of the cylinder. Two sizes are available.

Catalog No.	Description	Size	Price/Each
AP6034	Galileo Thermometer	14½"	$64.20

Mechanics—Motion

FLINN360science™: The Buoyant Force



This kit presents the essential concepts of buoyancy, buoyant force, Archimedes Principle, weight, and force of gravity. In this lab , students determine the buoyant force acting on objects submerged in water. They discover that the buoyant force acting on a submerged object is equal to the weight of the fluid the object displaces. Teacher can extend learning through associated phenomena including, "How does a ball deform on impact?"

Catalog No.	Description	Digital Access	Price/Each
AP11306	360Science: The Buoyant Force	1-Year	$125.10

FLINNeverydayscience™ Water and Motion

NEW!



With this FlinnEverydayScience™ lab, students investigate different temperatures of water using thermometers and food coloring. Then, students research how water currents work and observe a demonstration by the teacher with warm and cold water.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

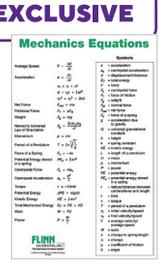
This kit includes 50 polystyrene cups, food dye, water diffusion chamber, and 2 of each black and blue wax pencils.

Complete for 30 students working in groups of two.

Catalog No.	Description	Price/Each
AP11821	Water and Motion	$97.00

Mechanics Equations Poster

FLINN EXCLUSIVE



Easy-to-read poster is a handy reference chart with more than 20 physical science equations, including equations for linear and rotational motion, force, work, gravitation, momentum, potential and kinetic energy and many more. Symbol key included on poster. Poster size 24" x 36", printed on heavy-duty laminated stock.

Catalog No.	Description	Price/Each
AP7283	Mechanics Equations Poster	$18.26

Air Pucks—Student Laboratory Activity

FLINN EXCLUSIVE



No need for an air table—these pucks float on a cushion of air above any smooth, flat surface as air escapes from a balloon. These hands-on experiments explore Newton's laws of motion and investigate the principles of inertia, collisions, velocity and acceleration.

See free video at flinnsci.com.

Catalog No.	Description	Type	Price/Each
AP6917	Air Pucks—Classroom Set	Full-Size Kit	$104.30
AP10158		Full-Size, Refill Kit	95.50
AP10236		Small-Size Kit	53.00
AP10314		Small-Size, Refill Kit	44.00
AP6420	Balloons, 5", pkg/50, Assorted Colors		7.55

Puck Set, Balloon



Study inertia, constant velocity and acceleration, and collisions in two dimensions. Air escaping from inflated balloons allows plastic pucks to levitate above any smooth surface.

Catalog No.	Description	Price/Each
AP5619	Puck Set, Balloon	$50.95

More Newton's Laws of Motion Activities

See Mechanics—Forces and Equilibrium, page 335.

Acceleration Trolley



When students measure the distance the trolley moves between each second they will quickly discover distance is proportional to the square of the time—that's acceleration! Students will see that the acceleration rate is independent of mass. A great way to teach Newton's laws of motion or investigate potential and kinetic energy.

Catalog No.	Description	Price/Each
AP6487	Acceleration Trolley	$88.20
OB2067	Slotted Weight Set, Economy Choice	105.00
AP8856	Hanger, Slotted Weights	12.30
AP1572	Timer, Stopwatch, Flinn	15.30

Investigating Pendulums—Student Laboratory Kit

FLINN EXCLUSIVE



What determines the period of a pendulum's swing? Is it the weight of the plumb bob, the length of the pendulum or the height at which it is set in motion? Flinn's quick and easy setup allows students to run a variety of experiments to discover the properties of a pendulum's swing. Teacher Notes, reproducible student handouts and all specialized equipment are provided.

Catalog No.	Description	Price/Each
AP6282	Investigating Pendulums—Student Laboratory Kit	$45.40

Pendulum Clamp



Suspend three pendulums at one time with this specially designed pendulum clamp. The clamp measures 28 cm in length.

Catalog No.	Description	Price/Each
AP5695	Pendulum Clamp	$32.00

MECHANICS—MOTION continued on next page.

Mechanics—Motion, continued

PSworks™ Pendulum

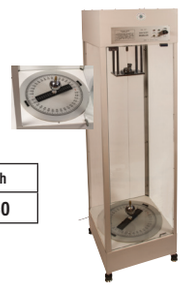
FLINN EXCLUSIVE

Demonstrate simple harmonic motion and the conservation of energy with this large, easy-to-see pendulum setup. Students will see the pendulum swing evenly from side to side in simple harmonic motion. Use the Flinn *PSworks*™ Photogate Timer to measure the period of the pendulum or the speed of the pendulum bob at the bottom of the swing.



Catalog No.	Description	Price/Each
AP7000	*PSworks*™ Pendulum	$ 57.15
AP6998	*PSworks*™ Photogate Timer	418.20
AP6999	*PSworks*™ Support Stand	120.36

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

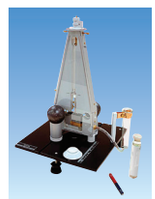


Foucault's Pendulum

Catalog No.	Description	Price/Each
AP7862	Foucault's Pendulum	$2588.80

* Must be shipped by motor truck freight.

Cavendish Gravitational Balance



Catalog No.	Description	Price/Each
AP8094	Cavendish Gravitational Balance	$1011.65

Simple Harmonic Motion See page 327.

Rubber Band Cannon—Super Value Laboratory Kit

FLINN EXCLUSIVE

Use the scientific method to determine what characteristics of the Rubber Band Cannon allow to shoot rubber bands certain distances.

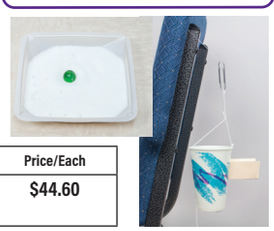


Catalog No.	Description	Price/Each
AP6624	Rubber Band Cannon—Super Value Laboratory Kit	$134.90

Drop Zone—Flinn STEM Design Challenge™

FLINN EXCLUSIVE

Students are challenged to recreate the pinpoint accuracy required to air drop a package during times of war or natural disaster when land is inaccessible.



Catalog No.	Description	Price/Each
AP8059	Drop Zone—Flinn STEM Design Challenge	$44.60

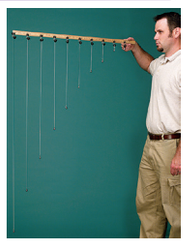
Free Fall and Projectile Motion Poster See page 337.

Modeling Projectile Motion—Super Value Kit

FLINN EXCLUSIVE

Visibly demonstrate the parabolic path of a projectile. Students will clearly see that for each time interval, the object falls a greater distance as it accelerates.

See free video at flinnsci.com.



Catalog No.	Description	Price/Each
AP7039	Modeling Projectile Motion—Super Value Kit	$28.50
AP8294	Meter Stick, Hardwood, Natural with Plain Ends	6.45

Projectile Motion with an Inclined Plane—Super Value Laboratory Kit

FLINN EXCLUSIVE

Students learn about projectile motion and the law of conservation of energy as they determine the launch speed of a steel sphere after it rolls down an inclined plane.



Catalog No.	Description	Price/Each
AP6755	Projectile Motion with an Inclined Plane—Super Value Laboratory Kit	$39.30

PSworks™ Marble Ramp

FLINN EXCLUSIVE

Two-in-one dynamics apparatus! Using the *PSworks*™ Photogate Timer, students record the transit times of a marble at different positions along the marble ramp.



Catalog No.	Description	Price/Each
AP7071	*PSworks*™ Marble Ramp	$126.48
AP6998	*PSworks*™ Photogate Timer	418.20
AP6999	*PSworks*™ Support Stand	120.36

PSworks™ Parabola

FLINN EXCLUSIVE

Clearly convince your students that a projectile follows a parabolic path! Launch a ball bearing using the unique launching mechanism, and watch the ball skim the surface of the track which is in the shape of a parabola. Show students that a ball will roll to the same starting height even if the path to get there is longer or shorter. This two-for-one demonstration apparatus is a versatile addition to your physics equipment.



Catalog No.	Description	Price/Each
AP7208	*PSworks* Parabola	$149.00
AP6998	*PSworks* Photogate Timer	418.20
AP6999	*PSworks* Support Stand	120.36

Ballistic Car

See free video at flinnsci.com.



Catalog No.	Description	Price/Each
AP4637	Ballistic Car	$105.37

Marble Launcher

Durable apparatus to study velocity, acceleration, and projectile motion. Marbles can be launched from five different speeds at any angle between 0 and 90°.



Catalog No.	Description	Price/Each
AP7800	Marble Launcher	$90.80

Projectile Launcher

Comes with directions and experiment outlines including projectile motion paths, muzzle velocity, angle effects, force effects, weight of projectiles and mechanical efficiency.



Catalog No.	Description	Price/Each
AP5696	Projectile Launcher	$144.00

Trajectory Apparatus

Includes a 36 x 43 cm plotting board, two wooden supports, an adjustable aluminum launcher with a stop, an aluminum target plate, and target paper.



Catalog No.	Description	Price/Each
AP9231	Trajectory Apparatus	$66.20

MECHANICS—MOTION continued on next page.

Mechanics—Motion, continued

Trebuchet—Flinn STEM Design Challenge™



By: The Flinn Staff

FLINN EXCLUSIVE

Students make use of an easily adjustable base to test how different heights, arm lengths, counterweights and release angles determine the flight distance of the projectile.

Catalog No.	Description	Price/Each
AP8347	Trebuchet—Flinn STEM Design Challenge	$178.35

Leonardo da Vinci Trebuchet



Explore concepts, such as projectile motion, mechanical advantage, velocity, acceleration due to gravity, moment of inertia and more.

Catalog No.	Description	Price/Each
AP7864	Leonardo da Vinci Trebuchet	$28.97

Trebuchet



Explore first-class levers, conservation of energy, torque, gravitational force, and projectile motion. Students will soon learn how the relatively small motion of the counterpoise weight and the whipping action of the sling launch projectiles so efficiently.

Catalog No.	Description	Price/Each
AP6907	Trebuchet	$28.70

Build a Model Catapult—Flinn STEM Design Challenge™



STEM INTEGRATED

By: The Flinn Staff

Build a basic catapult using simple materials. Test the machines to determine how variables, such as the length of the lever arm and mass of the projectile, affect launch distance.

Catalog No.	Description	Type	Price/Each
AP8054	Build a Model Catapult—Flinn STEM Design Challenge	Full-Size Kit	$56.80
AP10162		Full-Size, Refill Kit	48.95
AP10240		Small-Size Kit	35.30

Catapult



Where a trebuchet uses gravity and counterweights to provide propulsion, a traditional catapult uses the mechanical advantage of a lever and tension forces.

Catalog No.	Description	Price/Each
AP7788	Catapult	$23.15

"Speed of Bubble" Tube Set



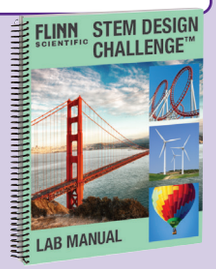
Students may be challenged to predict the effect of angle on bubble speed and to design and conduct an experiment to test their hypotheses.

Catalog No.	Description	Price/Each
AP6032	"Speed of Bubble" Tube Set	$55.00

Motion Detectors See pages 537–538.

Flinn STEM Design Challenge™ Lab Manual

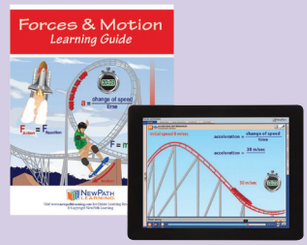
FLINN EXCLUSIVE



Each of the 22 activities incorporates inquiry and design, providing a wonderful opportunity for students to connect science and engineering practices to conceptual knowledge and reasoning skills across science disciplines.

Catalog No.	Description	Price/Each
AP8333	Flinn STEM Design Challenge Lab Manual	$143.61

NewPath Learning Guides for Forces & Motion



The NewPath Learning Guides are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11510	Forces & Motion Student Learning Guide with Online Lesson	$15.59
AP11260	Forces & Motion Student Learning Guide with Online Lesson, Set of 10	99.00

Mechanics—Forces and Equilibrium

Force and Motion—Super Value Laboratory Kit



FLINN EXCLUSIVE

Five experiments cover topics such as balanced and unbalanced forces on an inclined plane, frictional forces, Hooke's law, rotational motion and collisions in one dimension.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6929	Force and Motion—Super Value Laboratory Kit	$178.50
AP6997	Spring-Scale, Pull Type, 250-g, Package of 6	49.40

Levers See page 330.

Slingshot Cars—Newton's Laws Activity Kit

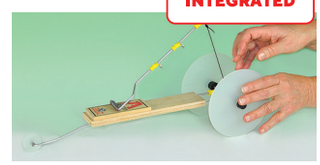


FLINN EXCLUSIVE

By increasing the force that accelerates the car, students observe the relationship between force, mass and acceleration in action.

Catalog No.	Description	Price/Each
AP7521	Slingshot Cars—Newton's Laws Activity Kit	$79.40

Mousetrap Cars—Super Value Guided-Inquiry Kit



STEM INTEGRATED

By: Brad Christensen,

Illinois State University, Normal, IL

Students plan and carry out investigations to test variables of wheel diameter, hub diameter and length of the lever arm.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7667	Mousetrap Cars—Super Value Guided-Inquiry Kit	$270.30

Balloon Cars Challenge—Guided-Inquiry Kit



FLINN EXCLUSIVE

Each group constructs and tests an easy-to-assemble balloon-powered car prototype.

Catalog No.	Description	Price/Each
AP7922	Balloon Cars Challenge—Guided-Inquiry Kit	$63.90

MECHANICS—MOTION continued on next page.

Mechanics—Forces and Equilibrium, continued

FLINN EXCLUSIVE

Flywheel Powered Car

Demonstrate conservation of energy, kinetic energy, gears, and other concepts.

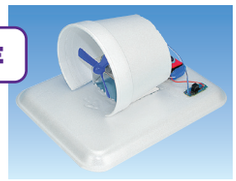


Catalog No.	Description	Price/Each
AP7787	Flywheel Powered Car	$22.05

FLINN EXCLUSIVE

Build a Mini Hovercraft—Guided-Inquiry Kit

Learn how a vessel is able to "ride on air."



Catalog No.	Description	Type	Price/Each
AP7519	Build a Mini Hovercraft—Guided-Inquiry Kit	Full-Size Kit	$84.75
AP10159		Full-Size, Refill Kit	74.70
AP10237		Small-Size Kit	56.95
AP10315		Small-Size, Refill Kit	49.03
AP1430	Battery, 9-V		6.32

FLINN EXCLUSIVE

Personal Hovercraft—Demonstration Kit

The study of Newton's three laws of motion.



Catalog No.	Description	Price/Each
AP7516	Personal Hovercraft—Demonstration Kit	$377.25
AP7635	Leaf Blower	171.45

Newton's Laws—Activity-Stations Kit

FLINN EXCLUSIVE

Investigate inertia, force and acceleration using air pucks, carts and pulleys with hanging weights and balloon rockets, respectively.

See free video at flinnsci.com.



Catalog No.	Description	Price/Each
AP7408	Newton's Laws—Activity-Stations Kit	$101.00

Diving Eggs Inertia Challenge—Newton's First Law Demonstration Kit

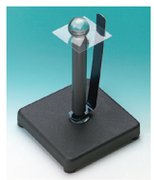
FLINN EXCLUSIVE

Simultaneously drop three eggs into beakers of water, without touching the eggs!



Catalog No.	Description	Price/Each
AP7419	Diving Eggs Inertia Challenge—Newton's First Law Demonstration Kit	$21.80

Inertia Device



Catalog No.	Description	Price/Each
AP4538	Inertia Device	$20.60

Inertial Balance



Catalog No.	Description	Price/Each
AP4607	Inertial Balance	$54.35

Inertia Ball/Pendulum Bob



Catalog No.	Description	Price/Each
AP6037	Inertia Ball/Pendulum Bob	$36.05

Force Stick



Catalog No.	Description	Price/Each
AP9209	Force Stick	$62.55

Newton's Apple



Catalog No.	Description	Price/Each
AP7915	Newton's Apple	$7.30

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HAS BEEN WRITTEN AND TESTED BY OUR FLINN STAFF

FLINN EXCLUSIVE

Shoot the Monkey—Demonstration Kit

See free video at flinnsci.com.



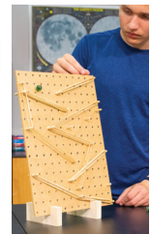
Catalog No.	Description	Price/Each
AP6439	Shoot the Monkey—Demonstration Kit	$83.95

FLINN EXCLUSIVE

Marble Down—Flinn STEM Design Challenge™

By: Art Ellis, Bedford M.S., Westport, CT

Ask questions, define problems, plan, create, test, evaluate and more!



Catalog No.	Description	Type	Price/Each
AP8315	Marble Down—Flinn STEM Design Challenge™	Full-Size Kit	$89.95
AP10118		Full-Size, Refill Kit	79.40
AP10196		Small-Size Kit	64.75
AP10274		Small-Size, Refill Kit	55.95
AP6396	Student Timers, Pkg. of 12		116.25

Newton's G Ball

Study gravity, acceleration, height and velocity by throwing this tool in any direction.



Catalog No.	Description	Price/Each
AP7801	Newton's G Ball	$83.25

NEW!

Forces & Motion—NewPath Visual Learning Guide, Set of 10



Forces & Motion Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11732	Forces & Motion—NewPath Visual Learning Guide, Set of 10	$43.32

MECHANICS continued on next page.

Mechanics—Forces and Equilibrium, continued

Investigate a Twirling Toy—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff

Make observations regarding spin, flight path, stability and descent time of each model.



Catalog No.	Description	Price/Each
AP8053	Investigate a Twirling Toy—Flinn STEM Design Challenge	$21.15

Egg-streme Parachuting—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff

Design and construct a parachute that will protect an egg from cracking open.



Catalog No.	Description	Price/Each
AP8060	Egg-streme Parachuting—Flinn STEM Design Challenge	$31.10
AP4665	Spring Scale, Pull Type, 1 kg/10 N	10.00

Investigating Gravity—Super Value Laboratory Kit

FLINN EXCLUSIVE

Four hands-on lab activities allow students to study the motion of a pendulum, determine the center of gravity of irregular objects, measure the acceleration due to gravity using an Atwood's machine and build a boat to explore the anti-gravity force known as buoyancy.



Catalog No.	Description	Price/Each
AP7188	Investigating Gravity—Super Value Laboratory Kit	$110.15
AP6396	Flinn Student Timer, 12-Pack	116.25
OB2123	Hook Weight, 200 g	31.50

Free Fall—Student Laboratory Kit

FLINN EXCLUSIVE

When two steel spheres whose masses differ by a factor of 10 are dropped together, students are shocked that the balls hit the ground at the same time. Audible proof that their rate of acceleration is constant!

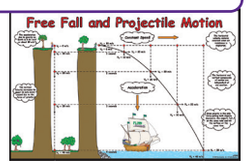


Catalog No.	Description	Price/Each
AP7376	Free Fall—Student Laboratory Kit	$61.45
AP6396	Timers, Student, pkg. 12	116.25

Free Fall and Projectile Motion Poster

FLINN EXCLUSIVE

Durable 24" x 36" poster is a great teaching tool and a convenient reference for exploring the independent horizontal and vertical components of projectile motion.



Catalog No.	Description	Price/Each
AP7280	Free Fall and Projectile Motion Poster	$19.05

Guinea and Feather Tube—Demonstration Kit

FLINN EXCLUSIVE

Watch and compare the falling acceleration rate of a feather and a guinea (coin) with air resistance and in a vacuum using this clear acrylic demonstration tube. The results are unforgettable!



Catalog No.	Description	Price/Each
AP4670	Guinea and Feather Tube—Demonstration Kit	$110.35
AP1712	Vacuum Pump, Single-Stage	841.50
AP1597	Vacuum Pump, Two-Stage	953.70
AP8789	Vacuum Tubing, 10 feet	31.78

Second Law of Motion Apparatus See below.

FLINN EXCLUSIVE

Atwood's Machine, Economy Choice

An inexpensive Atwood's machine that successfully measures the acceleration due to gravity. It's also a perfect device to effectively teach Newton's second law of motion, friction, rotational inertia and measurement accuracy.



Catalog No.	Description	Price/Each
AP6495	Atwood's Machine, Economy Choice	$ 47.00
AP8219	Clamp Holder	22.85
OB2067	Slotted Weight Set, Economy Choice	105.00
AP8856	Hanger, Slotted Weights	12.30
AP1572	Timer, Stopwatch, Flinn	15.30

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HAS BEEN WRITTEN AND TESTED BY OUR FLINN STAFF

Orion Science Free Fall & Atwood's Machine



Catalog No.	Description	Price/Each
AP10973	Orion Science Free Fall & Atwood's Machine	$699.31

Galileo's Gravity Drop



Catalog No.	Description	Price/Each
AP7297	Galileo's Gravity Drop	$65.65

Galileo's Paradox See page 345.

Second Law of Motion Apparatus



See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP4737	Second Law of Motion Apparatus	$46.95

Balloon Rockets—Guided-Inquiry Kit

FLINN EXCLUSIVE

This hands-on, inquiry-based lab will teach students how to design an experiment as they investigate Newton's laws of motion and rocket thrust. Students tether a balloon to fishing line stretched across the room and then must find a successful combination of orientation, drag, and thrust that will launch the balloon across the room. The task requires students to run various trials and then modify their balloon rockets based on what they learn in each trial.

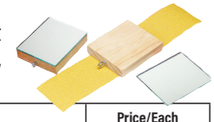


Catalog No.	Description	Price/Each
AP6927	Balloon Rockets—Guided-Inquiry Kit	$47.80

Friction Blocks—Student Laboratory Kit

FLINN EXCLUSIVE

Students perform hands-on laboratory experiments that lead them to generalizations about how the surface area, weight and texture of objects affect friction.



Catalog No.	Description	Price/Each
AP4605	Friction Blocks—Individual Kit	$ 21.20
AP6222	Friction Blocks—Classroom Set	104.60
AP4836	Spring Scale, Pull Type, 250 g/2.5 N	10.35

MECHANICS—FORCES AND EQUILIBRIUM continued on next page.

Mechanics—Forces and Equilibrium, continued

Sliding Friction Sled



Catalog No.	Description	Price/Each
AP6732	Sliding Friction Sled	$47.47
AP4665	Spring Scale, Pull Type, 1000 g/10 N	10.00

Science of Sailing—Newton's Third Law Laboratory Kit

STEM INTEGRATED



By: The Flinn Staff

This fun, hands-on activity provides a real-world application of Newton's third law, as well as Bernoulli's principle.

Catalog No.	Description	Price/Each
AP6933	Science of Sailing—Newton's Third Law Laboratory Kit	$71.80

Sail Cart



Catalog No.	Description	Price/Each
AP6482	Sail Cart	$47.21

Orion Science Universal Force Table



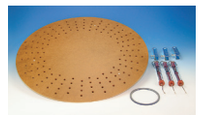
Catalog No.	Description	Price/Each
AP10975	Orion Science Universal Force Table	$765.00

Economy Force Table



Catalog No.	Description	Price/Each
AP4612	Economy Force Table	$164.60

Force Board



Catalog No.	Description	Price/Each
AP5643	Force Board	$101.21

Balances, Spring Scale See page 108.

Catenary Arch Set



Students construct the catenary arch from the template and provided blocks to see the strength and stability of this type of arch and where it might be useful.

Catalog No.	Description	Price/Each
AP6477	Catenary Arch Set	$29.10

Roman Arch Set



With this hands-on kit students learn how force vector analysis is used in architectural strength—just like the ancient Roman structures.

Catalog No.	Description	Price/Each
AP4628	Roman Arch Set	$38.50

Balsa Bridge Construction Set



Build different types of bridges from the more simple beam, arch, and truss to the more complex cantilever, suspension or cable-stayed.

Catalog No.	Description	Price/Each
AP7793	Balsa Bridge Construction Set	$113.15

Polydron Bridges



Students build bridges and discuss why certain designs work while others fall down. Build truss, suspension, cantilever, drawbridge, cablestay, swing and bascule bridges.

Catalog No.	Description	Price/Each
AP7817	Polydron Bridges	$243.30

Building Bridges—Flinn STEM Design Challenge™

STEM INTEGRATED



By: The Flinn Staff

Students design and build a balsa wood bridge using only wood and glue. Their goal is to build a bridge that supports the largest amount of weight.

Catalog No.	Description	Type	Price/Each
AP8062	Building Bridges—Flinn STEM Design Challenge	Full-Size Kit	$119.91
AP10168		Full-Size, Refill Kit	112.00
AP10246		Small-Size Kit	79.75
AP10324		Small-Size, Refill Kit	72.17

K'NEX Bridge Kits See page 348.

Bottle Balance Beam—Demonstration Kit

FLINN EXCLUSIVE



By: Robert Farber, Central High School, Philadelphia, PA

A large water-filled bottle and a wooden board seem to defy gravity as together they balance on the board's edge.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6376	Bottle Balance Beam—Demonstration Kit	$16.15

Maxwell's Wheel



Catalog No.	Description	Price/Each
AP7798	Maxwell's Wheel	$37.00

Hanging Nails Challenge—Super Value Guided-Inquiry Kit

FLINN EXCLUSIVE



The challenge in this inquiry-based kit is to arrange 10 nails so they will hang in perfect balance on the head of one other nail. No other materials may be used!

Catalog No.	Description	Price/Each
AP7309	Hanging Nails Challenge—Super Value Guided-Inquiry Kit	$50.65

Create a Mobile—Flinn STEM Design Challenge™

STEM INTEGRATED



By: The Flinn Staff

Students discover the law of levers by balancing different numbers of washers on either end of a ruler. The results guide students to design a three-tiered mobile, weigh each object and predict the location of the center of gravity for each level.

Catalog No.	Description	Price/Each
AP8056	Create a Mobile—Flinn STEM Design Challenge	$58.10
AP4550	Support Stand, Economy Choice	27.50
AP8230	Support Ring, 2", with Clamp	9.97

Center of Gravity Demonstration Set

FLINN EXCLUSIVE



Show your students how to locate the center of gravity of an object using a hanging plumb line. Defy gravity with the Balancing Bottle and Finger Balance. Four demonstrations are provided and all the materials are completely reusable.

Catalog No.	Description	Price/Each
AP7068	Center of Gravity Demonstration Set	$61.15

Double Cone and Ramp



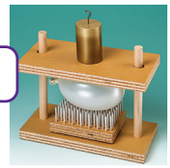
Catalog No.	Description	Price/Each
AP4712	Double Cone and Ramp	$42.64

MECHANICS—FORCES AND EQUILIBRIUM continued on next page.

Mechanics—Forces and Equilibrium, continued

Bed of Nails—Demonstration Kit

FLINN EXCLUSIVE



Show that pressure is a force per unit area.

Catalog No.	Description	Price/Each
AP6769	Bed of Nails—Demonstration Kit	$62.35
AP6420	Balloons, 50, Pkg. of 50	7.55
OB2066	Hook Weight Set, Economy Choice	66.50

Egg Elimination—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff

Utilizing concepts of engineering, physics and poultry, students are challenged to create a vehicle that will not only protecte its precious cargo, but destroy the competition!



Catalog No.	Description	Price/Each
AP8058	Egg Elimination—Flinn STEM Design Challenge	$42.75
AP8325	Egg Elimination Apparatus	59.40

Mechanics—Momentum and Collisions

FLINN360science℠: Momentum and Impulse During Collisions



This kit presents the essential concepts of collision, momentum and impulse through hands-on science activities designed to engage all your students, regardless of level. In this lab, students discover that the impulse associated with a collision increases as the height of the ball increases, and that a more pliable material can lower the impulse. The activity is further expanded by modifying the impact surface and/or the ball to see how the impulse is affected.

Catalog No.	Description	Digital Access	Price/Each
AP11337	360Science: Momentum and Impulse During Collisions	1-Year	$37.20
AP11437		3-Year	53.00

FLINN360science℠: Elastic and Inelastic Collisions



This kit presents the concepts of conservation of momentum, conservation of energy, and inelastic and elastic collisions through hands-on activities that engage students, regardless of level. In this lab, students discover that while momentum is always conserved in a collision, only elastic collisions conserve kinetic energy.

Catalog No.	Description	Digital Access	Price/Each
AP11338	360Science: Elastic and Inelastic Collisions	1-Year	$138.25
AP11438		3-Year	152.00

Momentum and Collisions—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



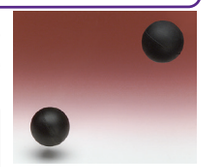
Which collision imparts more momentum—an object that hits a block of wood and sticks to it or an object that bounces straight off? The answer will knock over one of the blocks. This simple but effective demonstration uses two different types of rubber balls that swing into wooden blocks to distinguish between elastic and inelastic collisions. One ball is very resilient, or bouncy, and will rebound to its initial height or position when striking a surface. The other ball hardly bounces at all as it absorbs all of the energy from a collision. Includes student worksheet and comprehensive Teacher Notes with lab hints and teaching tips as well as answers to discussion questions.

Catalog No.	Description	Price/Each
AP7399	Momentum and Collisions—Demonstration Kit	$47.10

Happy/Sad Balls

FLINN EXCLUSIVE

One rubber ball will bounce very high; the other rubber ball will hit the ground and not bounce. They look the same, but they are different. Explore polymer chemistry with the Happy/Sad Balls. One Happy and one Sad Ball are included in each package.



Catalog No.	Description	Price/Pkg.
AP1971	Happy/Sad Balls	$16.05

Basketball Blaster—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Place a marble on top of a basketball, drop them together, and the marble will shoot up to the ceiling. In this unique hands-on laboratory activity, students perform this double-ball drop and experiment with different ball combinations to determine which arrangement creates the best "basketball blaster." Students use the scientific method to explore the laws of conservation of momentum and energy and identify key variables, such as compression and mass, that affect the rebound height. The theoretical height the top ball can reach is nine times the original drop height! Includes marbles, mini basketballs, Ping Pong balls and rubber balls as well as student worksheets, background information and complete instructions.

Full-size kits are complete for 30 students working in pairs. Small-size kits are complete for 10 students in pairs. Refill kits contain materials only. All materials are reusable. Meter sticks, support stands and clamps are required for each lab group and available separately.

Catalog No.	Description	Type	Price/Each
AP6915	Basketball Blaster—Super Value Laboratory Kit	Full-Size Kit	$65.80
AP10171		Full-Size, Refill Kit	75.00
AP10327		Small-Size, Refill Kit	31.78
AP8294	Meter Stick, Hardwood, English/Metric		6.45
AP8354	Single Buret Clamp, Plain Jaw		11.31
AP4550	Support Stand, Economy Choice		27.50

Collisions in One Dimension—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students learn the fundamentals of the laws of conservation of energy and momentum with this hands-on collisions lab. Includes five steel ball bearings of the same size and mass, a 75-cm long metal track, and complete instructions.

Complete for one student group. Classroom Set is complete for 8 student groups.

Catalog No.	Description	Price/Each
AP5625	Collisions in One Dimension—Individual Kit	$ 29.25
AP6869	Collisions in One Dimension—Classroom Set	174.00

Newtonian Demonstrator



This classic demonstrator is perfect for illustrating Newton's laws of motion and the conservation of momentum. The large swinging balls can be manually aligned to produce nearly perfect elastic collisions. High-quality wooden construction will last for years. Measures 7" x 9" x 8½" tall.

Catalog No.	Description	Price/Each
AP6913	Newtonian Demonstrator	$39.73

MECHANICS—MOMENTUM AND COLLISIONS continued on next page.

Mechanics—Momentum and Collisions, continued

Newtonian Demonstrator, Economy Choice



Demonstrate that for every action there is an equal and opposite reaction. Lift and drop one ball to see one ball pop out from the other side. Lift two balls and two pop out.

Catalog No.	Description	Price/Each
AP9211	Newtonian Demonstrator, Economy Choice	$29.35

Ballistic Pendulum, Economy Choice



Effectively demonstrate the conservation of momentum, calculate the initial velocity of a projectile, or determine the potential energy of a spring. Shoot the ball into a pendulum bob to inelastically capture it. The ball and bob swing to a maximum angle that is registered by a light-weight, counterbalanced pointer. Using the mass of the ball and bob, the maximum angle, and their knowledge of the conservation of momentum, students calculate the initial "muzzle" velocity of the ball. Repeatable, accurate results are achieved quickly and easily. Detailed instructions are included.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7110	Ballistic Pendulum, Economy Choice	$72.20

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Discovering STEM—Newton's Laws



Build 8 working models, including a ballistic catapult, gravity fan, collision car, moving cabin, balloon-powered plane and dragster. Booklet provides building instructions and detailed explanations of the different scientific principles applied as well as innovative experimental activities for hands-on learning. A quiz section is available to challenge newly acquired knowledge!

Catalog No.	Description	Price/Each
AP10540	Discovering STEM—Newton's Laws	$42.75

Collision in Two Dimensions



Study the conservation of momentum and the conservation of energy in collisions. Demonstrate the differences between elastic and inelastic collisions. The Collision in Two Dimensions apparatus works by holding a steel ball at the top of a curved aluminum track. When the ball is released, it travels down the track and collides with another ball placed on an adjustable target support. Students then observe how the two balls fall. Supplied with track, two steel balls, a hollow wooden ball, and a plumb bob. Complete instructions provided.

Catalog No.	Description	Price/Each
AP9165	Collision in Two Dimensions	$29.55

Mechanics—Energy and Work

FLINN360science™: Converting Sunlight into Electricity



This kit presents the essential concepts of gas particles and work through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will see that as more particles of gas are generated there is more kinetic energy available to do work.

Catalog No.	Description	Digital Access	Price/Each
AP11332	360Science: Gas Particles and Work	1-Year	$92.50

FLINN360science™: Pendulums and the Conservation of Energy



This kit presents the essential concepts of conservation of energy, potential energy, kinetic energy, and simple pendulum through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will see that the pendulum's velocity increases with increasing height and angle of release. Teachers can extend learning through guided inquiry into associated phenomena such as, "How does energy change as an object falls?

Catalog No.	Description	Digital Access	Price/Each
AP11334	360Science: Pendulums and the Conservation of Energy	1-Year	$22.85

Force Mechanism Trough



The four-position, spring-trigger device allows for controlled and repeatable force applications to the 1" steel balls and/or friction block. Comes assembled with five steel balls and one friction block.

Catalog No.	Description	Price/Each
AP5644	Force Mechanism Trough	$41.55

Kinetic Energy Ball Drop—Demonstration Kit

FLINN EXCLUSIVE





Demonstrate the relationship between speed and kinetic energy by dropping a ball from two different heights onto a bed of soft clay. All materials are completely reusable. Detailed instructions, historical background information, and student worksheet are provided.

Note: The clay must be heated to soften it.

Catalog No.	Description	Price/Each
AP7187	Kinetic Energy Ball Drop—Demonstration Kit	$24.45

Pendulum Kits See page 330.

Roller Coasters—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff



First, students determine how changing the release height and mass of a ball affects the distance the ball will travel on a straight track with a single rise. Students apply their findings and knowledge of conservation of energy to design a roller coaster with specific criteria and constraints, using only the materials provided, to create a thrilling yet safe ride!

Complete for 30 students working in groups of three. Support stand and ring clamp are recommended for each group and available separately.

Catalog No.	Description	Price/Each
AP8055	Roller Coasters—Flinn STEM Design Challenge	$80.72
AP4550	Support Stand, Economy Choice	27.50
AP8230	Support Ring, 2", with Clamp	9.97

MECHANICS continued on next page.

Mechanics—Energy and Work, continued

PSworks™ Conservation of Energy Tracks

FLINN EXCLUSIVE



This activity quickly illustrates that the kinetic energy of a ball at the bottom of a track is directly related to the potential energy it had at the top. Precision-cut tracks are made of durable, high-quality wood. Complete instructions are provided.

A Flinn PSworks Support Stand or stand and clamp is required, but not included.

Catalog No.	Description	Price/Each
AP7069	*PSworks* Conservation of Energy Tracks	$143.55
AP6999	*PSworks* Support Stand	120.36

PSworks™ Roller Coaster Track

FLINN EXCLUSIVE



As the steel marble rolls along the hilly track, it continuously exchanges potential and kinetic energy—clearly visible by the speed of the marble. A Flinn *PSworks* Support Stand and Photogate Timer are required, but not included.

Catalog No.	Description	Price/Each
AP7002	*PSworks* Roller Coaster Track	$134.00
AP6998	*PSworks* Photogate Timer	418.20
AP6999	*PSworks* Support Stand	120.36

Magnetic Linear Accelerator—Demonstration Kit

FLINN EXCLUSIVE



A slow-moving ball bearing collides with a magnet-ball bearing system, knocking away the last ball in the series, obeying the conservation of momentum. One problem—the knocked-away ball appears to shoot at nearly three times the original speed! When a series of magnets and ball bearings are aligned, a simple magnetic linear accelerator is created. Similar to the energy stored in a stretched spring, or gravitational potential energy, magnetic fields also store energy and give the ball bearing its unbelievable boost. Background information and complete instructions are provided.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6838	Magnetic Linear Accelerator—Demonstration Kit	$60.50

Loop-de-Loop Track



Effectively demonstrate the conservation of energy as potential energy is converted into kinetic energy. Includes two ball bearings and instructions.

Catalog No.	Description	Price/Each
AP7109	Loop-de-Loop Track	$59.50

Hooke's Law—Super Value Laboratory Kit

FLINN EXCLUSIVE



Students discover Hooke's law by experimenting with two different elastic materials and graphically determining the stretch distance and the force exerted by those materials.

Catalog No.	Description	Price/Each
AP7162	Hooke's Law—Super Value Laboratory Kit	$48.35
OB2066	Hook Weight Set, Economy Choice	66.50

The Bungee-Jumping Egg—Super Value Laboratory Kit

FLINN EXCLUSIVE



Students simulate a bungee jump using an egg and an elastic band. Students calculate the necessary length of the unstretched bungee cord that will result in the most exhilarating and safe bungee jump. Includes detailed instructions and a reproducible student worksheet. Two ceiling hooks, which connect to standard ceiling track, are supplied to easily create a "jumping platform."

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6381	The Bungee-Jumping Egg—Super Value Laboratory Kit	$47.00
AP4823	String, Thin	2.10

FLINN EXCLUSIVE
HAS BEEN WRITTEN AND TESTED BY OUR FLINN STAFF

Helical Spring Set



Catalog No.	Description	Price/Each
AP5699	Helical Spring Set	$76.60

Hooke's Law Apparatus



Measure and prove that the stretch of a spring is proportional to its load. You can also determine harmonic motion by counting oscillations.

Catalog No.	Description	Price/Each
AP9210	Hooke's Law Apparatus	$39.95
AP5642	Replacement Spring	6.85

Linked Springs



Effectively demonstrate spring properties and simple harmonic motion.

Catalog No.	Description	Price/Each
AP6419	Linked Springs	$36.00
OB2066	Hook Weight Set, Economy Choice	66.50
AP7938	Support Rod, Aluminum	3.40

FLINN EXCLUSIVE

Simple Machines Poster



Includes descriptions of the basic physical science concepts for each machine and explains how the machine works by changing either the size or direction of the applied force. 24" x 36". Heavy stock with a laminate covering.

Catalog No.	Description	Price/Each
AP7397	Simple Machines Poster	$27.25

NEW!

Work & Machines—NewPath Visual Learning Guide, Set of 10



Work & Machines Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11735	Work & Machines—NewPath Visual Learning Guide, Set of 10	$43.32

MECHANICS—ENERGY AND WORK continued on next page.

Mechanics—Energy and Work, continued

NewPath Learning Guides for Physical Science



The NewPath Learning Guides are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11554	Physical Science Student Learning Guide with Online Lesson, Set of 10	$105.25

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Mechanics—Simple Machines

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

FLINN EXCLUSIVE

Catalog No.	Description	Price/Each
AP6931	Simple Machines—Student Laboratory Kit, Full-Size Kit	$190.40
AP10160	Simple Machines—Student Laboratory Kit, Full-Size, Refill Kit	174.00
AP10238	Simple Machines—Student Laboratory Kit, Small-Size Kit	125.00
AP10316	Simple Machines—Student Laboratory Kit, Small-Size, Refill Kit	125.00
AP6306	Investigating Levers—Student Laboratory Kit	89.00
AP6890	Human Block and Tackle—Demonstration Kit	30.50
AP6355	Investigating Pulleys—Student Laboratory Kit	26.00
AP7583	Investigating Pulleys—Super Value Laboratory Kit	96.35

FLINN EXCLUSIVE

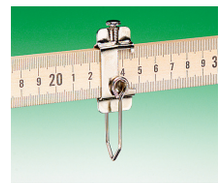
*PS*WORKS™ Lever Arm



Students can now effortlessly experiment with first-, second- and third-class levers and see the relationships between distance, mass and the position of the fulcrum. The Flinn *PS*WORKS Lever Arm quickly attaches to the *PS*WORKS Support Stand, not included. Additional materials needed are weight hangers, weights and string.

Catalog No.	Description	Price/Each
AP7001	*PS*WORKS Lever Arm	$ 59.60
AP6999	*PS*WORKS Support Stand	120.36

Clamp with Hanger, Lever



Use these clamps with any meter stick and a balance support and you are ready to study levers and torque in a hands-on fashion. The clamp's unique design allows easy reading of measurements and the setscrew locks the clamp securely on the meter stick. The removable stirrup allows for dual purpose use—as a knife-edge fulcrum pivot and as a mass hanger.

Note: Will not fit meter sticks with metal ends.

Catalog No.	Description	Price/Each
AP4672	Clamp with Hanger, Lever	$9.65

Demonstration Balance Support



You want a stable and rugged fulcrum platform when you do your meter stick lever experiments. This is the one you want! Its cast aluminum construction is so durable that it will not spring out of shape during use. Its wide base (3" x 3") and tall arch (7½") make it perfect for teenage hands trying to make things "balance." The smooth notched top is matched perfectly to accommodate a knife-edge clamp for smooth operation. Meter stick and knife-edge clamp (AP4672) sold separately.

Catalog No.	Description	Price/Each
AP4669	Demonstration Balance Support	$24.50

K'NEX Simple Machine Kits

See page 348.

Pulley Cord



High strength, low stretch braided pulley cord.

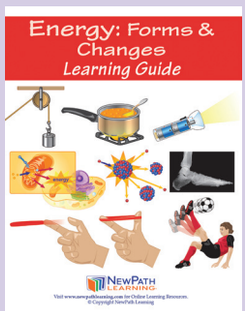
Catalog No.	Description	Price/Each
AP9330	Pulley Cord, 9 m	$ 8.75
AP6036	Pulley Cord, 45 m	19.10

MECHANICS—SIMPLE MACHINES continued on next page.

NewPath Learning Guides and Flip Chart for Energy

The NewPath Learning Guides and Flip Charts are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11509	Energy: Forms & Changes Student Learning Guide with Online Lesson	$14.95
AP11259	Energy: Forms & Changes Student Learning Guide with Online Lesson, Set of 10	99.00
AP11527	All About Energy FlipChart	41.65
AP11520	All About Energy Student Learning Guide with Online Lesson	14.95
AP11570	All About Energy Student Learning Guide with Online Lesson with Set of 10	103.21



Energy: Forms & Changes Student Learning Guide with Online Lesson AP11509



All About Energy FlipChart AP11527

Mechanics—Simple Machines, continued

Pulley Clamp, Adjustable

Low-friction ball bearing pulley. Pulley adjusts up to 10 cm in height and clamps to a table up to 5 cm thick.



Catalog No.	Description	Price/Each
AP9218	Pulley Clamp, Adjustable	$54.00

Pulley with Clamp

A handy pulley that clamps where needed. Fits any surface up to 19 mm thick. Attach it to tables, benches, and inclined planes.



Catalog No.	Description	Price/Each
AP5700	Pulley with Clamp	$18.10



Pulley, Aluminum AP7806, etc.



Pulleys, Economy Choice AP7803, etc.

Pulleys

Catalog No.	Description	Price/Each
AP7806	Pulley, Aluminum, Single	$ 6.20
AP7807	Pulley, Aluminum, Double	7.65
AP7808	Pulley, Aluminum, Triple	9.25
AP7809	Pulley, Aluminum, Quad	10.11
AP7810	Pulley, Aluminum, Double Tandem	10.45
AP7811	Pulley, Aluminum, Triple Tandem	10.85
AP9053	Pulley, Single	5.75
AP9054	Pulley, Double	6.50
AP9055	Pulley, Triple	8.57
AP6401	Pulley, Quad	9.95
AP9167	Pulley, Double Tandem	10.31
AP7803	Pulley, Single, Economy Choice	2.50
AP7804	Pulley, Double, Economy Choice	3.50
AP7805	Pulley, Triple, Economy Choice	5.00

Pulley, with Rod, Economy Choice

This affordable pulley with rod is an excellent choice for those simple pulley demonstrations that do not require high precision. Sturdy construction will last for years. Clamps to a support stand with Clamp Holder (AP8219). Pulley diameter is 1½"; rod diameter is ¼"; overall length is 6".



Catalog No.	Description	Price/Each
AP6943	Pulley, with Rod, Economy Choice	$ 9.20
AP8219	Clamp Holder	22.85

Pulley Demonstration Kit, Economy Choice

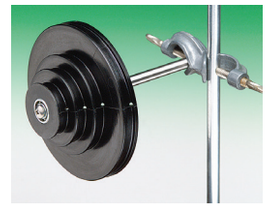
Highly visible red pulleys can be seen from the back of the room for demonstrations. Or purchase multiple sets for students to use at lab stations—the price is affordable and this equipment will last. Durable set includes all materials necessary to set up a variety of experiments: metal pulleys, slotted weights, weight hangers, wheel and axle, string, and a sturdy wooden base and metal frame. Includes instructions and sample experiments. 32" H x 32" W x 8½" deep.



Catalog No.	Description	Price/Each
AP7812	Pulley Demonstration Kit, Economy Choice	$273.20

Wheel and Axle

Demonstrate the mechanical advantage of the lever system capable of continuous rotation—the wheel and axle. The multiple pulley steps make the differences in mechanical advantage clear for students. The drilled holes in the rims of the pulley steps on the standard wheel and axle make attachment of pulley cords easy. Its ball bearing and stainless steel axle assure low friction and better results.



Catalog No.	Description	Price/Each
AP6031	Wheel and Axle, Standard	$34.00

Pulley Demonstration Kit

This comprehensive kit contains everything you need to demonstrate all the major principles associated with pulleys. Every major type of pulley arrangement is included as well as a wheel and axle. Weight hangers, weights, hook collars and pulley cord are also provided. This kit is suited for large classroom demonstrations. The kit also contains complete operating instructions describing the set's assembly and experiments on mechanical advantage, efficiency and the effects of friction.



Catalog No.	Description	Price/Each
AP5698	Pulley Demonstration Kit	$775.00

Inclined Plane Classroom Set

FLINN EXCLUSIVE

By: The Flinn Staff



The Inclined Plane Classroom Set includes inclined planes, end pulleys, string and support rods—enough for eight groups of students. *Mechanical Advantage with an Inclined Plane* laboratory instructions give students hands-on experience conducting experiments to learn the benefits of an inclined plane, commonly referred to as a ramp. Inclined planes are made of durable wood, have a smooth finish, and measure 5" x 19". Hall's carriages, support stands and clamps and spring scales or slotted weight sets are required for this laboratory, but are not included.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6685	Inclined Plane Classroom Set	$154.65
AP4550	Support Stand, Economy Choice	27.50
AP6532	Hall's Carriage, Economy Choice	16.75
OB2067	Slotted Weight Set, Economy Choice	105.00

Inclined Plane, Economy Choice

FLINN EXCLUSIVE

By: The Flinn Staff



An inclined plane is an essential tool for every physical science classroom. Use this four-foot-long, heavy-duty metal inclined plane to demonstrate and study frictional forces, potential and kinetic energy and constant acceleration. Tough enough to support a fully loaded dynamics cart. Includes a 12" long metal support rod and adjustable-height pulley system. A clamp holder is required to support the inclined plane on a ring stand and is sold separately. Dimensions: 48" x 6".

Catalog No.	Description	Price/Each
AP4535	Inclined Plane, Economy Choice	$59.95
AP8219	Clamp Holder	22.85

MECHANICS—SIMPLE MACHINES continued on next page.

Mechanics—Simple Machines, continued

Inclined Plane and Cart Model



A simple and durable wooden model of an inclined plane with a cart. Additional weight can be added to the cart to explore the effects on motion. Constructed of particle board and wooden components. Cart has rubber wheels that fit into grooves on the track of the inclined plane. Includes pulley, cart, string, and inclined plane with grooves. 16½" L x 3¼" x adjustable height to 4".

Catalog No.	Description	Price/Each
AP7845	Inclined Plane and Cart Model	$39.25

*PS*WORKS™ Carriage and Ramp

FLINN EXCLUSIVE

By: The Flinn Staff



Explore the fundamentals of force and motion with the Flinn *PS*WORKS Carriage and Ramp. With this apparatus, students study Newton's laws of motion in action and understand the relationships between distance, time, speed, and acceleration. Students will also be able to verify the mechanical advantage of an inclined plane—the simplest of simple machines. An extension rod is provided to support the ramp over the edge of a tabletop, which allows the hanging weights to fall and move the carriage over the entire length of the ramp.

Additional materials that are required, but not included, are a *PS*WORKS support stand, photogate timer, weight hanger, weights and pulley cord.

Catalog No.	Description	Price/Each
AP7003	*PS*WORKS Carriage and Ramp	$207.70
AP6998	*PS*WORKS Photogate Timer	418.20
AP6999	*PS*WORKS Support Stand	120.36

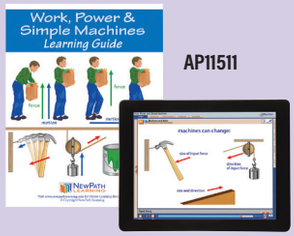
Inclined Plane



Investigate acceleration, friction and gravity; duplicate Galileo's free fall experiments. Folds for storage with a special hinge. A removable protractor allows you to clamp the inclined plane up to 45°. Aluminum. 20" x 4¾" x 2¼".

Catalog No.	Description	Price/Each
AP9268	Inclined Plane	$108.75

NewPath Learning Guides for Work, Power & Simple Machines



AP11511

The NewPath Learning Guides are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11511	Work, Power & Simple Machines Student Learning Guide with Online Lesson	$14.95
AP11561	Work, Power & Simple Machines Student Learning Guide with Online Lesson, Set of 10	99.00

Mechanics—Rotational

The Flying Pig



A flying pig is tethered to the ceiling with a string and propelled in a circle by flapping wings—what is the angle the string makes? What would the force diagram look like? How can the flying pig be explained by Newton's laws? Two AA batteries are required and available separately.

Catalog No.	Description	Price/Each
AP7842	The Flying Pig	$19.15
AP1423	Battery, AA	2.75

Bracken's Demonstration Spinner

FLINN EXCLUSIVE

By: Jeff Bracken, Westerville North H.S., Westerville, OH

Perform a wide array of physical science and chemistry demonstrations such as the Standing Wave Generator, Newton's Color Wheels, Butterfly Orbital, and Centrifugal Hoop using the Bracken's Demonstration Spinner's powerful motor. Best of all, you only have to purchase one demonstration spinner to perform all of these exciting demonstrations! Operates on one D battery (included).

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6202	Bracken's Demonstration Spinner	$34.00
AP6161	Standing Wave Generator	34.10

Centrifugal Circle



Help students understand centripetal force while they dispel popular misconceptions about centrifugal force. A vivid demonstration of Newton's first law of motion—the law of inertia. Students watch a ball roll along a circular course. They then predict what will happen when the ball exits the wooden circular pattern. Will it continue on its circular path, does it curve away from the circle, or does it follow a straight line? Students may be surprised with the result! A great apparatus to use in conjunction with the Centripetal Force Apparatus, AP9164. Includes large wood ball and complete instructions.

Catalog No.	Description	Price/Each
AP6471	Centrifugal Circle	$82.70

Celt



Tap the Celt on either end and watch it spin. Spin the Celt clockwise and it will stop and spin in the other direction. What causes the Celt to spin this way?

Catalog No.	Description	Price/Each
AP1972	Celt	$6.38

Torque Feeler



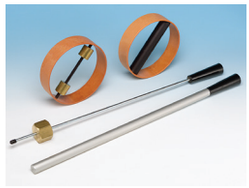
Successfully teach the concept of the "rotating force," or torque, with this unique device. First, place the hanging mass close to the gripping handle. Students will find it easy to hold the rod horizontal. Then, slide the same mass to the end of the rod—not even your strongest student will be able to grip tightly enough to prevent the handle from twisting in their hands! Effectively demonstrates how lever-arm distance influences the strength of a torque. Comes complete with instructions and 1-kg hooked mass.

Catalog No.	Description	Price/Each
AP4621	Torque Feeler	$95.70

MECHANICScontinued on next page.

Mechanics—Rotational, continued

Moment of Inertia Set



Each wand is equal in mass, but the mass of one wand is evenly distributed while the mass on the other wand can be moved along its length. Students will feel the dramatic difference between the efforts they use to rotate each wand. The second demonstration illustrates how changing the moment of inertia of a ring affects the speed at which it rolls down an inclined plane. Each ring has the same mass, but again, the mass distribution can be changed on one of the rings. Which ring will roll faster?

Catalog No.	Description	Price/Each
AP6714	Moment of Inertia Set	$168.05

Variable Inertia Kit



Students get involved by varying the distribution of large steel ball bearings inside the hollow, compartmentalized plastic discs. They can make the discs "center heavy" or "rim heavy" and see dramatically the effects of rotational inertia as they run them down an inclined plane. Comes complete with two disc setups, experiment suggestions, and explanations of the theory.

Catalog No.	Description	Price/Each
AP4633	Variable Inertia Kit	$22.70



AP6038



AP1955



AP9967

Gyroscopes

Catalog No.	Description	Price/Each
AP6038	Gyroscope and Gimbal Cradle Kit	$89.00
AP1955	Gyroscope	13.45
AP9967	Gravitron Space Gyroscope	13.17

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Gyroscope Bicycle Wheel

FLINN EXCLUSIVE

By: The Flinn Staff



Amaze your students with an object that appears to defy gravity! Twist the handles of the spinning handheld bicycle wheel and feel the peculiar body sensation associated with gyroscopic motion. The resulting resistance illustrates the use of gyroscopes as stabilizers and navigational devices. Stand on a rotational turntable and dramatically demonstrate the conservation of angular momentum—you are bound to have your students' undivided attention. For a real crowd-pleasing demonstration, tie a rope to an eye screw in one of the handles of the spinning wheel and it will "violate" gravity as it refuses to topple over—but it will precess. Comes completely assembled with spoked bicycle wheel, handles with hand grips and eye screws. Advanced background information and activity instructions are included.

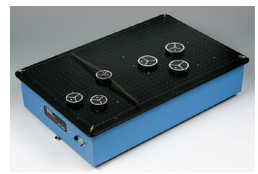
See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP4610	Gyroscope Bicycle Wheel	$149.00
AP4609	Rotational Turntable	70.15

Maxwell's Wheel See page 338.

Mechanics Equipment

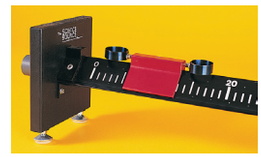
Air Table, Built-in Air Supply



Improve your laws of motion experiments with this top-quality air table. The durable air pucks will accurately show Newton's laws of motion, and vividly demonstrate elastic and inelastic collisions in two dimensions. Built-in air supply makes this unit compact and simple to operate. Complete operating instructions include 13 experiments that cover topics such as pendulum motion, oscillations, gravitational mass, and measuring the acceleration of gravity. Black surface provides an excellent background for advanced experiments using photographic or stroboscopic measurements. Includes three large and three small air pucks, two coil springs, and two Velcro® strips for inelastic collisions. Corner posts with bumper wire create a deflecting wall around the entire table surface. Surface area measures 60 x 90 cm.

Catalog No.	Description	Price/Each
AP6397	Air Table, Built-in Air Supply	$885.90

Air Track, Economy Choice



The sturdy 1.8-m anodized track is precisely machined to provide near frictionless movement of the gliders. The unit comes complete; all you need to supply is air. Unit includes: 1.8-m anodized track; 15-cm, 210-g and 7.5-cm, 105-g anodized gliders; two large bumpers; two small bumpers; two coil springs; end pulley with string; set of magnetic bumpers for elastic collisions; inelastic bumper; and hand-held glider launcher.

Catalog No.	Description	Price/Each
AP6061	Air Track, Economy Choice	$669.00

Catalog No.	Description		Price/Each
AP9164	Centripetal Force—Student Laboratory Kit	Individual Kit	$11.15
AP7272		Classroom Kit	81.00
AP7362	Curve Ahead, Reduce Speed! Centripetal Force—Demonstration Kit		45.00
AP7031	Greek Waiter's Tray—Super Value Laboratory Kit		38.00
AP6382	Circular Motion Paradox—Demonstration Kit		70.20
AP6693	Galileo's Paradox—Hinged Stick vs. Falling Ball—Demonstration Kit		64.00
AP4634	Ring and Discs—Demonstration Kit		22.80
AP6840	Figure Skating Dumbbells—Demonstration Kit		37.95
AP9677	Fidget Spinner—Flinn STEM Design Challenge™		56.50

FLINN EXCLUSIVE



Centripetal Force—Individual Kit AP9164

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

MECHANICS—ROTATIONAL continued on next page.

Mechanics Equipment, continued

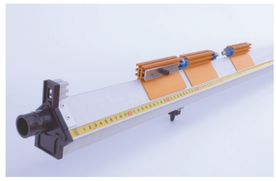
Air Source, Economy Choice



The 1½ horsepower motor will keep air carts floating freely for all dynamics experiments. Sound output is similar to that of an ordinary shop vac blower. If sound is an issue, this compact unit is easy to encase in a noise-dampening box or cabinet. Hose length is 4 feet. Recommended for Economy Choice Air Track AP6061. AP7528 Hose Adapter is required to connect AP6527 and AP6061.

Catalog No.	Description	Price/Each
AP6527	Air Source, Economy Choice	$98.25
AP7528	Hose Adapter	9.35

Air Track



Durability and maintenance-free performance are the benchmarks of this air track system. Designed specifically for introductory mechanics, its student-proof design can also double as a precision optics bench. (See Optics section for optics components.) You will obtain accurate results in your classic acceleration, conservation of momentum, collision and oscillator experiments. The air track is one-piece extruded aluminum. The clear, anodized track has a full-length meter tape and guide groove for spark paper. The air track is supplied with the following:

- 3 gliders, 100 g each
- 8 spring bumpers
- 3 magnetic bumpers
- 4 hook and loop bumpers
- 6 thumbscrews
- 1 spool of thread
- 2 long springs
- 2 short springs
- 1 weight hook
- 4 hanging weights, 5-g each
- 1 glider launcher
- 4 spring connecting brackets
- 12 masses, 25-g each
- 1 set of leveling pads
- 2 photogate arms
- 4 sizes of photogate light blocking gates (large, medium, small and single)
- Instruction manual

Specifications:

Working Length: 1.6 m
Wall Thickness: 0.3 cm
Air Holes: Two rows, 0.9 mm dia.
Cross Section: 90° apex isosceles triangle
Base Width: 9.4 cm
Support: Crossfoot and adjustable foot

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5615	Air Track	$785.60

Air Source with Hose for Air Track



The air input port has three foam sound absorbers. The straight-through air path reduces pressure loss and unnecessary turbulence—resulting in a smoother glider operation. The square design allows the units to be stacked for convenient off-season storage. One air source can power two AP5615 Air Tracks! The air source comes with one air hose. If you want to power two air tracks at once, you will need an extra air hose (AP5743).

Catalog No.	Description	Price/Each
AP5617	Air Source with Hose for Air Track	$798.00
AP5743	Air Hose, 2 m	54.60

Gliders for Air Track



Designed for rugged student laboratory use. Screw-head grooves on the top and sides allow additions to be made without drilling and tapping holes. Gliders are manufactured to within ±1 g of their rated masses. For Air Track AP5615.

Catalog No.	Description	Price/Each
AP8137	Glider, Gold, 100 g	$42.00
AP8169	Glider, Green, 200 g	52.23
AP8139	Glider, Red, 300 g	64.50

Riser Blocks



Turns the Air Track into an inclined plane, which can be used in projectile experiments. One set of 8 included with AP5615 Air Track.

Catalog No.	Description	Price/Each
AP8142	Riser Blocks, Set of 8	$28.80

Smart Timer for Air Track



The purpose of this device is to allow precise timing of experiments done with the Air Tracks. Timer contains seven separate functions and may be used to count time or measure acceleration when used with air track and collision devices. Device uses a six digit LCD and has a timer range of up to 1,000 seconds, with an accuracy of 0.0001 seconds. Timer conveniently displays functions with a large graphical user interface. Includes two photogates.

Catalog No.	Description	Price/Each
AP8155	Smart Timer for Air Track	$468.65

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WWW.FLINNSCI.COM

Electronic Stop Clock



Line-powered, more expensive, but we think it is worth it. There is no AC adapter to lose or batteries to replace just before the lab starts. Our six-digit electronic stop clock provides memory and period measurement with a resolution of 0.0001 s. The timer base is generated by a 10-k Hz quartz crystal with a lifetime accuracy of ±0.02%. The clock can be operated with one or two photogates, measuring the interruption of a single photogate or the time between breaking a pair of gates. Includes one photogate.

Catalog No.	Description	Price/Each
AP5745	Electronic Stop Clock	$533.73

Acceleration Timer—AC



Acceleration timer produces precisely 60 dots per second on a moving strip of paper. Demonstrate increases in velocity and precisely calculate acceleration, drag, and friction by measuring the interval between a series of dots. Includes paper, carbon paper disks, and a plastic feeler gauge.

Catalog No.	Description	Price/Each
AP9221	Acceleration Timer—AC	$101.00
AP9222	Replacement Paper	6.65

Acceleration Timer, AC, Mountable



The built-in two-way, ring-stand-clamp holes allow for easy setup on an upright support rod or cross bar. The timer unit produces 60 dots per second on a moving strip of paper. Comes complete with 1.8-m cord with an on/off switch, a roll of tape, red and black carbon disks and instructions including experiment suggestions.

Catalog No.	Description	Price/Each
AP5612	Acceleration Timer, AC, Mountable	$68.05
AP5613	Replacement Tape	5.85
AP5614	Replacement Carbon Disks, Pkg. 12	6.30

MECHANICS continued on next page.

Mechanics Equipment, continued

Accelerometers, Electronic See page 633.

Velocity Speed Gun, Digital



This radar gun uses digital technology and signal processing to record speeds with a ±1 mph accuracy. Values are easy-to-read on a large LCD display. Measure speeds for small objects and people from up to 90 feet away and vehicles from 1,300 feet.

Catalog No.	Description	Price/Each
AP7802	Velocity Speed Gun, Digital	$217.98

Accelerometer, Pocket



A portable, durable accelerometer/altimeter for field use. A locking mechanism stores current readings until they can be recorded. Accelerometer display is printed with both degrees and units of acceleration (in G) so you can measure altitudes or use it to measure centripetal acceleration.

Catalog No.	Description	Price/Each
AP9224	Accelerometer, Pocket	$39.90

Cart, Economy Choice



Low-cost general purpose cart for motion and force experiments. Cart is constructed of a durable I-beam plastic body with plastic wheels. Assembly and use instructions provided. Works great with the Economy Choice Inclined Plane AP4535.

Catalog No.	Description	Price/Each
AP4534	Cart, Economy Choice	$29.65

Constant Speed Vehicle



This simple vehicle provides the constant speed with zero acceleration you need to illustrate numerous physical science phenomena. The platform top allows the easy addition of weight; and the hooked end allows easy attachments and additional vehicles. Complete with teaching instructions. Two AA batteries are required and available separately.

Catalog No.	Description	Price/Each
AP5627	Constant Speed Vehicle	$41.00



AP9278



AP5633

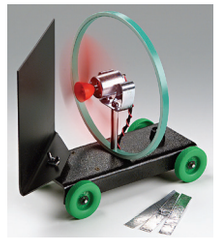


AP5632

Dynamics Carts

Catalog No.	Description	Price/Each
AP9278	Dynamics Carts, Three-Wheeled	$111.62
AP5633	Dynamics Carts, Four-Wheel	121.15
AP5632	Mini-Dynamics Carts	36.15

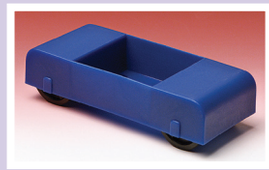
Fan Cart



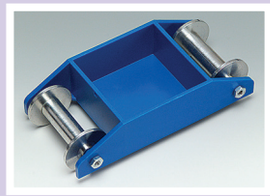
How does a propeller move an airplane? With this cart, students study the force generated by a motorized fan to learn about thrust, drag, air pressure, and Bernoulli's principle. Attach the sail and students will learn about Newton's law of action–reaction. By varying the angle of the sail in relation to the fan, students can see first-hand what "balanced forces" and "net force" really are. Complete instructions provided. Requires four AA batteries, not included.

Catalog No.	Description	Price/Each
AP6481	Fan Cart	$97.10
AP1423	AA Alkaline Battery	2.75

Force Tables See page 357.



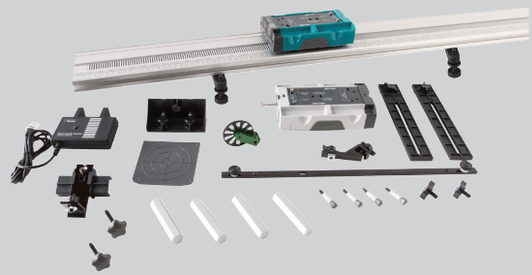
AP6532



AP9271

Hall's Carriage

Catalog No.	Description	Price/Each
AP9271	Hall's Carriage	$31.00
AP6532	Hall's Carriage, Economy Choice	16.75



Vernier Dynamics Track and Cart System with Motion Encoder TC1603

Vernier Dynamics Track and Cart System

Use these tracks with the included Vernier carts and obtain amazingly accurate results when studying the laws of motion. Coated with a clear anodized finish, these tracks provide lower friction than bare metal. Adjustable feet and ring-stand bracket make it easy to level or turn it them into a ramp. Track length of 1.2 meters is long enough for most dynamics experiments yet a convenient length for storage. Track includes a plunger cart that has a spring-loaded plunger while the included dynamics cart is similar but has no plunger. Interchangeable magnetic and hook and pile end caps make for many possible experiments.

TC1603 includes standard cart with magnetic and hook-and-pile end caps. TC1595 includes motion encoder receiver and motion encoder cart with magnetic and hook-and-pile end caps. *Additional standard and plunger carts available separately.* Tracks include combination 1.2 m dynamics track/optics bench, plunger cart with magnetic and hook-and-pile end caps, 4 hexagonal masses, mounting hardware for dual-range force sensor and accelerometers, adjustable end stop and motion detector bracket, 2 adjustable two-foot levelers, rod clamp and 2 Photogate brackets, and ultra-pulley attachment and pulley bracket.

Fan Cart (available separately) has three speeds for studying the effect of variable thrust. Two mass bars let you change the total mass of the cart to observe how mass affects acceleration. The fan turns on a protractor base, allowing the thrust to be directed at a known angle from the direction of travel. Included sail lets students perform the fan on-a-sailboat experiment. *Four AA batteries are required and available separately.*

Vernier Optics Expansion Kit (available separately) includes parts that snap directly onto the track so they can be left in place while the track is moved and adjusted. Includes three lenses permanently mounted to plastic supports, which makes for adjusting the distance between the lenses and light source easy. Also includes a power supply, light sensor holder and an aperture screen and holder.

Catalog No.	Description	Price/Each
TC1603	Vernier Dynamics Track and Cart System	$382.50
TC1595	Vernier Dynamics Track and Cart System with Motion Encoder	561.00
TC1552	Standard Cart	89.00
TC1553	Plunger Cart	99.00
TC1596	Fan Cart for TC1603 (Not for TC1595	134.00
TC1598	Vernier Optics Expansion Kit	225.00

MECHANICS EQUIPMENT continued on next page.

Mechanics Equipment, continued

Balls

Drilled balls are used for pendulum bobs or impact experiments. Other balls are suitable for collision experiments and density/volume experiments.

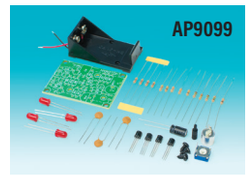
Ball Set, Drilled
AP6057



Catalog No.	Description	Price/Each
AP6057	Ball Set, Drilled	$95.00
AP5801	Aluminum ¾", Drilled	6.91
AP5802	Aluminum 1", Drilled	8.88
AP5803	Aluminum 1", with Hook	10.36
AP5804	Brass ¾", Drilled	11.50
AP5807	Cork ¾", Drilled	3.05
AP5808	Cork 1", Drilled	4.75
AP5810	Lead 1", Drilled	10.80
AP5811	Lead 1", with Hook	10.79
AP5812	Steel ¾", Drilled	6.96
AP5813	Steel 1", Drilled	8.02
AP5814	Steel 1", with Hook	8.14
AP5819	Steel ¾", Solid	2.31
AP5820	Steel ⅝", Solid	1.76
AP5626	Steel 1", Solid	4.05
AP7942	Steel 1 5/16", Solid	4.05
AP5815	Wood ¾", Drilled	2.64
AP5816	Wood 1", Drilled	4.00
AP5817	Glass ¾", Solid	1.96
AP5818	Glass 1", Solid	2.04

Robotics

Soldering Mini Kits



Sound to Light Mini Kit: Four LEDs light up to every sound within its range. Includes an onboard microphone. 00½" × 2¼" × 1½". 9-V battery is required.

Electronic Cricket Mini Kit: The circuit automatically comes on in the dark, and you can adjust the chirping repetition, effect, tone and light sensitivity with the onboard trimmer potentiometers. 1½" x 2¼" x 1". 9-V battery is required.

Flashing LED Sweetheart Mini Kit: Twenty-eight LEDs form two blinking hearts. 5.31" H x 1.38" L x 6.1" W. 9-V battery is required.

3D Xmas Tree Mini Kit: Contains 16 flashing red LEDs with extra green and yellow LEDs provided to customize your tree. 3" x 3½" x 4". 9-V battery is required.

Brain Game Mini Kit: The microcontroller circuit generates random patterns with light and sound. Then four on-board push buttons are used to replicate the pattern. Four difficulty levels. 3 AA batteries are required.

A soldering iron, solder and batteries are required and available separately.

Catalog No.	Description	Price/Each
AP9099	Sound to Light Mini Kit	$10.65
AP9147	Electronic Cricket Mini Kit	29.19
AP9148	Flashing LED Sweetheart Mini Kit	14.90
AP9197	3D Xmas Tree Mini Kit	23.05
AP9244	Brain Game Mini Kit	17.80
AP7919	Soldering Tool Kit	21.25
AP1423	Batteries, AA (Alkaline), 1.5 V	2.75
AP1430	Batteries, Transistor Battery (Alkaline), 9 V	6.32

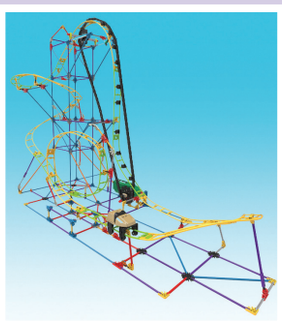
Robotic Smart Car



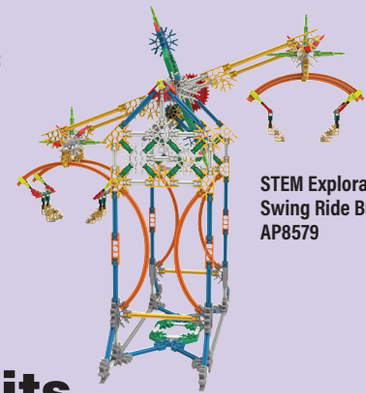
Build your own robotic smart car. This easy-to-assemble kit uses an Arduino Uno R3 to control the car. Has four different operation modes: autonomous obstacle avoidance, line tracing, IR remote and Bluetooth® smartphone control. Users can also reprogram the car and add additional modules to customize its performance.

Catalog No.	Description	Price/Each
AP9874	Robotic Smart Car	$122.30

ROBOTICS continued on next page.



STEM Explorations:
Roller Coaster
Building Set
AP8697



STEM Explorations:
Swing Ride Building Set
AP8579

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K'NEX Activity Kits

Catalog No.	Description	Price/Each
AP6949	Introduction to Simple Machines: Levers and Pulleys	$ 52.55
AP6948	Introduction to Simple Machines:Wheels and Axles, and Inclined Planes	50.75
AP6951	Introduction to Simple Machines: Gears	50.00
AP6950	Introduction to Structures: Bridges	52.55
AP8579	STEM Explorations: Swing Ride Building Set	53.00
AP8697	STEM Explorations: Roller Coaster Building Set	49.95

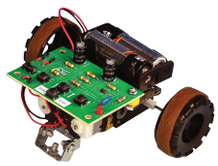


Introduction to Simple Machines:
Wheels and Axles, and Inclined Planes
AP6948

Robotics, continued

Solar Robots See pages 440–441.

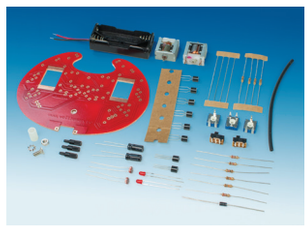
Robot, Push-Button Programmable



Assemble and program a robot to move in complex patterns! Program the robot to go forward, left and right in any order that you want. Learn about resistors, oscillators, capacitors, switching diodes, LEDs, gearboxes, switches and how a push button operates. Program up to 360 commands for the robot to follow. Includes assembly instructions, a sample program and a brief description of the circuit components. Three AA batteries are required and available separately.

Catalog No.	Description	Price/Each
AP7844	Robot, Push-Button Programmable	$43.80
AP1423	Battery, AA	2.75

Crawling Microbug



- Two open-chassis subminiature motors
- Almost any light intensity
- Adjustable light sensitivity suits
- Choice of two different walks
- Adjustable speed
- Stops in total darkness
- LED 'eyes' indicate driving direction

Catalog No.	Description	Price/Each
AP9098	Crawling Microbug	$25.50

Robotics: BT Beginner



With the Robotics BT Beginner kit, construct 12 models, such as a conveyor belt with or without punch, hand dryer, lighthouse with blinking light, merry-go-round, two tracked vehicles, parking barrier, pedestrian light, punching machine with safety switch, refrigerator and washing machine. The included controller has Bluetooth® capability and requires a 9-V battery (and Bluetooth® 4.0 sticks if used with Windows 7). Comprehensive instruction manual contains detailed directions, activity booklet, background information and a troubleshooting guide. Included software is compatible with Windows 7, 8 and 10 and Android tablets.

Catalog No.	Description	Price/Each
AP9566	Robotics: BT Beginner	$278.90
AP1430	Battery, Transister (Alkaline), 9 V	6.32

Model Rocketry

Model rockets combine math and physical science principles in a highly motivating student activity. Estes model rockets are by far the most widely used student rockets. The reason stems from the safety features built into the ignition system and the emphasis on safety throughout the curriculum materials. From the low-cost, solid-fuel engine to the Safety Code incorporated into all the flight activities, this emphasis on safety will make rocketry enjoyable for both you and your students. Models all feature:

- Lightweight construction of cardboard, plastic or balsa wood.
- Engine ignition using a launching system from a safe distance.
- A reverse engine recovery system to return the rocket safely to the ground to allow multiple flights for each rocket.
- Decorative features to make the rockets look authentic.
- Different skill levels for you and your students.
- High-altitude flights.
- Durability.

Alpha III Rocket Launch Set



The Alpha III E2X® Almost Ready to Fly Rocket is easy to build and hits an altitude of 335 m! Specifications: 12" parachute recovery system, brightly colored plastic one-piece fin unit makes assembly a snap, 31.1 cm x 24.9 mm, weighs 34 g.

Catalog No.	Description	Price/Each
AP7389	Alpha III Rocket Launch Set	$34.52
AP1430	Battery, 9-V	6.32

Tandem-X Rocket Launch Set



Two is better than one! Blast off again and again with this exciting pair of rockets. Almost three feet high, the tiger-striped Amazon™ rocket can reach over 650 feet! With aerodynamic fins and nose cone, the streamlined 15" tall Crossfire™ can reach atmospheric heights of 1,200 feet! Straightforward building directions and durable construction. Rockets safely return to earth using colorful parachutes.

Catalog No.	Description	Price/Each
AP7390	Tandem-X Rocket Launch Set	$44.00
AP1430	Battery, 9-V	6.32

ROCKETS AND FLIGHT continued on next page.

Individual Rocket Kits and Bulk Packs

All individual rocket kits are complete with assembly instructions and many are available in bulk packs for classroom savings.

Catalog No.	Description	Assembly Level*	1st Flight Engine	Other Engines	Maximum Altitude	Dimensions (Ht. x Dia. x Wt.)	Price/Each
AP4802	WIZARD: Good for wind drift studies. High altitude performance. Streamer.	C	A8-3	B4-4 B6-4 C6-5	457 m	30.5 cm x 13.8 mm 22.4 g	$ 15.83
AP4803	WIZARD: Bulk Pack (12 Pack)						97.15
AP5711	VIKING: Build one of 48 fin combinations with this basic rocket. Streamer.	C	A8-3	B6-4 C6-5	448 m	30.8 cm x 18.7 mm 17.0 g	14.53
AP5734	VIKING: Bulk Pack (12 Pack)						91.78
AP4804	ALPHA: Swept fin performance rocket. Ideal for illustrating basic stability principles. 12" parachute.	C	A8-3	B6-4 C6-5	366 m	31.1 cm x 24.8 mm 22.6 g	19.03
AP4805	ALPHA: Bulk Pack (12 Pack)						151.00
AP6425	HI-FLIER: Keep an eye on this one! Soars to over 1600 ft. Streamer.	C	A8-3	B6-4 C6-5	515 m	30.5 cm x 18.8 mm 23.2 g	12.75
AP6426	GENERIC E2X: Bulk Pack. (12 Pack) 12" parachute.	B	A8-3	B6-4 C6-5	335 m	38.1 cm x 24.8 mm 36.0 g	139.45

*Assembly Level A = No assembly—no painting B = Minimal assembly—no painting C = Single stage, simple balsa fins and simple painting.



Rockets and Flight, continued

Launch System





Launch control sequence is maintained through the use of an electron beam launch controller and a stable launch pad. The Launch Pad features:

- Large 24" square launch pad for stability.
- Steel blast deflector.
- Easy set-up and quick take-down for storage.
- Easy adjustment for wind directions up to 20 mph.

The Electron Beam Launch Controller requires no assembly, has a 17-foot launch cable with micro clips, a safety key and a compact, hand-held design. Four AA batteries required and available separately.

Catalog No.	Description	Price/Each
AP5708	Electron Beam Launch Controller	$30.20
AP5709	Launch Pad	27.40
AP1423	AA Alkaline Battery	2.75

Rocket Engines

All engines include complete operating instructions.

1. The first letter stands for the relative power of the engine. A "B" engine is twice as powerful as an "A" while "C" is twice as powerful as a "B."
2. The first number following the letter indicates the engine's average thrust in newtons.
3. The number after the hyphen is the number of seconds between the end of thrusting and the start of the ejection charge. This double charge occurs because the engines fire in two directions—at launch and then in the opposite direction to eject the streamer or parachute or to fire the second stage of the rocket.

For example: A C6-5 engine is the most powerful engine we sell. It has an average thrust of 6 newtons and has a five-second delay before the ejection charge, or second stage, is ignited.

Regular engine packs include three or four engines, igniters and igniter plugs. Our economical Bulk Packs include 24 engines, igniters, igniter plugs and recovery wadding.

Catalog No.	Description	Price/Each
AP4809	A8-3, 3 each	$ 12.80
AP4810	A8-3, Bulk, 24 pack	93.16
AP4811	B6-4, 3 each	13.28
AP4812	B6-4, Bulk, 24 pack	94.31
AP6429	C6-5, 3 each	16.02
AP6430	C6-5, Bulk, 24 pack	109.75
AP6428	½ A3-4T, Bulk, 24 pack	68.98



Blast-off Flight Pack

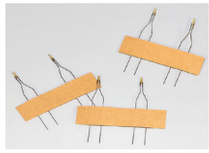
Big savings with this bulk pack of basic rocket consumables. Set includes 24 Rocket Engines and Plugs, 30 Rocket Igniters, and 25 Flights of Recovery Wadding. Provided are six each of the following engines: A8-3, B6-4, C6-3 and C6-5.

Catalog No.	Description	Price/Each
AP5710	Blast-off Flight Pack	$85.15

Model Rocket Starters

The most reliable and safe igniters available. Completely compatible with all of our rockets. Six per package.

Catalog No.	Description	Price/Pkg.
AP4818	Model Rocket Starters, Pkg. of 6	$7.85



Recovery Wadding

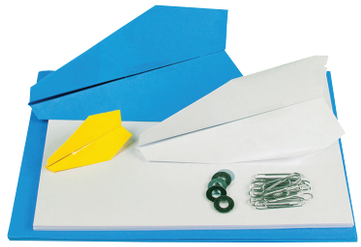
Enough flame-resistant wadding for up to 25 flights. This important material protects your rocket's recovery system from hot gases at ejection to ensure reliable deployment. Complete instructions provided.

Catalog No.	Description	Price/Each
AP4817	Recovery Wadding	$6.97

Paper Airplanes—Flinn STEM Design Challenge™

FLINN EXCLUSIVE

By: The Flinn Staff

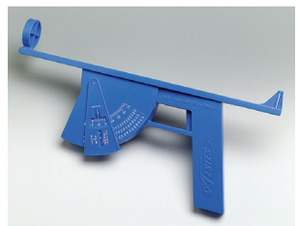


After learning the basics of paper airplane design, teams are asked to design a new toy paper airplane. Can they design a long-distance, load-carrying flyer? While staying within a budget, teams decide which materials to use and the best overall design to meet the criteria. As weights are added and materials change, students will have to make design alterations to ensure a long and stable flight. Whose design will win?

Complete for 30 students working in pairs. Tape measures are required and available separately.

Catalog No.	Description	Price/Each
AP8061	Paper Airplanes—Flinn STEM Design Challenge™	$30.00
AP6323	Tape Measure, Wind-Up Type, Metric, 30 m	29.99

Altitude Finder



Ideal for gathering experimental performance and altitude data. Simply follow the flight of your rocket in the sights of this device. When the trigger is released the maximum altitude is locked in. The finder displays the rocket's height in meters and the elevation angle in degrees. Upon returning to the laboratory the measurements can be used to calculate the height of the rocket.

Catalog No.	Description	Price/Each
AP4807	Altitude Finder	$29.95

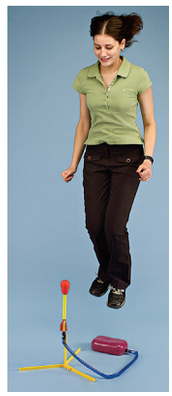
Ultralight Airplanes



Students construct awesome flying gliders with ultralight plastic and bamboo parts. They can build five different types of planes with different wing configurations to learn how wings provide lift and how planes stay up in the air.

Catalog No.	Description	Price/Each
AP11665	Ultralight Airplanes	$21.95

Ultra Stomp Rocket



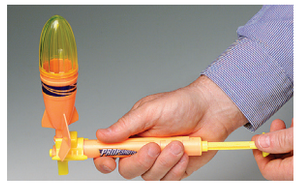
Simple, safe and superb rocket science! This inexpensive air rocket sets up in less than five minutes, and blasts off rockets to incredible altitudes of 200 feet. Each rocket has a foam-padded tip for safety. Launch bladder is composed of high-strength plastic. Complete with launch pad and stand, launch bladder, and four safety-tipped rockets.

Catalog No.	Description	Price/Each
AP6932	Ultra Stomp Rocket	$27.65

ROCKETS AND FLIGHT continued on next page.

Rockets and Flight, continued

Water Rocket, Mini



Fill the rocket with propellant (ordinary water) using the funnel provided. Place the rocket on the air pump "launch pad" and add fuel (air pressure) to the inside of the rocket. Flip the switch and watch the rocket soar up to 200 feet!

Catalog No.	Description	Price/Each
AP6407	Water Rocket, Mini	$10.10

Pressure—Gases

Airzooka See page 397.

Atmosphere Bar

FLINN EXCLUSIVE

By: Walter Rohr, Retired
Eastchester High School
Eastchester, NY



What does atmospheric pressure really feel like? This one-inch-square steel bar, weighing 14.7 lbs and measuring 52 inches long, will drive home the point! Students will be amazed how much the bar weighs when they lift it. They will be even more impressed when they stand the atmosphere bar on end and "feel" the 14.7 lbs of pressure. Instructions with teaching tips included.

Catalog No.	Description	Price/Each
AP5882	Atmosphere Bar	$56.35

Pressure Bottle

FLINN EXCLUSIVE

By: Walter Rohr, Retired,
Eastchester HS, Eastchester, NY

When the cap is in place, the bottle can be pumped up just like a tire! The pressure can then be varied inside the bottle by adding or releasing air using the valve in the cap. A sealed syringe inside the bottle will change volume in response to pressure changes in the bottle and can be viewed right through the side of the bottle.

Comes with bottle, cap with mounted valve and complete instructions with laboratory exercise suggestions. A bicyle pump is required and available separately.

Catalog No.	Description	Price/Each
AP5930	Pressure Bottle	$12.40
AP6884	Bicycle Pump with Pressure Gauge and Release Valve	87.30
AP7669	Plastic Bottle, 1-L	1.90

Boyle's Law Apparatus

FLINN EXCLUSIVE

By: The Flinn Staff



This easy-to-use apparatus is made of a 10-mL calibrated plastic syringe, a piston supporting a metal hanger and a pinch clamp. Students produce a graph showing the relationship between pressure and volume by varying the mass on the metal hanger and recording the change in volume. Includes detailed Teacher Notes, background information and two reproducible student handouts.

Catalog No.	Description	Price/Each
AP9223	Boyle's Law Apparatus	$31.90

Catalog No.	Description	Price/Each
AP4695	Collapsing Can—Demonstration Kit	$ 15.60
AP4713	Breaking Board Paradox—Demonstration Kit	35.35
AP7201	Investigating Pressure—Super Value Activity-Stations Kit	121.65
AP6936	Pressure Mat—Demonstration Kit	36.00
AP6310	Up, Up and Away—Hot Air Balloon—Laboratory Kit	85.30



FLINN EXCLUSIVE

Up, Up and Away—Hot Air Balloon Laboratory Kit
AP6310

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

PRESSURE—GASES continued on next page.

Physical Science—Flinn STEM Design Challenge™ 9-Kit Bundle

STEM INTEGRATED



Cost-saving bundle includes 9 Flinn STEM Design Challenge Physical Science kits! Bring engineering design into your class with confidence and save money by purchasing the kits as a bundle rather than individually.

- AP8053 Investigate a Twirling Toy—Design a spinning toy to land on a target with the slowest descent.
- AP8054 Build a Model Catapult—Use knowledge of levers, projectile motion and energy to accurately launch a projectile.
- AP8055 Roller Coasters—Conservation of energy is the key to designing a thrilling yet safe ride.
- AP8056 Create a Mobile—Add art to math, science and engineering to create a mobile that hangs in equilibrium.
- AP8058 Egg Elimination—Create a vehicle that protects its cargo and eliminates the competition.
- AP8059 Drop Zone—Design a vehicle to air drop a marble "package" with pinpoint accuracy.
- AP8060 Eggs-streme Parachuting—Construct an egg-carrying parachute that lands safely without breaking the egg.
- AP8061 Paper Airplanes—Become engineers for ToyCo and make a cost-effective, long-distance, load-carrying flyer.
- AP8062 Building Bridges—Build a balsa wood bridge that supports the most weight.

Catalog No.	Description	Price/Each
AP8084	Physical Science—Flinn STEM Design Challenge 9-Kit Bundle	$459.00

Pressure—Gases, continued

Absolute Zero Device

FLINN EXCLUSIVE

Unique device shows the relationship of pressure to temperature of a gas, allowing students to determine the value of absolute zero. The bulb is immersed in hot water, cold water and a dry ice acetone mixture. Temperatures and pressure readings are recorded. Pressure versus temperature readings, when plotted, provide a value of absolute zero. Bulb diameter 100 mm. A thermometer (thermocouple) with a –100 to 100 °C range is required and available separately.



Catalog No.	Description	Price/Each
AP4531	Absolute Zero Device	$173.71
TC1523	Thermocouple	85.00



AP8353



AP8356

Historical Inventions Laboratory Kits

FLINN EXCLUSIVE

By: The Flinn Staff

The new Flinn Scientific Historical Inventions Laboratory Kits are a great way to integrate science and history. Students will learn of groundbreaking ideas and interesting historical periods while re-creating the scientific inventions that were shared by the great minds of those times. From Greek philosophers to the Industrial Revolution, students will earn an appreciation for the collaborative scientific work that leads to technological advance and just maybe be inspired to become inventors themselves!

Catalog No.	Description	Price/Each
AP8353	Camera Obscura—Historical Inventions Laboratory Kit	$179.00
AP8356	Water Wheel Generator—Historical Inventions Laboratory Kit	148.60

Magdeburg Hemispheres



Simply hook up the hemispheres to a hand vacuum pump, an aspirator or vacuum pump and evacuate the air. Close the valve and let the pulling begin! This economical demonstration features a convenient two-way valve for easy operation and release, two tough plastic 11-cm diameter hemispheres with wooden handles, and comes complete with directions, experiment suggestions and historical information about Magdeburg hemispheres. Requires a three-way valve or a ¼" tubing connector to attach to an electric vacuum pump.

Catalog No.	Description	Price/Each
AP4638	Magdeburg Hemispheres	$49.20
AP5353	3-Way Valve for Vacuum Pump	62.75
AP8879	Tubing Connector, Straight, Polypropylene, ¼" i.d.	5.65

Magdeburg Hemispheres, Rubber



Air is removed by simply pushing the two rubber plungers together. Once they are together, your students will be amazed how difficult it is to pull them apart! Have students design an experiment to determine how many Newtons of force are required to pull them apart.

Catalog No.	Description	Price/Each
AP5661	Magdeburg Hemispheres, Rubber	$22.85

Elasticity of Gases Apparatus

FLINN EXCLUSIVE

By: The Flinn Staff



Demonstrate the elasticity of gases using this simple instrument. Set a volume of gas in the piston, then use weights to pressurize the system. As the weights are added, the volume of gas is decreased. Students plot volume versus pressure to approximate Boyle's law. Includes a six-page handout with detailed teacher notes, background information and a reproducible student handout.

Catalog No.	Description	Price/Each
AP9022	Elasticity of Gases Apparatus	$22.25
AP7102	Replacement Syringe for Elasticity of Gases Apparatus	6.40

Harbottle



Simply place the balloon into the opening of the Harbottle and stretch the mouth of the balloon over the mouth of the bottle. Blow into the balloon and, when it is fully inflated, stopper the bottom hole of the Harbottle. Release your mouth—the balloon stays inflated! No twisting or tying required. Surprise your students even more with the strength of air pressure by filling the balloon with water before releasing the stopper! Includes Harbottle, balloon, rubber stopper, and complete instructions. Replacement balloons may be purchased separately.

Catalog No.	Description	Price/Each
AP7205	Harbottle	$53.00
AP1900	Balloons, 12" Round, Latex, 20/Pkg.	6.45

Pumps, Bicycle

AP6884



Bicycle pumps have several applications in a physical science classroom. The handheld bicycle pump is an excellent and inexpensive choice for pumping up water rockets. Use the Bicycle Pump with Gauge and Release Valve for precise quantitative pressure measurements. This bicycle pump is perfect for the Pressure Bottle Demonstration (AP5930), Boyle's Law in a Bottle Laboratory Kit (AP6855), and Absolute Zero Device (AP4531). Gauge range: 0–260 psi. Both bicycle pumps are made from durable aluminum and will last for years.

Catalog No.	Description	Price/Each
AP6910	Bicycle Pump, Handheld	$26.06
AP6884	Bicycle Pump with Gauge and Release Valve	87.30

Pumps, Vacuum See page 179.

Introduction to Bernoulli's Principle—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



What prevents a card from blowing away or a ball from flying out of a cup? How does an atomizer work? With this kit, students will explore the basic conceptual applications of Bernoulli's principle. Students perform four fundamental hands-on activities and there are also two teacher demonstrations to help students grasp the concepts. An excellent activity to tie together the concepts of air pressure, force, fluid motion, aerodynamics and flight. Student worksheets and complete instructions are provided.

Complete for 30 students working individually.

Catalog No.	Description	Price/Each
AP6904	Introduction to Bernoulli's Principle—Student Laboratory Kit	$50.00

PRESSURE—GASES continued on next page.

Pressure—Fluids

Cartesian Diver Construction—Super Value Kit

STEM INTEGRATED

By: Bob Becker, Kirkwood H.S., Kirkwood, MO



Students learn the relationship between pressure and air volume and how air volume acts to regulate buoyancy by constructing Cartesian divers made of simple equipment and materials. Procedures for constructing 11 different types of Cartesian divers are provided.

Super Value Kit is complete with 100 pipets and hex nuts. Requires water and two-liter soda bottles. Includes Flinn Exclusive STEM Integration Guide.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP9082	Cartesian Diver Construction—Super Value Kit	$37.30

Cartesian Diver Design Challenge—Guided-Inquiry Kit

STEM INTEGRATED

By: The Flinn Staff



After testing a basic diver, students are challenged to create divers that retrieve, descend in a particular order and even spin! This STEM activity helps students practice critical thinking and incorporates engineering design. Choose one challenge or do all three! Connect engineering design to density, Boyle's law and pressure. Enough materials are included for each group to design and test ten Cartesian divers. Reproducible student handouts and valuable Teacher Notes complete the kit.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP7926	Cartesian Diver Design Challenge—Guided-Inquiry Kit	$85.00

Pascal's Law—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



First, challenge students to a Pascal-syringe "thumb war" using connected syringes filled with water. Then, after your victory, students will experiment with three different syringe systems to effectively learn about the properties of Pascal's law and the mechanical advantage of a hydraulic system. Their results will clearly show why you won the "thumb war." Includes reproducible student handouts, complete teacher notes and all consumable supplies needed to perform the lab.

Complete for 32 students working in groups of four.

Catalog No.	Description	Price/Each
AP6623	Pascal's Law—Student Laboratory Kit	$56.75

Convection of Liquids Tube

See page 356.

Density of Hot and Cold Liquid Demonstration

See page 233.

Pythagoras Cup



A wonderful practical joke that can be used to teach science over and over again. Legend has it that Greek philosopher and mathematician Pythagoras of Samos gave this cup to his students when he served them all wine. Any students who chose to be greedy and pour wine into their cups to a level higher than permitted would watch the entire contents of the cups drain away! Have fun investigating the siphoning effect in this memorable activity.

Catalog No.	Description	Price/Each
AP9686	Pythagoras Cup	$34.97

Bottomless Bottle—Pascal's Law Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Use this old parlor trick to dramatically demonstrate Pascal's law of equal pressure and the incompressibility of fluids. Fill a glass bottle with water. Firmly grip the neck of the bottle, give the top of the bottle a whack with a rubber mallet and—Pop! The bottom of the bottle drops out. The small force applied to the water in the narrow neck of the bottle becomes a much larger force on the bottle's wider bottom—Pascal's law in action! The force is large enough to break the glass at the base of the bottle. Includes instructions and enough glass bottles to perform the demonstration 12 times.

Note: Protective gloves are recommended when performing this demonstration and are available separately.

Catalog No.	Description	Price/Each
AP6643	Bottomless Bottle—Pascal's Law Demonstration Kit	$35.50
SE1030	Gloves, Terrycloth, General Purpose (Pair)	7.00

Water Hammer



Shake the Water Hammer up and down and an unexpected sound will be produced—the "ping" of a hammer hitting a nail. Students will suspect that this is a trick, but will be amazed to learn that it is only water causing the noise—no other objects are used. The Water Hammer is a great device to introduce students to concepts such as water pressure, fluid properties, and resonance. Instructions and background information are provided.

Catalog No.	Description	Price/Each
AP6760	Water Hammer	$63.37

Principles of Hydraulics—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students will measure the diameters of hydraulic pistons, calculate their areas and then measure the forces necessary to lift specific loads. The significance of the mechanical advantage calculation will become crystal clear to students as they personally manipulate the hydraulic system. Students will love building a working model hydraulic jack and measuring the forces involved in lifting heavy objects. The transparent valves and tubing used in their lab work will allow them to view all the working parts.

Includes one complete hydraulic system, enough for one student group. Buy multiple kits to equip an entire classroom. All materials are reusable.

Catalog No.	Description	Price/Each
AP6494	Principles of Hydraulics—Student Laboratory Kit	$74.30

Mini Hydraulic Experiment Set



Students are guided through the construction of machines and then asked to reflect on their final product—what worked or did not work? Includes a teacher information booklet and a 15-page student building manual. Along with detailed illustrations, the manual includes background information about the history of hydraulic machines. Sturdy wooden pieces are pre-cut and pre-drilled. Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP7865	Mini Hydraulic Experiment Set	$193.20

PRESSURE—FLUIDS continued on next page.

Pressure—Fluids, continued

Hydraulic Hot Water Bottle—Multi-Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff

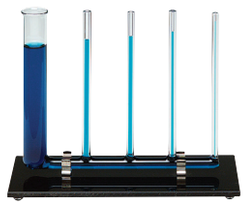


Three fun water pressure demonstrations in one complete kit! Demonstrate why water is stored in tall water towers. Illustrate Bernoulli's principle as you teach about fluid motion. Easily lift a student with the press of your thumb to demonstrate a hydraulic jack. Finally, weigh a student by measuring the height of a water column. Excellent hands-on demonstrations for middle school and high school level students. Detailed instructions and background information are provided.

Notes: A tape measure is required and available separately.

Catalog No.	Description	Price/Each
AP6857	Hydraulic Hot Water Bottle—Multi-Demonstration Kit	$68.00
AP8400	Tape Measure, 10'	9.75

Capillary Equilibrium Tube



Normally water in a series of commonly connected tubes at the same height would all reach equilibrium due to equal air pressure on the columns. But in this demonstration the diameter of some of the tubes is so small that the force of capillary action pulling up on the water is greater than the air pressure above the water, thus pulling the water even higher. Since the force of capillary action is essentially constant for a particular liquid, the cross-sectional area of the tube is the determining factor for the final height of the water. The four tubes and reservoir form a single all-glass unit that is held upright in its enclosed stand. Detailed exploration of capillary force is included.

Catalog No.	Description	Price/Each
AP4734	Capillary Equilibrium Tube	$64.55

Heat and Thermodynamics

FLINN360science™: Kinetic Energy



This kit presents the concepts of molecules and atoms, temperature, and kinetic energy through hands-on activities that engage all your students, regardless of level. By completing this investigation students gain a better understanding of the many factors that contribute to the process of erosion Teachers can extend learning through guided inquiry into associated phenomena including, "Why does shivering make a person warmer?"

Catalog No.	Description	Digital Access	Price/Each
AP11342	360Science: Kinetic Energy	1-Year	$32.00
AP11442		3-Year	45.00

FLINN360science™: Heat Transfer



This kit presents the essential concepts of conservation of energy, equilibrium, and calorimetry through hands-on science activities designed to engage all your students, regardless of level. During this lab, students will identify metal samples by determining the specific heat capacity of each metal, using a calorimeter. Teachers can extend learning through guided inquiry into associated phenomena such as, "How does a blanket keep you warm?"

Catalog No.	Description	Digital Access	Price/Each
AP11343	360Science: Heat Transfer	1-Year	$157.00
AP11443		3-Year	165.00

FLINN360science™: Convection, Conduction, and Radiation



This kit presents the essential concepts of convention, conduction and radiation through hands-on science activities designed to engage all your students, regardless of level. In this lab experience, students rotate through three stations to observe convection, conduction, and radiation. Students then apply their observations to processes related to Earth's mantle, oceans, and atmosphere. Teachers can extend learning through associated phenomena such as, "What causes geysers?"

Catalog No.	Description	Digital Access	Price/Each
AP11344	360Science™: Convection, Conduction, and Radiation	1-Year	$141.00
AP11444		3-Year	159.50

HEAT AND THERMODYNAMICS continued on next page.

Physical Science—Flinn STEM Design Challenge™ 9-Kit Bundle

STEM INTEGRATED

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- AP8058 Egg Elimination—Create a vehicle that protects its cargo and eliminates the competition.
- AP8059 Drop Zone—Design a vehicle to air drop a marble "package" with pinpoint accuracy.
- AP8060 Eggs-streme Parachuting—Construct an egg-carrying parachute that lands safely without breaking the egg.
- AP8061 Paper Airplanes—Become engineers and make a cost-effective, long-distance, load-carrying flyer.
- AP8062 Building Bridges—Build a balsa wood bridge that supports the most weight.



AP8054



AP8059



AP8062

Catalog No.	Description	Price/Each
AP8084	Physical Science—Flinn STEM Design Challenge™ 9-Kit Bundle	$459.00

Heat and Thermodynamics, continued

Heat and Temperature—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



This "series" of four hands-on experiments and one demonstration provides students with an in-depth understanding of heat, temperature and heat energy transfer.

- Conductometer—Compare thermal conductivity of five different metals.
- Specific Heat—Investigate the concepts of specific heat and calorimetry by heating metal samples and placing them into foam calorimeter cups filled with water.
- Radiation Cans—Study heat transfer by means of infrared radiation, and explore the properties of heat-absorbing and heat-reflecting materials.
- Relative Humidity and Dew Point—Use a sling psychrometer to validate the significance of evaporation as a heat-removal method.
- Ball and Ring Apparatus—Included as a teacher demonstration to show the expansion and contraction of metals in hot and cold environments, respectively.

Versatile "activity stations" allow different student groups to work independently to explore a specific aspect of heat energy. Detailed instructions and Teacher Notes are provided.

Complete for 30 students working in groups of three. An infrared heat source is required and available separately.

Catalog No.	Description	Price/Each
AP7017	Heat and Temperature—Student Laboratory Kit	$145.20
AP5372	Infrared Lamp and Reflector	55.06

Conduction, Convection and Radiation—Activity-Stations Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students will eagerly "take the heat" as they discover for themselves the basic principles of heat transfer with this series of four hands-on experiments.

- Conduction—Test the thermal conductivity of different materials, and compare the results with known quantities.
- Convection of a Liquid—Investigate how temperature affects the density of a liquid, and watch as convection currents are created when the hot and cold liquids rise and sink, respectively.
- Convection of a Gas—Observe the dramatic effects of convection currents in air on a lighted candle that will really make students use their "thinking caps."
- Radiation—Explore heat transfer through radiation by measuring the temperature increases for two types of sand exposed to a heat source.

Standard laboratory equipment and a light source are required, but not included. Includes comprehensive background information, Teacher Notes and student worksheets.

Complete for 12 student groups.

Catalog No.	Description	Price/Each
AP7183	Conduction, Convection and Radiation—Activity-Stations Kit	$89.60

HEAT AND THERMODYNAMICS continued on next page.

Useful Scientific Conversion Factors and Physical Constants

Some Conversion Factors

Length	1 in = 2.54 cm
	1 cm = 0.394 in
	1 km = 0.6214 mi
	1 mi = 1.609 km = 5,280 ft
	1 m = 39.37 in = 3.281 ft = 1.094 yd
	1Å = 1×10^{-10} m = 0.1 nm
Area	1 m^2 = 1×10^4 cm^2 = 10.76 ft^2 = 1,550 in^2
	1 ft^2 = 0.0929 m^2 = 144 in^2
Volume	1 L = 1,000 cm^3 = 61.02 in^3 = 33.81 oz
	1 gal = 4 qt = 8 pt = 128 fl oz = 3.786 L
	1 fl oz = 29.58 mL
	1 Tbsp = 3 tsp = 14.8 mL
	1 cup = 237 mL
Mass	1 oz = 28.35 g = 0.0625 lb
	1 kg = 2.20 lb
	1 lb = 16 oz = 453.6 g = 0.4536 kg
Density	1 g/cm^3 = 62.43 lb/ft^3 = 0.03613 lb/in^3
Pressure	1 torr = 1 mm Hg = 1.32×10^{-3} atm
	1 atm = 760 torr = 1.01×10^5 Pa = 14.7 lb/in^2
Energy	1 J = 10^7 erg = 0.239 cal
	1 cal = 4.184 J
Time	1 year = 365.25 days = 8,766 hours
	1 year = 5.26×10^5 min = 3.156×10^7 sec
Temperature	°C = 5/9 (°F – 32)
	°F = 9/5 (°C) + 32
	K = °C + 273.15

Some Physical Constants

Atomic mass unit	amu	1.6606×10^{-24} g
Avogadro's number	*N*	6.0221×10^{23}/mol
Boltzman constant	k	1.3807×10^{-23} J/K
		3.3000×10^{-24} cal/K
Charge of an electron	e	1.6022×10^{-19} C
Curie	Ci	3.70×10^{10} dps
Electron volt	eV	1.602×10^{-19} J
		3.829×10^{-20} cal
Faraday constant	*F*	96,485 C/mol e^-
Gas constant	*R*	8.315 J/mol • K
		0.08206 (L •-atm)/(mol-•K)
Mass of an electron	m_e	9.1094×10^{-28} g
		5.4858×10^{-4} amu
Mass of a neutron	m_n	1.6749×10^{-24} g
		1.0087 amu
Mass of a proton	m_p	1.6726×10^{-24} g
		1.0073 amu
Planck's constant	*h*	6.626×10^{-34} J • s
		1.584×10^{-34} cal • s
Speed of light (in vacuum)	*c*	2.9979×10^8 m/s
Acceleration of gravity (standard value)	*g*	9.80665 m/s^2
Speed of sound (in air at STP)		331 m/s

Some Metric Prefixes

p	n	μ	m	c	d	k	M	G
pico	nano	micro	milli	centi	deci	kilo	mega	giga
10^{-12}	10^{-9}	10^{-6}	10^{-3}	10^{-2}	10^{-1}	10^3	10^6	10^9

Heat and Thermodynamics, continued

Heat Transfer Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students learn about the flow and transfer of heat energy with this hands-on laboratory activity. They fill one insulated container with hot water and the other with cold water; and link the two containers with an aluminum transfer bar—heat transfer occurs across the bar. Students record the temperature change of the water in the cups over time and relate the change to the associated heat transfer. Kit contains aluminum transfer bar, two insulated containers, two thermometers and detailed laboratory instructions. Purchase one as a classroom demonstration, or purchase one for each laboratory group.

Catalog No.	Description	Price/Each
AP4536	Heat Transfer Kit	$32.30

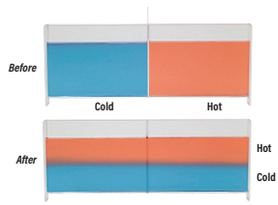
Hand Boiler See page 400.

Pulse Glass See page 400.

Density Box—Demonstration Kit

FLINN EXCLUSIVE

By: David A. Katz, Retired, Wilmington, DE



The demonstration apparatus is a clear acrylic chamber that is divided down the middle with a removable wall. Hot, red water is placed on one side of the chamber and cold, blue water on the other. The center dividing wall is then carefully removed, allowing the two solutions to mix. The two different-temperature solutions very dramatically separate with the hot, red water on top and the cold, blue water on the bottom. A great demonstration when discussing convection currents, air turbulence and water turnover in lakes and ponds. Includes instructions and teaching information.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP4784	Density Box—Demonstration Kit	$44.88

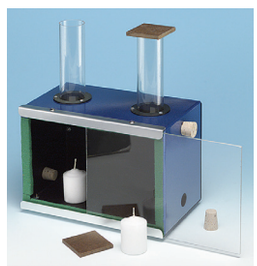
Convection of Liquids Tube



Dramatically demonstrate the motion caused by the convection in a liquid. Fill this glass apparatus with water, then introduce a dye at the top. Heat one of the lower corners, and watch as the dye follows the path of the convection current. Apparatus is glass and measures 15 x 20 cm. Food dye is available separately. Includes instructions, a detailed discussion and a reproducible worksheet.

Catalog No.	Description	Price/Each
AP6053	Convection of Liquids Tube	$40.75
V0003	Vegetable Dyes	7.75

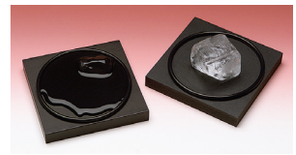
Convection/Ventilation Box



Place a lighted candle under one chimney, then use a smoke source over the other chimney to reveal the flow of convection currents. The consequences of ventilation can also be shown by covering the chimneys and removing, in various combinations, the corks in the side panels. The apparatus consists of a 22 x 9 x 10 cm metal box with a glass front panel, two chimneys, a candle, and complete instructions. The demonstration requires a smoke source, such as Touch Paper.

Catalog No.	Description	Price/Each
AP6028	Convection/Ventilation Box	$92.35

Ice Melting Blocks



Place an ice cube on each block and watch as one ice cube rapidly melts. Which block melts the ice cube—"cold" or "warm?" Students will be amazed when they see the "cold" block melting the ice cube remarkably faster than the "warm" block. How is this possible? The "cold" block is a heat conductor—it easily transfers heat energy. The "warm" block is an insulator. Instructions provided. Block dimensions: 10 x 10 cm.

Catalog No.	Description	Price/Each
AP6488	Ice Melting Blocks	$34.00

Nitinol "Live" Wire



Wire with a memory! Nitinol wire was discovered in 1961 and has "shape" memory. When placed in cold water it can be bent into any shape. Put into hot water, it springs back to its original shape. Shape memory alloys are discussed in the provided instructions. Price is per inch; may be purchased in any length requested.

Catalog No.	Description	Price/Inch
AP1937	Nitinol "Live" Wire	$2.31

Specific Heat Set—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



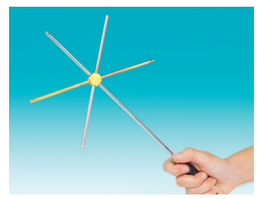
Heat up five different metal cylinders to exactly the same temperature, add each to a precise amount of water at known temperature, and observe the water temperature change. Students perform a lab activity and calculate the specific heat of each metal specimen. Instructions include background, lab activity procedure, tips and sample problems. Five cylinders—aluminum, copper, steel, tin and zinc, each with the same 58-g mass and 19-mm diameter—are included in the set.

Complete for 5 student groups. Super Value Kit is complete for 10 student groups. All materials are reusable.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP9220	Specific Heat Set—Student Laboratory Kit	$47.52
AP7566	Specific Heat Set—Super Value Laboratory Kit	93.84

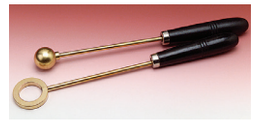
Conductometer



Investigate how different types of metals conduct heat as you hold the center of the conductometer over a flame. Small amounts of wax placed in wells at the end of each metal rod melt at different rates demonstrating the relative thermal conductivity of each metal. The five metal rods are steel, nickel (or iron), aluminum, copper, and brass. Plastic handle and instructions are provided.

Catalog No.	Description	Price/Each
AP9212	Conductometer	$24.05

Ball and Ring Apparatus



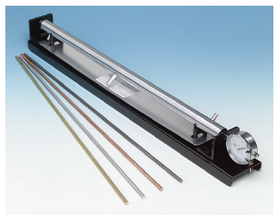
Perform the classic demonstration "thermal expansion of metal" with this ball and ring apparatus. Brass ball passes freely through ring at room temperature but when the ball is heated, it no longer passes through the ring. Plastic or wooden handle keeps hands cool. Instructions included.

Catalog No.	Description	Price/Each
AP9031	Ball and Ring Apparatus	$19.70

HEAT AND THERMODYNAMICS continued on next page.

Heat and Thermodynamics, continued

Linear Expansion Apparatus



Determine the coefficient of expansion of four different metals. The dial indicator on this newly engineered linear expansion apparatus will provide more accurate and reproducible results and is more accurate than the old micrometer form. This quality instrument is easy to set up, use and store. Includes an aluminum base and heating jacket with three nipples for water intake, outlet, and thermometer. The apparatus comes complete with four different experimental rods and detailed instructions.

Catalog No.	Description	Price/Each
AP4679	Linear Expansion Apparatus	$340.00

Linear Expansion Demonstration



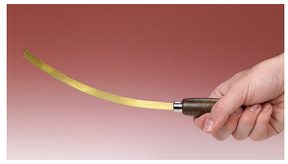
A new twist to an old classic! Demonstrate both linear and volume expansion and contraction with this simple device. At room temperature, the metal rod fits between the metal bracket and into the drilled-out holes. However, when the metal rod is heated, it becomes clearly visible that the rod has lengthened and swelled when it no longer fits between the metal bracket or into the holes. Reverse the process by plunging the metal bracket into ice-cold water to show the contraction of cold metal.

Catalog No.	Description	Price/Each
AP7113	Linear Expansion Demonstration	$21.40

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Molecular Motion Demonstrator See page 230.

Compound Bimetallic Strip



This bimetallic bar will bend dramatically when heated in a Bunsen burner due to the different thermal expansion rates of each metal used in the bar. Let students examine the bar and discover for themselves that the two different sides of the bar are different colors and infer that different metals are fused together. Bar has a convenient insulated handle. Bar length is 20 cm, overall length is 30 cm.

Catalog No.	Description	Price/Each
AP5650	Compound Bimetallic Strip	$10.20

Solar Energy See pages 393–396.

Hero's Engine—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Add water to the flask, insert the rubber stopper with exhaust arms, and hang it securely. Then heat the water with a Bunsen burner and watch the engine spin! Illustrates important physical principles such as phase changes, pressure, conservation of momentum and Newton's third law of motion. Includes a reproducible student worksheet and complete instructions.

Catalog No.	Description	Price/Each
AP7115	Hero's Engine—Demonstration Kit	$42.00

Superheated Steam—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Vividly demonstrate the thermal energy content and potential skin burning hazards associated with steam. Steam is channeled through a copper coil heated by a Meker burner flame, which raises the temperature of the steam well above 100 °C. Place a piece of paper in the exhaust steam and watch as it chars. Hold a match head in the exhaust—it will ignite! Includes a reproducible student worksheet and detailed instructions.

Note: A Meker burner, 250-mL Erlenmeyer flask, hot plate and support stand and clamp are required and available separately.

Catalog No.	Description	Price/Each
AP6158	Superheated Steam—Demonstration Kit	$18.00

Stirling Engine



This low temperature difference Stirling engine runs at approximately 150 rpm when placed over a cup of hot water. Flywheel is 9 cm in diameter and the unit is 14.5 cm tall.

Catalog No.	Description	Price/Each
AP9708	Stirling Engine	$118.90

Steam Generator



Generate steam in a controlled and safe fashion. This steam generator will not break or rupture since there are no seams. The same aluminum alloy is used throughout to minimize the problem of galvanic corrosion. The generator includes a wood handled sample cup and instructions for use.

Catalog No.	Description	Price/Each
AP5719	Steam Generator	$92.00

Steam Engine



Trace all the energy conversions starting with lighting the match to burning the dry fuel to converting the water to steam and finally to converting the steam to mechanical power. Every step of the process can be viewed with this totally visible functioning steam engine. The accessible drive wheels make powering small electrical or mechanical devices easy. The engine has a built-in safety valve and comes with fuel pellets, maintenance tips and complete instructions.

Catalog No.	Description	Price/Each
AP5718	Steam Engine	$324.65
AP8178	Fuel Pellets for Steam Engine, Pkg. of 20	9.55

Electric Generator



Attach this functioning electric generator to a steam engine (AP5718) and amaze your students as you convert steam power to electrical power. The included drive belt is easily attached to the flywheel of the steam engine and starts generating power instantly. The steam engine will generate enough energy to light the attached lightbulb. Some assembly required. Engine and generator must be mounted to a new base, such as a wooden board.

Catalog No.	Description	Price/Each
AP6043	Electric Generator	$182.90

Handheld Generator See page 419.

Thermoelectric Generator Demonstrator See page 440.

HEAT AND THERMODYNAMICS continued on next page.

Heat and Thermodynamics, continued

Calorimeter, Economy Choice

FLINN EXCLUSIVE

By: The Flinn Staff



Here it is—the easiest and most inexpensive way to determine the caloric content in solid foods. For instance, to determine the number of calories in a peanut, simply suspend a flask containing 50 mL of water in the calorimeter, place a peanut of known mass beneath the flask and ignite it with a match or lighter. The released energy from the burning peanut heats the water in the flask. Once the flame burns out, students measure the increase in water temperature and the decrease in mass of the peanut to calculate the caloric content of the peanut. Multiple trials can be performed in just one class period. Kit includes calorimeter chamber, flask and detailed laboratory instructions.

Note: Solid food items like peanuts or cracker pieces are needed.

Catalog No.	Description	Price/Each
AP4533	Calorimeter, Economy Choice	$50.63

Calorimeter, Foam

FLINN EXCLUSIVE

By: The Flinn Staff



The thick walls and lids make these calorimeters more effective than ordinary foam drinking cups by preventing heat loss in all directions. Their wide, stable base prevents tipping when mixing with a magnetic stir bar. Use a sharp knife to cut the foam lid to fit any thermometer. 900 mL capacity. Sold in packages of two.

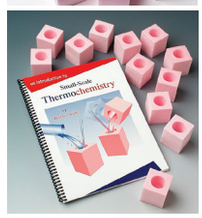
Catalog No.	Description	Price/Each
AP6456	Calorimeter, Foam	$13.75

Calorimeters, Small-Scale

FLINN EXCLUSIVE

By: Walter Rohr, Retired Chemistry Teacher





The perfect small-scale calorimeter! These high-quality, 2"-thick polystyrene calorimeters allow for quantitative thermodynamics experiments with only 15 mL of reagents. Smaller amounts provide faster results so several trials can be completed in a single class period. A specially formulated coating permeates the pores of the foam to prevent water absorption and maximize heat efficiency. The calorimeter constant and the calorimeter's mass will remain the same for the entire experiment! *An Introduction to Small-Scale Thermochemistry* lab manual (AP5912) provides excellent hands-on experiments that utilize the full potential of these calorimeters (sold separately).

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5928	Calorimeters, Small-Scale, Pkg. of 12	$42.00
AP5912	An Introduction to Small-Scale Thermochemistry	45.70

Calorimetry Laboratory Kits See page 285.

Calorimeter, Aneroid, Dry





A specially insulated outer wall makes this quality calorimeter five times more sensitive than traditional instruments. It is constructed of an aluminum inner cylinder surrounded by a thick layer of styrofoam insulation, then enclosed in a durable plastic case. This special design results in minimal heat loss. Accepts Specific Heat Cylinders (AP6112).

Catalog No.	Description	Price/Each
AP9160	Calorimeter, Aneroid, Dry	$53.07
AP6112	Specific Heat Cylinders, Pkg. of 3	47.90

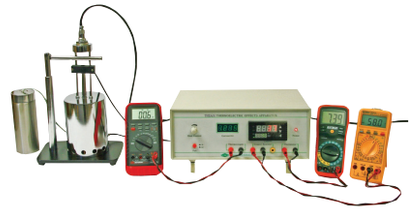
Calorimeter Resistor



Used to measure the amount of heat generated by an electrical circuit. Includes instructions for measuring the heat generated in the circuit and step-by-step equations for calculating the electrical equivalent of heat (1 cal = 4.186 J). To perform the experiment, the calorimeter resistor is placed in the aneroid calorimeter (AP9160) and set up in a circuit. You will also need a 6-volt power supply or battery, ammeter, voltmeter, connecting wires, thermometer, stopwatch and balance. Diagram for setup included.

Catalog No.	Description	Price/Each
AP4733	Calorimeter Resistor	$16.75

Thermoelectric Effects Apparatus



Study the thermal behavior of a three-pole metal resistor, thermistor and thermocouple, and also explore the features of a closed loop digital temperature control system. Full details at flinnsci.com.

Catalog No.	Description	Price/Each
AP8124	Thermoelectric Effects Apparatus	$1475.00

Calorimeter, Electric



Use this versatile double-walled calorimeter with or without the electric heating element. With the heating element students can determine the electrical equivalent of heat or use the calorimeter without the heating element as a standard double-walled calorimeter. The spring heating element operates on 0–6 V DC and approximately 2–3.5 W. The 1.7-cm thick polystyrene lining, plastic insulator ring and aluminum heat reservoir are designed to control heat loss. Reservoir has 150-mL capacity and has a built-in thermometer cork. Size: 10.5 cm diameter x 10 cm high.

Catalog No.	Description	Price/Each
AP5347	Calorimeter, Electric	$42.00

Electricity and Magnetism—Electrostatics

FLINN360science™: Build a Battery



This kit presents the concepts of battery, electricity, and oxidation-reduction reaction through hands-on science designed to engage all your students, regardless of level. Students observe that batteries can be constructed from relatively simple items, and that the arrangement of cells within a battery affects the power output. Teachers can extend learning through guided inquiry into associated subjects such as, "How are batteries able to supply a specific amount of power to a device?

Catalog No.	Description	Digital Access	Price/Each
AP11347	360Science: Build a Battery	1-Year	$53.15
AP11447		3-Year	67.75

FLINN360science™: Electric Motors and Generators



In this lab experience, students build a fan powered by an electric motor to develop an understanding of how electrical energy is transformed into mechanical energy. Likewise, they turn the fan-motor assembly into an electric generator, which produces electricity when the fan spins, without a battery supplying power to the motor.

Catalog No.	Description	Digital Access	Price/Each
AP11349	360Science: Electric Motors and Generators	1-Year	$47.85
AP11449		3-Year	62.55

ELECTRICITY AND MAGNETISM—ELECTROSTATICS continued on next page.

Electricity and Magnetism—Electrostatics, continued

FLINN360science™: Energy Transmission in Circuits



This kit presents the essential concepts of conservation of charge, Kirchhoff's rules, and Ohm's law. Students will observe that resistors in series add their resistance together and that resistors in parallel add as the reciprocal of their resistance. Students construct two different circuits to explore the difference in behavior between series and parallel circuits.

Catalog No.	Description	Digital Access	Price/Each
AP11348	360Science: Energy Transmission in Circuits	1-Year	$ 95.00
AP11448		3-Year	110.00

FLINN360science™: Electric Charges and Coulomb's Law



This kit presents the concepts of electric charge, electric forces, Coulomb's law, conservation of charge, and conduction and induction through hands-on science activities. Students discover that objects can be positively or negatively charged and will develop an understanding of electric forces, and their dependence on charge and the distance or separation between charged objects.

Catalog No.	Description	Digital Access	Price/Each
AP11316	360Science: Electric Charges and Coulomb's Law	1-Year	$94.00

FLINN360science™: Electric Fields



This kit presents the concepts of electric fields, electric potential, Coulomb's Law, and equipotential lines through hands-on science activities designed to engage all your students, regardless of level. Students locate the equipotential lines created by a two-point and a parallel plates charge configuration and upon tracing the equipotential lines, will be able to sketch the electric field map generated by these charge configurations. Teachers can extend learning through guided inquiry into associated subjects such as, "How can charged objects affect each other at a distance?

Catalog No.	Description	Digital Access	Price/Each
AP11317	360Science: Electric Fields	1-Year	$124.05

FLINN360science™: Electrical Resistance and Resistivity



This kit presents the concepts of electric current, electric forces, resistance and resistivity through hands-on science. Students determine that resistance is directly proportional to the length of a wire, and inversely proportional to its thickness or cross-sectional area. Likewise, students confirm that resistivity is an intrinsic property of the wire material, and it is not affected by the length or cross-section area of the wire.

Catalog No.	Description	Digital Access	Price/Each
AP11318	360Science: Electrical Resistance and Resistivity	1-Year	$91.00

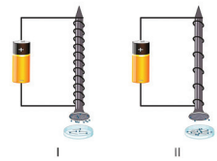
FLINN360science™: Magnetic Force and Separation Distance



Students will observe how the change in force between two dipole magnets changes as their separation distance decreases.Editable, differentiated instructions range from a time-sensitive prescriptive lab to full open inquiry, and robust online videos and content help students prepare for and better understand the labs they're conducting.

Catalog No.	Description	Digital Access	Price/Each
AP11421	360Science: Magnetic Force and Separation Distance	3-Year	$80.00

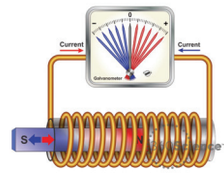
FLINN360science™: Electromagnets and Magnetism



Students will investigate the magnetism produced by a current carrying wire. They will then build an electromagnet and observe how the strength is affected by the metal core used to build the magnet.Editable, differentiated instructions range from a time-sensitive prescriptive lab to full open inquiry, and robust online videos and content help students prepare for and better understand the labs they're conducting.

Catalog No.	Description	Digital Access	Price/Each
AP11422	360Science: Electromagnets and Magnetism	3-Year	$185.00

FLINN360science™: Induction of Electrical Current



Students will investigate electromagnetic induction. A coil of magnet wire is attached to a galvanometer and the deflection of the needle observed as neodymium magnets are moved in and out of the coil in varying orientations. They will then investigate how an increase in the number of coils affects current output.Editable, differentiated instructions range from a time-sensitive prescriptive lab to full open inquiry, and robust online videos and content help students prepare for and better understand the labs they're conducting.

Catalog No.	Description	Digital Access	Price/Each
AP11423	360Science: Induction of Electrical Current	3-Year	$156.40

Electrostatics Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Demonstrate static electricity using a variety of easy-to-use materials. Kit contains three friction rods and pads (silk, flannel and fur) for creating friction, three balloons and 10 feet of string. Complete instructions for use are provided.

Catalog No.	Description	Price/Each
AP9026	Electrostatics Kit	$33.55

Investigating Static Electricity—Super Value Activity-Stations Kit

FLINN EXCLUSIVE



Four mini-lab stations are set up around the classroom, each a self-contained activity focusing on a specific topic.

- Sticky Charges—Students investigate positive and negative electric charges and observe how like and unlike charges behave.
- The Mysterious Moving Board—Students will be amazed as they discover how an uncharged insulator can be "mysteriously" attracted by a charged object.
- Ready, Set, Charge!—The interaction of charged pith balls help students distinguish between charging by conduction and induction.
- Curving Water—As students observe the effect of an electric charge on polar molecules, they have fun seeing just how far the stream of water will bend.

Kit includes complete instructions with reproducible student handouts and valuable Teacher Notes.

Super Value Kit is complete for 12 student groups. All materials are reusable!

Catalog No.	Description	Price/Each
AP7632	Investigating Static Electricity—Super Value Activity-Stations Kit	$80.30

ELECTRICITY AND MAGNETISM—ELECTROSTATICS continued on next page.

Electricity and Magnetism—Electrostatics, continued

NEW!



Magnetism—NewPath Visual Learning Guide, Set of 10

Magnetism Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11748	Magnetism—NewPath Visual Learning Guide, Set of 10	$43.32

NEW!



Electricity—NewPath Visual Learning Guide, Set of 10

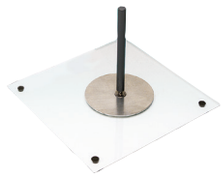
Electricity Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11747	Electricity—NewPath Visual Learning Guide, Set of 10	$43.32

Electrophorus

FLINN EXCLUSIVE

By: The Flinn Staff



Demonstrate laws of electrostatic induction, generate and store large electrostatic charges and effectively transfer charges with this classic device. Simply rub the acrylic plate with fur or silk to build up a charge. Then holding the insulated handle, induce a charge from the acrylic plate onto the aluminum disk. The disk can then be moved to transfer the charge to an electrostatic device, such as an electroscope or Leyden jar. The built-up charge will continue on the acrylic plate so you can return with the aluminum disk repeatedly without recharging the plate.

Apparatus includes aluminum disk with insulated handle, charging plate and complete instructions. Charging materials not included.

Catalog No.	Description	Price/Each
AP6493	Electrophorus	$32.10

Electrostatics—Multi-Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Teach the basic principles of electrostatics using this comprehensive, all-in-one kit that contains all the equipment needed for five demonstrations!

- Charging a Flask Form Electroscope—Verify the existence and properties of static electric charge. Demonstrate charging the electroscope by conduction and by induction.
- Electrophorus and Condensing Electroscope—Show how much greater amounts of charge can be stored using an electrophorus and a condensing electroscope.
- Charge Distribution and Discharge—Use two condensing electroscopes to show how charges distribute and how a lightning rod works.
- Faraday's Cage and "Ice Pail"—Show students how charge accumulates on the outside of a conducting shell.
- Curving Water into a Beaker—"Bend" a stream of water using an externally charged object, proving that water molecules are polar.

Includes detailed instructions and reproducible student worksheets for each demonstration.

Catalog No.	Description	Price/Each
AP7029	Electrostatics—Multi-Demonstration Kit	$161.45

Flask Form Electroscope

FLINN EXCLUSIVE

By: The Flinn Staff



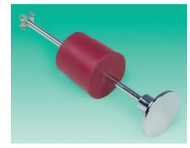
Ready to use! Simply hang two pieces of foil from the hook and insert into the flask. Includes Teacher Notes, a reproducible student worksheet, electroscope assembly, and flask.

Catalog No.	Description	Price/Each
AP7150	Flask Form Electroscope	$25.55

Photoelectric Effect Demonstration

See pages 232 and 331.

Electroscope Without Flask



Insert this simple device into the top of a 250-mL Erlenmeyer flask and you instantly have a flask form electroscope. Start charging the ball terminal by contact or induction and watch the foil leaves respond. Flask sold separately.

Catalog No.	Description	Price/Each
AP4631	Electroscope Without Flask	$17.20
GP3045	Flask, Erlenmeyer	6.00

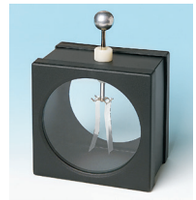
Pith Ball Electroscope



It's magic! Students love to see pith balls be repulsed and attracted during your electrostatic magic show. You will remove the magic, however, as your students develop an understanding of the electrostatic principles involved. Two pith balls included.

Catalog No.	Description	Price/Each
AP5639	Pith Ball Electroscope	$20.45

Metal Electroscope



The aluminum case has front and rear glass windows for easy viewing. The square design keeps the foil leaves farther from the side of the electroscope and thus it is less susceptible to erratic exterior static charges. The foil leaves only react to charges that you intentionally place on the ball of the electroscope. Complete instructions are provided.

Catalog No.	Description	Price/Each
AP5640	Metal Electroscope	$55.25

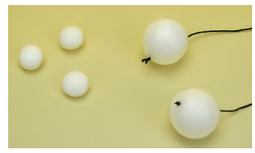
Faraday Cage



Demonstrate why it is safe to stay in a car during a lightning storm. Place a discharged flask form electroscope inside the metal cage. Bring an electrically charged rod near the cage and the electroscope's foil leaves don't move. Charge the cage by touching it with the charge rod and the foil leaves still don't budge. Why? The metal cage clearly shows that electric charges remain on the outside of a conductive shell and don't affect the inside. Includes cage with metal bases and insulating stands, charging rod and instructions. Flask form electroscope is required and available separately. Cage dimensions: 26.5 x 11.5 cm.

Catalog No.	Description	Price/Each
AP6480	Faraday Cage	$34.05
AP7150	Flask Form Electroscope	25.55

Pith Balls



Better pith balls? Yes! Because our pith balls are made from durable polystyrene, they give a better electrostatic performance even in humid conditions.

Catalog No.	Description	Price/Pkg.
AP4624	Pith Balls Without Threads	$8.00/12
AP4625	Pith Balls With Threads	7.40/6

ELECTRICITY AND MAGNETISM—ELECTROSTATICS continued on next page.

Electricity and Magnetism—Electrostatics, continued



Friction Rods and Friction Pads

Friction pads are used together with friction rods to produce static electricity in varying amounts and charges.

Catalog No.	Description	Size	Price/Each
AP9169	Hard Rubber Friction Rod	12"	$ 8.80
AP9201	Lucite® Friction Rod	10"	5.50
AP9202	Hollow Glass Friction Rod	12"	7.05
AP9203	Solid Glass Friction Rod	10"	8.60
AP9204	Animal Fur Friction Pad, Large	9" x 11"	23.30
AP9206	Wool Friction Pad	6" x 6"	7.15
AP9207	Flannel Friction Pad	6" x 6"	4.15
AP9208	Silk Friction Pad	6" x 6"	5.80

Coulomb's Law Apparatus

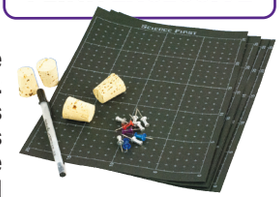


Apparatus includes a rugged wooden base, rigid fiberboard housing, parallax eliminating mirror, metric scale, grid, hardboard and Lucite® tops, acetate and vinyl strips, pith balls, fabric squares, monofilament, and polyethylene insulators. Complete instructions provided.

Catalog No.	Description	Price/Each
AP9227	Coulomb's Law Apparatus	$62.75

Electric Field Mapping—Demonstration Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Using a conductive pen, simply draw any type of charge configuration onto conductive paper. By measuring the voltage at different locations between the charges, you can determine lines of equal potential and then draw in or "map" the electric field lines as well. Amazing! Find the field between a dipole, charged plates or a quadrupole, or even measure the charge of an electric field during a thunderstorm!

Note: A power supply or 6-V battery, voltmeter and connector cords are required and available separately.

Catalog No.	Description	Price/Each
AP7282	Electric Field Mapping—Demonstration Kit	$140.45
AP5375	Power Supply, Multiple Voltage Battery Eliminator	147.90



NewPath Learning Guides for Elementary Science

The NewPath Learning Guides are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11528	Elementary Science Student Learning Guides with Online Lessons, Set of 6	$59.95

Van de Graaff Generator



- Small convenient size (45 cm high, 18 cm sphere).
- Rugged moving parts will hold up under continual student use.
- Easily dismantled and reassembled for cleaning, drying, minor adjustments, and belt replacement.
- Delivers continuous supply of charge at high voltage (200,000 V maximum potential).
- Complete with numerous step-by-step teacher demonstrations.

Catalog No.	Description	Price/Each
AP4699	Van de Graaff Generator	$249.90
AP4700	Replacement Belt	21.05
AP4701	Replacement Upper Comb Assembly	25.00

Wimshurst Static Machine



Produce high voltage during your electrostatic demonstrations. The rapidly spinning plates on the Wimshurst machine add a level of motion and excitement to the electrostatic charges being produced. The electrostatic charges are collected and discharged across the spark gap consisting of two balls mounted on metal rods. The spark length can be safely changed by adjusting the rods using the insulated ebonite handles. With the two Leyden jars in place, sparks of over two inches can be created. Without the Leyden jars in the circuit a rapid succession of low energy sparks is produced. A very durable unit with unbreakable plastic static plates. Comes complete with user guide and suggested experiments.

Catalog No.	Description	Price/Each
AP4738	Wimshurst Static Machine	$204.60

Tesla Coil See page 367.

Flinn Van de Graaff Generator

FLINN EXCLUSIVE



- Small convenient size (60 cm high, 20 cm sphere).
- Ready to use, 1-step assembly.
- Delivers continuous supply of charge at high voltage (300,000 V maximum potential).
- Complete with owner's manual containing operation and safety procedures.

Catalog No.	Description	Price/Each
AP8501	Flinn Van de Graaff Generator	$240.00
AP9429	Replacement Belt for Flinn Van de Graaff Generator	17.00
AP9460	Replacement Wand for Flinn Van de Graaff Generator	13.45

Discharge Electrode





Safely discharge your electrostatic generator with this discharge electrode. A polished aluminum 18-cm sphere is mounted on a 40-cm long insulated plastic rod. A long, flexible wire lead has an alligator clip on its free end for easy attachment to the base of your generator. Store the discharge electrode on its sturdy cast iron tripod base.

This unit does not include a base.

Catalog No.	Description	Price/Each
AP5634	Discharge Electrode	$115.45
AP7111	Discharge Electrode, Economy Choice	66.85

ELECTRICITY AND MAGNETISM—ELECTROSTATICS, VAN DE GRAAFF GENERATORS continued on next page.

Electricity and Magnetism—Electrostatics, Van de Graaff Generators

The Van de Graaff Generator—Multi-Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



This kit contains five safe and "electrifying" demonstrations that are sure to WOW your students! The included detailed safety information will help you reduce the risk of accidental shocks.

- Let the Sparks Fly!—Observe flying sparks as a discharge electrode is brought near the dome of the generator.
- What a Blast!—Foam peanuts shoot right out of a plastic cup.
- Flying Saucers!—Aluminum pans fly off the dome due to repulsive electric forces.
- A Hair-Raising Experience!—Use a static "hair" wand to illustrate the classic hair-raising demonstration.
- The Neon Wand!—Be amazed as a neon wand glows bright orange when brought into the electric field surrounding the Van de Graaff generator.

Kit provides vital safety information along with detailed teacher instructions and a reproducible student worksheet.

Note: A Van de Graaff generator and discharge electrode are required and available separately.

Catalog No.	Description	Price/Each
AP7274	The Van de Graaff Generator—Multi-Demonstration Kit	$40.45

Build a Mini Van de Graaff Generator—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



The mini Van de Graaff generator stands about 18 cm tall and will generate enough charge to make the hair on a piece of animal fur stand up! As the static charge on the generator increases, various materials such as small paper pieces and tinsel can also be sent flying off its dome. A very small shock may even be felt when a fingertip is brought near the generator. Includes detailed instructions, Teacher Notes and student activity sheets.

Complete complete for eight student groups. A 3-volt power supply is required but not included.

Catalog No.	Description	Price/Each
AP7278	Build a Mini Van de Graaff Generator	$130.00

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WWW.FLINNSCI.COM

Flying Ball and Silver Snake



The metalized ball, when first brought near the dome, is attracted by induction until it touches. It is immediately charged to the full dome potential and repelled. The ball then "floats" at a distance from the dome. The silver snake is also attracted by induction, but as soon as it touches the dome, it too is repelled. The ball retains its charge, causing the floating behavior. The "snake" ribbon does not retain its charge and repeatedly strikes back at the dome.

Catalog No.	Description	Price/Each
AP5988	Flying Ball and Silver Snake	$38.65

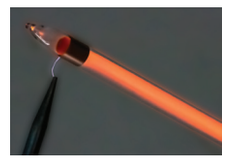
Leyden Jar



Charge up the Leyden jar with a Van de Graaff generator, Wimshurst machine or electrophorus. The static-electric charge will last for hours. Use it later to charge up an electroscope. Easily disassemble the charged Leyden jar to show students that the electricity is stored on the insulator and not the metal cups. Reassemble it and discover that it still carries a charge. Informative instructions are provided.

Catalog No.	Description	Price/Each
AP6478	Leyden Jar	$43.30

Neon Wand



No plugs nor contact electrodes, yet it still "lights up" when held in a high-voltage field! This wand is easier to handle than a large fluorescent lightbulb. 24 x 1 cm. Includes background information on neon.

Catalog No.	Description	Price/Each
AP5675	Neon Wand	$17.85

Simple Circuits—Super Value Laboratory Kit

FLINN EXCLUSIVE



Do your students know how to connect a series or a parallel circuit? Students use lightbulbs and alligator-clipped wires to build simple series and parallel circuits and study their characteristics. By observing the brightness of the bulbs, students learn that the amount of electric current flowing through the lightbulbs varies with different circuit configurations.

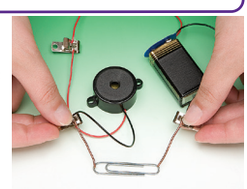
Catalog No.	Description	Price/Each
AP6302	Simple Circuits—Super Value Laboratory Kit	$55.10
AP1429	Battery, 6-V	13.25
AP9072	Lightbulb, Miniature, 3.7-V	2.26

Electricity and Magnetism—Electricity and Circuits

Build Your Own Conductivity Tester—Student Laboratory Kit

FLINN EXCLUSIVE

By: David A. Katz, Retired, Wilmington, DE



Students safely discover the essential components of an electric circuit as they build their very own audio conductivity testers. Once the testers are assembled, students use the inquiry method to determine the conductivity of common solids and liquids. Students also explore relative resistance as the volume and pitch of the buzzer varies with conductivity. At the end of the lab, testers may be disassembled, ready to be built again by the next class.

Catalog No.	Description	Price/Each
AP7265	Build Your Own Conductivity Tester—Student Laboratory Kit	$78.80
AP1430	Transistor Battery (Alkaline), 9-volt	6.32

ELECTRICITY AND MAGNETISM—ELECTROSTATICS, VAN DE GRAAFF GENERATORS continued on next page.

Electricity and Magnetism—Electricity and Circuits, continued

Investigating Electricity—Activity-Stations Kit

FLINN EXCLUSIVE



Discover the basic principles of electricity with this "series" of four engaging, hands-on experiments. Students explore the concepts of electric current and voltage in series and parallel circuits. Using friction rods, friction pads and an electroscope, students learn about electrostatics. Then they compare different electrochemical cells to determine which one produces the most electricity. Finally students determine how the thickness and length of a wire affect its electrical resistance.

Catalog No.	Description	Price/Each
AP7019	Investigating Electricity—Activity-Stations Kit	$172.60
AP1425	Battery, D, 1.5-V	4.50
AP1429	Battery, 6-V	13.25

Introducing STEM with Electricity—Flinn STEM Design Challenge™

FLINN EXCLUSIVE



Students learn how to make a simple electric circuit and draw circuit diagrams. Next they apply their knowledge of series and parallel circuits to wire a duplex outlet with two lamps in which one lamp is controlled by a switch and the other is not.

Catalog No.	Description	Price/Each
AP8318	Introducing STEM with Electricity—Flinn STEM Design Challenge	$59.40
AP1425	Batteries, D (Alkaline), 1.5 V	4.50
AP9275	Battery Holder, D-cell, Double	3.75

How a Fuse Works—Demonstration Kit

FLINN EXCLUSIVE



Demonstration provides both audio and visual clues to help students understand how fuses work and shows why fuses are important safeguards against electrical fires.

Catalog No.	Description	Price/Each
AP7365	How a Fuse Works—Demonstration Kit	$32.60

FLINNeverydayscience™ Electrical Conductors and Insulators

NEW!



With this FlinnEverydayScience™ lab, students build a conductivity tester to determine whether various types of household objects, materials, and substances are electrical conductors or insulators. The conductivity tester consists of a simple electric circuit with a small LED, a button battery, and the appropriate electrical connections. Students will learn about electrical conductivity, conductors, insulators, and simple electrical circuits.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 10 3.0 V button batteries, 10' copper tape, 10 LED lights, 20 paper clips, 10 g table salt (sodium chloride), 1 roll tape, and 10 wooden sticks.

Complete for 30 students working in groups of 3, or for 10 groups of students.

Catalog No.	Description	Price/Each
AP11809	Electrical Conductors and Insulators	$57.70

Build an Electronic Quiz Board—Flinn STEM Design Challenge™

FLINN EXCLUSIVE



By: The Flinn Staff

In this engineering design challenge, students build a quiz board they can use all year long! In the first part of this activity, students learn about and create a simple circuit. Next they brainstorm how to make a quiz board that will light up when the correct answer is chosen. Then they draw a circuit diagram and determine how much wiring they will need that offers the most flexibility in modifying the design. Once their plan is complete, students build and test their quiz boards.

Complete for 30 students working in pairs. 1.5-V batteries and holders required and available separately.

Catalog No.	Description	Price/Each
AP7991	Build an Electronic Quiz Board—Flinn STEM Design Challenge	$69.55

Makey Makey Classic Kit



The critically acclaimed Makey Makey Classic makes STEM education fun! Turn everyday objects into computer keys. From a simple banana piano to automatic cat selfies, there are thousands of possibilities. With Makey Makey, the world is your construction kit! Includes Makey Makey Board, USB cable, 7 alligator clips, 6 connector wires, instructions with Visual Project Start Guide, online documentation and 20 color stickers.

Catalog No.	Description	Price/Each
AP9706	Makey Makey Classic Kit	$69.00

Energy Stick



Completely safe to touch and handle, the Energy Stick features electrodes on each end of its 7½" tube. When these electrodes are touched simultaneously, long-lasting LED lights inside the tube flash and the tube makes a noise. Release one or both of the electrodes and the flashing lights and noise stop. 1¼" diameter.

Catalog No.	Description	Price/Each
AP7598	Energy Stick	$10.25

Arduino Starter Kits



Start your coding adventure with these Arduino starter kits. Each kit comes with either an Arduino Uno R3 or Arduino MEGA 2560, instruction manual, breadboard and a large selection of components packed in a convenient container. The capabilities of the kits can be further extended through the purchase of the 37-in-1 Sensor Module Kit (catalog No. AP9873).

Catalog No.	Description	Price/Each
AP9875	Arduino Super Starter Kit	$55.85
AP9876	Arduino Complete Starter Kit	92.00
AP9877	Arduino Mega Complete Starter Kit	95.71

ELECTRICITY AND MAGNETISM—ELECTRICITY AND CIRCUITS continued on next page.

Electricity and Magnetism—Electricity and Circuits, continued

37-in-1 Sensor Module Kit

Add new functionality to your creations with these 37 additional modules, all 100% Arduino compatible. Includes a tutorial detailing how to use and code each module.



Catalog No.	Description	Price/Each
AP9873	37-in-1 Sensor Module Kit	$69.95

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Mand Labs™ STEM Electronics Kits

Learn about circuits and electronics with the Mand Labs STEM Electronics Kits. Each pack comes will all the components needed to complete more than 50 guided experiments, two full-color reference books and online access to more-than 9 hours of video tutorials.



Catalog No.	Description	Price/Each
AP10000	Mand Labs STEM Electronics Kit, Standard Edition	$199.00
AP10001	Mand Labs STEM Electronics Kit, Premium Edition	244.55

FLINN EXCLUSIVE

Snap Circuits®

With these components, students can design more than 300 electronic devices. Durable plastic modules easily clip together and mount on the plastic "circuit" board—no addition tools or soldering are required. All the components and instruction diagrams are color-coded so building is a snap!



Snap Circuits Extreme
AP7830



Snap Circuits, Light
AP7831

Catalog No.	Description	Price/Each
AP7830	Snap Circuits Extreme	$180.54
AP6531	Snap Circuits	96.90
AP7467	Snap Circuits, Jr.	45.68
AP7472	Snap Circuits, Green	95.88
AP7831	Snap Circuits Light	103.35
AP7895	Snap Circuits Rover	112.00

Snap Circuits Discover Coding

NEW!



For nearly 20 years, future engineers all over the world have learned basic electricity with Snap Circuits kits. Now, Snap Circuits is taking the next generation into the world of coding. Download the Snap Circuits App and control Snap Circuits projects using your smartphone or tablet to control lights, sounds and a motor. Discover Coding is a great introduction to coding, using easy graphical coding. More advanced coders can move up to BLOCKLY coding.

- Illustrated, easy-to-use, full-color project manual explains electrical and coding concepts and includes exciting coding challenges
- Over 30 Snap Circuits parts, including the new Bluetooth-powered SC Controller
- 5 Control Outputs: Control up to 5 circuit paths together or independently to create different circuits and projects

Three ways to control: real-time control, easy-to-use graphical coding, and BLOCKLY code. Ages 8+.

Catalog No.	Description	Price/Each
AP11643	Snap Circuits Discover Coding	$98.99

Snap Circuits Bric: Structures

NEW!



Kids can use their imagination to combine Snap Circuits with ordinary building bricks and make endless combinations of construction and circuitry. With patent-pending, Bric-2-Snap technology, kids can wire up their brick builds with Snap Circuits lights, sounds, moving parts and 3-D circuits to invent almost anything and make it go!

Instead of just building a structure, now kids can learn how to build the circuit that makes the lights on a skyscraper illuminate or that makes the gears on a drawbridge move. Elenco's team of engineers has come up with a great way for kids to Learn By Doing® and be creative with their everyday, building bricks.

Includes: 20 Snap Circuits component parts, 75 Bric-2-Snap adapters, over 140 fully compatible building bricks, and full-color, easy-to-read project manual.

Catalog No.	Description	Price/Each
AP11647	Snap Circuits Bric: Structures	$58.99

Snap Circuits My Home

NEW!



Electricity is everywhere—even in your home. Whether you live in a city skyscraper or a house in the country, our homes are powered by electricity. It's not magic, it's science, and it's easy to learn. Build a house or city tower with real, working, 3-D circuits, just like the ones you use every day. With seven colorful base grids to make your structure your own, learn how electricity travels and powers your home. Features:

- Seven colored base grids to make your structure your own
- Learn about circuitry, security systems, dimmer switches, automatic lights, alarms, motion detectors, fan speeds, appliance motors, generators, and much more
- Illustrated, easy-to-use, full-color project manual
- Approximately 60 parts and 25 projects

Catalog No.	Description	Price/Each
AP11649	Snap Circuits My Home	$89.00

ELECTRICITY AND MAGNETISM—ELECTRICITY AND CIRCUITS continued on next page.

Electricity and Magnetism—Electricity and Circuits, continued

Snap Circuits Motion

NEW!



Snap Circuits Motion contains over 50 parts and over 165 projects to complete—all projects focused on concepts of motion and physics. Experiment with gears ratios using various gears and pulleys. Experiments include: Color changing lighted fan, air "fountain", motion detector and so much more.

With its easy-to-follow instructions, Snap Circuits gives your child a hands-on education to discover how electrical circuits—like those found in everyday devices kids are familiar with—function and operate. They'll also gain valuable lessons in building and following instructions. The project manual includes large color illustrations and simple directions for each project. Features:

- Over 50 parts and over 165 project to complete—all motion and physics focused
- Experiment with gears ratios using various gears and pulleys.
- Gain valuable lessons in assembly and following instructions.
- Project manual includes large color illustrations and simple directions for projects.

Catalog No.	Description	Price/Each
AP11650	Snap Circuits Motion	$115.00

Circuit Scribe Kits



Use the conductive silver pen included in these kits to quickly and easily draw circuits. Steel sheets combined with magnetic components makes assembling a circuit a breeze. Build, make, learn and prototype circuits quickly and efficiently for individuals or the entire class!

Catalog No.	Description	Price/Each
AP9693	Basic Kit	$ 53.45
AP10650	Everything Classroom Kit	2972.00

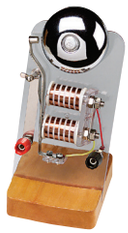
Circuit Scribe Pens



Quickly and easily draw circuits with the conductive silver ink in this pen. Replace an empty pen from a Circuit Scribe kit, or use the pen with your own electrical components. Works on any surface a regular rollerball pen writes on.

Catalog No.	Description	Price/Each
AP9697	Circuit Scribe Pen	$ 11.71
AP9699	Circuit Scribe Pens, Pkg. of 10	116.60

Demonstration Bell



This large demonstration bell is perfect for many topics in physical science. Use it to test simple electric circuits, to teach about electromagnetism, or to show students how the components of a bell work together. Place the bell inside a large bell jar and evacuate it—students will see the bell moving, but no sound will be heard! Banana plug jacks make for easy connections. Operates on a 6-volt battery. Bell assembly is 18 x 9 x 4.5 cm and includes a 9 x 9 x 2.5 cm polished wood base.

Catalog No.	Description	Price/Each
AP7105	Demonstration Bell	$23.14

Electric Buzzer



Electric circuit labs will be buzzing with this easy-to-wire device. Students will enjoy the buzzing sound signifying a successful completion of a wiring circuit. Pressed-steel outer shell provides for long-term, heavy-duty student use. Requires 6 to 10 volts AC or 3 to 6 volts DC to operate. Overall size 2½" wide x 2 15/16" high x 1 1/16" deep.

Catalog No.	Description	Price/Each
AP4824	Electric Buzzer	$16.10

Electric Doorbell

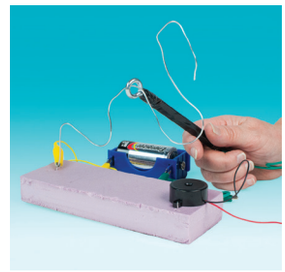


The classic doorbell. Simple and rugged. Requires 6 to 10 volts AC or 3 to 6 volts DC to operate. Overall size 2½" wide x 5⅞" high x 1 1/16" deep.

Catalog No.	Description	Price/Each
AP4825	Electric Doorbell	$17.08

Make a Wire Maze Game—Flinn STEM Design Challenge™

FLINN EXCLUSIVE



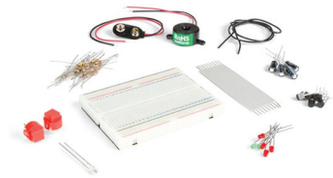
By: The Flinn Staff

In this Flinn STEM Design Challenge, students create a wire maze game that puts their hand-eye coordination to the test. First students complete an introductory activity that reinforces the concepts of open and closed circuits. Then the creativity begins! As students brainstorm to ensure they are meeting the specific design criteria and constraints to design a successful solution, they actively engage in science and engineering practices.

Complete for eight student groups. 1.5 V batteries and holders (or equivalent power supply) are required and available separately.

Catalog No.	Description	Price/Each
AP7992	Make a Wire Maze Game—Flinn STEM Design Challenge	$76.70

Educational Experimentation Kit



With this experimentation box, we want to introduce you in a safe, cool, and educational way to electronic circuits that are still the foundation of our state-of-the-art electronics today. This kit contains all the necessary components and an experiment board, called a 'breadboard,' to get started right away and build your first circuit in minutes.

Catalog No.	Description	Price/Each
AP11675	Educational Experimentation Kit	$18.00

Educational Experimentation Kit, Solar Power



Solar energy is one of the most important environmentally friendly alternative energy sources. Learn all about the future of energy: How does a solar panel work? How do you convert light into energy? "

Catalog No.	Description	Price/Each
AP11671	Educational Experimentation Kit, Solar Power	$24.00

Educational Soldering Kit



Soldering this kit is easy and fun, and you will learn more about electronics in the process. The first kit is shaped in the form of a Jules Verne hot air balloon that can also be hung thanks to a little mounting hole in the top, or it can stand on its own. It has a unique orange-red print and features multiple orange LEDs plus a warm candle flickering LED in the middle. The second kit is a Jules Verne-style bicycle and can be placed or hung like the other models. The bike has a unique brown circuit board with yellow LEDs and a soft flickering LED at the top.

Catalog No.	Description	Price/Each
AP11677	Educational Soldering Kit 1—Hot Air Balloon & Bicycle	$40.00
AP11678	Educational Soldering Kit 2— Submarine & Biplane	40.00

ELECTRICITY AND MAGNETISM—ELECTRICITY AND CIRCUITS continued on next page.

Electricity and Magnetism—Electricity and Circuits, continued

Resistance in Wires—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students will observe the brightness of a lightbulb to determine how these wire variables affect the current in an electrical circuit. Then they will heat up a wire and see the effect that temperature plays on the resistance in a wire. Will the resistance increase, decrease or stay the same? This engaging experiment will help students learn about simple circuits, resistance, current and Ohm's law. Includes detailed instructions, a reproducible student worksheet and Teacher Notes with sample answers and teaching tips.

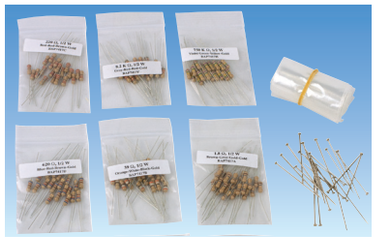
Super Value Kit is complete for 8 student groups. All materials are reusable except for the 28-gauge wire, which is available as a refill. 1.5-V batteries, battery holder and Bunsen burners are required and available separately.

Catalog No.	Description	Price/Each
AP7093	Resistance in Wires—Super Value Laboratory Kit	$71.60
AP1425	Battery, D, 1.5-Volt	4.50

Resistance Mystery—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In this two-part "mystery" analysis, students first decode the color bands on a series of nine unidentified resistors to predict their resistance values. They then test their predictions by placing the resistors in series and parallel circuit combinations and measure the current and voltage. Students see how resistors help control the current to circuit components and split voltage to bring power to multiple components.

Super Value Kit is complete for 15 student groups. All materials are reusable.

Catalog No.	Description	Price/Each
AP7417	Resistance Mystery—Super Value Laboratory Kit	$39.75

Haunting Bat



This Halloween gadget looks like a creepy bat and has a matte black color with white coating. The circuit board features 4 holes to give the bat claws, or to hang the gadget.

This kit includes through-hole components and 12 orange SMD LEDs. Ideal for those who want to start SMD soldering. Thanks to the built-in microphone, the LEDs switch on when sound is heard. The microphone sensitivity is adjustable with the potentiometer to scare the others even more."

Catalog No.	Description	Price/Each
AP11679	Haunting Bat	$18.00

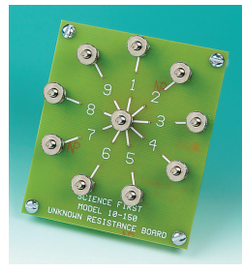
Panda Plant Guardian



The circuit board in the shape of a panda bear has gold-plated contact points or probes that measure the moisture content of the earth. Assembly and use is very simple. Stick the probes into the soil of your favourite houseplant. The panda's RGB eyes flash every 30 seconds, indicating whether the plant has too much (blue), too little (red) or just enough (green) water. So keep your plants in top condition if you don't want the panda staring at you with fiery red eyes!

Catalog No.	Description	Price/Each
AP11676	Panda Plant Guardian	$24.00

Resistance Board



This resistance board is conveniently wired so every student can have his or her own unknown resistance. You can quickly assign a unique number combination for each student. This set of nine precision resistors is ideal for use with a wheatstone bridge or other resistance measuring experiments. The resistors are mounted on a PC board with a binding post at the end of each resistor (nine on the periphery, one at the center). This layout allows any two resistors to be wired in series. The values of the resistors are unknown to students but are provided in the included Teacher's Instructions.

Catalog No.	Description	Price/Each
AP5702	Resistance Board	$64.50

What Is a Capacitor? Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students investigate the properties and function of capacitors by using them to build and test simple circuits. By connecting a known capacitor in series with different resistors and a light-emitting diode (LED), students discover how a capacitor stores and releases charge and electrical energy.

Super Value Kit is complete for 15 student groups. All materials are reusable. Multimeters and connecting cords are required and available separately.

Catalog No.	Description	Price/Each
AP7412	What Is a Capacitor? Super Value Laboratory Kit	$64.00
AP4639	Multimeter, Student	35.00
AP6052	Alligator Cords	13.46

Advanced Thermostat Kit

NEW!



This apparatus helps students to observe energy transfer and conversion and investigate the systems that keep homes comfortable and safe. The suggested activities will: explore the relationship between parallel circuits and current; understand how thermostats and circuit breakers operate; and compare the energy efficiency of LEDs to incandescent bulbs.

Includes:

- 6V DC connections
- Multimeter connections
- Multimeter
- 5 bulb sockets
- Bimetallic bar wwitch
- 5 on/off switches
- 5 6V incandescent bulbs
- 5 LED bulbs
- Candle
- Activity guide
- Advanced thermostat apparatus

Additional Supplies Needed: 6V DC power supply and stopwatch

Catalog No.	Description	Price/Each
AP9477	Advanced Thermostat Kit	$60.00

Tape-O-Tronics Craft Box



Combine easy electronics with creative cardboard crafting thanks to this all-inclusive set. Everything that you need to make 4 projects, plus some extra electronic components to create your own ideas! You will need to connect the electronic components by using conductive copper tape. You can choose to either tape or solder the components to create a connection.

The components include a battery, a resistor and one or more LEDs in various colours. The manual is illustrated with pictures and a simple explanation in 5 languages. The only extra tools you need are scissors, pliers and some glue.

Catalog No.	Description	Price/Each
AP11673	Tape-O-Tronics Craft Box	$30.00

ELECTRICITY AND MAGNETISM—ELECTRICITY AND CIRCUITS continued on next page.

Electricity and Magnetism—Electricity and Circuits, continued

Build a Shake Flashlight—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Shake and light up your classroom! Engage students by building a flashlight that doesn't need batteries—it harnesses and stores the power of a handshake. Students see a real-world application of Faraday's law of magnetic induction and learn how to build a circuit. Powerful neodymium magnets are shaken through 600 feet of coiled magnet wire, inducing an alternating current. An arrangement of diodes converts the current from AC to DC, which is stored in a supercapacitor. Simply flip the switch, and the capacitor releases the stored energy in the form of light through an LED. Flashlight can be dismantled and reassembled or left completed. Includes all components to create one shake flashlight detailed instructions and a reproducible student worksheet.

Catalog No.	Description	Price/Each
AP7320	Build a Shake Flashlight—Demonstration Kit	$68.35

Walking Microbug



Solder your own mini-insect! This mini-insect in the shape of a beetle is always looking for light and stops at complete darkness. You can control its behavior via the adjustable light sensitivity. The LED 'eyes' indicate the direction of travel. The kit has two open-chassis motors and runs on two 1.5V AAA batteries (not included)."

Catalog No.	Description	Price/Each
AP11674	Walking Microbug	$17.50

Learn to Solder Kit



Learn basic soldering techniques and become familiar with electronic components. Includes a printed circuit board, soldering iron, lead-free solder, solder wick, battery cord, speaker, wire, resistors, capacitors, and semiconductors. The 15-page manual contains detailed instructions, tips, diagrams, a glossary of terms, and a short quiz with answers.

Catalog No.	Description	Price/Each
AP7932	Learn to Solder Kit	$24.45

Plasma Globe



Create a safe lightning storm in the comfort of your classroom. The electrically charged base creates colorful arcs across the gas inside the globe. Watch as the electric arcs migrate toward a hand placed on the globe. Use it to teach about positive and negative charges, grounded objects and lightning production. Globe diameter is 4". Includes a power adapter.

Catalog No.	Description	Price/Each
AP6911	Plasma Globe	$45.45

Tesla Coil



Self-contained, hand-held Tesla coil produces a high voltage at a high frequency. Coil can be used to light fluorescent bulbs, spectrum tubes, and incandescent bulbs without wires or touching! The heavy-duty case is a convenient handle. The 2" electrode has an output between 10,000 to 50,000 volts at a frequency of approximately 500 kHz. The intensity of the 1" spark is adjustable by a knob on the end of the unit. Unit is designed for intermittent use and must be turned off to cool after ten minutes of use. AP5443 is equipped with an ON/OFF momentary switch in the handle for improved safety.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP1594	Tesla Coil	$303.05
AP5443	Tesla Coil, with ON/OFF Safety Switch	441.30

Tesla Coil, Tabletop



Spark enthusiasm in your classroom! Hold a fluorescent lightbulb near the Tesla coil and watch it glow—no wires needed. Amaze your students by allowing a continuous 50,000-volt electric spark to jump safely onto your finger. You can't do that with a Van de Graaff generator! Use this hands-free Tesla coil to demonstrate the unusual properties of high-frequency electrical phenomena. This electrifying device is bound to have your students asking questions and becoming excited about science and technology. Along the way, teach many important topics such as transformers, electromagnetism, resonating electrical circuits, electric inductance, capacitance, and electrical power transmission. The set includes two antenna plates, small neon lightbulb, mini discharge electrode, and lamp socket. Detailed instructions containing background information and 18 experiments are also provided.

Catalog No.	Description	Price/Each
AP6479	Tesla Coil, Tabletop	$382.80
AP5675	Neon Wand	17.85

Electricity and Magnetism—Circuit Components

Alligator Cords



An economical set of connector cords for basic circuitry experiments. These versatile connector cords have alligator clips on both ends with safety protective sleeves over the clips. A set of ten cords in five different colors, each 18" long.

Catalog No.	Description	Price/Pkg. of 10
AP6052	Alligator Cords	$13.46

Connector Cords



A wide variety of connector cords for almost any application, from lamp boards to circuits. Available in red or black.

Catalog No.	Description	Color	Length	Price/Each
AP6321	Alligator Clips, Both Ends	Red	12"	$ 2.15
AP6322		Black		
AP9060	Alligator Clips, Both Ends	Red	20"	4.55
AP9061		Black		10.95
AP9062	Alligator Clip—Banana Plug, Stacking	Red	26"	7.80
AP9063		Black		8.30
AP9064	Banana Plugs—Stacking, Both Ends	Red	26"	9.48
AP9065		Black		9.80

Alligator Test Clip, Pointed



Pointed tip clips especially suited for smaller space electrical connections. Constructed of plated steel and with a screw mount connection. The jaw spread is 10 mm and it has a 5-A capacity.

Catalog No.	Description	Price/Each
AP5335	Alligator Test Clip, Pointed	$ 0.86

Alligator Test Clips, Square Tip



Snub-nosed clips especially suitable for electrical connections. Constructed of plated steel. Rated for 10 amps.

Catalog No.	Description	Price/Each
AP9273	Alligator Test Clips, Square Tip	$2.13

Ammeters See page 438.

Annunciator Wire (Bell Wire)



Excellent wire for basic circuit wiring when using batteries as a power source. The wire is AWG 18 coated with a high-quality PVC coating. Each roll contains over 43 m of wire.

Catalog No.	Description	Price/Each
AP5417	Annunciator Wire (Bell Wire)	$24.95

ELECTRICITY AND MAGNETISM—CIRCUIT COMPONENTS continued on next page.

Electricity and Magnetism—Circuit Components, continued

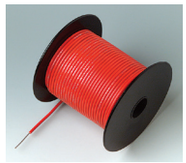
Electromagnet Coil Kit, Set of 3



Turn the electricity produced by the hand generator into a powerful electromagnet with the Electromagnet Coil Set. This great hands-on device lets students see the properties of an electromagnet in action. Students determine how the strength of an electromagnet is affected by the number of turns in the coil and by the nature of the material inserted into the coil. Includes one 200-turn coil, one 100-turn coil and 4 different cores: aluminum, copper, glass and iron. The electromagnet coils can also be used with a 6V battery. Coils measure 48 mm x 17 mm diameter; cores measure 55 mm x 5 mm diameter. Set of 3.

Catalog No.	Description	Price/Each
AP11839	Electromagnet Coil Kit, Set of 3	$215.00

PVC-Insulated Copper Wire



Solid copper wire conveniently packaged on 100-foot rolls. PVC coating is easily stripped off. Three standardized colors make color. Specifications: 18 gauge, tin coated. Maximum voltage 1000 VAC/1200 VDC. Maximum temperature rating, 105 °C. Insulation, 1/32 Thermoplastic.

Catalog No.	Description	Color	Price/Each
AP4715	PVC-Insulated Copper Wire	Red	$16.55
AP4716		Black	16.25
AP4717		White	15.97

Magnet Wire



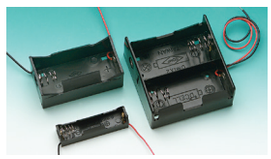
High-quality enameled copper wire neatly packaged on 125-ft spools. Nonconductive, thin enamel coat allows for tightly wrapped coils. Specifications: 22 gauge, maximum voltage 100 VDC.

Catalog No.	Description	Price/Each
AP6204	Magnet Wire	$9.00

Batteries and Accessories

See pages 105–106.

Battery Holders



Each holder has color-coded (positive or negative) leads. Double battery holder (AP9275) keeps the batteries in series. Batteries not included.

Catalog No.	Description	Price/Each
AP6944	Battery Holder, AA-cell, Single	$2.00
AP9274	Battery Holder, D-cell, Single	2.69
AP9275	Battery Holder, D-cell, Double	3.75

Battery Holder, D-cell with Wire Clips



This versatile holder allows students to power alternative circuits quickly. The flat back on the holder prevents the battery from rolling around, and the "quick-lock" clips allow easy wiring without tedious nuts or other connectors. Connecting wires and battery available separately.

Catalog No.	Description	Price/Each
AP4653	Battery Holder, D-cell with Wire Clips	$2.75

Battery Pack



This cleverly designed battery holder keeps four D-cell batteries in series. By attaching the included leads to zinc terminals at various locations you can get 1.5V, 3V, 4.5V or 6V without removing or touching the batteries. The molded plastic feet on the bottom of the holder prevent the batteries from rolling off your work surface. The battery pack comes with complete operating instructions. D batteries sold separately.

Catalog No.	Description	Price/Each
AP5621	Battery Pack	$17.75

Lamp Boards



Demonstrate parallel and series wiring with these miniature receptacles mounted on a clear acrylic base. Each receptacle is connected to two terminals.

Catalog No.	Description	Price/Each
AP9057	Lamp Board, Three-Lamp Series	$28.05
AP6475	Lamp Board, Five-Lamp Series	33.12

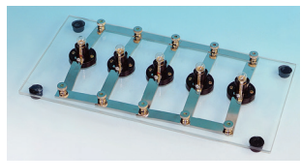
Lamp Board, Series/Parallel



Investigate basic electrical principles by experimenting with series and parallel circuits. Polycarbonate base has two lamp sockets, binding posts and metal switches. Requires the use of 3.7-V DC clear bulbs (AP9072). 6-V lantern battery must be used. Battery and bulbs available separately.

Catalog No.	Description	Price/Each
AP4541	Lamp Board, Series/Parallel	$42.50

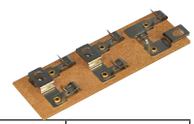
Lamp Board, Rheostat



Investigate basic electrical principles by experimenting with series and parallel circuits and observing the bulbs' brightness and intensity. Lamp board consists of five miniature lamp receptacles and five sets of binding posts with connecting leads mounded on a polycarbonate base. Requires use of 3.7-V DC clear bulbs (AP9072). 6-V lantern battery and bulbs available separately.

Catalog No.	Description	Price/Each
AP4539	Lamp Board, Rheostat	$89.15

Miniature Light Bulb Holder



Metal holders are securely mounted to a sturdy Masonite base. 5½" in length.

Catalog No.	Description	Price/Each
AP7826	Miniature Light Bulb Holder	$5.50

Light Bulb, Miniature



For use with all our lamp boards and receptacles.

Catalog No.	Description	V	A	Price/Each
AP9248	Light Bulb, Miniature	1.2	0.22	$2.25
AP9249		2.25	0.25	1.76
AP9256		2.47	0.3	2.18
AP9072		3.7	0.3	2.26
AP9258		6.3	0.15	1.77

Contact Key



Quickly and easily open and close any electrical circuit, or use this switch to study Morse code. Connections can be made with banana plugs or alligator clips. Measures 4¼" x 2".

Catalog No.	Description	Price/Each
AP6940	Contact Key	$8.30

Receptacles, Lamp, Economy Choice



Durable, economical miniature light sockets for use with all screw-type bulbs. Polypropylene base and all-metal clips. Two pinch-clip wire connectors.

Catalog No.	Description	Price/Each
AP6035	Receptacles, Lamp, Economy Choice	$2.28

ELECTRICITY AND MAGNETISM—CIRCUIT COMPONENTS continued on next page.

Electricity and Magnetism—Circuit Components, continued



Receptacles, Lamp

High quality plastic or porcelain lamp receptacles with screw type binding posts. For use with miniature lightbulbs.

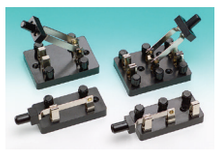
Catalog No.	Description	Price/Each
AP9058	Receptacles, Lamp, Plastic	$2.69
AP9059	Receptacles, Lamp, Porcelain	4.95



Socket, Lamp

Miniature socket has two terminals. It is compatible with all of our miniature lightbulbs.

Catalog No.	Description	Price/Each
AP9259	Socket, Lamp	$1.40



Switches, Knife

Durable plastic base knife switches that stand up during tough student use. Poles and knives are made of brass for good electrical connections.

Catalog No.	Description	Price/Each
AP6942	Single Pole, Single Throw, Economy Choice	$2.77
AP9068	Single Pole, Single Throw	5.66
AP9069	Single Pole, Double Throw	6.30
AP9070	Double Pole, Single Throw	8.05
AP9071	Double Pole, Double Throw	8.99



Piezoelectric Buzzer

Generates a continuous tone when supplied with a DC voltage between 3 and 20 V. Includes attached lead wires and mounting ears.

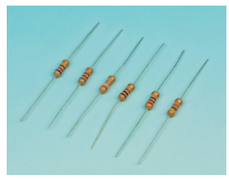
Catalog No.	Description	Price/Each
AP9863	Piezoelectric Buzzer	$4.40



Resistance Coils

Strengthen your hands-on lab exercises on the Laws of Resistance with this handy set of eight all-purpose labeled resistance coils. Students can use them to test how resistance is affected by type, length, and diameter of the wire used. The math is easy and the results very predictable. Each coil is clearly labeled with wire length, gauge, and material composition and has two convenient soldered terminals for easy connection to your measuring devices. Comes complete with instructions, answers and a plastic compartmentalized storage container.

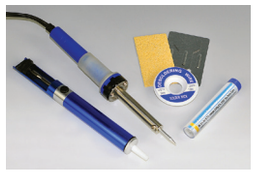
Catalog No.	Description	Price/Each
AP5701	Resistance Coils	$90.00



Resistor Set

Resistors are a necessity when investigating electrical circuits. Use resistors to confirm Ohm's law or design a challenge to illuminate an LED. Set includes 600 total resistors, 100 of each of the following resistance values: 39 Ω, 220 Ω, 620 Ω, 1.1 kΩ, 8.2 kΩ, and 47 kΩ. Rated ½ watt.

Catalog No.	Description	Price/Each
AP7940	Resistor Set	$38.70



Soldering Tool Kit

Learn to practice and master the art of soldering with the necessary tools provided in this set. Includes a soldering iron, desoldering pump and wire, solder wick, soldering iron stand, tip cleaning sponge, and lead-free solder. Also includes a booklet with detailed instructions, diagrams, and essential safety precautions.

Catalog No.	Description	Price/Each
AP7919	Soldering Tool Kit	$21.25



Arduino Nano V3.0 Boards

Arduino Nano boards are perfect for when you are ready to stop prototyping and start making. The small size of these boards helps conserve space when assembling your creations. The boards connect to your computer through a mini USB cable (not included) and can be powered by either a mini USB cable, 6–12 V unregulated external power supply or 5 V regulated external power supply. The package also includes header pins so you can connect your Arduino Nano to a breadboard.

Catalog No.	Description	Price/Each
AP9871	Arduino Nano V3.0 Boards	$57.50



Solderless Breadboards

Solderless breadboards enable you to quickly prototype and modify your circuits. The central body of the board has 630 tie-points with two 100 point distribution strips on the sides providing four power rails.

Catalog No.	Description	Price/Each
AP9872	Solderless Breadboards	$20.00



Lead-Free Solder

Lead-free solder (99.3% tin, 0.7% copper, rosin core).

Catalog No.	Description	Price/Each
AP9818	Lead-Free Solder, Roll, 5'	$2.53



Solder Wick

Solder wick removes solder from all types of connections. 1.5 m roll in a convenient dispenser. 2 mm wide and braided.

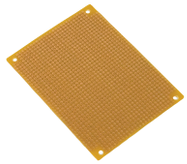
Catalog No.	Description	Price/Each
AP9819	Solder Wick	$1.62



Digital Solder Station

High-quality professional soldering station. Includes a 48 W soldering iron and can achieve temperatures as high as 480 °C. An easy-to-read digital display makes it simple to select your desired working temperature, which can be maintained to within 5 °C. Lead-free solder is available separately.

Catalog No.	Description	Price/Each
AP9820	Digital Solder Station	$103.05



Solderable Perfboard

Take your prototypes to the next level with this solderable perfboard. Measuring 8 cm x 11 cm with a 2.54 mm (0.1") matrix, this perfboard has copper solder pads for each hole and is perfect for use with through-hole components.

Catalog No.	Description	Price/Each
AP10014	Solderable Perfboard, 8 cm x 11 cm	$4.91

ELECTRICITY AND MAGNETISM continued on next page.

Electricity and Magnetism—Magnetism

FLINN360science™: Electromagnets and Magnetism



This kit presents the concepts of magnetic force and magnetic properties through hands-on activities. Students will discover the compass will always point perpendicular to the wire and will deflect either clockwise or counterclockwise depending on the direction of the current. They will also observe that the electromagnet with the iron core is much stronger than without. This is due to the current-carrying coils causing the iron nail to become a temporary magnet.

Catalog No.	Description	Digital Access	Price/Each
AP11322	360Science: Electromagnets and Magnetism	1-Year	$249.00

FLINN360science™: Electricity and Wind Energy



This kit presents the essential concepts of solar energy, wind energy and power through hands-on science activities designed to engage all your students, regardless of level. Through this activity, students will discover that no single variable makes the difference in how much power the wind turbine can produce. All the different pieces must work together for the most efficient design. Blade material, angle, size, shape and placement are all important.

Catalog No.	Description	Digital Access	Price/Each
AP10339	360Science: Electricity with Wind Energy	1-Year	$58.85
AP10439		3-Year	76.55

FLINN360science™: Induction of Electrical Current



This kit presents the essential concepts of electromagnetic induction, magnetic flux, Lenz's Law and Faraday's Law through hands-on science activities designed to engage all your students, regardless of level. Students will observe that there is a larger deflection of the needle on the galvanometer when the magnet is moved quickly. Without magnet movement there is no needle deflection. They will also notice that as the number of coils increases a larger deflection of the galvanometer needle is observed.

Catalog No.	Description	Digital Access	Price/Each
AP11323	360Science: Induction of Electrical Current	1-Year	$141.00

FLINN360science™: Magnetic Force and Separation Distance



This kit presents the concepts of magnetic force and magnetic properties. Students will discover the relationship between the force due to magnetism exerted by two repelling magnets and their separation distance. They will see that the force due to a magnet decreases faster with distance compared to the force due to gravity.

Catalog No.	Description	Digital Access	Price/Each
AP11321	360Science: Magnetic Force and Separation Distance	1-Year	$68.00

FLINN360science™: Introduction to Electromagnetism



This kit presents essential concepts of magnetic properties of current-carrying wires, conservation of energy, electromagnets, and magnetic field through hands-on science activities. Students will build their own electromagnet to prove that electric current can generate a magnetic field and that a magnetic field can be used to generate an electric current. They will then observe the difference in strength with and without the iron core. Then, students will create a magnetic field in one tube covered in magnet wire and see the resulting effect on a compass in another tube wrapped in magnet wire. They should draw the conclusion that the magnetic field created an electric field that carried down the wire to the other tube. Teachers can extend learning through guided inquiry into associated phenomena, "How can heat that is deep underground be used at the surface?"

Catalog No.	Description	Digital Access	Price/Each
AP10340	360Science: Introduction to Electromagnetism	1-Year	$111.85
AP10440		3-Year	126.65

FLINN360science™: Build a Basic Generator



This kit presents essential concepts of magnetic properties of current-carrying wires, conservation of energy, electromagnets, and magnetic fields through hands-on science activities designed to engage students. Students find that the nail must be completely surrounded by the wire or a strong enough current cannot be produced. The faster the nail and magnets are spun, the brighter the LED bulb will glow.

Catalog No.	Description	Digital Access	Price/Each
AP10420	360Science: Build a Basic Generator	1-Year	$115.45
AP10520		3-Year	126.85

Make a Print of a Magnetic Field—Student Laboratory Kit

FLINN EXCLUSIVE

By: Stephen Fuller, Lincoln College Prep High School, Kansas City, MO



Help students visualize the lines of force of a magnetic field—permanently! This hands-on activity combines science with art as students create beautiful, permanent prints of a magnetic field using special photosensitive paper, iron filings, and a bar magnet. The bar magnets included with the kit may be combined in different arrangements to explore how the lines of force change with attraction or repulsion. The photosensitive paper may be exposed using either sunlight or a UV lamp. Kit includes complete instructions with reproducible student handouts, valuable Teacher Notes with answers to all questions, and enough materials for eight groups of students. A total of 30 prints may be made.

Catalog No.	Description	Price/Each
AP7287	Make a Print of a Magnetic Field—Student Laboratory Kit	$70.25

3-D Magnetic Field Jar—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Beautiful demonstration clearly reveals the shape and strength of the magnetic field. Simply fill the special jar-and-tube assembly with oil, add iron filings, shake and insert a magnet. The filings line up along the magnetic field, concentrating especially at the poles where the field strength is greater. Seeing is believing, and this large-scale magnetic field is very visible—and persuasive!

Note: Neodymium magnets (sold separately) may be used to demonstrate other magnetic field variations. Materials may be reused for many years!

Catalog No.	Description	Price/Each
AP7347	3-D Magnetic Field Jar—Demonstration Kit	$51.35
AP5666	Neodymium Magnet	16.83

Introduction to Magnets—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In this hands-on introductory kit, students experiment with bar magnets to visibly see why magnets "stick" to certain objects but not others. They test magnetic polarity and determine what types of materials are magnetic. Lastly, students sprinkle iron filings over the magnets to display the invisible magnetic fields that surround all magnets and see how the magnetic fields are bent when two magnetic north poles repel and when north and south poles attract. Includes detailed laboratory instructions and background information.

Full-size kits are complete for 8 student groups. Small-size kits are complete for 4 student groups. Refill kits contain materials only. All materials are reusable.

Catalog No.	Description	Description	Price/Each
AP6457	Introduction to Magnets—Super Value Laboratory Kit	Full-Size Kit	$95.60
AP10169		Full-Size, Refill Kit	85.45
AP10325		Small-Size, Refill Kit	54.86

ELECTRICITY AND MAGNETISM—MAGNETISM continued on next page.

Electricity and Magnetism—Magnetism, continued

Magnets and Magnetism—Super Value Activity-Stations Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Explore the captivating world of magnetism with this all-in-one kit.

- Properties of Magnets—Learn about the nature of magnets by classifying materials as magnetic or nonmagnetic and by feeling attractive and repulsive magnetic forces.
- Build an Electromagnet—Bridge the world between electricity and magnetism.
- Electromagnetic Induction—Investigate Faraday's Law by building a simple galvanometer.
- Build a DC Motor—Apply the concept of electromagnetism to construct a model of a working DC motor.

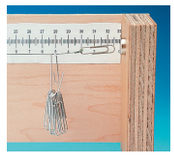
Easy-to-set-up lab stations allow different student groups to work independently to examine a specific aspect of magnetism. Once one activity is complete, students move on to the next lab station. Detailed instructions and Teacher Notes are provided.

Super Value Kit is complete for 16 student groups. All materials are reusable. 9-V batteries are required and available separately.

Catalog No.	Description	Price/Each
AP7013	Magnets and Magnetism—Super Value Activity-Stations Kit	$171.36
AP1430	Battery, 9-V	6.32

Gravity and Magnetism: A Battle of Two Forces—Super Value Laboratory Kit

FLINN EXCLUSIVE



By: Bill Grosser, Oak Park and River Forest H.S., Oak Park

Gravitational versus magnetic force—which is stronger? With this kit, students perform hands-on experiments using the teacher-designed magnetic levitation device. Students will determine the relationship between force and the distance between two objects. Students follow the engaging lab investigations or explore and design their own experiments. Kit includes three assembled magnetic levitation devices (as pictured), 300 paper clip masses, reproducible student instructions and complete teaching information.

Super Value Kit is complete for three student groups. All materials are reusable.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5964	Gravity and Magnetism: A Battle of Two Forces—Super Value Laboratory Kit	$51.85

Measuring Magnetic Force—Super Value Laboratory Kit

FLINN EXCLUSIVE



By: The Flinn Staff

In this experiment, students examine the force between repelling magnets to determine the mathematical relationship between the magnitude of magnetic force and the separation distance. By plotting the data, students will easily see the exponential relationship and will actually be able to calculate the exponential value. Includes comprehensive instructions and detailed Teacher Notes.

Super Value Kit is complete for 8 student groups. All materials are reusable. Support stands and spring scales are required for each lab group and available separately.

Catalog No.	Description	Price/Each
AP7097	Measuring Magnetic Force—Super Value Laboratory Kit	$57.25
AP4837	Spring Scale, Pull Type, 500 g/5 N	10.35

Electromagnetism—NewPath Visual Learning Guide, Set of 10

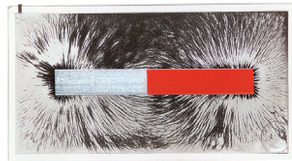
NEW!



Electromagnetism Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11728	Electromagnetism—NewPath Visual Learning Guide, Set of 10	$43.32

Magnetic Field Demonstrator



The transparent acrylic case is filled with fluid and fine iron filings and then permanently sealed shut. Set the magnetic field demonstrator on an overhead projector. Place a magnet beneath the demonstrator and watch the clear lines of magnetic force become visible through the clear sides of the chamber. Under the bright light of the overhead projector, the lines of force are magnified and very clear. 12 x 22 x 1 cm.

Catalog No.	Description	Price/Each
AP4748	Magnetic Field Demonstrator	$39.30

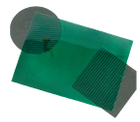
Student Magnetic Field Demonstrator



The economical price of this magnetic field demonstrator makes individual student experimentation possible. The iron filings are sealed in a circular plastic transparent case and respond to magnets placed on the flat outer surfaces. Includes one bar magnet and one disc magnet.

Catalog No.	Description	Price/Each
AP6077	Student Magnetic Field Demonstrator	$10.20

Magnetic Field Viewing Film



With the reusable Magnetic Field Viewing Film, easily see the magnetized regions of various materials. A simple way to spark curiosity! 4" x 3".

Catalog No.	Description	Price/Each
AP9683	Magnetic Field Viewing Film	$11.10

Iron Filings

See page 63.

Magnetic Needle



Versatile for demonstrating Earth's magnetic field. The magnetic needle "floats" on a pin-point pivot and is extremely sensitive and accurate. Small changes in a magnetic field can be easily detected with this rugged magnetic needle. Needle is 14.3 cm long; support rod is 9.9 cm tall with a 6 cm square base.

Catalog No.	Description	Price/Each
AP4680	Magnetic Needle	$12.30

Magnetic Field Sensor

See pages 537–538.

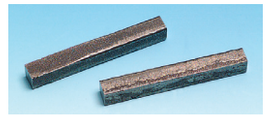
Bar Magnet, Alnico



Alnico magnets are ferrous alloys of aluminum, nickel, and cobalt. 150 x 12 x 7 mm.

Catalog No.	Description	Price/Each
AP9263	Bar Magnet, Alnico	$17.70

Bar Magnet, Cobalt Steel



A 50 x 6 x 6 mm cobalt steel bar magnet. Cobalt steel makes a great permanent magnet.

Catalog No.	Description	Price/Each
AP9261	Bar Magnet, Cobalt Steel	$10.05

Bar Magnets, Pair, Alnico



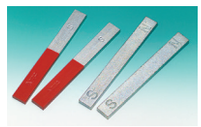
Two magnets per package. 100 x 10 x 7 mm. Keepers included for longer life.

Catalog No.	Description	Price/Each
AP9264	Bar Magnets, Pair, Alnico	$22.44

ELECTRICITY AND MAGNETISM—MAGNETISM continued on next page.

Electricity and Magnetism—Magnetism, continued

Bar Magnets, Pair, Steel



Two 6" steel bar magnets with North and South poles permanently inscribed. Magnets are painted red on the North poles. Keepers included with AP9040.

Catalog No.	Description	Price/Each
AP9040	Bar Magnets, Pair, Steel, Painted	$28.71
AP9260	Bar Magnets, Pair, Steel, Unpainted	24.11

Magnet Stirrup



Ideal support for a bar magnet—stirrup allows the magnet to hang freely in the horizontal plane. Hooks are 3½" (89 mm) apart. Magnet not included.

Catalog No.	Description	Price/Each
AP6194	Magnet Stirrup	$3.75

Cow Magnet



Cow magnets are used by farmers to trap metal that cows have ingested. Use a cow magnet to demonstrate a three-dimensional magnetic field, to determine the amount of iron in breakfast cereal, and to show in an unusual way that not all metals are magnetic. Includes instructions for three demonstrations.

Catalog No.	Description	Price/Each
AP1944	Cow Magnet	$15.55

Magnet, Alnico, Cylindrical



Quality Alnico magnet with cylindrical shape. Permanent magnet with high magnetic force. Magnet is 100 mm long and 10 mm in diameter.

Catalog No.	Description	Price/Each
AP5663	Magnet, Alnico, Cylindrical	$16.00

Mega-Magnet



Mega-Magnets are from salvaged computer parts and may have a chip or two in them. While they may not always look pretty, they are as strong for their size as any magnet gets! Nine fun activities are included with each magnet. Dimensions are 1¼" L x ¾" W x ½" H.

Catalog No.	Description	Price/Each
AP1738	Mega-Magnet	$24.20

Neodymium Magnet



Unbelievably strong magnet! Watch your fingers if you bring two of them together! These ceramic magnets are a perfect example of how technology is producing new materials with space-age properties. These crystalline, ceramic cobalt–neodymium magnets retain their magnetic strength much longer than normal soft metal magnets and emit their strength to other materials easily. Your students will be totally impressed with the strength of this magnet. Magnet 12 mm in diameter.

Catalog No.	Description	Price/Each
AP5666	Neodymium Magnet	$16.83

Electromagnet See page 411.

Horseshoe Magnet, Ceramic



Permanent high-strength magnet. 30 x 30 mm. Distance between poles is 14 mm.

Catalog No.	Description	Price/Each
AP9266	Horseshoe Magnet, Ceramic	$3.70

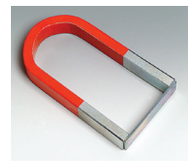
Horseshoe Magnet, Steel



Strong 4 or 6" chrome steel horseshoe magnets with North and South poles permanently inscribed. Magnets are painted red with silver poles. Keeper included for long life.

Catalog No.	Description	Size	Price/Each
AP9265	Horseshoe Magnet, Steel	4"	$16.25
AP9041		6"	22.50

U-Shaped Magnet, Permanent Chrome Steel



A very impressive chrome steel magnet with the North pole permanently inscribed. Distance between poles is 50 mm. Supplied with keeper.

Catalog No.	Description	Price/Each
AP8081	U-Shaped Magnet, Permanent Chrome Steel	$53.00

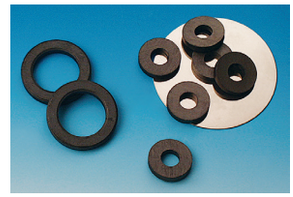
Ceramic Disc Magnets, Package of 6



These round, flat, disc magnets have very defined poles at opposite ends of their diameters. Six ceramic disc magnets per set. Each magnet is 25 mm in diameter and 5 mm thick.

Catalog No.	Description	Price/Pkg. of 6
AP4655	Ceramic Disc Magnets	$9.10

Economy Ceramic Ring Magnets



Good for building generators, motors, and teaching other electromagnetic principles. These economy magnets are not painted and are magnetized parallel to their thickness. Offered in two sizes.

Catalog No.	Description	Price
AP5664	Small Economy Ceramic Ring Magnet 0.75" o.d. x 0.25" i.d. x 0.125" Thick	$1.91 Pkg. of 6
AP5665	Large Economy Ceramic Ring Magnet 1.25" o.d. x 0.75" i.d. x 0.125" Thick	0.40 Each

Ceramic Ring Magnets



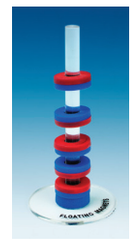
Defying gravity? That's what these magnets appear to be doing as they climb up a pencil. Magnets 34 mm in diameter, 9 mm thick with 8-mm diameter hole. Two magnets per set.

Catalog No.	Description	Price/Set
AP4654	Ceramic Ring Magnets	$5.55

Magnetic Tape See page 192.

Magnetic Wand See page 275.

Floating Magnet



When placed on the center pole in the right order, these ring magnets appear to magically levitate above each other. When reversed they are attracted to each other at the base of the center pole.

Catalog No.	Description	Price/Each
AP6059	Floating Magnet	$12.40

Ferrofluid See page 439.

Buzzing Stunt Magnets



When tossed into the air, the two ellipsoidal hematite magnets collide and then "wrestle" for equilibrium in a great clattering, buzzing collision.

Catalog No.	Description	Price/Each
AP6965	Buzzing Stunt Magnets	$10.90

Magnet Kit, Economy Choice



The perfect magnet set for schools on a tight budget. Perform numerous demonstrations to present the important properties of magnetism to your students. Kit includes a 26-page activity manual to guide you through the demonstrations.

Catalog No.	Description	Price/Each
AP6710	Magnet Kit, Economy Choice	$42.85

ELECTRICITY AND MAGNETISM—MAGNETISM continued on next page.

Electricity and Magnetism—Magnetism, continued

Magnetizer



Don't spend money every year buying new magnets! Remagnetize your old ones in a flash with this high-powered magnetizer. A flip of the switch produces a magnetic field that completely magnetizes soft steel and iron materials. The unit has two 2.5 x 2.5 cm holes, one polarized North and the other South. The holes are large enough to accept most bar or horseshoe magnets. A typical magnet is remagnetized in several seconds once power is applied. The unit uses regular 115 V 50/60 Hz power and comes with complete operating instructions. Three magnet keepers are provided for completing contact points for magnetizing uniquely shaped magnets.

Catalog No.	Description	Price/Each
AP5662	Magnetizer	$230.75

Basic Student Electricity Supplies



Great value assortment of student supplies to use when investigating electricity. Contains: (6) Round Plastic Bulb Holder, (3) Knife Switch, Single Pole, Single Throw, (10) Battery Holder with Fahnestock Clip, (1) Wire Stripper, (3) Wire with Alligator Clips, 18 in., Assorted Colors, (3) Wire with Banana Clips, 18 in., Assorted Colors, (1) Insulated Copper Wire, 22 gauge, 100 foot roll, (10) 1.5 V Light Bulb

Catalog No.	Description	Price/Each
AP11077	Basic Student Electricity Supplies	$55.00

Classroom Attractions Level 3



This exciting magnet kit provides you with the materials you need to implement or supplement a study of magnets in your classroom. The easy-to-use educational guide is filled with suggestions for hands-on activities that will help you introduce your students to the wonderful world of magnets.

Catalog No.	Description	Price/Each
AP11642	Classroom Attractions Level 3	$130.00

Electricity and Magnetism Circuit Kit



Introduce students to the basic principles of electricity and magnetism with this 29-piece kit. Not only does this kit cover the concepts of electrical circuits, including both parallel and series circuits, it also empowers students to explore the forces in a magnetic field and the basic principles of an electric motor. Comes with an activity guide.

Catalog No.	Description	Price/Each
AP11076	Electricity and Magnetism Circuit Kit	$90.00

Float and Spin Magnet Demonstrator



This demonstration of magnetic repulsion uses a clear acrylic plate that keeps a spinning axle oriented above magnets built into the base of the apparatus. With a simple twist of your fingers, you can start this levitating magnet spinning and kick start a classroom discussion. The black and white coloring makes the demonstration easy to see and helps track the speed of the rotation.

Catalog No.	Description	Price/Each
AP11670	Float and Spin Magnet Demonstrator	$8.00

Commercial Ferrofluid—Chemical Demonstration Kit

FLINN EXCLUSIVE



Ferrofluid, first developed by NASA in the 1960s, consists of nanosized magnetic particles suspended in a liquid. Your students will be fascinated as you demonstrate the unique properties of this nanoscience material and produce interesting 3-dimensional magnetic sculptures. Suggested demonstration instructions and handling tips are included. **Note:** A magnet is required and available separately.

Catalog No.	Description	Price/Each
AP7432	Commercial Ferrofluid—Chemical Demonstration Kit	$48.30
AP5666	Neodymium Magnet	16.83

Floating Magnet Rings



Make these colorful rings magically levitate! Explore and interact with magnetic forces—arrange and rearrange the rings to investigate attraction and repulsion. Includes pencil and 6 ceramic ring magnets. Package measures 6.13" H x 1.5" D.

Catalog No.	Description	Price/Each
AP11641	Floating Magnet Rings	$8.00

Hand Rule Demonstrator



As electrons flow in a wire, they create a magnetic field. The strength of the magnetic field is directly proportional to the current. When this current-carrying wire is near a permanent magnet it causes magnetic repulsion and motion is created. The horseshoe magnet can be removed to reverse the poles so students can see how the motion is affected by the orientation of the magnetic field and the current. The apparatus works on 3V to 6 V DC and has a switch to cause a temporary current in the magnetic coil.

Catalog No.	Description	Price/Each
AP11669	Hand Rule Demonstrator	$45.00

LED Name Badge Kit





This simple activity teaches kids about optics and circuitry through an engaging art activity. Students start with a blank piece of acrylic and etch their names or design on it using an (included) safety pin. Once finished, they add in an LED to make their project light up!

Catalog No.	Description	Price/Each
AP11615	LED Name Badge Kit, 25 pk	$ 95.00
AP11616	LED Name Badge Kit, 100 pk	160.00

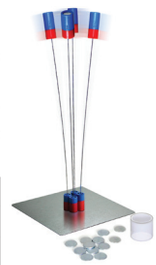
Magic Penny Magic Kit, Fifth Edition



Perform astounding feats of magnetism as you playfully explore magnetic forces, motion and stability. Integrates geometry and art too—discuss shapes, positions, planes, symmetry, and more. Kit includes 2 super strong magnets encased in stainless steel. 32 newly-minted British pennies plus a bonus US penny. Activity booklet packed with magnet facts, penny history, and 44 activities.

Catalog No.	Description	Price/Each
AP11637	Magic Penny Magic Kit, Fifth Edition	$30.00

Wave Wires Magnet



Place the magnet wires on the base, activate them, and watch the unique ways they oscillate as their invisible magnetic forces "bounce" off one another! Great for an individual or 1 small group in classroom labs (grades 3–8), STEM programs, science fairs, maker spaces, and more. Includes 4 magnet wires, 12 disc weights, base plate, activation ring, and activity booklet.

Catalog No.	Description	Price/Each
AP11638	Wave Wires Magnet Set	$ 15.00
AP11639	Wave Wires Magnet Station Pack	100.00
AP11640	Wave Wires Magnet Station	50.00

LED Paper Name Tag Classroom Set



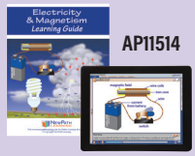
This fun project is a perfect group activity for classrooms, camps, after school programs, or high interest days. Each student creates their own colorful light-up "Hello My name Is" style name tag. The project takes 10–15 minutes to complete.

Catalog No.	Description	Price/Each
AP11623	LED Paper Name Tag Classroom Set	$104.00

ELECTRICITY AND MAGNETISM—MAGNETISM continued on next page.

Electricity and Magnetism—Magnetism, continued

NewPath Learning Guides for Electricity & Magnetism



AP11514

The NewPath Learning Guides are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11514	Electricity & Magnetism Student Learning Guide with Online Lesson	$14.95
AP11564	Electricity & Magnetism Student Learning Guide with Online Lesson, Set of 10	99.00

Electricity and Magnetism—Electromagnetism

Tangent Galvanometer



Investigate magnetic fields produced by an electric current. Students observe as a current carrying coiled wire produces a magnetic field perpendicular to the direction of the current. Students learn that the strength of the magnetic field varies with the number of times the wire is coiled. Complete instructions provided.

Catalog No.	Description	Price/Each
AP9230	Tangent Galvanometer	$77.35

Eddy Currents—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Drop a nonmagnetic cylinder down a two-foot long metal tube and watch it fall through the bottom in less than a second. Next drop a similar-looking magnetic cylinder down the same tube. Students will be amazed as they impatiently wait for several seconds before this cylinder finally emerges out of the bottom. Students discover that it's not friction that slows the cylinder down—it's Lenz's law in action! As the magnetic cylinder falls through the metal tube, electrical (eddy) currents in the tube produce their own magnetic field that repels the magnetic field of the falling magnet, causing it to slow down and fall at a constant speed. Comes complete with instructions and discussion of eddy currents. Tube comes with end caps to make storage of the cylinders a snap.

Concepts: Eddy current s, Lenz's law, magnetism.

Time Required: 10 minutes

Materials Provided: Aluminum tube with end caps, sheathed nonmagnetic and magnetic cylinders.

Catalog No.	Description	Price/Each
AP4698	Eddy Currents—Demonstration Kit	$37.20

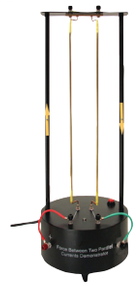
LaPlace's Law Demonstrator



A magnetic field is generated by a current-carrying wire. Verify the existence of this magnetic field with the LaPlace's Law Demonstrator. A U-shaped magnet is placed between two separate parallel conductors. Then a rod with a disc is placed across the conductors. This creates a complete conducting path. When a current is passed through the parallel conductors, a force acts on the rod with the disc causing it to roll. 8" L x 5" W x 3¾" H.

Catalog No.	Description	Price/Each
AP7867	LaPlace's Law Demonstrator	$43.85

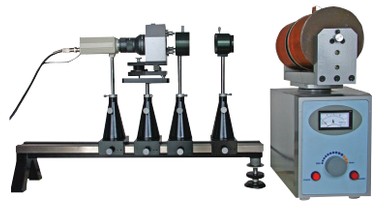
Force Between Conductors Demonstrator



Demonstrate a basic property of electromagnetism in a safe and easy to-use device. Force Between Conductors Demonstrator consists of a metal frame that supports two long, straight conductors. A pushbutton applies a voltage, momentarily producing a large current in the conductors. The conductors are able to rotate freely about the vertical axis to show attraction or repulsion due to the mechanical force between them. Voltage can be applied in various configurations: series or parallel, and same sense or opposite sense. Simply connect the heavy duty cords to the appropriate binding posts. Indicator arrows can be adjusted to show the direction of current in each conductor. Students will be fascinated watching the conductors attract and repel due to the induced magnetic fields. This simple, direct method demonstration will allow your students to observe first-hand this electromagnetic phenomenon. Operates at 110 VAC.

Catalog No.	Description	Price/Each
AP8165	Force Between Conductors Demonstrator	$180.44

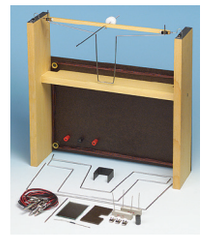
Zeeman Effect Apparatus



The Zeeman Effect Apparatus examines the effect of a strong magnetic field on the green emission line of mercury at 545.1 nm wavelength. Full details at flinnsci.com.

Catalog No.	Description	Price/Each
AP8154	Zeeman Effect Apparatus	$10848.25

Current Balance, External



If a conductor, usually a wire, carries a current and is placed in a magnetic field, it experiences a small force. Electric motors are a good example where such a force occurs. To measure this small force you need a very sensitive balance—like this one! This unit's design assures highly accurate measurement of these small forces. Force vs. current or force vs. conductor distance can be determined easily. A series of built-in multi-turn coils can be utilized for multiple runs of the experiments. Includes two 1-ohm, 25-W resistors for current limiting, instructions for assembly and experiments. Requires two DC power supplies capable of delivering 5 A.

Catalog No.	Description	Price/Each
AP5630	Current Balance, External	$239.00

Orion Science Current Balance Kit



This high-quality current balance from Orion Science lets student investigate the forces acting on a current-carrying wire. Current, wire lengths, magnetic field and coil angles all can be adjusted.

Catalog No.	Description	Price/Each
AP10977	Orion Science Current Balance Kit	$668.70

Electromagnet Kit



Use this economical kit to teach all the basics of electromagnetism. Students can build a bar magnet or a U-shaped electromagnet. Measure the polarity and magnitude of electromagnetic forces. The kit includes two coils on plastic spools, a U-shape iron core, two magnetic needles with stands and a pair of easy-connect wires. Comes in a plastic storage case and an activity manual is included.

Catalog No.	Description	Price/Each
AP5728	Electromagnet Kit	$38.70

ELECTRICITY AND MAGNETISM—ELECTROMAGNETISM continued on next page.

Electricity and Magnetism—Electromagnetism, continued

Electromagnet



What can lift 100 times its own weight? Answer: This electromagnet! Lift up to 200 pounds using one 1.5 V D-cell battery! The battery is conveniently held in a battery clip on top of the magnet and alligator clips make completing the circuit easy.

Catalog No.	Description	Price/Each
AP5637	Electromagnet	$79.75

Gilley Coil Kit



Use the modular pieces to perform experiments in magnetic induction, primary and secondary coil transformers, effects of current direction and distance on magnetic lines of force, and effects of electromagnetic polarity between two coils. Background and directions are provided. Requires a 6-V dry cell, sold separately.

Catalog No.	Description	Price/Each
AP5654	Gilley Coil Kit	$65.81
AP1429	Battery, 6.0-V	13.25

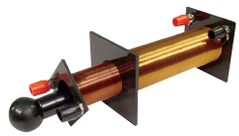
Air Core Solenoid



A versatile solenoid. Its large size allows for more applications than smaller solenoids and can be used with a cathode ray tube or current balance. Heavy enamel #16 niclad copper wire is carefully wound on a tough phenolic core. The coil has 570 turns and the wire ends at easy-to-use binding posts on the rigid plastic end plates. It can carry 10 amps intermittently and 5 amps continuously without overheating. Includes instructions and experiments. Solenoid is 15 cm long, 9 x 9-cm ends, and large 6-cm interior diameter.

Catalog No.	Description	Price/Each
AP5628	Air Core Solenoid	$184.70

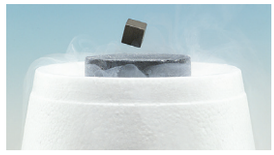
Primary/Secondary Coil



The key concepts you can demonstrate with this quality induction coil set are: electromagnetic induction, Faraday's Law of induction, step-up and step-down transformers, induced current, induction of current vs. induction of voltage, and Lenz's Law. The easily accessible binding posts make circuit wire connections easy. The tight wire windings on the coils provide outstanding induction results. Comes complete with two coils, a soft metal core and complete instructions.

Catalog No.	Description	Price/Each
AP4630	Primary/Secondary Coil	$73.35

Superconductivity Demonstration Kit



Superconductivity is the spectacular characteristic of the total disappearance of electrical resistance when a superconductor is cooled below a critical temperature. Another important property of superconductors is that if a magnetic field is applied to the superconductor, the effect of magnetization can be reversed. This reversible magnetic behavior is called the Meissner Effect. It is this Meissner Effect that would enable a train to levitate above its tracks. Since there would be no friction between wheels and track, the train could operate while consuming very little energy.

This unique demonstration kit will provide you with all the materials needed (except liquid nitrogen) to successfully demonstrate the characteristics of superconductivity and the Meissner Effect. Each demonstration kit includes a rugged 1" superconductor, a rare earth magnet, non-metallic forceps and one "how to" instruction manual.

▶ See free video at flinnsci.com.

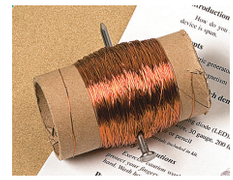
Catalog No.	Description	Price/Each
AP1489	Superconductivity Demonstration Kit	$122.30

Electricity and Magnetism—Generators

Build a Simple AC Generator—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Create power! Demonstrate the fundamental principles of generators by converting the spinning mechanical energy into electrical energy that will light an LED. In this simple, easy-to-make device, two powerful neodymium magnets spinning in a coil of wire induce a current, in accord with Faraday's Law. You can also use the device to show students the difference between direct and alternating current. Includes complete instructions and a reproducible student worksheet. Classroom Set includes enough materials for eight student groups.

Catalog No.	Description	Price/Each
AP7275	Build a Simple AC Generator—Demonstration Kit	$ 31.05
AP7276	Build a Simple AC Generator—Classroom Set	155.77

Hand Generator



With a turn of the crank, students can conduct dozens of hands-on experiments to study electromagnetism, polarity, simple circuits, resistance and mechanical work. Nylon-plastic gears and color-coded cord and plug are designed for durability and long-lasting performance. Sturdy, transparent case allows students to see the movement of the inner components of the generator. Supplies direct current with an output of up to 12 volts and 200 mA. When one hand generator is connected to another or to a low power source, it will act as a motor. Replacement connecting leads and gear set are available separately.

Catalog No.	Description	Price/Each
AP6585	Hand Generator	$83.65
AP6593	Replacement Gear Set for AP6585	22.13

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WWW.FLINNSCI.COM

Electric-to-Heat Energy Conversion Device



Demonstrate the conversion of mechanical energy to electrical energy that then leads to the production of heat energy. A wonderful unit to have to teach concepts of Ohm's law, wire resistance and electrical power loss in wires. Connect the terminals of the conversion device to a hand generator, turn the crank, and the supplied mechanical energy will be transformed into electrical energy. The electrical energy then passes through the 5-ohm resistor and heat is produced. A liquid crystal thermometer displays the temperature of the resistor over a range of 10–56 °C. Your students will definitely feel how much work it takes to raise the temperature of the wire by 10 or 20 degrees. Requires a hand generator.

Catalog No.	Description	Price/Each
AP6589	Electric-to-Heat Energy Conversion Device	$47.68
AP6585	Hand Generator	83.65

ELECTRICITY AND MAGNETISM—GENERATORS continued on next page.

Electricity and Magnetism—Generators, continued

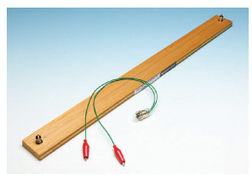
Orion Science Basic Electricity



Investigate electrical laws with the high-quality labeled board in the Basic Electricity kit from Orion Science. Experiments include Ohm's law, serial and parallel circuits, Kirchoff's rule and charging and discharging a capacitor. All cables can be conveniently stored inside the kit.

Catalog No.	Description	Price/Each
AP10972	Orion Science Basic Electricity	$1083.77

Ohm's Law Experiment Set



A fantastic lab to show the relationship between voltage, current and resistance. Students will easily make the comparison between brightness of a lightbulb and the amount of nichrome wire between the clip leads of the circuit. Students will also "feel" the change in the electric circuit's resistance when they power it with a hand generator. Verify Ohm's law quantitatively by connecting a voltmeter and ammeter to the circuit. Includes 470 mm of nichrome wire mounted on a wood base, wire lead with lightbulb socket and alligator clips, miniature lightbulb and one piece of replacement nichrome wire.

Catalog No.	Description	Price/Each
AP6591	Ohm's Law Experiment Set	$82.94
AP6585	Hand Generator	83.65

1-Farad Capacitor Demonstration



Teach principles in capacitance, energy conversion and potential energy by storing the energy from a hand generator in this palm-sized disk! Once energy is stored in the ingenious capacitor, use it to temporarily operate electrical devices, such as motors, lightbulbs and other electric circuits. The large capacitance will provide charging and discharging rates that will be on time scales that students can actually measure. Rated at 5 volts and 1 farad.

Catalog No.	Description	Price/Each
AP6594	1-Farad Capacitor Demonstration	$61.40
AP6585	Hand Generator	83.65

Electric Swing Apparatus with U-Magnet



Demonstrate how a current-carrying wire in a magnetic field will be acted on by a force. Verify the Right-Hand Rule by changing the direction of the current and observing a corresponding change in the direction of the force. Then generate alternating current with a hand generator to produce a resonating swing that illustrates the basic principles involved in making an electric motor turn. Includes a swing holder, coated copper wire swing and a U-shaped magnet. A support stand and clamp are needed to hold up the swing and are available separately.

Catalog No.	Description	Price/Each
AP6588	Electric Swing Apparatus with U-Magnet	$79.90
AP6585	Hand Generator	83.65

Electricity and Magnetism—Motors

Build a Simple Motor—Flinn STEM Design Challenge™

FLINN EXCLUSIVE



By: The Flinn Staff

Challenge your students to build a simple motor with only three components: a battery, a piece of copper wire and a strong magnet! In this design challenge, students recreate a simple model of Faraday's device that operates on the same electromagnetic principles. Once success is achieved, science and art are combined as students design and build a more creative motor. Includes magnets, batteries and copper wire. Students may supply additional materials for their creations.

Complete for 10 student groups.

Catalog No.	Description	Price/Each
AP7936	Build a Simple Motor—Flinn STEM Design Challenge™	$65.60

DC Motor Made Simple—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In minutes, students can build a simple spinning motor using just a magnet, copper wire and a 9-V battery. Once they learn what makes the motor run, they can experiment with various designs to see who can construct the fastest spinning motor! Excellent hands-on activity to introduce how electricity and magnetism work to generate power. Includes Teacher Notes, reproducible student handouts and all necessary equipment.

Super Value Kit is complete for 30 students working in pairs. All materials are reusable. 9-V battery and 9-V battery clip with alligator clip leads are required for each group and available separately.

Catalog No.	Description	Price/Each
AP6263	DC Motor Made Simple—Super Value Laboratory Kit	$36.00
AP8954	Battery Clips with Alligator Clip Leads, 9-V	6.15
AP1430	Battery, Alkaline, 9-V	6.32

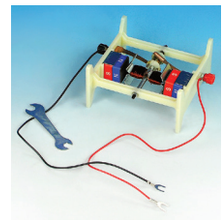
Motor, DC



Just add 1.5–6.0 volts of power and watch this efficient little motor "hum" at 7,000–11,000 rpm. Includes connecting wires with alligator clips. Optimum performance with 3.0–4.5 V.

Catalog No.	Description	Price/Each
AP6041	Motor, DC	$4.15

DC Motor Demonstration



Study electromagnetic forces with this pre-assembled DC motor. The open structure resembles textbook diagrams and allows students to see how the motor works. Reverse the polarity of the magnets to change the direction of rotation. Use the motor with a rheostat to observe how speed changes are relative to current changes. A power source of at least 1.5 V is required and available separately. 5½" x 4½" x 2½".

Catalog No.	Description	Price/Each
AP7827	DC Motor Demonstration	$19.20

Electrochemical Clock Kit See page 237.

Electrodes See page 147.

Electrolysis of Water Laboratory Kits See page 271.

The Two-Potato Clock See page 398.

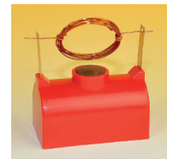
Motor Kit, Electric



Demonstrate the conversion of electrical energy to mechanical energy using this small electric motor with attached wheel and axle. Motor runs on regular or homemade batteries. Set includes motor, attached wheel and axle, and a weight (for lifting). Pulley cord or string required.

Catalog No.	Description	Price/Each
AP4540	Motor Kit, Electric	$17.70

Motor, Simple



The world's simplest motor! Demonstrate the basic principles of electromagnetism with a bit of wire, a magnet, metal support stand, and a battery. Requires one D battery, which is available separately.

Catalog No.	Description	Price/Each
AP7828	Motor, Simple	$10.55
AP1425	Battery, D	4.50

ELECTRICITY AND MAGNETISM—MOTORS continued on next page.

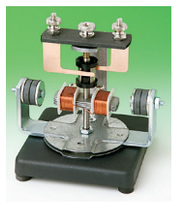
Electricity and Magnetism—Motors, continued

Motor, St. Louis

All the parts are clearly visible so you can show each component of a motor or generator in operation. This remarkable teaching tool comes with instructions for:

- Transformation of electrical to rotational mechanical energy
- Transformation of rotational mechanical energy to electrical energy
- Forces of magnetic field interactions
- Force on a current-carrying wire
- Electromagnetic induction in a conductor
- Induced electromotive force on an existing current

Requires a low-voltage DC power supply.



Catalog No.	Description	Price/Each
AP4629	Motor, St. Louis	$82.35

Electrolysis Apparatus, Brownlee

FLINN EXCLUSIVE

By: The Flinn Staff



Set up a complete electrolysis demonstration within minutes! This rugged, economical electrolysis apparatus is easy to operate and perfect for student use—simply fill the tubes with an electrolyte solution, place them in a battery jar or 600-mL beaker, mount the tubes, insert the electrodes, and it's ready to go! Comes with stainless steel electrode pair, nonconducting support base, two test tubes, two rubber stoppers, and detailed instructions for use. Operates on a 9-V battery or DC power supply, not provided. Available with or without battery jar.

Catalog No.	Description	Price/Each
AP9027	Electrolysis Apparatus, Brownlee, with Battery Jar	$72.40
AP9028	Electrolysis Apparatus, Brownlee, without Battery Jar	43.85

Electricity and Magnetism—Electrochemistry

Hofmann Electrolysis Apparatus



One-way glass stopcocks conveniently located on the top of this high-quality apparatus allow for easy collection of gases during electrolysis experiments. The large center reservoir bulb will easily handle the liquid displacement from the two side columns and prevent any overflow during your experiments. Electrodes and directions included. Requires ring stand, support clamp and a 9-V battery or DC power supply. Measures 41 x 17 cm.

Catalog No.	Description	Price/Each
AP5879	Hofmann Electrolysis Apparatus	$170.00

Build a Dry Cell Battery—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students build a simple dry cell battery from household materials and then investigate the battery's electrical properties. They may also test modifications of the battery to improve its performance. By connecting their batteries in series and parallel and measuring the changes in voltage and current, students also learn about the properties of electric circuits. Concepts covered include electrodes, oxidation–reduction reactions, voltaic cells, electric circuits, voltage and current. Includes complete instructions with sample data and answers to all questions.

Complete for 30 students working in pairs. Multimeters are required for quantitative measurements, and DC motors are recommended for each lab group; both are available separately.

Catalog No.	Description	Price/Each
AP6925	Build a Dry Cell Battery—Student Laboratory Kit	$89.75
AP4639	Multimeter, Student	35.00
AP6041	Motor, DC	4.15

Hofmann Electrolysis Demonstration Apparatus



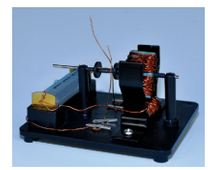
Calibrated for precise measurements, this electrolysis apparatus is of superior quality—providing accurate results that are quantifiable. The clear glass collecting tubes are calibrated for easy measurement and observation. While this apparatus is primarily designed to hydrolyze water, it can be used for other compounds as well. The apparatus has its own rugged ring stand base. The built-in thistle tube and stopcocks make for easy no-mess filling. Operates on a 9-V battery or DC power supply. Platinum electrodes are included. Replacement glass assembly and electrodes are available separately.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP5439	Hofmann Electrolysis Demonstration Apparatus	$311.10
AP6410	Replacement Glass Assembly for AP5439	104.90
AP6217	Replacement Electrodes for AP5439, Pkg. of 2	54.75

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Motor Set, Basic



Students first begin by constructing their own motor parts such as the armature, commutator, and brushes. They then assemble the motor parts, hook up the power, and watch their motor run. All parts are included and easy-to-follow, step-by-step instructions are provided. AA battery is required and available separately.

Catalog No.	Description	Price/Each
AP4635	Motor Set, Basic	$12.60
AP1423	AA Alkaline Battery	2.75

FLINN360science℠: Diffraction



This kit presents the essential concepts of measurement, diffraction, interference and wavelength through hands-on science activities designed to engage all your students, regardless of level. In this lab experience, students observe the interference patterns that result when red and green laser lights are shined at very thin objects. Teachers can extend learning through associated phenomena such as, "Is light a longitudinal or a transverse wave?"

Catalog No.	Description	Digital Access	Price/Each
AP11358	360Science: Diffraction	1-Year	$72.00

FLINN360science℠: Converting Sunlight into Electricity



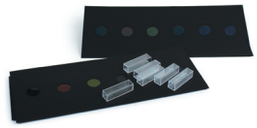
Provides comprehensive coverage of a key, standards-based NGSS concept along with one-year online access to a corresponding Multimedia Lesson featuring in-depth, interactive coverage of the concept. The Multimedia Lesson can be accessed by a teacher and all of their students anywhere, anytime, on any device—including Chromebooks, tablets, computers and mobile devices!

Catalog No.	Description	Digital Access	Price/Each
AP11465	360Science: Converting Sunlight into Electricity	3-Year	$219.00

ELECTRICITY AND MAGNETISM—ELECTROCHEMISTRY continued on next page.

Electricity and Magnetism—Electrochemistry, continued

FLINN360science™: Particle Nature of Light



This kit presents the essential concepts of energy, light as a particle, light as a wave, and photoelectric effect. In this lab , students come to understand that light's energy, not its intensity, induces the photoelectric effect. Teacher can extend learning through associated phenomena including, "Can rainbows be best described by the particle model or the wave model of light? Why?"

Catalog No.	Description	Digital Access	Price/Each
AP11359	360Science: Particle Nature of Light	1-Year	$92.00

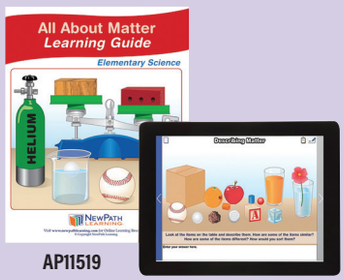
FLINN360science™: Electromagnetic Radiation and Matter



In this lab experience, students observe what happens to an electroscope when it is exposed to electromagnetic radiation of varying frequencies. Students use their observations to understand how electromagnetic radiation affects living and nonliving matter. Editable, differentiated instructions range from a time-sensitive prescriptive lab to full open inquiry, and robust online videos and content help students prepare for and better understand the labs they're conducting.

Catalog No.	Description	Digital Access	Price/Each
AP11360	360Science: Electromagnetic Radiation and Matter	1-Year	$166.80

NewPath Learning Guides and FlipCharts for Matter



AP11519

The NewPath Learning Guides and FlipCharts are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, free-standing easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11526	All About Matter FlipChart	$39.95
AP11519	All About Matter Student Learning Guide with Online Lesson	14.95
AP11569	All About Matter Student Learning Guide with Online Lesson, Set of 10	99.00

Waves and Sound

Standing Wave Generator

FLINN EXCLUSIVE

By: Jeff Bracken, Westerville North H.S., Westerville, OH



This inexpensive, yet reliable, standing wave generator allows the principles of wavelength, amplitude, nodes and antinodes to become concrete for students. Highly visible apparatus measures four feet in height—allowing for the study of the first, second, third and even the fourth harmonic! Kit includes the standing wave generator apparatus, an instruction guide with a detailed procedure section and an extensive background section.

Bracken's Demonstration Spinner is required and sold separately.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6161	Standing Wave Generator	$34.10
AP6202	Bracken's Demonstration Spinner	34.00

Waves and Sound—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Comprehensive kit consists of five hands-on experiments to explore the properties of waves and sound.

- Using springs, students study longitudinal and transverse waves and learn about frequency, amplitude and period.
- Observing the motion of three waves traveling at the same speed, students see how wavelength and frequency are related.
- Using simulated point-source circles of different "wavelengths," students investigate constructive and destructive interference patterns.
- Experimenting with a telescoping resonance tube and tuning forks, students determine the speed of sound in air.
- Using a variety of solid rods and tubes, students examine the variables that affect resonance and rotate the "singing rod" to observe and understand the Doppler effect.

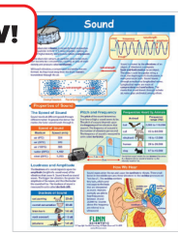
Easy-to-set-up lab stations allow groups to investigate specific aspects of waves and sound then move on to the next station. Detailed instructions, Teacher Notes and all the necessary materials are provided.

Full-size kits are complete for 30 students working in groups of 3. Small-size kits are complete for 15 students working in groups of 3. Refill kits contain materials only.

Catalog No.	Description	Type	Price/Each
AP7014	Waves and Sound—Student Laboratory Kit	Full-Size Kit	$154.18
AP10117		Full-Size, Refill Kit	147.00
AP10195		Small-Size Kit	105.95
AP10273		Small-Size, Refill Kit	97.00

NEW!

Sound—NewPath Visual Learning Guide, Set of 10



Sound Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11749	Sound—NewPath Visual Learning Guide, Set of 10	$43.32

Super Spring and Stand



Super-size your wave demonstrations with this extra long spring. Long enough to stretch across a classroom or gymnasium. Effectively shows transverse and longitudinal traveling waves, as well as standing wave patterns. Convenient storage stand will guarantee that the spring will remain tangle-free year after year. Instructions provided. Dimensions: 8" long x 3" diameter.

Catalog No.	Description	Price/Each
AP6565	Super Spring and Stand	$55.40

FLINNeverydayscience™

NEW!

Waves and Energy



With this FlinnEverydayScience™ lab, learn about the properties of mechanical waves, and how waves carry and transfer energy.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 20 Slinkys, 50 pom-poms, and 10 rolls of tape.

Complete for 30 students working in groups of 3, or for 10 groups of students.

Catalog No.	Description	Price/Each
AP11813	Waves and Energy	$70.15

WAVES AND SOUND continued on next page.

Waves and Sound, continued

String Vibrator



Produce standing waves at 60 Hz with this AC-powered String Vibrator. Plug in and clamp down the String Vibrator to a table and hold the other end of the string taut to easily make waves. Its small size makes it quiet and easy to store. Includes five 8-foot lengths of cotton string.

Catalog No.	Description	Price/Each
AP9229	String Vibrator	$89.00

Light Source, High Power



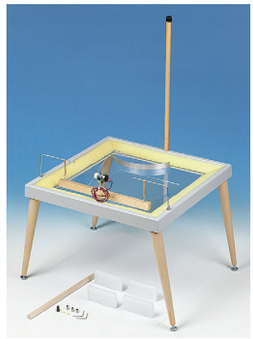
A perfect light source for ripple tank illumination and any other experiments requiring intense illumination. Whether you need a point source, a line source or just high-power illumination, this inexpensive light source is your best bet. Orientation of the filament will give you the point or desired line.

The included Pole Cat™ will help mount the light's spring clamp on a vertical pole such as a ring stand or a ripple tank post. Light source is 150W.

Catalog No.	Description	Price/Each
AP5707	Light Source, High Power	$65.95

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WWW.FLINNSCI.COM

Ripple Tank Apparatus



Always a popular lab/demo sequence—waves in a ripple tank! Proven method for studying numerous wave/optics principles. This sturdy ripple tank is made of molded plastic and features a viewing area larger than other ripple tanks. Its bottom is made of high-quality plate glass to ensure projection of distortion-free wave images. Special angled foam beaches around the perimeter of the tank greatly reduce unwanted reflections.

The rippler unit consists of a 1.5-volt motor mounted on a rippler bar that can generate both straight and circular waves. The motor is equipped with a movable counterweight for varying wave amplitude. The complete apparatus includes four foam beaches, one light source support rod, one rippler bar with hangers, one rippler motor, one white plastic view screen, one parabolic reflector, one glass plate, four barriers, four detachable legs with leveling feet and complete instructions and experiment ideas. For added versatility, an alternative wave generator can be easily mounted. Requires a 6-V DC low-voltage power supply and a high-power light source. Dimensions: tank surface area is 24" x 24"; tank stands 24" H; light source support rod extends 24" above tank surface.

Catalog No.	Description	Price/Each
AP5705	Ripple Tank Apparatus	$479.55

FLINN EXCLUSIVE

Wave Demonstrator

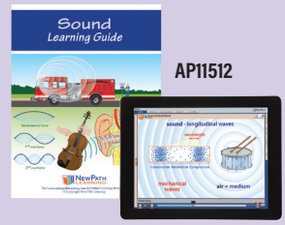


By: The Flinn Staff

Make waves with this 1.8-meter helical spring. Demonstrate standing, transverse and longitudinal wave properties.

Catalog No.	Description	Price/Each
AP9023	Wave Demonstrator	$34.68

NewPath Learning Guides for Sound



AP11512

The NewPath Learning Guides are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11512	All About Sound Student Learning Guide with Online Lesson	$15.59
AP11562	All About Sound Student Learning Guide with Online Lesson, Set of 10	99.00

Simulated Double-Slit Interference Plates

See page 385.

Water Waves



Designed specifically for use on your overhead projector. Demonstrate wave concepts or supplement individual student work with ripple tanks. All the wave basics—pulses, reflections, traveling waves, waves and obstacles, and interference patterns are clearly shown. Perfect for student presentations or for practical classroom quiz sessions. Comes complete with wave tray, concave parabolic reflector, convex parabolic reflector, a two-point wave source, a multi-point wave source, foam beaches, and complete instructions.

Catalog No.	Description	Price/Each
AP4611	Water Waves	$133.36

FLINN360science™: Binary Logic



This kit presents the essential concepts of circuits, logic and computers through hands-on science activities designed to engage all your students, regardless of level. Students carry out an investigation to explore the way that logic gates can be used to process information.

Catalog No.	Description	Digital Access	Price/Each
AP11363	360Science: Binary Logic	1-Year	$141.00
AP11463		3-Year	156.38

FLINN360science™: Mechanical Waves



This kit presents the essential concepts of circuits, logic and computers through hands-on science activities designed to engage all your students, regardless of level. Students carry out an investigation to explore the way that logic gates can be used to process information.

Catalog No.	Description	Digital Access	Price/Each
AP11353	360Science: Mechanical Waves	1-Year	$87.75

FLINN360science™: Converting Electrical Signals to Sound



This kit presents the essential concepts of electromagnetism, energy conversion, and sound waves through hands-on science activities designed to engage all your students, regardless of level. Students carry out an investigation to explore how speakers work and will be amazed that a working speaker can be built with plastic cups, magnets, and wire. Students will come to understand how speakers produce sound through electromagnetism.

Catalog No.	Description	Digital Access	Price/Each
AP11364	360Science: Converting Electrical Signals to Sound	1-Year	$83.40
AP11464		3-Year	101.00

WAVES AND SOUND continued on next page.

Waves and Sound, continued

FLINN360science™: Interference of Sound Waves



This kit presents the essential concepts of frequency, wavelength, speed, interference, longitudinal waves and sound waves through hands-on activities that will engage all your students, regardless of level. In this lab, students will explore the destructive interference of sound waves produced by tuning forks and be able to demonstrate destructive interference. Teachers can extend learning through associated phenomena such as, "How can you tell that a guitar string is out of tune?"

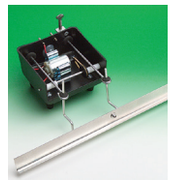
Catalog No.	Description	Digital Access	Price/Each
AP11354	360Science: Interference of Sound Waves	1-Year	$155.50

Slinky®

The original Slinky®—it stretches, snaps back, and will actually walk down stairs. Great for wave demonstrations.

Catalog No.	Description	Price/Each
AP1957	Slinky®	$13.26

Wave Generator, Adjustable Phase



Add versatility to your ripple tank. With simple adjustments on this wave generator, you can produce circular waves from a single point source, interference patterns from two point sources in phase, interference patterns from two point sources out of phase and straight waves. The long attachment rod screws in the back of the generator and is easily attached to a ring stand. Wave frequency can further be varied by using a variable DC power supply or by using an external rheostat. Operation requires a low voltage power supply that outputs 0–6 V DC (available separately). Comes complete with instructions.

Catalog No.	Description	Price/Each
AP5706	Wave Generator, Adjustable Phase	$106.95

Doppler Football—Demonstration Kit

FLINN EXCLUSIVE



Score extra points with your students as you drive home the concepts of sound wavelength and frequency with an audible tone emitted from a foam football. After connecting the buzzer to a 9-V battery, simply place the buzzer inside the specially-prepared football, seal and throw! The receiver hears a higher pitch and the passer hears a lower pitch compared to the actual tone emitted by the buzzer. Teacher Demonstration Notes include complete instructions, background information, reproducible student worksheet and answers to all questions.

Note: 9-V battery is required and available separately.

Catalog No.	Description	Price/Each
AP7457	Doppler Football—Demonstration Kit	$41.15
AP1430	Battery, 9-V	6.32

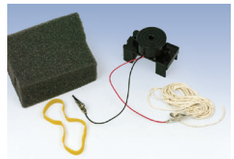
Velocity Speed Gun, Digital See page 380.

Demonstration Bell See page 407.

Doppler Effect Buzzer—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff

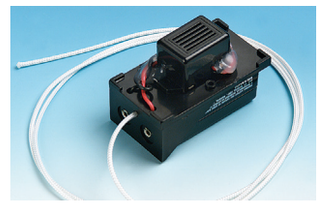


Easily demonstrate the Doppler effect and fundamental principles of sounds. Tie a string to the buzzer and spin the buzzer over your head. Students will clearly hear the Doppler effect as the buzzer moves toward them and then away from them. Battery and buzzer are secure so there is no worry of the battery disconnecting. An optional second demonstration may be performed with a vacuum pump and bell jar to show students that sounds do not exist in the vacuum of space. Kit includes a reproducible student worksheet and detailed Teacher Notes with teaching tips, instructions and background information for both demonstrations.

Note: A 9-V battery is required and available separately.

Catalog No.	Description	Price/Each
AP6856	Doppler Effect Buzzer—Demonstration Kit	$28.00
AP1430	Battery, 9-V	6.32

Doppler Effect Demo, Electronic



Swing this battery-operated buzzer over your head from its tethered string. Students will quickly observe a significantly higher pitch when it moves toward them and a lower tone when it moves away. The frequency changes will be indisputable. The longer the string, the more dramatic the effect! Instructions, buzzer and 3 feet of string are provided. Requires 9-V battery, available separately.

Catalog No.	Description	Price/Each
AP6577	Doppler Effect Demo, Electronic	$26.20
AP1430	Battery, 9-V	6.32

Sound Pipe



Noise hose, singing tube, or sound pipe—whatever you call it—you'll have fun demonstrating the Doppler effect while producing five different resonant tones. 30".

Catalog No.	Description	Price/Each
AP9241	Sound Pipe	$7.00

Boom Whackers



Simply bang the tube on a knee or on the floor and you will hear a note from the C major diatonic scale—the longer the tube, the lower the note. Each tube is color-coded and labeled with the proper musical note. Use with tuning forks to demonstrate how wonderfully tuned these tubes are. An E-note tuning fork, for example, will not resonate in a D-note Boom Whacker. Composed of soft plastic that is rugged and safe. Set includes 8 tubes.

Catalog No.	Description	Price/Each
AP6985	Boom Whackers	$39.65

Discovering the Speed of Sound in Air—Student Laboratory Kit

By: The Flinn Staff

STEM INTEGRATED



Striking a tuning fork and holding it over the open end of a tube filled with water, students slowly lift the tube and tuning fork out of the water until they "hear" the resonance. They then measure the length of the tube above the water's surface and use this value to calculate the wavelength and speed of sound. Comes complete with student activity sheets, detailed Teacher Notes and sample data. The experiment requires the use of a tuning fork set ranging from 256 Hz to 512 Hz, which can be shared among student groups.

Complete for one student group. Classroom Set is complete for 8 student groups. Tuning fork set, support stand, and two extension clamps are required and available separately. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP7259	Discovering the Speed of Sound in Air—Individual Kit	$ 32.30
AP7260	Discovering the Speed of Sound in Air—Classroom Set	177.20
AP9242	Tuning Forks, Set of 8	102.86

Buzzer in a Vacuum



The buzzer operates on a DC power source. Turn the power on, and it buzzes loudly. Connect a vacuum pump to the jar assembly and turn on the pump. As air is pumped out of the jar, the sound of the buzzer becomes fainter. When all the air is removed, you can barely hear the sound. Slowly allow air to re-enter the jar and the sound of the buzzer becomes stronger. Requires ¼" tubing. Vacuum pump available separately.

Catalog No.	Description	Price/Each
AP4532	Buzzer in a Vacuum	$88.15

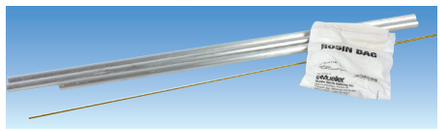
WAVES AND SOUND continued on next page.

Waves and Sound, continued

Singing Rods—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



A classic demonstration—times four! Demonstrate resonance in a variety of different metal rods. Compare thick and thin rods, short and long rods and solid and hollow rods. Position your fingers at different locations along the rods and hear the effect on the sound's frequency. Includes detailed instructions and a reproducible student worksheet.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7040	Singing Rods—Demonstration Kit	$52.00

Singing Tubes—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Mystify your students by creating a "singing" pipe organ from an ordinary metal tube. Use a Bunsen burner to heat a metal screen hidden inside the tube. Remove the tube from the flame and the tube immediately begins to hum loudly. Tip the tube horizontally and the sound stops. The Singing Tube Demonstration comes with one 17" long tube to demonstrate the "organ" principle. The Triple Singing Tubes Demonstration comes with three different tube lengths—19¾", 19½" and 13⅛". Play the two longer tubes simultaneously to demonstrate the principle of a beat frequency. Play the shorter tube to produce a distinctly higher pitch to show how column length affects the resonating frequency.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6312	Singing Tube—Demonstration Kit	$34.00
AP6305	Triple Singing Tubes—Demonstration Kit	97.95

Sound Wave Interference Tube—Student Activity Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Demonstrate the apparent discrepant effects of sound interference using an easy-to-assemble apparatus. Build a solid foundation for conceptual understanding by constructing the path length of the apparatus to correspond to the half-wavelength of the 512-Hz tuning fork included with the kit. An effective and fun demonstration as written, it can also be modified to promote inquiry! Challenge students to customize the apparatus for other tuning fork frequencies. Includes student worksheet and comprehensive Teacher Notes with lab hints and teaching tips, sample data and answers to all questions.

Catalog No.	Description	Price/Each
AP7400	Sound Wave Interference Tube—Student Activity Kit	$43.75

Audio Function Generator



Easily produce perfect tones between 10 Hz and 10 kHz with this high-quality sound wave generator. Ideal for acoustic demonstrations that require precise sound frequencies like the Doppler effect or sound wave resonance. Or use it in conjunction with tuning forks to determine exact pitch and illustrate beat frequencies. The electrical output is also ideal for powering the Electromechanical Driver (AP5789) to produce perfect sinusoidal vibrations that are great for displaying ripple patterns in Chladni plates, strings or ripple tanks. Additional square wave output is provided to synchronize the sound output with an oscilloscope. Students can then view the signal pattern on the oscilloscope screen. Volume and frequency are easily set with separate control knobs. Frequency output is shown on a 4-digit display. Resolution: 0.1 Hz below 1000 Hz; 1 Hz above 1000 Hz.

Catalog No.	Description	Price/Each
AP6529	Audio Function Generator	$765.90

Electromechanical Driver



Ideal device for your harmonic motion demonstrations. This ruggedly built oscillator will provide mechanical vibrations for driving strings, springs, ripple tanks, Chladni plates, or any other objects used in wave demonstrations. It sits on any flat surface or can be easily clamped to ring stand poles. Unit can be powered by our Audio Driver AP6529.

Catalog No.	Description	Price/Each
AP5789	Electromechanical Driver	$358.30

Sonic Flame Tube—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff

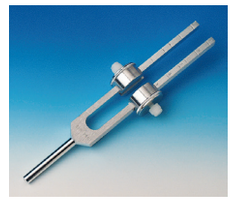


The Sonic Flame Tube, also called a Ruben's tube, is a demonstration that allows students to visualize waves and resonance. Natural gas is allowed to flow through a 3-foot aluminum tube containing predrilled, evenly spaced holes, and is then ignited. A speaker attached to the opposite end of the tube is used to send specific frequency sound waves through the tube, creating resonance. Watch as the gas flames above each hole move with the frequency, creating a beautiful wave pattern that is due to the formation of nodes and antinodes in the tube. Apparatus may be connected to an electronic instrument, such as a keyboard. Kit includes materials to construct one permanent flame tube and instructions with safety information and tips for generating resonant frequencies.

Note: A speaker is required and available separately.

Catalog No.	Description	Price/Each
AP7363	Sonic Flame Tube—Demonstration Kit	$87.60
AP9968	Speaker	45.75

Adjustable Tuning Fork



This single fork is essentially a seven-tone set with physical-pitched frequencies of the C Major scale: 128C, 144D, 160E, 170.7F, 192G, 213.3A and 240B. Weights are easily moved into position using the scale lines engraved on each tine. Nylon set screws prevent scratching of the polished aluminum fork and increase tone quality.

Catalog No.	Description	Price/Each
AP5723	Adjustable Tuning Fork	$29.00

FLINN EXCLUSIVE

Tuning Fork Block



Finished blocks are 20 x 9 x 4 cm with deep-drilled holes for up to eight tuning forks. Tuning forks are available separately.

Catalog No.	Description	Price/Each
AP4598	Tuning Fork Block	$14.65

Sympathetic and Differential Tuning Fork Set



Get a tuning fork to sing out its note without ever touching it! Set both forks at the same frequency with the open ends of the resonating boxes facing each other. Excite one fork only long enough to instill sympathetic resonance and then dampen the excited fork. The note on the other fork continues to "ring on" to the amazement of your students! What happens when two tuning forks sound at different frequencies instead of identical ones? Explore this concept by using the adjustable weights on one of the tuning forks. Let the music begin!

Catalog No.	Description	Price/Each
AP5724	Sympathetic and Differential Tuning Fork Set	$160.05

WAVES AND SOUND continued on next page.

Waves and Sound, continued

Tuning Forks

The finest quality aluminum alloy tuning forks with exceptional tone duration and superior sound. Each tuning fork is stamped with the frequency of sound and note. Set of four premium tuning forks includes 256-C, 320-E, 385-G and 512-C. Set of eight premium tuning forks includes set of four plus 288-D, 341.3-F, 426.7-A and 480-B. These premium tuning forks are also available individually.



AP9032, etc.

Set of four standard tuning forks includes 256-C, 320-E, 385-G and 512-C. Set of eight standard tuning forks includes set of four plus 288-D, 341-F, 426-A and 480-B. Only available in sets of 4 or 8.



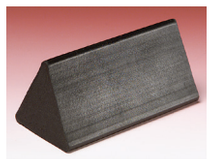
AP9039

All tuning forks fit the Tuning Fork Block AP4598. Rubber mallet is perfect for striking tuning forks. 1" diameter rubber ball attached to a sturdy wooden handle.

Catalog No.	Description	Price/Each
AP9032	Tuning Forks, Set of 4, Premium	$ 59.32
AP9242	Tuning Forks, Set of 8, Premium	102.86
AP6984	Tuning Forks, Set of 4	51.45
AP6982	Tuning Forks, Set of 8	78.85
AP6974	Tuning Fork, C-256	16.35
AP6975	Tuning Fork, D-288	16.35
AP6976	Tuning Fork, E-320	16.35
AP6978	Tuning Fork, G-384	16.35
AP6979	Tuning Fork, A-426.7	16.35
AP6981	Tuning Fork, C-512	16.35
AP9039	Rubber Mallet	8.35

Tuning Fork Activator

Make sure your tuning forks always ring true by striking them on this hands-free rubber wedge. Activating a tuning fork on the soft edge will make it ring at its proper resonance—no distortion from higher harmonics. Eliminates dings and scratches caused when tuning forks are chimed against each other or on a tabletop. 6 cm x 3 cm.



Catalog No.	Description	Price/Each
AP6422	Tuning Fork Activator	$16.53

Vibrating Tube Set



Quickly and effectively demonstrate constructive and destructive interference! One tube rings at precisely 440 Hz, the other at 441 Hz. Strike the bars with the rubber mallet to make them both ring at the same time. When the two nearly identical waveforms combine, the resulting wave pattern's frequency is actually the difference between the two frequencies. Students will clearly hear the ensuing "beat frequency" as the tone pulsates "on" and "off" with a frequency of 1 Hz. Set includes both high-quality vibrating tubes, rubber mallet and instructions.

Catalog No.	Description	Price/Each
AP6417	Vibrating Tube Set	$68.60

The Resonator—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In the first demonstration, four wooden dowels of various lengths are placed in the wooden base, which is then rocked back and forth. The different-size wooden dowels resonate at different times as the frequency of the back-and-forth motion of the base is varied. In the second demonstration, dowels of different diameter are used—varying the frequency of the back-and-forth motion of the wooden base again causes the dowels to achieve resonance at different times. Teacher instructions and student worksheets provided.

Catalog No.	Description	Price/Each
AP7261	The Resonator—Demonstration Kit	$44.45

Open-Ended Resonance Tube Set

FLINN EXCLUSIVE

By: The Flinn Staff



A tuning fork is struck and held at the end of an open-ended hollow resonance tube. While listening to the tuning fork, students slide the expandable column until the tuning fork sound is at its loudest. At this point, the air column is in resonance with the tuning fork. The length of the tube during resonance has a relationship to the wave frequency of the tuning fork. Students then use their measurements to determine the wavelength, frequency and velocity of the sound waves. Includes tuning fork, expandable resonance tube, end tube plug, complete background information and instructions.

Catalog No.	Description	Price/Each
AP4616	Open-Ended Resonance Tube Set	$24.95

Acoustical Physics Demonstration Kit



The Ames tube is a unique acoustical device that combines a tuning fork and a tuning fork resonator cavity. Without elaborate bench equipment, demonstrate in uncontrolled conditions a variety of acoustical experiments, such as mechanical acoustical coupling, resonant cavities, sympathetic vibrations, heterodyning and the Doppler Effect. Comes with complete instructions and a convenient storage box.

Catalog No.	Description	Price/Each
AP5730	Acoustical Physics Demonstration Kit	$60.46

Orion Science Resonance Tube



Using this resonance tube from Orion Science, students investigate standing sound waves in a column of air and measure the speed of sound. Compatible with Vernier probes.

Catalog No.	Description	Price/Each
AP10979	Orion Science Resonance Tube	$400.08

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Resonance Tube Apparatus



No need to mess around trying to mount meter sticks when you do your resonance experiments. The glass resonance tube in this superior apparatus is calibrated right on the glass! This direct calibration provides more consistent student data and more accurate readings. The tube is mounted on its own support stand and connected with surgical tubing to its aluminum water reservoir. The reservoir is easily moved up and down with the knurled adjustment screw built into the support clamp. Experiments require the use of a tuning fork with a frequency of 512 Hz, included. Comes complete with experiment directions.

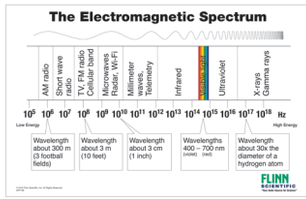
Catalog No.	Description	Price/Each
AP5703	Resonance Tube Apparatus	$175.85

Optics and Light—Color

Flinn Electromagnetic Spectrum Chart

FLINN EXCLUSIVE

By: The Flinn Staff



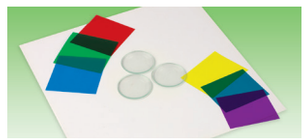
Displays the wavelengths of familiar electromagnetic waves, such as FM radio, cellular phones and X-rays, and colorfully shows the relatively small bandwidth of visible light. Frequency increases in 10-Hz increments. Printed on sturdy 80# paper, with matte finish, reduced-glare lamination and four metal eyelets at the top prevent tearing. 48" x 32".

Catalog No.	Description	Price/Each
AP7148	Flinn Electromagnetic Spectrum Chart	$37.00
AP7230	Flinn Electromagnetic Spectrum, Notebook Size, Pad of 30	17.50

Color Addition and Subtraction—Primary Colors Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Help students clearly see the difference between primary colors of light and primary colors of pigment. Show color mixing by addition using blue, red and green filters. The three primary colors of light are projected onto a screen then refracted to overlap and produce white light. Next color mixing by subtraction is demonstrated by overlapping filters of magenta, yellow and cyan—the true primary colors of pigment—to completely absorb all wavelengths of visible light, producing black. An unforgettable demonstration with complete instructions, reproducible student worksheet and extensive discussion notes. All materials are reusable—a super value!

Note: Requires an overhead projector.

Catalog No.	Description	Price/Each
AP7398	Color Addition and Subtraction—Primary Colors Demonstration Kit	$33.25

Color and Light—Spectrum Demonstration Kit

FLINN EXCLUSIVE

By: Doug De La Matter, Retired, Madawaska Valley D.H.S., Barry's Bay, ON



This demonstration uses a diffraction grating and an overhead projector to cast a large spectrum onto a wall or projection screen. The pure colors of the projected spectrum are then manipulated with the simple materials in this kit to study where color originates and to answer the questions above. Instructions and materials are provided for three different demonstrations that will surely illuminate and educate your students about color absorption, color reflection, color filtering and blending colors of light. All the materials, except the food dye, can be reused.

Note: Requires an overhead projector.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6172	Color and Light—Spectrum Demonstration Kit	$52.10

Color Mixer



Red + blue + green = white? Prove to your students that white light is indeed composed of all colors with this durable and affordable color mixer! Three unique screens are included that allow you to mix the colored light in several different ways. Pair these screens with the ability to show one, two or three lights at once and you have a very versatile demonstration tool. You can even choose to shine the lights from the center of the unit! Constructed with heavy-duty steel and high-quality LED lights. Built-in digital screen shows the exact percentage of red, green or blue light currently displayed. Color mixer is 12" H × 10" W. Screens are 14" H × 11¾" W.

Catalog No.	Description	Price/Each
AP7943	Color Mixer	$489.00

Color Wheel Light Reflection Kit



Clearly demonstrate that white light is composed of all the colors of the rainbow. This 23-cm diameter sturdy plastic color wheel comes with a plastic handle that attaches to the center of the wheel. Start the wheel spinning with the included cord and students see white—a combination of all the reflected colors. Stop the wheel and the separate colors are once again seen. The white portions of the wheel increase the amount of reflected light for better viewing across the classroom. Includes Teacher's Guide with sample questions.

Catalog No.	Description	Price/Each
AP6712	Color Wheel Light Reflection Kit	$38.20

Seeing Is Believing—Color "Magic" with Cone Cells—Super Value Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Challenge your students' sense of sight by saturating their cone cells! After focusing on an "oddly colored" image for one minute, students will be amazed at what they "see" when they look down at a sheet of white paper. The colors magically change to the "familiar" colors of the object, right before their eyes! This is a great way to teach students about how the eye works, colorblindness and the primary colors of light. Kit includes four cards each of four different images—an apple, a flower, the U.S. flag and the continent of Africa—16 cards total. All cards are printed on 8½" x 5½" durable card stock for years of repeated use.

Super Value Kit is complete for 32 students working in pairs. All materials are reusable.

Catalog No.	Description	Price/Each
AP6843	Seeing Is Believing—Color "Magic" with Cone Cells—Super Value Kit	$18.50

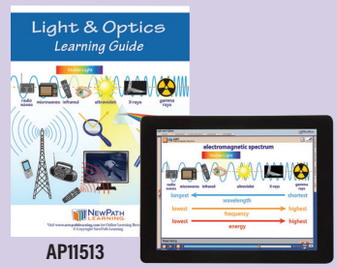
Color Filters, Acrylic



This set of five transparent acrylic squares will be a valuable resource during your discussions of color theory. The filters are 48 mm squares and the set includes red, orange, green, blue and yellow filters.

Catalog No.	Description	Price/Pkg. of 5
AP4785	Color Filters, Acrylic	$11.00

NewPath Learning Guides for Lights & Optics



AP11513

The NewPath Learning Guides are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11513	Light & Optics Student Learning Guide with Online Lesson	$15.59
AP11563	Light & Optics Student Learning Guide with Online Lesson, Set of 10	99.00

WAVES AND SOUND continued on next page.

Optics and Light—Color

FLINNeverydayscience™

NEW!

Changing Colors



With this FlinnEverydayScience™ lab, students investigate how color filters block certain colors, or more specifically certain wavelengths of visible light. They begin their investigation observing how different color filters work. Then, based on their results and observations, they select and combine filters to achieve specific color outcomes.

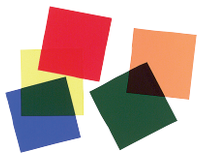
Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 10 sets of color filters (red, blue, green, cyan, yellow, and magenta), and 10 sheets (each color) of construction paper (black, red, green, and blue).

Complete for 30 students working in groups of 3, or for 10 groups of students.

Catalog No.	Description	Price/Each
AP11819	Changing Colors	$125.35

Color Filters, Gelatin



This color filter set is ideal for work that requires "flexibility." The cellophane-type material can be curved around test tubes or other objects for filtering effects. The filters are 10 cm squares. Each set includes one red, orange, green, blue and yellow filter.

Catalog No.	Description	Price/Pkg. of 5
AP4786	Color Filters, Gelatin	$10.80

Color Filters, Paddles



Excellent color filters, at an affordable price! Set includes six transparent paddles colored red, orange, yellow, green, blue and violet.

Catalog No.	Description	Price/Pkg. of 6
AP6423	Color Filters, Paddles	$4.85

Beyond the Rainbow—Infrared and UV Light Demonstration Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Two "enlightening" demonstrations reveal evidence for light energy beyond the visible spectrum.

- The first demonstration using a glass prism and four thermometers simulates William Herschel's 1800 discovery of infrared radiation. As students observe and record temperature data from various parts of the spectrum, they will be astonished to discover the greatest increase in temperature occurs just beyond the red portion of the spectrum.
- The second demonstration follows Johann Ritter's quest in 1801 to detect invisible energy beyond the violet end of the spectrum by chemical means. The evidence is clear as students observe photosensitive paper after it's exposed to the spectrum produced by passing sunlight through a glass prism.

Note: Refill packages of photosensitive paper are available separately. An 11" x 17" x 9" cardboard box with a lid is needed for both demonstrations, but not included.

Catalog No.	Description	Price/Each
AP7284	Beyond the Rainbow—Infrared and UV Light Demonstration Kit	$39.45
FB1554	Sun Print Paper	14.80

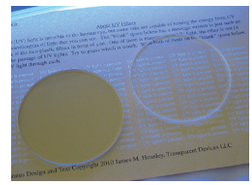
Intermediate Spectrometer with 30 mm Optics



Intermediate Spectrometer is an excellent instrument designed for students to make precise measurements. Full details at flinnsci.com.

Catalog No.	Description	Price/Each
AP8168	Intermediate Spectrometer with 30 mm Optics	$1900.00

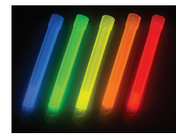
UV Filter Set



A common misconception is that ultraviolet light is purple in color—it's actually invisible! Demonstrate this fascinating concept visually with two plastic filters. One prevents the passage of UV light and the other allows it. When these filters are placed over a special UV fluorescent ink and then under an ultraviolet light, a message appears under the one of the filters, but not the other. You can also use the yellow card to test windows, eye glasses, and safety glasses for their ability to filter UV light. Set includes detailed instructions with activity suggestions, yellow card printed with UV sensitive ink, and two plastic filters, 2.75" diameter.

Catalog No.	Description	Price/Each
AP7589	UV Filter Set	$20.85

Light Sticks



All chemicals involved are safe, and the tubes can simply be discarded in the trash when exhausted. Each light stick will remain lit for about 12 hours. Packaged in individual foil wrappers, the sticks can be stored in this wrapper until ready for use—up to four years. Each light stick measures 6" long x ⅝" in diameter.

Catalog No.	Description	Price/Each
AP1443	Light Stick, Green	$4.05
AP2066	Light Stick, Red	4.00
AP2067	Light Stick, Blue	3.85
AP2068	Light Stick, Yellow	4.00
AP2069	Light Stick, Orange	3.85
Please specify your color choice.		

Chemiluminescent Demonstration Kits See pages 231–232.

Spectroscope, Advanced

Measure the angles of prisms using the Law of Reflection, demonstrate optics phenomena with a diffraction grating or measure the wavelengths of monochromatic light sources with this economical spectrometer. Reliable results will be obtained while students work with this precise instrument.

Specifications:

- Resolution: 1°
- Field of View: 5.7°
- Grating: 600 Lines/mm
- Weight: 2 kg
- Focal Length of Lens: 130 mm
- Relative Aperture: 1:7.2
- Telescope Scales: accurate to 50 angstrom
- Dimensions: 28 x 24 x 26 cm

Catalog No.	Description	Price/Each
AP5716	Spectroscope, Advanced	$383.50

LED Array



The vertically-aligned set of LEDs, ranging from red to violet and white, demonstrates the relationship between the energy and intensity of light. Color and wavelengths are illustrated on the LED Array for reference. The rotary switch allows for illumination of the LEDs all at once or one at a time. Using a spectrometer, the spectral lines of each LED can be investigated. Includes power supply and activity guide.

Catalog No.	Description	Price/Each
AP10229	LED Array	$94.82

Flashlight, LED High Intensity



Improve your light and optic demonstrations with this LED high intensity flashlight! Features include a high performance LED and incredible 205 meter beam distance. TrueSpot Reflector provides 800 lumens of power. Rugged, weather resistant, air craft grade aluminum construction. Two AA batteries included.

Catalog No.	Description	Price/Each
AP8082	Flashlight, LED High Intensity	$24.66

OPTICS AND LIGHT—COLOR continued on next page.

Optics and Light—Color, continued

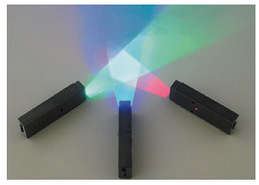
LED Micro Light



Demonstrate the effect of wavelength on light energy and phosphorescence with different color LED micro lights; or use as colorful flashlights. Miniature, keychain-style. For free activity instructions, please contact Flinn Scientific and request Publication No. 10978, *Phosphorescence and LED Lights.*

Catalog No.	Description	Price/Each
AP7784	LED Micro Light, Yellow	$14.50
AP7781	LED Micro Light, Blue	14.18
AP7779	LED Micro Light, Purple	14.50
AP7780	LED Micro Light, Green	14.79
AP7782	LED Micro Light, Red	14.79
AP7783	LED Micro Light, White	14.50

LED Light Blocks



Affordable and effective! Quickly and easily demonstrate reflection, refraction and color mixing. Unique design includes adapters that fit on the end of each block to create a thin light beam that can be directed through optical blocks to study reflection, refraction and focal length. Arrange the beams to be parallel, diffused or convergent. Remove the adapters to create wider beams of light to show color mixing—blue + green + red = white light! A magnet is attached to the bottom so these versatile blocks can be used for classroom demonstrations on a whiteboard. 4½" x 1¼" x ¾".

Catalog No.	Description	Price/Each
AP7771	LED Light Blocks	$37.75

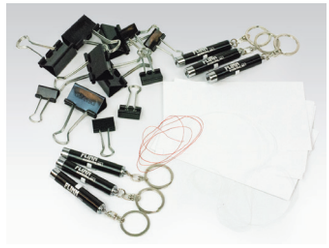
Spectrophotometers, Spectroscopes, and Spectrum Charts

See pages 183–184.

Measuring with Laser Light—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

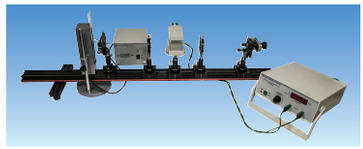


Students use a laser pointer to measure the width of three objects—fishing line, copper wire and a strand of human hair. As the laser light bends around each object, students analyze the diffraction patterns produced. Concepts such as wavelength, diffraction and constructive and destructive interference become clear. When students compare the experimental values with the accepted values, they will be astonished at the accuracy of this "high-tech" method of measurement! Teacher Notes with sample data, extensive background information and reproducible student worksheet are provided. Includes six laser pointers, fishing line, copper wire and materials to make frames for the objects being measured. Students supply their own hair.

Complete for 24 students working in groups of four.

Catalog No.	Description	Price/Each
AP7403	Measuring with Laser Light—Student Laboratory Kit	$58.10

Ultrasonic Grating Apparatus



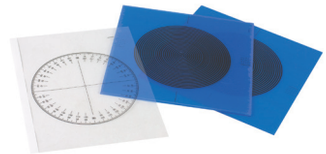
The Ultrasonic Grating Apparatus is both a unique demonstration of the interaction of longitudinal sound waves and transverse light waves and also a method for the precise determination of the speed of sound in liquids. Full details at flinnsci.com.

Catalog No.	Description	Price/Each
AP8167	Ultrasonic Grating Apparatus	$3391.63

Simulated Double-Slit Interference—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Stack two identical circle patterns together on an overhead projector. Slowly slide one pattern over the other and the interference pattern will clearly develop before your eyes. Then measure the angles of the interference bands to confirm the relationship between wavelength and slit separation. Repeat the demonstration using the larger spaced circles to show how the interference pattern is affected by "wavelength." Circle Pattern Masters are provided and can be photocopied onto transparency paper for students to follow along with the demonstration at their desks. Includes complete demonstration instructions.

Note: Requires an overhead projector. Student transparency paper is not provided.

Catalog No.	Description	Price/Each
AP6626	Simulated Double-Slit Interference—Demonstration Kit	$83.00

Optics and Light—Polarization

Basic Polarized Light—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff

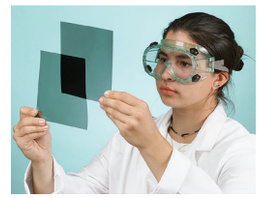


Introduce your students to the principles of polarization using this fun kit. The activities may be used to demonstrate the transverse wave characteristic of light and to illustrate the properties of birefringence and interference colors. The effect of crystal structure on the properties of light is also observed. Kit includes materials for each demonstration and complete instructions.

Note: Requires an overhead projector.

Catalog No.	Description	Price/Each
AP9307	Basic Polarized Light—Demonstration Kit	$60.75

Polarizing Film

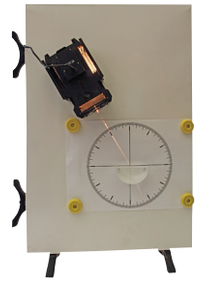


5⅝" x 6" sheet of linear polarizing film. Each sheet is laminated to protect the film from damage, yet can be easily cut to any size.

Catalog No.	Description	Price/Each
AP8913	Polarizing Film, 5⅝" x 6"	$45.60

Optics and Light—Reflection and Refraction, Optics Benches

Magnetic Optics and Ray Box Set



Optics the whole class can see! Ray box and accessories are magnetic and can be placed on the included whiteboard or any steel whiteboard. Comprehensive set is complete with everything you need to demonstrate optics concepts of reflection, refraction, focal length, color-mixing, and more. Whiteboard is 24" x 17¼" and can be set up in a tall or wide format. Durable, double-ended ray box contains a halogen lamp cooled by a built-in fan. One end is designed with a cylindrical lens and slots to insert slit plates to create one, two, three or four parallel beams. The other end has places for color filters and two adjustable mirrors that can be moved to any angle to study color mixing. Includes whiteboard, ray box, convex lens, concave lens, semicircular lens, rectangular lens, right angle prism, equilateral prism, 30°/60°/90° prism, hollow rectangular cell for water refraction, plane mirror, adjustable convex/concave mirror, seven color filters, seven color paddles, 10" x 10" white card screen, card protractor circle, magnet to hold protractor, experiment manual, and convenient storage box. Prisms and lenses are acrylic.

Catalog No.	Description	Price/Each
AP7823	Magnetic Optics and Ray Box Set	$274.34

OPTICS AND LIGHT continued on next page.

Optics and Light—Diffraction

Blackboard Optics Kit



All you need is a chalkboard to conduct optics experiments and demos with high visual impact—without turning out the lights! Vivid demonstrations can be set up quickly and easily. The lenses, mirrors and other components average 3.8 cm thick and 20 cm high, so they're easy to see even from the back of the room. Two adjustable ray projectors provide light ranging from a thin pencil to a divergent cone. Once you have the experiment set up on the chalkboard, use the chalkboard to highlight axes, normals, tangents, vertical rays and equations relating to the ongoing experiment. A real stimulus for your optics unit. Very effective for lab practical test questions!

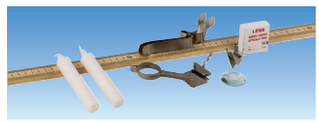
The durable acrylic components are packed in a sturdy box. Lenses, mirrors, prisms and light sources attach securely to the chal board in seconds. Many components can be rotated without shifting supporting brackets during an experiment. Includes instructions and a variety of suggested experiments. Requires a transformer.

Catalog No.	Description	Price/Each
AP5689	Blackboard Optics Kit, Magnetic	$1775.00

Meter Stick Optics Bench Kit

FLINN EXCLUSIVE

By: The Flinn Staff



No need to bust your budget buying expensive optics benches when your students can explore basic optics principles utilizing a meter stick and simple attachments. Students will discover how light travels and how lenses can affect its travel. In addition, students will learn the basic properties of lenses by conducting a series of hands-on lab experiments. Buy multiple kits for your entire class for less than the price of one expensive optics bench!

This kit includes a single meter stick optics bench setup that has a meter stick, meter stick support, two experimental lenses, lens support, two candles, candle holder, optic target, screen support and complete kit instructions.

Catalog No.	Description	Price/Each
AP6098	Meter Stick Optics Bench Kit	$47.30

Meter Stick Optics Equipment Set



Meter stick optics equipment is a great alternative to expensive optics benches. The equipment provides accurate results for many basic optics principles and experiments. The hardened metal pieces will hold up to continual student use. Enough materials are included for six student groups working on one or two meter sticks.

Set includes: 24 meter stick supports, lens/mirror supports: 6 large (7–8 cm) and 6 small (4–5 cm), 6 candles and candle holders, and 6 optic targets and screen supports. *Meter sticks, lenses and mirrors are available separately.*

Catalog No.	Description	Price/Each
AP8177	Meter Stick Optics Equipment Set	$107.00
AP4645	Lens, Double Concave	5.70
AP4646	Lens, Double Convex	5.50
AP7302	Concave/Convex Mirror	10.65
AP8294	Meter Stick	6.45

Meter Stick Optical Bench



Alternative to expensive optics benches. This set won't break your budget and will provide accurate results for basic optic principles. All pieces are made of hardened metal and will hold up under continual student use. Starter set includes two meter stick supports, one marker/object, one screen, one screen support, and one lens/mirror support. Meter stick and light sources are sold separately.

Catalog No.	Description	Price/Each
AP4702	Meter Stick Optical Bench	$12.00
AP8294	Meter Stick	6.45

Meter Stick Supports

Create your own meter stick optics bench with this pair of extra-heavy-gauge metal support bases. They will securely hold the meter stick upright to allow perfect alignment when using other meter stick optics bench components.

Catalog No.	Description	Price/Each
AP4703	Meter Stick Supports	$4.80

Candle Holder



The four adjustable prongs on this all-metal candle holder will hold your candles, up to 2.0 cm diameter, securely during your optics experiments.

Catalog No.	Description	Price/Each
AP4709	Candle Holder	$4.00

Paraffin Candles

Each candle measures 1.9 x 13 cm. Package of 10.

Catalog No.	Description	Price/Pkg.
AP4835	Paraffin Candles	$9.00

Lens/Mirror Supports

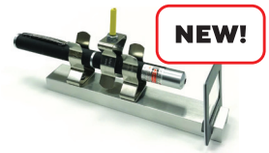


Hold lenses or mirrors firmly above your meter stick optics bench with these metal lens/mirror supports.

Catalog No.	Description	Size	Price/Each
AP4710	Lens/Mirror Supports	Small: 4–5 cm	$2.84
AP4711		Large: 7–8 cm	3.50

Laser Diffraction Kit

NEW!



This kit lets students create, view, and measure diffraction and interference patterns. Two of the included slides have various double slit patterns. One slide has a fixed slit separation with the slits on either side varying in width. The other has the slit width constant with varying slit separations. For investigating single slit patterns, one of the slides contains five slits of varying widths. An additional slide carries a traditional diffraction grating with 300 lines/mm.

Includes two laser pointers—red and green (requires two "AAA" batteries per laser, not included)—along with a convenient mounting base and a slide set of diffraction objects. The lasers are Class 3R, and are each 6" long x ½" diameter. The unique base securely holds the included standard laser pointers. An included clip allows you to hold the laser button on during experiments. Measurements of the light patterns are easy to read when the laser patterns are projected against a wall. Includes activity guide.

Catalog No.	Description	Price/Each
AP9816	Laser Diffraction Kit	$108.00

Light—NewPath Visual Learning Guide, Set of 10

NEW!



Light Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11750	Light—NewPath Visual Learning Guide, Set of 10	$43.32

FLINNeverydayscience™

NEW!

True Mirror Reflections



With this FlinnEverydayScience™ lab, explore how mirrors work to produce images, and assemble a mirror that produces a true image instead of a reflected image.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 20 flat mirrors and 40 mirror supports.

Complete for 30 students working in groups of 3, or for 10 groups of students.

Catalog No.	Description	Price/Each
AP11810	True Mirror Reflections	$107.70

OPTICS AND LIGHT continued on next page.

Optics and Light—Reflection and Refraction, Kits

FLINN360science™: Physical Properties of Solid Materials



This kit presents the essential concepts of light waves, reflection, refraction and transmission through hands-on science activities designed to engage all your students, regardless of level. In this lab experience, students will come to understand that light's angle of incidence is equal to its angle of reflection, and that when light passes from one medium into another its direction changes. Teachers can extend learning through associated phenomena such as, "How do fun mirrors at an amusement park work?"

Catalog No.	Description	Digital Access	Price/Each
AP11355	360Science™: Reflection and Refraction	1-Year	$76.00

Optics and Light—Reflection and Refraction, Optics Benches

FLINN EXCLUSIVE

Orion Science Advanced Optics with Brewster
AP10974



FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Catalog No.	Description		Price/Each
AP7449	Introduction to Reflection and Refraction—Activity-Stations Kit		$ 50.45
AP6483	Investigating Mirrors Kit		211.60
AP9043	Optics Kit—Classroom Set		61.00
AP7055	Investigating Light and Optics—Student Laboratory Kit	Full-Size Kit	190.90
AP10163		Full-Size, Refill Kit	176.00
AP10241		Small-Size Kit	134.90
AP10319		Small-Size, Refill Kit	125.00
AP10974	Orion Science Advanced Optics with Brewster		1655.81
AP6709	Optics Kit, Economy Choice		49.95
AP8135	Precision Fresnel Biprism Interference Apparatus		2241.38
AP7269	Refraction and Total Internal Reflection—Student Laboratory Kit—Individual Kit		42.85
AP7270	Refraction and Total Internal Reflection—Student Laboratory Kit—Classroom Set		82.60
AP6266	Build a Telescope—Student Laboratory Kit—Individual Kit		33.02
AP6297	Build a Telescope—Student Laboratory Kit—Classroom Set		137.00
AP8353	Camera Obscura—Historical Inventions—Laboratory Kit		179.00
AP8162	Michelson & Farby-Pérot Interferometer		3400.00
AP6459	Bracken's Laser Light Show—Demonstration Kit		31.95

Economy Light Source

Power wires can be secured with the screws on the base or clipped on with alligator clip connectors. Bulb available separately.



Catalog No.	Description	Price/Each
AP6070	Economy Light Source	$4.05

Reflection-Refraction Kit

NEW!



Introduce students to the basic concepts of light reflection and refraction with this economical kit. Guided activities include reflection of light at a plane mirror and the refraction of light at a water interface.

Includes: clear protractor, 15 x 15 cm cork mat, 4 steel T-pins, activity guide, 10 x 10 cm acrylic plane mirror, 12 cm Dia. x 2½ cm H semicircular refraction cell, and pair of mirror support clips.

Catalog No.	Description	Price/Each
AP9727	Reflection–Refraction Kit	$15.00

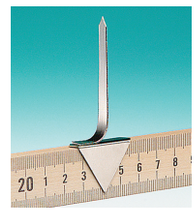
Light Source with Battery Holder



Clip the battery into its receptacle and the miniature lightbulb glows as bright as a candle. It's that simple! Battery and miniature lightbulb are provided.

Catalog No.	Description	Price/Each
AP6418	Light Source with Battery Holder	$11.20
AP9248	Lightbulbs, Miniature, 1.2 V	2.25
AP1423	AA Alkaline Battery	2.75

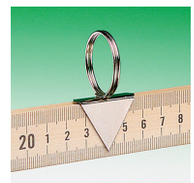
Object and Marker



This dual-purpose device can serve as an object or an image in your lens and mirror experiments.

Catalog No.	Description	Price/Each
AP4708	Object and Marker	$3.15

Screen Support



Use this convenient metal holder to support a cardboard or light metal screen on your meter stick optics bench.

Catalog No.	Description	Price/Each
AP4707	Screen Support	$3.25

Mirrors



Nearly unbreakable. Mirrors have scratchproof silvered backing.

Catalog No.	Description	Size	Focal Length	Price/Each
AP4641	Mirror, Flat, Acrylic	10 x 10 cm	—	$4.35
AP5672		10 x 15 cm	—	6.25
AP5673	Mirror, Flat, Glass	5 x 15 cm	—	4.25
AP5674		10 x 15 cm	—	5.95
AP4642	Mirror, Convex, Spherical, Glass	50 mm	50 mm	5.10
AP5690		75 mm	75 mm	6.85
AP4643	Mirror, Concave, Spherical, Glass	50 mm	50 mm	5.60
AP5688		75 mm	70 mm	6.30
AP4644	Mirror and Lens Support, Pkg. of 6			7.25

Mirror, Handheld



Compact mirror with integral plastic handle. Approximately 3" x 3".

Catalog No.	Description	Price/Each
FB0662	Mirror, Handheld	$3.85

OPTICS AND LIGHT—REFLECTION AND REFRACTION, OPTICS BENCHES continued on next page.

Optics and Light—Reflection and Refraction, Optics Benches, continued

Spherical Mirror Set



Save money with this low-cost set of curved spherical mirrors. An excellent choice for your optics curriculum. Set includes three concave and three convex mirrors. Mirrors are silver-backed glass so they won't scratch. Focal lengths for the concave and convex mirror series are 50, 100 and 200 mm. Mirror diameter is 50 mm.

Catalog No.	Description	Price/Each
AP6392	Spherical Mirror Set	$27.50

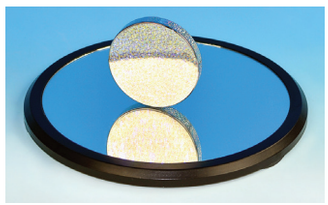
Concave/Convex Mirror



This 7.4-cm diameter mirror will provide years of rugged classroom use. The mirror is reflective on both sides providing the dual-purpose concave/convex feature. The mirror is unmounted and has a 20-cm focal length.

Catalog No.	Description	Price/Each
AP7302	Concave/Convex Mirror	$10.65

Euler's Disk

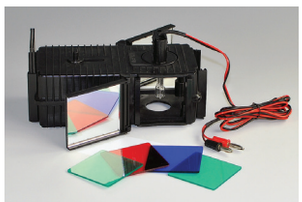


Simply give the disk a gentle spin and watch as it spins around and around! As the disk spins faster and its angle changes, students are captivated by the different sounds and fascinating visual displays. Many concepts can be discussed with this unique product such as angular momentum, forces and vectors, friction, and conservation of energy. Includes a mirror, steel disk, three holographic films, and several holographic wedges. Mirror diameter is 9" and the steel disk is 3".

Catalog No.	Description	Price/Each
AP7791	Euler's Disk	$52.85

Optical Block Set See page 389.

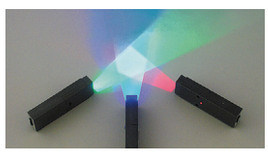
Light Ray Box



Brighten up your optics lab with this versatile light ray box! Made of durable plastic, this light ray box is both rugged and affordable. Use included slit plates to project parallel light beams to study reflection, refraction and focal length. Two finned sides include built-in mirrors that can be moved to any angle. Use colored filters to reflect light off the mirrors to demonstrate the result of color mixing. Includes internal halogen bulb; red, blue and green color filters; and slit plates with one, two, three and four slits. A 12 V, 2 A power source is required and available separately. 6½" x 3" x 2".

Catalog No.	Description	Price/Each
AP7916	Light Ray Box	$ 68.10
AP5375	Power Supply, Multiple Voltage	147.90

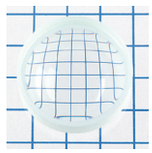
LED Light Blocks



Affordable and effective! Quickly and easily demonstrate reflection, refraction and color mixing. Unique design includes adapters that fit on the end of each block to create a thin light beam that can be directed through optical blocks to study reflection, refraction and focal length. Arrange the beams to be parallel, diffused or convergent. Remove the adapters to create wider beams of light to show color mixing—blue + green + red = white light! A magnet is attached to the bottom so these versatile blocks can be used for classroom demonstrations on a whiteboard. 4½" x 1¼" x ¾".

Catalog No.	Description	Price/Each
AP7771	LED Light Blocks	$37.75

Student Lenses, Round



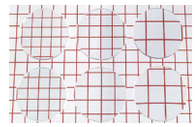


These top-quality flint glass lenses are useful in a variety of optical experiments. Their brightly polished surfaces will provide clear images and good optical results.

Catalog No.	Description	Diameter	Focal Length	Price/Each
AP5676	Lens, Double Concave	38 mm	5 cm	$5.15
AP5677		38 mm	10 cm	4.45
AP5678		38 mm	15 cm	5.20
AP5679		38 mm	20 cm	4.95
AP4645		50 mm	150 mm	5.70
AP5680		75 mm	20 cm	8.10
AP5681	Lens, Double Convex	38 mm	5 cm	6.10
AP5682		38 mm	10 cm	4.70
AP5683		38 mm	15 cm	4.95
AP5684		38 mm	20 cm	4.95
AP5685		38 mm	30 cm	4.85
AP4646		50 mm	150 mm	5.50
AP6391		50 mm	250 mm	5.10
AP5686		75 mm	17.5 cm	8.50
AP4644	Mirror and Lens Support, Pkg. of 6			7.25

Optics and Light—Reflection and Refraction, Supplies

Demonstration Lens Set, 50 mm Diameter



Set includes one each of the following: double concave, double convex, concavo convex, convexo-concave, plano-convex, and plano-concave. Each lens is individually wrapped and safely stored in its own protective labeled box. Flint glass.

Catalog No.	Description	Price/Pkg. of 6
AP4651	Demonstration Lens Set, 50 mm Diameter	$32.00

Acrylic Lens Set, 50 mm Diameter



Set includes six acrylic lenses: a double convex, plano convex, concavo convex, double concave, plano concave, and convexo concave. Storage box contains a labeled plastic tray to make identifying the different lenses a snap. Activity guide is included.

Catalog No.	Description	Price/Each
AP6708	Acrylic Lens Set, 50 mm Diameter	$22.80

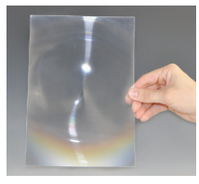
Lenses Set



Six 5-cm diameter lenses cover all of the permutations of curvature from positive power biconvex to negative power biconcave. The power of the symmetrical lenses is 5 diopters. These lenses are excellent for the study of Gaussian optics and the investigation of lens combinations to build simple instruments such as telescopes. Lenses come in a varnished wooden case with a latched lid.

Catalog No.	Description	Price/Each
AP5782	Lenses Set	$44.65

Fresnel Lens



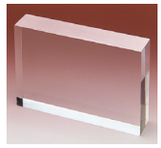
Plastic sheet is covered with small, narrow concentric grooves. 7⅛" x 10¼".

Catalog No.	Description	Price/Each
AP7790	Fresnel Lens	$6.47

OPTICS AND LIGHT—REFLECTION AND REFRACTION, SUPPLIES continued on next page.

Optics and Light—Reflection and Refraction, Supplies, continued

Lenses, Double Concave and Double Convex



Made of long-lasting clear acrylic. Double concave lens is 86 mm long, 15 mm thick, and 18 mm wide at its center. Double convex lens is 89 mm long, 15 mm thick, and 25 mm wide at its center.

Catalog No.	Description	Price/Each
AP9232	Lens, Double Concave	$23.90
AP9233	Lens, Double Convex	23.90

Index of Refraction Plate, Acrylic



115 x 65 x 20 mm.

Catalog No.	Description	Price/Each
AP9329	Index of Refraction Plate, Acrylic	$14.90

Refraction Dish, Semicircle



Filled with water or other liquids, these semicircular, transparent tanks become perfect cylindrical lenses. Radius of 4¾" and a depth of 1".

Catalog No.	Description	Price/Each
AP6039	Refraction Dish, Semicircle	$4.35

Refraction Cube



This large, 50-mm cube is great for studying refraction, reflection, and Snell's law. Highly polished. Acrylic cube has an index of refraction of about 1.5.

Catalog No.	Description	Price/Each
AP6941	Refraction Cube	$31.70

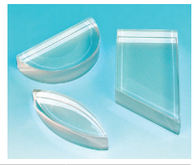
Acrylic Prism Set



These six large, oversized pieces will be visible to all students and will provide excellent optic results. Set of lenses contains a double convex, two double concaves, a semi-circle, a rectangle and an equilateral triangle. All come in a padded wooden storage box.

Catalog No.	Description	Price/Each
AP4650	Acrylic Prism Set	$53.33

Optical Block Set



Set includes three well-made acrylic blocks in three shapes: trapezoidal, semicircular and double convex. Purchase one for classroom demonstration or multiple sets for students to study in groups! Pairs nicely with the LED Light Blocks (Catalog No. AP7771).

Catalog No.	Description	Price/Each
AP7773	Optical Block Set	$18.35

Prisms, Equilateral, Acrylic



Save money with the conveniently packaged set of acrylic prisms. Set includes one each of the following prism sizes: 25 x 25 mm (AP6055), 25 x 50 mm (AP4647), 25 x 75 mm and 25 x 100 mm (AP4649).

Catalog No.	Description	Dimensions (mm)	Price/Each
AP6055	Prisms, Equilateral, Acrylic	25 x 25	$ 6.44
AP4647		25 x 50	6.85
AP4648		25 x 75	8.95
AP4649		25 x 100	10.95
AP6056	Equilateral Prism Set		29.65

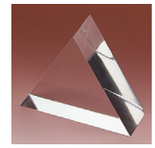
Prisms, Equilateral, Glass



High quality, flint glass prisms.

Catalog No.	Description	Dimensions (mm)	Price/Each
AP9237	Prisms, Equilateral, Glass	25 x 50	$11.00
AP9238		25 x 75	11.95
AP9239		25 x 100	13.35

Prism, Equilateral, Refraction



Made of long-lasting acrylic 75 mm on each side x 25 mm thick.

Catalog No.	Description	Price/Each
AP9236	Prism, Equilateral, Refraction	$18.50

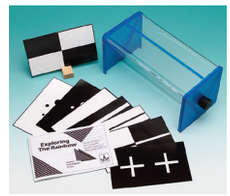
Prism, Right Angle, Glass



Flint glass prism. 32 mm hypotenuse x 50 mm long.

Catalog No.	Description	Price/Each
AP9240	Prism, Right Angle, Glass	$10.55

Giant Prism



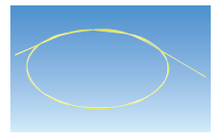
Fill this giant prism with water and create giant rainbows (spectrum) for your optics demonstrations! Fill it with other liquids and study the effects of different liquids on reflection and refraction. Add different food colorings and further experiment with absorption and reflection. Includes teacher's guide with over 20 classic experiments of Boyle, Goethe and Newton. The patterned observation cards included in the set illustrate light phenomena related to color.

Catalog No.	Description	Price/Each
AP5697	Giant Prism	$54.35

Fiber Optics Strand

FLINN EXCLUSIVE

By: The Flinn Staff



How does this "light pipe" work? The construction of the fiber is based on the refractive index of the material composing each of three layers that make up the strand. The inner core material has the highest refractive index, ensuring internal reflection so the light is "trapped" inside and travels the full length of the fiber before escaping. Includes a 30" length of the fiber. Includes teaching suggestions and explanations.

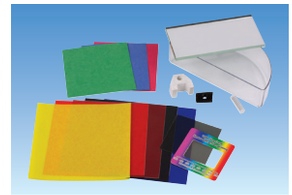
Catalog No.	Description	Price/Each
AP4558	Fiber Optics Strand	$14.50

Optics and Light—Lasers

Laser Pointer Education Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In eight laboratory experiments, students will use a simple laser pointer to measure the angle of reflection, determine the index of reflection of water, learn about polarization, observe and evaluate total internal reflection and use the property of diffraction to measure the wavelength of light generated by the laser pointer. Nine teacher demonstration activities are also provided. Includes detailed student handouts, background information, teacher notes and enough materials for one student group. Some common household and laboratory items are required for the teacher demonstrations. A laser pointer is required and available separately.

Catalog No.	Description	Price/Each
AP4507	Laser Pointer Education Kit	$32.30
AP8934	Laser Pointer	29.60

OPTICS AND LIGHT—LASERS continued on next page.

Optics and Light—Lasers, continued

Lumirod



Shine a flashlight or laser into one end of the acrylic rod—the light will be guided through the coiled pipe and emerge at the opposite end, perpendicular to the source. The Lumirod is crystal clear so students will vividly see the light undergoing internal reflection. The precoiled length of the Lumirod is 24 inches.

Catalog No.	Description	Price/Each
AP6325	Lumirod	$29.53

Measuring with Laser Light—Student Laboratory Kit See page 385.

Laser Optics Demonstrator



Demonstrate both ray optics and selected wave phenomena in a lighted room with this one-of-a-kind laser optics demonstrator. Full details at flinnsci.com.

Catalog No.	Description	Price/Each
AP8125	Laser Optics Demonstrator	$3200.00

Laser Pointer



The laser-beam projects a brilliant red dot, which can be seen easily in either a well-lit or darkened room. Arrives in a handy storage case with directions. Powered by two AAA batteries, which are included. Wavelength is 645 nm, power output is less than 5 mW, and range is 2,000 ft (600 m) in darkness.

Catalog No.	Description	Price/Each
AP8934	Laser Pointer	$29.60

Green Laser Pointer



The power and brightness of a benchtop laser for a fraction of the cost! This durable laser pointer projects an intense green beam that can be seen up to several thousand feet in darkness. Powered by two AAA batteries (included) and lasts as long as 3 hours on one set of batteries. Natural power fluctuations are regulated by a photodiode feedback loop to provide a consistently bright beam. Other features include: Wavelength—532 nm, Output power— < 5 mW, Operating Lifetime—2000 hours, and Range—500 meters.

Catalog No.	Description	Price/Each
AP6492	Green Laser Pointer	$174.90

Dual Laser Pointer, Red and Green



High-quality laser at a very affordable price! Laser emits both red and green beams individually or simultaneously. Able to point from 500 meters away. Incorporates the latest technology in Diode Pumped Solid State Laser. Includes two AAA batteries and a convenient, protective case.

Catalog No.	Description	Price/Each
AP7835	Dual Laser Pointer, Red and Green	$77.55

Laser, 0.8 mW, Unmodulated



This low-cost, unmodulated 0.8 milliWatt helium-neon laser is perfect for hands-on demonstrations.

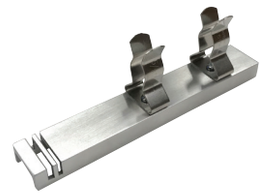
Features:

- Hard seal laser tubes provide long, dependable life
- Impact-resistant, see-through, two-tone acrylic case
- Tamper-resistant screws for safety

120 VAC 60 Hz. Dimensions: 36.7 x 7 x 5.8 cm.

Catalog No.	Description	Price/Each
AP9246	Laser, 0.8 mW, Unmodulated	$729.90

Laser Pointer Holder



Will hold a laser pointer light in the ON position; keeping the laser engaged during your experiment and a great addition to your physics lab! The design includes a unique base that will securely hold a laser pointer. The included clip allows you to keep the laser button in the ON position during experiments.

Catalog No.	Description	Price/Each
AP10221	Laser Pointer Holder	$18.00

Modern Atomic and Nuclear Science—Atomic Structure

FLINN360science™: Indirect Observation of the Atom



This kit presents the essential concepts of atomic structure, atomic models, gold foil experiment, indirect observations, and inferences through hands-on science activities designed to engage all your students, regardless of level. During this lab, students observe the interactions between a laser beam and the surface of a mirror assembly, or a wooden block hidden under a cardboard blind. Based on their observations and collected data, students make inferences about the shape and dimensions of the hidden objects.

Catalog No.	Description	Digital Access	Price/Each
AP11326	360Science: Indirect Observation of the Atom	1-Year	$245.00
AP11426		3-Year	261.00

FLINN360science™: Subatomic Particles



Through hands-on science activities, this kit presents the essential concepts of subatomic particles, fission and fusion. In this lab , students build models of subatomic particles and then apply those models to a fusion and fission reaction. Modeling should help students understand the complexity of subatomic particles and the role they play in fusion and fission reactions. Teachers can extend learning through associated phenomena such as, "How do objects and materials change over time?"

Catalog No.	Description	Digital Access	Price/Each
AP11368	360Science: Subatomic Particles	1-Year	$30.00
AP11468		3-Year	47.85

FLINN360science™: Forces and Atomic Nuclei



This kit presents the essential concepts of nuclear forces, binding energy and attraction and repulsion through hands-on science activities designed to engage all your students, regardless of level. In this lab experience, students observe how marbles, rubber bands, and a spring can be used to model nuclear forces.

Catalog No.	Description	Digital Access	Price/Each
AP11369	360Science: Forces and Atomic Nuclei	1-Year	$40.00
AP11469		3-Year	55.00

FLINN360science™: Nuclear Reactions and Critical Mass



This kit presents the essential concepts of fission, fusion and chain reaction, through hands-on science activities designed to engage all your students, regardless of level. In this lab experience, students build a model to demonstrate how critical mass affects the lifespan of chain reactions.

Catalog No.	Description	Digital Access	Price/Each
AP11370	360Science: Nuclear Reactions and Critical Mass	1-Year	$125.00
AP11470		3-Year	140.00

MODERN ATOMIC AND NUCLEAR SCIENCE—ATOMIC STRUCTURE continued on next page.

Modern Atomic and Nuclear Science—Atomic Structure, continued

Think Tube—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



What could it have been like to imagine the nature of an atom? How difficult is it to produce a model of something that can't be seen? The Think Tube allows students to appreciate the challenges associated with things that cannot be directly observed. A series of simple demonstrations will be performed using the Think Tube as students record their observations and generate hypotheses. Kit includes step-by-step instructions and a student worksheet master.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6149	Think Tube—Demonstration Kit	$16.70

Black Box Kit See page 277.

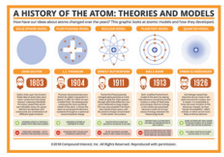
Anatomy of an Atom



An in-depth poster that looks at the inner workings of the atom. The atom is "dissected" into its neutron, proton, and electron components. These, in turn, are broken down into their building blocks, the quarks, the gluons, and the mesons. Each particle is beautifully illustrated and is accompanied by detailed explanation of the particle and its discovery. Poster measures 41" x 29".

Catalog No.	Description	Price/Each
AP6575	Anatomy of an Atom	$39.65

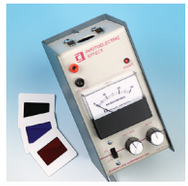
Compound Interest A History of the Atom: Theories and Models



How did we arrive at our current model of the atom? Have fun solidifying atomic theory concepts with this colorful poster. Watch the history of the atom unfold from Dalton's model to Shrödinger's! Laminated, 24" x 36".

Catalog No.	Description	Price/Each
AP9904	Compound Interest A History of the Atom: Theories and Models	$27.05

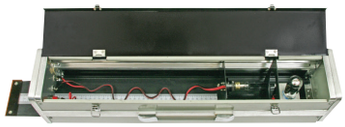
Photoelectric Effect with Amplifier



Demonstrate what Einstein theorized about back in 1905 and later confirmed—that the energy of an electron ionized by a photon of light depends only on the wavelength of light and not its intensity. Full detials at flinnsci.com.

Catalog No.	Description	Price/Each
AP5768	Photoelectric Effect with Amplifier	$1417.65
AP4639	Multimeter, Student	35.00

Photoelectric Effect Apparatus



Study the photoelectric emission from a mixed metal (Cs/Sb) vacuum tube using this device. Full detials at flinnsci.com.

Catalog No.	Description	Price/Each
AP8163	Photoelectric Effect Apparatus	$2364.65

Photoelectric Effect Demonstration Kits See page 230.

Flame Test/Emission Spectroscopy Laboratory Kits See page 245.

Force Between Conductors Apparatus



Accurately measure Planck's constant with this easy-to-use, compact apparatus. Unit contains an enclosed vacuum cesium (Cs) photocell, attachment for illuminating light sources, a high stability power supply, and a nanoammeter. LCD displays show stopping voltage and photocurrent values. Light from five interchangeable, narrow-spectrum LEDs are incident upon the photocell via enclosed fiber optic cables. The LED cables plug directly into the photocell enclosure, to minimize extraneous, ambient light sources. The maximum energy of photons from the LEDs is measured by determining the stopping voltage of the photocurrent, corresponding to the maximum wavelength of each LED. The energies and wavelengths of the LEDs are combined to calculate the value of Planck's constant through graphical or analytical methods. The work function of the Cs photocell can also be estimated.

Catalog No.	Description	Price/Each
AP8165	Force Between Conductors Apparatus	$180.44

SAFETY TIP

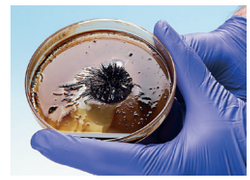
Radioactive Sources

All student radioactive sources supplied by Flinn Scientific, Inc., are safe. All student educational sources are considered "license exempt." No U.S. Nuclear Regulatory Commission or state licensing is required to obtain, handle or use these sources because of the small amounts of radioactivity involved. The radioactive chemicals in these low levels present no great radiation hazard. This does not mean that license-exempt quantities of radioactive materials should be handled indiscriminately; a laboratory worker should handle all chemicals, radioactive or not, with care and respect. Common sense, good technique and good housekeeping are just as essential with hydrochloric or sulfuric acids as they are with radioactive materials.

Modern Materials

Amazing Modern Materials—Multi-Demonstration Kit

FLINN EXCLUSIVE



This multi-demonstration kit includes:

- Ferrofluid—Dramatically demonstrate how magnetic nanoparticles respond to a magnetic field.
- Liquid crystals—Liquid crystal molecules move independently like a liquid and also organize themselves like a crystalline solid.
- Nitinol wire—Construct the desired shape of the nitinol wire in cold water. Then, place it in hot water and watch it quickly and forcefully spring back to its original shape.

Includes a reproducible student worksheet and detailed Teacher Notes with instructions, tips, and answers to all questions.

Catalog No.	Description	Price/Each
AP7531	Amazing Modern Materials—Multi-Demonstration Kit	$100.25

Commercial Ferrofluid—Chemical Demonstration Kit

FLINN EXCLUSIVE



Ferrofluid, first developed by NASA in the 1960s, consists of nano-sized magnetic particles suspended in a liquid. Your students will be fascinated as you demonstrate the unique properties of this nanoscience material and produce interesting 3-dimensional magnetic sculptures. Includes demonstration instructions and handling tips.

Note: A magnet is required and available separately.

Catalog No.	Description	Price/Each
AP7432	Commercial Ferrofluid—Chemical Demonstration Kit	$48.30
AP5666	Neodymium Magnet	16.83

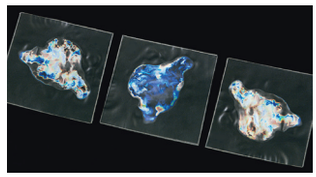
MODERN ATOMIC AND NUCLEAR SCIENCE—RADIOACTIVITY continued on next page.

Modern Materials, continued

Liquid Crystals—How Do They Do That?—Chemical Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff

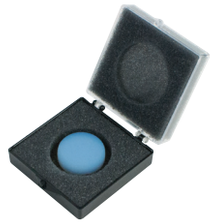


Combine two clear liquids and heat them, then watch as the mixture produces vivid color changes from red to green to blue as it cools. Liquid crystals have properties in between those of solid and liquids—molecules move independently as in a liquid, but they also tend to orient or align themselves like a crystalline solid. The alignment of the molecules changes with temperature and produces fascinating color changes. A simple introduction to the world of nanotechnology! Teacher Demonstration Notes, reproducible student worksheets and answer sheet are included.

Catalog No.	Description	Price/Each
AP7195	Liquid Crystals—How Do They Do That?—Chemical Demonstration Kit	$43.85

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Aerogel



A little piece of the future—right in your classroom! Aerogels are a diverse class of the world's lightest solid material, composed of up to 99% air by volume. This low-density, porous material is already used for insulation, high-energy radiation detectors, and oil remediation—it even went into space with the NASA probe Stardust to capture particles from a comet! Silica aerogel is an excellent insulator against heat and conductivity—if one side is heated, the other side will remain cool. High-quality silica aerogel is highly transparent with a light blue color due to Rayleigh scattering through the aerogel's nanoparticle framework. An unforgettable material to connect classroom concepts such as density, transfer of heat, conductivity, and properties of gases, solids and liquids to real-world applications in engineering and modern materials! Note: Sample is fragile and should be handled with care.

Catalog No.	Description	Price/Each
AP7776	Aerogel	$56.95

Nitinol "Live" Wire



Wire with a memory! Nitinol wire was discovered in 1961 and has "shape" memory. When placed in cold water it can be bent into any shape. Put into hot water, it springs back to its original shape. Shape memory alloys are discussed in the provided instructions. Price is per inch; may be purchased in any length requested.

Catalog No.	Description	Price/Inch
AP1937	Nitinol "Live" Wire	$2.31

FLINN360science™: Building a Better Bike



This challenge presents essential concepts of structure property relationships, manufacturing, and engineering through hands-on science activities. Students will explore different materials that have different weight to strength ratios, which can make them better suited to specific applications.

Catalog No.	Description	Digital Access	Price/Each
AP10426	360Science: Building a Better Bike	1-Year	$70.65
AP10526		3-Year	83.05

Alternative Energy

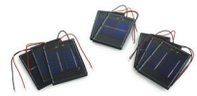
FLINN360science™: Converting Sunlight into Electricity



This kit presents the concepts of solar energy, energy conversion, and photovoltaic cells through science activities designed to engage all your students, regardless of level. Students investigate how solar energy is converted into electricity by building a solar powered car.

Catalog No.	Description	Digital Access	Price/Each
AP11365	360Science: Converting Sunlight into Electricity	1-Year	$203.29

FLINN360science™: Sunlight Intensity and Solar Flares



This kit presents the essential concepts of nuclear fusion, solar flares and solar energy. The high intensity LED light represents solar flares and shows an increase in energy when compared to normal sunlight. Designed to enhance comprehension, this kit also includes access to both virtual reality (VR) and augmented reality (AR) technologies to ensure students better understand the concepts and the lab they are about to conduct.

Catalog No.	Description	Digital Access	Price/Each
AP11379	360Science: Sunlight Intensity and Solar Flares	1-Year	$153.10
AP11479		3-Year	166.00

MODERN MATERIALS continued on next page.

SPOTLIGHT ON SAFETY



PRACTICE GOOD HAND HYGIENE

Encourage students and staff to practice hand hygiene etiquette and properly sanitize hands as they enter and exit the Classroom/lab area and any time the share equipment.

Keep hand sanitizer accessible to students at all times. Unless hands are visibly soiled, an alcohol-based hand rub is preferred over soap and water in most clinical situations due to evidence of better compliance compared to soap and water.

Constant reminders about proper hand hygiene, respiratory etiquette, and physical distancing guidelines will be useful to enhance the awareness of the new routines.

Alternative Energy, continued

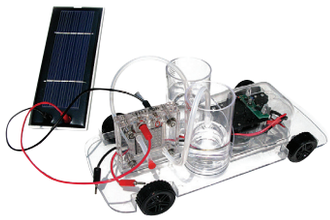
Thermoelectric Generator Demonstrator



Place each aluminum leg into a plastic cup with water. If the water temperature is the same, nothing happens. But, what happens if the water is hot on one side and cold on the other? The fan starts to spin! If you connect the apparatus to a battery or DC power source, the effect is reversed—one cup of water is heated, while the other is cooled. Amazingly simple demonstration to learn about relatively complex thermoelectric concepts such as the Seeback effect, Peltier effect, and Thomson effect. 2" L x 1½" W x 9" H.

Catalog No.	Description	Price/Each
AP7905	Thermoelectric Generator Demonstrator	$32.50

Fuel Cell Car



Over thirty hands-on experiments help students explore solar cell and fuel cell technology. Topics in chemistry, physics and engineering are studied as students learn about the electrolysis of water, how solar cells and fuel cells operate, mechanical work and energy conservation, power, efficiency, mathematics, and electric circuits. In the end, students will design a car of the future—an efficient, environmentally friendly, solar-fuel cell hybrid.

Catalog No.	Description	Price/Each
AP7317	Fuel Cell Car	$137.20

H-Racer Fuel Cell Car



Transparent design allows students to see the inner mechanics of the car. Kit includes a refueling station that produces hydrogen and oxygen from water, using electricity produced by a solar panel (included) or 2 AA batteries (sold separately). Once the car is fueled up, take the H-Racer out for a spin, controlling direction with a remote control! Each kit includes all parts necessary for easy assembly of the H-Racer, as well as hydrogen refueling station, remote control, fuel cell, connector cables, solar panel, and detailed user manual. Comes with 140 page Renewable Energy Science Education manual.

Catalog No.	Description	Price/Each
AP7329	H-Racer Fuel Cell Car	$227.50
AP1423	Batteries, AA, 1.5 V, Alkaline	2.75

Ethanol Fuel Cell Science Kit

This science kit shows the workings of a direct ethanol fuel cell and the principles behind the conversion of ethanol into electrical energy through oxidization. Create an ethanol/water mix and then transfer the solution into the fuel cell where it will be converted into electrical energy to power a mini turbine. Kit features pH paper to show the change of property of the consumed ethanol fuel and an experimental CD guide. Contents include a fuel cell module, fuel solution container, fuel tank with lid, fan module, fan blade, silicon tubes, wires, clamp and syringes.

Catalog No.	Description	Price/Each
AP8189	Ethanol Fuel Cell Science Kit	$275.40

Solar Critters



Students learn about solar energy by creating a simple solar circuit in minutes using only conductive tape! They will cut out a critter template, decorate it, and add to it a solar cell and vibrating motor! All parts are connected with the special Maker Tape conductive tape, perfect for younger students. Once built, these critters will move around in the sun, and best of all they'll never run out of power!

Catalog No.	Description	Price/Each
AP11624	Solar Critters—Standard Kit, 4 pk	$ 25.00
AP11625	Solar Critters—Classroom Set, 25 pk	100.00

Solar Bug 2.0

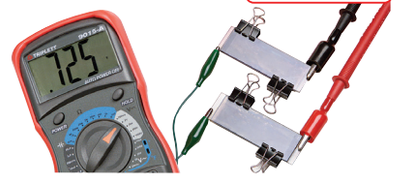


Students will learn about solar energy by creating a simple solar circuit in minutes using only conductive tape! They will cut out a bug, decorate it, and add to it a solar cell and vibrating motor! All parts are connected using the special Maker Tape conductive tape, perfect for younger students. Once built these bugs will move around in the sun, and best of all they'll never run out of power!

Catalog No.	Description	Price/Each
AP11626	Solar Bug 2.0—Standard Kit	$ 25.00
AP11627	Solar Bug 2.0—Classroom Set	100.00

Build a Solar Cell—Student Laboratory Kit

STEM INTEGRATED



By: The Flinn Staff

The energy crisis is real! Update your curriculum today and bring the latest technological developments in solar energy research into your classroom. Dye-sensitized solar cells (DSCs) mimic the process that occurs in photosynthesis to harvest sunlight and convert it to electricity. Students build a DSC and learn about the principles behind its operation. Light striking the dye surface is absorbed and promotes an electron to a photoexcited state. Electrons migrate through the titanium oxide film and travel through the external circuit to the cathode. The result—electricity from light!

Complete with enough materials to make four solar cells. A multimeter may be used to measure the voltage of the solar cell and is available separately. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP6916	Build a Solar Cell—Student Laboratory Kit	$73.87
AP9000	Multimeter	81.86

ALTERNATIVE ENERGY continued on next page.

Alternative Energy—Flinn STEM Design Challenge™ 5-Kit Bundle

STEM INTEGRATED

Cost-saving bundle includes 5 Flinn STEM Design Challenge™ Alternative Energy kits! Help students connect renewable energy concepts and engineering design with confidence. Save money by purchasing the kits as a bundle rather than individually.

- AP8048 Cooking with Solar Energy
- AP8049 Solar-Powered Cars
- AP8050 Build a Water Wheel
- AP8051 Generating Electricity with Wind
- AP8052 Biofuels

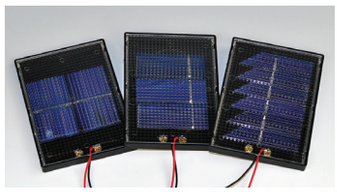


Alternative Energy—Flinn STEM Design Challenge™ 5-Kit Bundle AP8085

Catalog No.	Description	Price/Each
AP8085	Alternative Energy—Flinn STEM Design Challenge™ 5-Kit Bundle	$398.75

Alternative Energy, continued

Mini Solar Panels



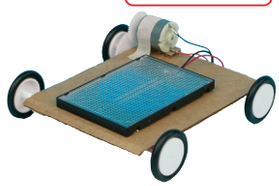
Design your own solar energy experiments! Durable, mini solar panels are encapsulated in a plastic case that will stand up to repeated student use. Connect to various devices with 6" lead wires. Each panel is 3¾" L x 2½" W.

Catalog No.	Description	Price/Each
AP7900	Mini Solar Panel, 1.5 V, 200 mA	$16.85
AP7902	Mini Solar Panel, 3 V, 100 mA	20.50
AP7903	Mini Solar Panel, 6 V, 50 mA	24.35

Solar-Powered Cars—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff

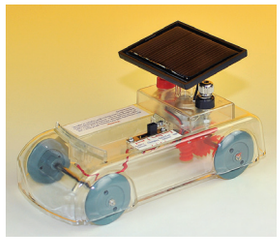


Students build their very own model cars that run on energy from the sun! In the first part of this activity, students learn how a solar car works and build a model prototype. Next they investigate different variables to determine their effect on the car's performance. Based on the data collected and their observations, students create an optimal design solution for a faster moving car.

Full-size kits are complete for eight student groups. Small-size kits are complete for 4 student groups. Refill kits contain materials only.

Catalog No.	Description	Type	Price/Each
AP8049	Solar-Powered Cars—Flinn STEM Design Challenge™	Full-Size Kit	$186.66
AP10098		Full-Size, Refill Kit	168.30
AP10176		Small-Size Kit	129.15
AP10254		Small-Size, Refill Kit	121.15

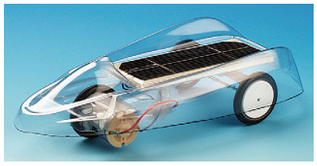
Solar Powered Car



Demonstrate how photovoltaic panels can produce electrical energy. Car can be operated two ways: by solar energy charging a AA battery or direct solar energy to move a motor that in turn moves the wheels to drive the car forward. An auxiliary mode is also available to connect the solar cell to other electrical devices. The car can be used outside in the Sun and indoors with a desk lamp.

Catalog No.	Description	Price/Each
AP7906	Solar Powered Car	$36.25

Photon Solar Racer

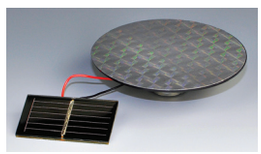


The Photon Solar Racer can be built in one class period and raced in another. All that is required for assembly are scissors and a small screwdriver. The model will achieve very fast speeds in bright sunlight. After building the initial model, the key solar/mechanical components can be used to power other cars of student design.

All materials to build one complete Photon Solar Racer are included.

Catalog No.	Description	Price/Each
AP6060	Photon Solar Racer	$41.20

Simple Solar Science



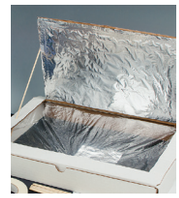
When the photovoltaic cell is exposed to the Sun, the motor spins and rotates the diffraction disk creating a beautiful color display. Includes a sheet with background information and activity ideas. Disk is 4" dia., solar cell is 2⅛", motor is 1" dia.

Catalog No.	Description	Price/Each
AP7820	Simple Solar Science	$14.45

Cooking with Solar Energy—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff



Solar ovens are a fuel-efficient and environmentally friendly method of using the Sun's ultraviolet radiation to cook food. Learn how solar ovens work and cook some yummy snacks with energy from the Sun—no electricity or flames needed! In the first part of this activity, students make a basic box-type solar oven and then investigate how high the internal temperature reaches in a given amount of time. Once the data are collected and analyzed, students then apply their knowledge of science concepts, such as heat transfer, reflection, absorption and the greenhouse effect to design and implement improvements for a more efficient oven.

Complete for eight student groups, including boxes. Thermometers are required and available separately.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP8048	Cooking with Solar Energy—Flinn STEM Design Challenge™	$62.93
AP1452	Spirit-Filled Thermometer	7.15

Solar Energy Demonstrator



Production of photovoltaic, or solar, energy depends on the surface area of the solar cell, the intensity and angle of the light, and wavelength. These variables can be changed to explore how different conditions affect energy production. Convenient demonstration set includes a 4" x 1½" solar cell, wire leads, lamp holder with bulb, music box, and electric motor with propeller.

Catalog No.	Description	Price/Each
AP7774	Solar Energy Demonstrator	$22.45

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

14-in-1 Solar Robot



Build a robot that is powered by the Sun! Learn how solar energy can turn a small motor. When that motor is connected to other materials, the possibilities are endless. Instructions are included to build 14 different robots. Construct a turtle, crab, boat, beetle and even a zombie! Enough materials included to build one robot at a time. Includes an 82-page assembly manual with helpful diagrams.

Catalog No.	Description	Price/Each
AP7910	14-in-1 Solar Robot	$39.20

Radiometer



It demonstrates the effect of infrared radiation with the spinning of its vanes. Just set it in bright light or the sun and away it goes. The hows and whys of solar motion are discussed in the accompanying literature.

Catalog No.	Description	Price/Each
AP1948	Radiometer	$17.75

ALTERNATIVE ENERGY continued on next page.

Alternative Energy, continued

Solar Bag



50-foot-long, 3-foot diameter, black plastic solar bag holds over 350 cubic feet of air. Simply fill with air, tie off the ends, and let the solar energy of the sun heat the air inside the bag. In less than ten minutes, the bag will rise into the sky. The solar bag rises so fast it must be tethered to hold it down. Detailed instructions included.

Catalog No.	Description	Price/Each
AP4622	Solar Bag	$42.25

Solar Furnace



This solar furnace is constructed with two major components—a concentrator and a receiver. A 30.5-cm mirrored parabolic dish is the concentrator, and the receiver is a copper container positioned at the focal length (18.5 cm) of the parabolic dish. May be used to boil liquids or melt various materials. Disassembles easily for storage and comes complete with a Teacher's Guide.

Catalog No.	Description	Price/Each
AP5108	Solar Furnace	$149.75

Biofuels—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff



In this lab, students explore ethanol production through the fermenta tion of carbohydrates by yeast cells. First students conduct a controlled experiment to investigate the amount of carbon dioxide produced through the fermentation reaction of yeast with two different types of carbohydrates. Students observe the amount of carbon dioxide produced and determine the most productive carbohydrate food source. Then students design and implement a method to collect and quantify the amount of carbon dioxide produced. Integrate scientific inquiry and engineering design and their application to challenges in our world with this engaging activity.

Complete for 30 students working in groups of three.

Catalog No.	Description	Price/Each
AP8052	Biofuels—Flinn STEM Design Challenge™	$56.70

Build a Water Wheel—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff



In the first part of this activity, students build an eight-bucket water wheel, choosing from the materials provided. Each group then tests its wheel, collecting data and making observations. Next students brainstorm and decide how to make improvements to their design. Variables, such as the size, shape and number, of buckets are considered. The improved water wheels are given a final test to determine maximum power generated. A unique testing-station setup eliminates the need for hot glue and allows for easy modification of the water wheels.

Complete for 30 students working in groups of three and two testing stations. A source of running or falling water is required for each testing station.

Catalog No.	Description	Price/Each
AP8050	Build a Water Wheel—Flinn STEM Design Challenge™	$61.45

Water Wheel Generator—Historical Inventions Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff

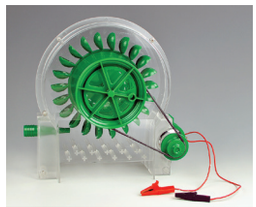


Student understanding increases as they actually see how energy from falling water is converted into electricity. A water wheel and a simple AC generator combine to construct a hydroelectric generator that enhance students' engineering skills and allow full appreciation of a monumental development from the Industrial Revolution!

Complete for 24 students working in groups of 4.

Catalog No.	Description	Price/Each
AP8356	Water Wheel Generator—Historical Inventions Laboratory Kit	$148.60

PowerWheel Kit



Explore the wonders of hydropower with this eye-catching hydro-generator. Hook the water wheel up to a faucet or hose and watch the energy from the flowing water be converted first into mechanical energy and then into electricity as it lights up a strip of LED lights. Includes fully assembled PowerWheel, LED light strip, bridge rectifier, 16½" hose, wiring and user's manual containing educational lessons and teaching suggestions. 10½" H x 10¾" W.

Catalog No.	Description	Price/Each
AP7818	PowerWheel Kit	$182.96

Wind-Powered Generator



This wind generator is a mini-research unit on wind power and windmill design. The unit comes with a lab manual with nine detailed experiments using the generator. Speed/voltage relationships, blade number and arrangement, maximum rpms and voltage, driveshaft ratios, and wind speed effects.

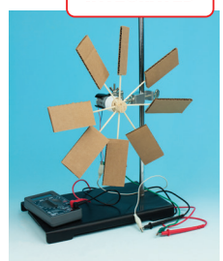
Experiments can be done indoors with fans or outdoors with natural winds. The generator has a weighted base, a structural aluminum tower, a wind-seeking tail assembly, removable fan blades, and convenient binding posts for electrical measurements.

Catalog No.	Description	Price/Each
AP5107	Wind-Powered Generator	$428.10

Generating Electricity with Wind—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff



In the first part of this activity, students build a rotor and blade assembly from the materials provided. Each group's prototype is tested by attaching it to a DC motor (acting in reverse as a generator) connected to a multimeter. A fan provides the wind. The highest readings of volts and amps are recorded and the maximum power output is calculated. Then, students brainstorm and decide how to make adjustments to enhance their design. The improved turbines are given a final test for electrical output.

Complete for 30 students working in pairs and two testing stations. Multimeters and support stands with clamps are required for each testing station and are available separately. Box-type floor fans or turbo fans are also required for each testing station.

Catalog No.	Description	Price/Each
AP8051	Generating Electricity with Wind—Flinn STEM Design Challenge™	$60.18
AP4639	Multimeter, Student	35.00
AP4550	Support Stand, Economy Choice	27.50
AP1034	Single Buret Clamp, Plastic-Coated Jaw	13.25

ALTERNATIVE ENERGY continued on next page.

Alternative Energy, continued

Wind Energy—Student Laboratory Kit

STEM INTEGRATED

By: The Flinn Staff



Each student group constructs a windmill with two interchangeable fans of three and four blades, respectively. Expose each windmill to a portable fan to measure the time required for the torque of the windmill shaft to lift a weight a given distance. From the data, students are able to determine the power produced from the two different blade designs and calculate which is more efficient.

Complete for 30 students working in pairs. Small portable fans are required but not included. Fans may be shared among student groups. Includes Flinn Exclusive STEM Integration Guide.

Catalog No.	Description	Price/Each
AP7512	Wind Energy—Student Laboratory Kit	$52.30

Wind Generator



Easy to assemble, this little-turbine-that-could produces enough electricity to power LED bulbs, a small power output board, and other devices such as mini water pumps and buzzers. Turbine can be easily adapted for possible inquiry activities challenging students to make different types of blades in the classroom or figure out how to adapt the turbine to yaw (or rotate) to face the wind. Kit includes the full turbine, a power output board with lights and sound generator, a pair of clip wires, and instructions with easy-to-follow assembly directions, experiments, and tips and hints.

Catalog No.	Description	Price/Each
AP7468	Wind Generator	$74.45

Wind Education Kit



Using this miniature realistic wind turbine, students can evaluate the pitch, or angle, of the blades and then investigate how pitch and number of blades affects power output. Students also learn how the turbine protects itself under strong wind conditions by stalling or reducing rotational speed. Up to 12 blades can be installed at a time and the kit includes three different types of profiled blades and one type of polypropylene sheet blades. Comes with an LED voltmeter, music maker, and LED lights to demonstrate the power created from the captured wind energy as well as an instruction manual with experiments, assembly guide, and background history. A definite real-life application—the 3-phase AC alternator used in the turbine is similar to the one used in actual commercial wind turbines.

Catalog No.	Description	Price/Each
AP7469	Wind Education Kit	$192.00

Electronics Equipment

DC Bench Meters, Economy



Full-size DC meters offer quality performance at an economical price. External zero-adjust calibration and overload protection.

Catalog No.	Description	Range	Price/Each
AP9045	DC Ammeters	0–1A, 0–5A	$23.85
AP9046		0–50 mA, 0–500 mA, 0–5A	24.35
AP9047	DC Voltmeters	0–5V, 0–15V	24.55
AP9048		0–3V, 0–15V, 0–300V	21.50
AP9049	Galvanometer	–35 to +35 mA	24.85
AP5742		–500 to +500 µA	26.00

Computer Interface Meters

See page 536.

Connector Cords and Accessories

See page 367.

Power Supplies

See page 178.

Kill-A-Watt™ Meter



The meter works with any appliance and is simple to use. Just plug an appliance in and the Kill-A-Watt displays the cumulative electricity usage in watts and watt-hours as well as dollars and cents! Large LCD display also shows measurements in volts, amps, Hz and VA with a 0.2% accuracy.

The Kill-A-Watt meter is a way to complement your curriculum and bring electricity exercises to life. It efficiently demonstrates many laws of electricity, including power as a function of voltage and inductance—and it can forecast energy costs! 5⅛" H x 2⅜" W x 1⅝" D.

Catalog No.	Description	Price/Each
AP7464	Kill-A-Watt™ Meter	$44.88

Multimeter, Student



This economically priced, compact, all-purpose multimeter is perfect for the rigors of student classroom use. Comes complete with battery and test leads. Specifications include: 3½-digit high-contrast LCD, DC current to 200 mA, fuse protected, voltage to 750 VAC/1000 VDC, overload protection to 500 V, and 100-hour battery life.

Catalog No.	Description	Price/Each
AP4639	Multimeter, Student	$35.00

PSworks™ Photogate Timer

FLINN EXCLUSIVE

By: The Flinn Staff



An inexpensive and accurate photogate timer for all your high-speed timing needs! Measure time to 0.0001 seconds with no fuss. The Flinn *PSworks* Photogate Timer is easy-to-use with five common function modes specifically used in the physical science classroom. Measure the time interval between two gates, measure the time to pass through one gate, determine the acceleration due to gravity using a picket fence, measure the period of a pendulum as well as the frequency of a rotating object. These five functions are perfect for accurately calculating instantaneous speed, average speed, acceleration, period or frequency. Timer holds 20 data points, allowing students to observe the actual experiment as it happens and then scroll through the data points after the experiment is complete. Photogates clamp to all Flinn *PSworks* equipment. This universal photogate can be used as a stand-alone product for most physical science experiments that require fast timing. Two photogates, one timer, connector cords and AC adapter are included. Threaded support rods for photogates are available and sold separately.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6998	*PSworks* Photogate Timer	$418.20
AP7009	Threaded Support Rods for Photogate, Pkg./2	12.97
TC1546	Picket Fence	13.30

Timers, Stopwatch

See page 198.

ELECTRONICS EQUIPMENT continued on next page.

Electronics Equipment, continued

Multimeter



Features an easy-to-read 33/4-digit LCD display. Auto and manual digital range selection. Protective rubber casing and foldout stand provide a safe and easy-to-use multimeter. This all-purpose multimeter comes complete with test leads and thermocouple temperature probe. Specifications include AC/DC volts—up to 600 volts, AC/DC current—up to 10 amps, resistance—up to 40 megohms, capacitance—up to 100 µF, temperature—from –58 °F to 752 °F, and safety test leads.

Catalog No.	Description	Price/Each
AP9000	Multimeter	$81.86

Stroboscope, Handheld



Determine the speed of a spinning fan blade. Make a vibrating string appear at rest. Conclusively show interference patterns in a ripple tank. These experiments and more are possible using this durable and affordable handheld stroboscope. Use the coarse and fine adjustment knobs to accurately "dial in" a flash rate from 100 ±0.2 to 10,000 ±6 flashes per minute. Fast enough to "stop" a fan blade and exact enough to measure the blade's speed to less than 0.2% error. The four-digit LED display is easy to read when performing experiments. Xenon flashlamp can operate continuously for 5–30 minutes, depending on the flash rate.

Catalog No.	Description	Price/Each
AP6394	Stroboscope, Handheld	$341.80

Stroboscope



Speed adjustment of this xenon flashlamp stroboscope is a snap due to its instantly responding LED display. The main speed and Vernier (fine adjustment) allows you to fine-tune your flash rate to 0.1/second (±0.08 flashes/second)! The output is adjustable from 3.0 to 83.3 flashes per second. The sturdy 20 cm^3 steel box has large urethane bumpers to keep it from moving during use. The carrying handle on the top of the unit makes it easy to move from class to class. Operates on 115 V/60 Hz grounded and comes with operating directions.

Catalog No.	Description	Price/Each
AP5720	Stroboscope	$770.00

Dual-Trace 30-MHz Oscilloscope



Large, high luminance CRT screen and low cost make this dual-trace oscilloscope an excellent choice for student laboratory work. The unit is compact and designed for continual student use. Key features include two channels and dual trace, 6" rectangular CRT with internal graticule, high sensitivity triggering, sweep magnification, 10X, DC to 30-MHz bandwidth, V sync. separator circuit, and compliance with international standards.

Catalog No.	Description	Price/Each
AP5616	Dual-Trace 30-MHz Oscilloscope	$763.00

Physics of Toys

Airzooka



Ready, Aim—Fire! This powerful air cannon will blow out a candle at 10 paces. Perform the "William Tell" demonstration as you knock a foam cup off a student's head from across the classroom with a blast of air. Have fun as you teach about air pressure, Bernoulli's principle and fluids. Rugged plastic design. Color may vary. *Safety note:* No physical projectiles fire from the Airzooka. Only a soft "ball" of air, in the form of an air vortex, shoots from the end of the air cannon.

Catalog No.	Description	Price/Each
AP6657	Airzooka	$26.50

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Bernoulli Demonstrator

FLINN EXCLUSIVE



What lifts a jet airplane off the runway? What makes a baseball curve? Why does your shower curtain cave in on you when you turn the shower on? Discuss these and other phenomena as explained by scientist Daniel Bernoulli with this easy-to-use, hands-on demonstrator. Get a class set so each student can feel the "pressure" and experience Bernoulli's principle first hand! Flinn instructions provided.

Catalog No.	Description	Price/Each	Price/12 or more
AP5933	Bernoulli Demonstrator	$ 0.60	$ 0.54

Balancing Bird



How does this bird defy the laws of gravity? Because of two well-placed weights at the end of its colorful wings, its center of gravity is located at the very tip of its beak. Spin it on its stand or balance it on a finger. Wingspan of 6½". Flinn instruction sheet provided.

Catalog No.	Description	Price/Each
AP9301	Balancing Bird	$6.90

Giant Bubble Wand Kit

FLINN EXCLUSIVE



By: Mike Shaw and Greg Smith, Chestnut Grove Middle School, King, NC

For this kit, Flinn provides the directions and the complicated hardware. You provide five feet of inexpensive PVC pipe, a hula hoop and a wading pool. Your students will love the excitement of being completely enclosed in a bubble. You can even enclose two students in a single bubble! The instructions contain all the information you need to get started plus they offer you help in teaching qualitative and quantitative observation skills.

Catalog No.	Description	Price/Each
AP9304	Giant Bubble Wand Kit	$14.30

Chemistry of Toys See page 299.

PHYSICS OF TOYS continued on next page.

Physics of Toys, continued

Drinking Bird



Truly a classic demonstration. Your students will be fascinated by the drinking bird that doesn't know when to stop. Teach thermodynamics and pressure, and have fun at the same time. Instruction sheet provided.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP9292	Drinking Bird	$12.65

Energy Stick



Students become human electrical conductors! Completely safe to touch and handle, the Energy Stick features electrodes on each end of its 7½" tube. When these electrodes are touched simultaneously, long-lasting LED lights inside the tube flash and the tube makes a noise. Release one or both of the electrodes and the flashing lights and noise stop. Also works with an entire circle of people holding hands. 1¼" diameter.

Catalog No.	Description	Price/Each
AP7598	Energy Stick	$10.25

Fidget Spinner



These handheld spinning devices feature high-quality bearings at the center for a long, smooth spin. Use these spinners to study gyroscopic motion, forces and kinetic energy or just use them as a fun way to de-stress!

Catalog No.	Description	Price/Each
AP9568	Fidget Spinner	$11.22

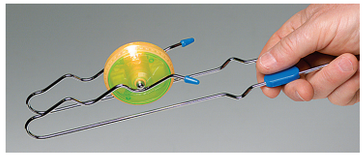
Hand Boiler



Amaze your students by having liquid boil with the touch of your hand. You can even perform a fractional distillation (instructions included).

Catalog No.	Description	Price/Each
AP9293	Hand Boiler	$10.55

Magnetic Spin Wheel



The perfect "toy" to teach concepts of resonance. Tilt the wand from side to side and watch as the wheel spins faster and faster. Students will become resonance enthusiasts as they attempt to get the wheel spinning as fast as possible. Relate the motion to that of a swing, or to the Tacoma Narrows suspension bridge collapse. This versatile toy can also be used to demonstrate concepts such as energy, momentum, and rotational motion.

Catalog No.	Description	Price/Each
AP6431	Magnetic Spin Wheel	$9.10

Pulse Glass



Dramatic demonstration with only the heat from your hand. Two glass bulbs are connected with a glass tube and contain a colored, volatile liquid. Holding one of the bulbs in your hand causes the liquid to boil and the vapor to move into the other bulb where it bubbles rapidly. *Caution:* Never use with any heat source warmer than body temperature.

Catalog No.	Description	Price/Each
AP5713	Pulse Glass	$20.40

Middle School Physical Science Curriculum Mastery® Game



Includes 25 individually packaged sets of 30 colorful, review cards per topic—a total of 750 curriculum-based questions! Also includes 12 double-sided, laminated game boards; comprehensive Teacher Planning & Resource Guide; and FREE 1-Year Premium Subscription to NewPath's Online Learning Program providing access to Science games, interactive activities, quizzes and more.

Catalog No.	Description	Price/Each
AP11662	Middle School Physical Science Curriculum Mastery Game, Class-Pack Edition	$112.15

Middle School Life Science Curriculum Mastery® Game



Includes 25 individually packaged sets of 30 colorful, review cards per topic—a total of 750 curriculum-based questions! Also includes 12 double-sided, laminated game boards; comprehensive Teacher Planning & Resource Guide; and FREE 1-Year Premium Subscription to NewPath's Online Learning Program providing access to Science games, interactive activities, quizzes and more.

Catalog No.	Description	Price/Each
AP11660	Middle School Life Science Curriculum Mastery Game, Class-Pack Edition	$112.15

Tornado Tube

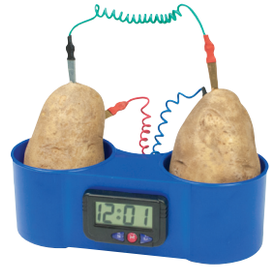


Create a tornado using two empty plastic soft drink bottles. This unique toy employs hydraulic principles to create the vortex of a tornado. The Tornado Tube can be used over and over again.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP1930	Tornado Tube	$5.75

The Two-Potato Clock



Operate a clock for months at a time using nothing but two potatoes as an energy source. Or you can try limes, lemons, plants, soda and more. Besides providing you with a clock that keeps great time, we also explain the chemistry of how and why the Potato Clock works. Fun!

Catalog No.	Description	Price/Each
AP1939	The Two-Potato Clock	$32.75

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Biology

From preserved materials to live specimens and everything in between, check out Flinn Scientific's assortment of equipment, kits and instructional tools that **help you explore the diverse world of biology.**

400 **Advanced Placement® Biology**
406 **Anatomy and Physiology**
418 **Animals,** Care Supplies, Study Kits
440 **Biochemistry**
443 **Biotechnology,** DNA Kits and Supplies
449 **Bio-Rad,** Kits and Supplies
465 **Cells**
467 **Classification and Taxonomy**
469 **DNA Study Kits and Models**
435 **Dissection Supplies**
503 **General Biology**
504 **Getting Nerdy® Science**
471 **Genetics**
427 **Insects,** Study Supplies, Owl Pellets
474 **Microbiology,** Media, Kits & Books
479 **Microscopes & Stereoscopes,** Supplies, Equipment & Slides
493 **Microscopy**
496 **Mitosis and Meiosis**
439 **Models & Posters**
497 **Plants,** Study Kits, Supplies & Models/Posters
502 **Population and Selection**
428 **Preserved Specimens**
503 **Viruses and Epidemiology**

FLINNconnect™

The Best of Our Best

Our BEST 32 labs covering the 20 most essential Biology topics.

Where your textbook may be lacking, **FLINNconnect** covers the top 20 most crucial Biology topics your students need to learn.

This supplemental and comprehensive full-year courseware integrates direct instruction with hands-on labs. Concepts are designed for single-class periods to save you planning and prep time.

Available in three options, comprehensive instructional material covers 20 units and includes text, images, formative and summative assessment, and videos and animations.

Catalog No.	Description	Includes	Price/Each
AP11681	**FLINNconnect** Kit Bundle: General Biology Lab Kits Bundle	Labs Bundle: Digital Labs + Materials	**$1650.00**
AP11682	**FLINNconnect** Complete: General Biology Courseware + Lab Kits Bundle	Complete: Labs Bundle + Digital Courseware	**1750.00**
EL0140	**FLINNconnect** Digital Courseware: General Biology Lab + Instructional Course Content	Digital Only: Courseware + Labs	**279.00**

FLINNprep™ has you covered for AP® Biology

Prepare Your Students for Success

FLINNprep is part of PAVO

A complete learning solution to support and prepare students for the fast pace and rigor of advanced courses. Carefully following the College Board guidelines for AP, we have developed a variety of solutions in accordance with the guidelines as well as the new Unit Breakouts.

FLINNprep is found within PAVO. PAVO is our award-winning gateway to comprehensive digital content. Educators can customize content, assign students work and monitor progress.

FLINNprep Courses: Textbook Alternatives

Online digital courses take students through BIG IDEAS and UNITS, one-by-one with content, supporting videos, assessments and practice exams.

FLINNprep Lab Solutions

Comprehensive Courses Plus Inquiry Labs: These unique blended labs enable a flipped classroom model by offering a combination of lab videos and simulations plus physical, inquiry-based labs.

Inquiry Lab Kits

Aligned to AP curriculum standards, these engaging inquiry labs include comprehensive background information, step-by-step procedures, student worksheets, teacher notes and the basic materials needed for each experiment.

Wet/Dry Inquiry Lab for One Period

Save valuable lab and lecture time with Flinn's Wet/Dry Inquiry Labs for One Period AP Biology! These tested inquiry labs are standards-based, and include real sample data. Flinn offers 16 wet/dry inquiry lab kits designed and developed to meet current AP Biology guidelines and the needs of the teacher and student.

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POGIL®

The College Board specifically calls out using POGIL activities as one of the learning strategies for teaching AP Courses. Only available from Flinn, POGIL is available in digital PDF format.

Review Demonstration Kits

Select these engaging activities to help students review for the AP Biology Exam. Choose from the five products, each containing three separate demonstrations. Students observe and record data, perform calculations and analyze the results to answer AP-style essay questions. Kits include all consumable chemicals and equipment needed for three demonstrations for two complete class sections.

Flinn Classic Laboratory Kits

Only six labs in your curriculum must be inquiry-based to meet College Board requirements. Flinn's tried-and-true Classic Labs meet standards and provide valid lessons for AP Biology students.

Flinn Inquiry Transition Guides are 2–3 pages each and include an Opportunity for Inquiry section. The guides show how each lab aligns with the Enduring Understandings, Essential Knowledge, Learning Objectives and Science Practices in the revised AP Biology Curriculum Framework.

Advanced Placement®—FLINNprep™

FLINNprep™ for AP® Biology

FLINNprep courses and inquiry labs use a blended approach that aves time, increases student engagement and comprehension and leads to better exam scores.



Lab Solution	Gold Bundle Lab Kits & 1 Year Access to Digital Content	Platinum Bundle Lab Kits & 3 Year Access to Digital Content
Digital student and teacher lab instructions	✓	✓
Introductory videos	✓	✓
Technique videos	✓	✓
Apply what you learned on the exam videos	✓	✓
Sample inquiry procedures and data	✓	✓
AP style practice exam questions	✓	✓
Reteach videos	✓	✓
Virtual reality simulations	✓	✓
Downloadable lab instructions	✓	✓
Physical lab materials for hands-on practice	✓	✓
30% off inquiry lab kits for years 2 and 3		✓
Flinn scientist concierge service		✓

Inquiry Labs for AP Biology: 14 Labs

FLINN EXCLUSIVE

FLINNprep is the only AP Solution that offers inquiry labs that connect the labs back to course content and the AP Exam.

Whether you want to use FLINNprep for a single discipline with your class or you want to adopt it for multiple disciplines across your school or district, we can create a custom solution for you. You can purchase the online course or inquiry labs or both for each discipline. Accompanying physical lab kits are available.

14 Investigations

- Artificial Selection
- Understanding Evolutionary Relationships
- Water Potential
- Diffusion and Osmosis
- Photosynthesis in Leaf Disks
- Cellular Respiration
- Environmental Effects on Mitosis
- Cancer and the Loss of Cell Cycle Control
- Sordaria Genetics
- Bacterial Transformation
- Restriction Enzyme Analysis of DNA
- Rate of Transpiration
- Fruit Fly Behavior
- Peroxidase Enzyme Activity

Visit flinnpavo.com—Online Course for AP Biology

AP® Biology

FLINNprep Course for AP Biology is a complete review of Biology's most important concepts with additional units of advanced Biology topics. Units include:

- Fundamental Biology Skills and Knowledge
- Cells: Structure and Function
- The Cell Cycle
- Meiosis: Heredity and Variation
- Mendelian and Molecular Genetics
- Evidence of Evolution
- Evolution: Natural Selection
- Evolution: Populations
- Interdependence in Ecosystems
- Ecology: Energy Flow and Nutrient Cycling
- Biochemistry
- Energy and Metabolism
- Organismal Regulation

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FLINNprep™ Inquiry Kits for AP® Biology

FLINN EXCLUSIVE

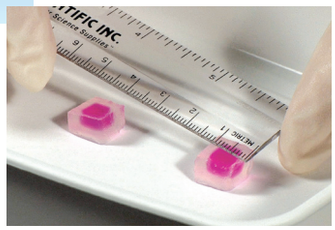
Flinn has developed a new way to implement our Inquiry Labs for AP Biology! Our new approach maximizes class and lab time while giving students extra support to help them succeed on the exam.

- New **blending learning options** combine the benefits of classroom, laboratory and digital learning.
- Your students can watch, pause, rewind and rewatch **prelab concept, technique and procedure videos** tied directly to each AP Biology experiment. Access anytime from any digital device!
- Each lab ends with a **summary video** that relates the experiment to the AP exam by showing sample exam questions based on that specific experiment.
- Each lab includes a **unique set of online problems** that relate the experiment to the exam, and each problem has its own reteach video students can watch if they get stuck.
- **Adaptable to you and how you teach.** Choose to run experiments in multiple ways with access to digital procedures that are both inquiry-based and step-by-step.
- **Built-in student lab safety training** with assessments as the introductory unit.
- **14 standards-based, tested inquiry labs** kits with real sample data that meet the most current AP guidelines and investigation requirements.

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Artificial Selection—Inquiry Lab Kit & Digital Content
FB2036



Diffusion and Osmosis—Inquiry Lab Kit & Digital Content
FB2030

The Flinn Inquiry Lab Kits for AP Biology are Available as a Cost-Saving Bundle!

Comprehensive bundle includes all the laboratory kits on pages 402–403 except FB2046 and FB2049. Live material is required and available separately.

Catalog No.	Description	Price/Each
FB2311	Inquiry Lab Kits & 1 Year of Digital Content—Gold Bundle for AP Biology	$1115.00
FB2312	Inquiry Lab Kits & 3 Years of Digital Content—Platinum Bundle for AP Biology	1295.00
FB2044	Wisconsin Fast Plants®, Pkg. of 200 Seeds	53.64
FB1468	Onion Sets, 100 Bulbs	15.50
LM1150	*Sordaria fimicola,* Wild Type	13.70
LM1219	*Sordaria fimicola,* Tan Mutant	13.70
LM1115	*Drosophila,* Wild Type	10.00

FLINNprep™ Inquiry Lab Kits for AP Biology

Catalog No.	Flinn Inquiry Kits for AP® Physics 1	Type	Price/Each
FB2036	**Artificial Selection**	Inquiry Lab Kit & Digital Content	$111.70
FB2041	**Understanding Evolutionary Relationships**	Inquiry Lab Kit & Digital Content	30.60
FB2046	**The Genetics of *Drosophila* Eye Color**	Inquiry Lab Kit & Digital Content	49.00
FB2032	**Water Potential**	Inquiry Lab Kit & Digital Content	64.75
FB2030	**Diffusion and Osmosis**	Inquiry Lab Kit & Digital Content	119.00
FB2034	**Photosynthesis in Leaf Disks**	Inquiry Lab Kit & Digital Content	79.15
FB2045	**Cellular Respiration**	Inquiry Lab Kit & Digital Content	96.35
FB2507	**Restriction Digestion and Analysis of Lambda DNA**	Inquiry Lab Kit	133.00

ADVANCED PLACEMENT—FLINNprep INQUIRY LAB KITS FOR AP BIOLOGY continued on next page.

Advanced Placement®—FLINNprep™ Inquiry Kits for AP® Biology, continued



Photosynthesis in Leaf Disks—Inquiry Lab Kit & Digital Content
FB2034



Environmental Effects on Mitosis—Inquiry Lab Kit & Digital Content
FB2031

Big Ideas for AP Biology 4-Kit Bundle

By: The Flinn Staff

Dive in to inquiry with these four best-selling kits developed around each of the four Big Ideas in AP Biology! Test enzyme activity, cell cycle control, artificial selection and photosynthesis under various environmental conditions. Each lab allows maximum opportunity to reinforce the inquiry process by centering the inquiry investigations around the manipulation of common abiotic factors. Fast Plants® seeds and onions are required and available separately.

- **Big Idea 1:** Artificial Selection—Inquiry Lab Kit for AP Biology (Catalog No. FB2036) Updated with more guidance on growing your plants!
- **Big Idea 2:** Photosynthesis in Leaf Disks—Inquiry Lab Kit for AP Biology (Catalog No. FB2034)
- **Big Idea 3:** Environmental Effects on Mitosis—Inquiry Lab Kit for AP Biology (Catalog No. FB2031)
- **Big Idea 4:** Peroxidase Enzyme Activity—Inquiry Lab Kit for AP Biology (Catalog No. FB2039)

Catalog No.	Description	Price/Each
FB2296	Big Ideas for AP Biology 4-Kit Bundle	**$371.50**
FB2044	Wisconsin Fast Plants® Seeds, *Brassica*	**53.64**
FB1468	Onion Sets, 100 Bulbs	**15.50**

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM

FLINNprep Inquiry Lab Kits for AP Biology, continued

Catalog No.	Flinn Inquiry Kits for AP® Physics 1	Type	Price/Each
FB2031	**Environmental Effects on Mitosis**	Inquiry Lab Kit & Digital Content	**$ 91.70**
FB2001	***Sordaria* Genetics**	Inquiry Lab Kit & Digital Content	**98.80**
FB2049	**Energy Dynamics**	Inquiry Lab Kit	**92.80**
FB2038	**Rate of Transpiration**	Inquiry Lab Kit	**103.30**
FB2037	**Fruit Fly Behavior**	Inquiry Lab Kit & Digital Content	**95.10**
FB2039	**Peroxidase Enzyme Activity**	Inquiry Lab Kit & Digital Content	**96.00**
FB2516	**pGLO Transformation**	Inquiry Lab Kit	**223.12**

ADVANCED PLACEMENT continued on next page.

Advanced Placement®—Books and Review Materials

Regulation—Review Demonstration Kit for AP® Biology

FLINN EXCLUSIVE



Engaging review and interactive demonstration activities help students explain and predict mechanisms of biological regulation. Part of Big Ideas 2 and 4. Sample AP-style essay questions included!

- Diffusion—Acids and bases cause an indicator to change color as they diffuse through the dialysis tubing.
- Buffers—Buffers provide essential pH regulation in cells, blood and the lungs and kidneys. Demonstrate the composition, reactions and mechanism of buffer action.
- Organism Regulation—Identify the different ways organisms regulate their bodies and respond to the environment with a colorful set of organism and habitat cards. Includes enough materials to perform each activity at least three times.

Catalog No.	Description	Price/Each
FB1969	Regulation—Review Demonstration Kit for AP Biology	$80.75

Structure and Function—Review Demonstration Kit for AP Biology

FLINN EXCLUSIVE

By: The Flinn Staff



Questions about structure and function occur frequently in the essay portion of the AP exam. Use these three biology demonstrations to review Big Ideas 2, 3 and 4.

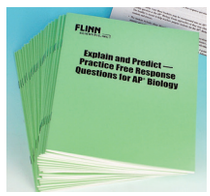
- Use acids and bases to demonstrate how the structure of some proteins allows for different structures in acidic versus basic solutions.
- Use an indicator to observe the permeability of a living membrane.
- Spool DNA to show the polymer structure of this and other important biomolecules. Then use the included sample essay questions to delve into the related function of these biomolecules.

Includes enough materials to perform each demonstration at least three times.

Catalog No.	Description	Price/Each
FB1981	Structure and Function— Review Demonstration Kit for AP Biology	$93.75

Explain and Predict—Practice Free Response Questions for AP Biology

FLINN EXCLUSIVE



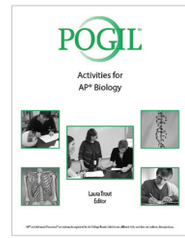
Prepare students for success on the AP Biology exam! Updated curriculum requirements emphasize the importance of integrating biological reasoning across all areas of biology. The types of skills needed to succeed are highlighted in the language of the science practices: students must analyze data, evaluate evidence, predict and explain observations, and apply the results. Each of the ten practice questions integrates not only the science practices, but also more than one Big Idea. The questions have been written using authentic data from our vast collection of biological experiments. Prepare your students by asking them to analyze, evaluate and design; predict, explain, and apply.

Classroom set of 24 booklets is very affordable and includes a comprehensive Teacher's Guide that lists the specific learning objectives for each question.

Catalog No.	Description	Price/Each
FB2091	Explain and Predict—Practice Free Response Questions for AP Biology	$52.20

POGIL® Activities for AP® Biology

FLINN EXCLUSIVE



Flinn Scientific is excited to join with The POGIL Project to publish this series of student-centered learning activities for AP biology. Integrate scientific practices, reasoning and inquiry in the AP biology curriculum with 31 interactive, guided-inquiry learning activities in six major topic areas: Biochemistry—Structure and Function, Genetics, Cells and Cellular Processes, Evolution, Ecology, and Body Systems.

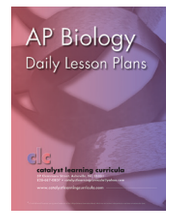
Each activity is aligned with the 2012 curriculum framework for AP Biology, including correlations with the four Big Ideas, enduring understandings and essential knowledge. This teacher's edition with complete student pages, answers to all questions and teacher resource pages with learning objectives, knowledge, prerequisites, assessment questions, and teaching tips. POGIL is accessed at www.flinnpavo.com.

Catalog No.	Description	Price/Each
FB2047	POGIL Activities for AP Biology	$67.50

SAMPLE ACTIVITY AVAILABLE AT FLINNSCI.COM

AP Biology Daily Lesson Plans CD

Edited by Kristen Dotti

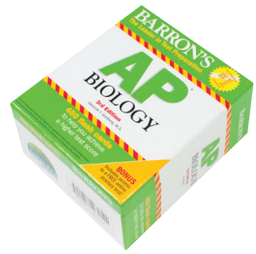


Convey complex information and clarify misconceptions using this comprehensive, full-year curriculum. This student-centered course nicely complements the redesigned AP Biology curriculum. An updated calendar, available online, lays out the daily lesson or lab from August to the test in May. The lessons were developed to cultivate critical-thinking skills, data manipulation, and inquiry using games, puzzles, case studies, demonstrations, manipulatives, and peer-teaching. Review of prerequisite material is incorporated as well as assignments that teach students how to effectively use their textbook and take notes during topic discussions and learning activities. Great for both experienced and new teachers!

All curriculum licenses extend to only one teacher. Multiple copies are required for each teacher who will be using the curriculum in a given school or school district.

Catalog No.	Description	Price/Each
FB2048	AP Biology Daily Lesson Plans CD	$717.75

Barron's AP Biology Flash Cards, 1st Edition



Be prepared for exam day with Barron's. Trusted content from AP experts! Barron's AP Biology Flashcards includes 500 up-to-date content review cards and practice questions. Learn from Barron's—all content is written and reviewed by AP experts.

Build your understanding with review and practice tailored to the most recent exam. Be confident on exam day. Strengthen your knowledge with in-depth review covering all units on the AP Biology exam. Sharpen your test-taking skills with content review questions. Customize your review using the enclosed sorting ring to arrange cards in an order that best suits your study needs.

Catalog No.	Description	Price/Each
FB2294	Barron's AP Biology Flash Cards, 3rd Edition	$29.70

ADVANCED PLACEMENT continued on next page.

Classic Lab Kits for AP® Biology

FLINN EXCLUSIVE

Scientific inquiry and reasoning are integrated in the revised AP Biology curriculum through a series of student-directed, inquiry-based laboratory investigations. As part of the new course requirements, students must complete two inquiry labs for each Big Idea (Evolution, Energy and Communications, Genetics and Information Transfer and Interactions). The good news is that any labs that reinforce one of the Big Ideas can be part of the inquiry investigations! As you update your laboratory syllabus to align with the new AP Biology curriculum framework, don't abandon the classic labs that you know so well. Reimagine them instead! Contact us and request Publication No. 11144 help transitioning the current labs to inquiry.



Diffusion and Osmosis
Classic Kit for AP Biology for 8 groups
FB1827

Use the following general strategy to help your students succeed as you transition your current labs to the new student-directed format:

- Promote inquiry by doing the first part of the lab as an interactive or cooperative demonstration or baseline experiment.
- Provide leading questions to support inquiry as students explore their understanding of the initial observations. Let students' observations and questions flow naturally as they brainstorm, debate, evaluate, extrapolate, predict and propose additional experiments to integrate their knowledge of the concepts and reasoning with scientific evidence.
- After designing and carrying out their experiments, students interpret the evidence—analyze, calculate, graph, extrapolate, explain and, above all, communicate!

Advanced Placement®—Classic Kits

Catalog No.	Description	Class Size	Price/Each
FB1827	Diffusion and Osmosis	8 Groups	$171.45
FB1829	Enzyme Catalysis	3 Groups	78.25
FB1830		8 Groups	147.45
FB1833	Mitosis	8 Groups	52.70
FB1812	Meiosis	16 Students	67.40
FB1835	Plant Pigments and Photosynthesis	3 Groups	66.55
FB1836		8 Groups	83.50
FB1838	Cell Respiration	3 Groups	110.60
FB1839		8 Groups	220.00
FB1841	Genetics of Organisms	3 Groups	77.50
FB1842		8 Groups	130.50
FB1844	Population Genetics and Evolution		27.55
FB1846	Transpiration	8 Groups	85.30
FB1814	Structure of Plant Tissues	8 Groups	102.00
FB1848	Circulatory System Physiology	8 Groups	105.25
FB1851	Isopod Behavior	8 Groups	97.10
FB1853	Dissolved Oxygen	3 Groups	95.50
FB1854		8 Groups	208.05

Advanced Biology Study Kits

FLINN EXCLUSIVE

Make your AP® classroom lab experience more memorable and engaging with hands-on Advance Biology study kits. Reading about concepts pales next to actually doing and engaging in the science at hand, so Flinn has provided step-by-step student procedures and all consumable materials in ready-to-use hands-on kits. Flinn's assortment of science kits, multimedia resources and editable lab procedures create a hands-on science curriculum to help you connect with every student.



Water Quality Index (WQI)—Field Trip Kit
AP7027

FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Catalog No.	Description	Type	Price/Each
AP7273	Exploring the Rate of Diffusion—Student Laboratory Kit	Diffusion & Osmosis	$ 57.50
FB1867	Enzyme Optimization—pH and Temperature Guided-Inquiry Kit	Enzymes	93.75
ML1434	Mitosis and Meiosis Study Set	Mitosis & Meiosis	105.45
FB1973	Counting Crossing Over—Sordaria Genetics Super Value Laboratory Kit	Cell Respiration	20.60
FB1966	Electron Capture and Photosynthesis—Student Laboratory Kit	Cell Respiration	40.50
FB1823	Mitochondria in Action—Student Laboratory Kit	Cell Respiration	35.95
FB1866	Transcription and Gene Expression in Bacteria—Student Laboratory Kit	Molecular Biology	49.85
FB1912	Fruit Fly Genetics Simulation—Super Value Kit	Genetics	56.00
FB1257	Metabolism Experiment	Metabolism	109.46
AP7027	Water Quality Index (WQI)—Field Trip Kit	Aquatic Ecosystem	344.02
FB1669	Nematode Study Kit	Animal Behavior	114.68
FB1969	Regulation—Review Demonstration Kit for AP® Biology		80.75
FB1981	Structure and Function—Review Demonstration Kit for AP® Biology		93.75

Anatomy and Physiology—Circulatory System Study Kits

ABO Simulated Blood Typing—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



This simulated blood typing kit allows the lifelike testing of simulated bloods in the ABO system. Antigen/antibody interactions are modeled on microscope slides. Once students have collected data on three simulated individuals, they consider paternity and genetic questions.

Enough materials to perform over 50 tests. No blood or blood products are used.

Catalog No.	Description	Price/Each
FB1237	ABO Simulated Blood Typing—Student Laboratory Kit	$47.75
FB1238	Refill Kit	24.85

ABO/Rh Simulated Blood Typing—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



This simulated blood typing kit allows the lifelike testing of blood types in the ABO system as well as for Rh factor. Students determine the blood type of four individuals. Actual medical blood-typing plates add to the realism. Once the data have been collected, students consider paternity and genetic questions about the four tested individuals.

Enough materials to perform over 50 tests. No blood or blood products are used. Blood typing slides are reusable and are not included in the refill kit.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
FB1225	ABO/Rh Simulated Blood Typing—Student Laboratory Kit	$61.70
FB1226	Refill Kit	31.55

Blood Typing Supplies

See page 409.

ABO Blood Typing—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students determine their own blood type while learning the basics of ABO blood grouping. Background information is provided about the mechanisms involved in ABO blood typing as well as the genetics of ABO blood types.

Complete for 50 students and ready to use. Lyophilized sera, no refrigeration necessary.

Catalog No.	Description	Price/Each
FB1229	ABO Blood Typing—Student Laboratory Kit	$94.15

ABO/Rh Blood Typing—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students can fully characterize their own blood with this complete blood typing kit. All materials are included and the activity can be completed in a single class period. Detailed instructions include safety considerations, genetics of blood types, transfusion considerations and details of blood typing mechanisms.

Complete for 50 students and ready to use. Lyophilized sera, no refrigeration necessary.

Catalog No.	Description	Price/Each
FB1221	ABO/Rh Blood Typing—Student Laboratory Kit	$167.28

Blood Typing Kit—Simulated ABO, Rh and HIV

By: Tom Russo, Science Teacher—Retired, Milburn, N.J.



Included are eight distinct simulated blood samples, each of which can be ABO typed, Rh factor typed, and tested for the presence of HIV antibodies. The agglutination reactions in the positive tests closely approximate those seen with real blood.

Complete for 12 student groups. Supplied materials are sufficient for up to three classes of 24 students. No blood or blood products are used.

Catalog No.	Description	Price/Each
FB0441	Blood Typing Kit—Simulated ABO, Rh and HIV	$66.00

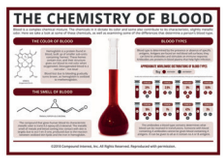
Blood Typing Sera, Anti-A, Anti-B and Anti-Rh



Includes 5 mL of each antiserum, enough serum for 75 tests. Lyophilized sera, no refrigeration required.

Catalog No.	Description	Price/Each
AB1217	Blood Typing Sera, Anti-Rh	$ 53.16
FB1258	Blood Typing Sera, Anti-A, Anti-B and Anti-Rh	112.30

Compound Interest™ The Chemistry of Blood



Explore the properties of blood and blood types! Laminated, 24" x 36".

Catalog No.	Description	Price/Each
AP9905	Compound Interest™ The Chemistry of Blood	$27.05

ANATOMY AND PHYSIOLOGY—CIRCULATORY SYSTEM STUDY KITS continued on next page.

High School Biology Curriculum Mastery Game

NEW!



Features 25 individually packaged sets of 30 full-color, review cards per topic—a total of 750 curriculum-based questions! Also includes 12 laminated, double-sided game boards; comprehensive Teacher Planning & Resource Guide; and a 1 Year Premium Subscription to NewPath's Online Learning Platform featuring animated, narrated tutorials, virtual lab exercises, inactive activities, quizzes, games and more! Complete curriculum coverage of the following standards-based topics:

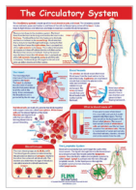
- The Science of Biology
- Introduction to Cells
- Cell Structure & Function
- Cell Processes
- Cell Reproduction
- Photosynthesis
- Genetics & Heredity II
- Evolution & Classification
- Plant Structure & Function
- Ecology II
- Microorganisms II
- Invertebrates I
- Vertebrates I
- Human Biology I
- Nucleic Acids & Protein Synthesis
- Genetics & Heredity I
- DNA Technology/Genetic Engineering
- Introduction to Plants
- Ecology I
- Microorganisms I
- Introduction to Animals
- Invertebrates II
- Vertebrates II
- Human Biology II
- Lab Investigations/Scientific Method

Catalog No.	Description	Price/Each
AP11713	High School Biology Curriculum Mastery Game	$119.95

Anatomy and Physiology—Circulatory System Study Kits, continued

The Circulatory System—NewPath Visual Learning Guide, Set of 10

NEW!



The Circulatory System Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11754	The Circulatory System—NewPath Visual Learning Guide, Set of 10	$43.32

Counting Simulated Red Blood Cells Using a Hemocytometer—Student Laboratory Kit

FLINN EXCLUSIVE



By: The Flinn Staff

In this experiment, students use hemocytometers to count red blood cells (RBCs) in a simulated blood sample. Each hemocytometer has two chambers with one counting grid per chamber. Simulated blood cells are counted under a microscope and the concentration of RBCs per cubic centimeter of blood is calculated to determine the blood count. Students learn about normal RBC counts and the types of diseases that are indicated when the counts are high or low. Kit contains 10 disposable hemocytometers and materials and instructions to prepare more than 1 L of simulated blood.

Complete for 30 students working in groups of three.

Catalog No.	Description	Price/Each
FB1863	Counting Simulated Red Blood Cells Using a Hemocytometer—Student Laboratory Kit	$99.85
FB1868	Hemocytometer, Disposable	8.60

The Coroner's Report—Urine and Blood Analysis Laboratory Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Students act as pathologists by conducting an autopsy using simulated blood and urine samples from a prospective mystery corpse. Use the test results and Pathology Evidence Chart to solve a mysterious death scenario. Kit includes detailed Teacher's Notes, extensive background information and reproducible student handouts.

Complete for 30 students working in pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7316	The Coroner's Report—Urine and Blood Analysis Laboratory Kit	$31.50
AP7571	The Coroner's Report—Urine and Blood Analysis Super Value Laboratory Kit	70.00

Antigens and Antibodies—Bloodless Transfusion Super Value Kit

FLINN EXCLUSIVE



Use this creative simulation to improve your students' understanding of antigens and antibodies and their role in blood typing and transfusions. No blood, blood products or simulated blood required. Each student makes their own "blood bag" containing a specific type of paper red blood cell and any accompanying antibodies. Then they exchange and mix their "blood" with one another. The basic principles of blood transfusion are discovered as students identify the exchanges that will be "rejected" by the human body. Includes reproducible student handouts and zipper-type bags for the storage of parts.

Super Value Kit is complete for 32 students working individually. All materials are reusable.

Catalog No.	Description	Price/Each
FB1744	Antigens and Antibodies—Bloodless Transfusion Super Value Kit	$29.30

Build a Model Heart—Student Laboratory Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Build a functioning heart model! Balloons, rubber tubing and adjustable plastic clamps are used to construct this hands-on and highly visual model. Pressure is applied to the chambers and the clamps are manipulated to show students how blood flows through the heart itself to the rest of the body. Includes materials to build six model hearts, extensive background information, student worksheets with answers and valuable Teacher Notes.

Complete for 6 student groups.

Catalog No.	Description	Price/Each
FB1986	Build a Model Heart—Student Laboratory Kit	$81.56

Physiology of the Circulatory System—Super Value Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Explore the human circulatory system's response to exercise in this very "active" student laboratory kit. Students gain experience using a stethoscope and sphygmomanometer as they measure blood pressure and heart rate while at rest, while reclining and after exercise. They then learn how these different measurements are combined to evaluate relative cardiac fitness. Background information provides a thorough explanation of blood pressure, heart rate and the baroreceptor response. Includes 10 stethoscopes, a sphygmomanometer, student worksheets, background information, detailed procedures and comprehensive Teacher Notes.

Super Value Kit is complete for 10 student groups. All materials are reusable.

Catalog No.	Description	Price/Each
FB1865	Physiology of the Circulatory System—Super Value Kit	$139.45

Investigating Heart Rate—Demonstration Kit

FLINN EXCLUSIVE



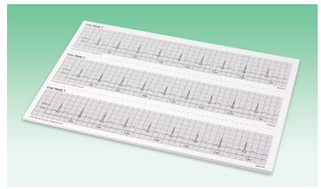
By: The Flinn Staff

Resting heart rate, maximum heart rate, target heart rate—how are these heart rates determined? In this completely reusable demonstration, three student volunteers perform fitness activities while three other volunteers use a stethoscope to measure heart rate at specific times. Discuss how activity affects heart rate. Make this a classroom activity with the purchase of additional stethoscopes.

Catalog No.	Description	Price/Each
FB1987	Investigating Heart Rate—Demonstration Kit	$35.20
AB1249	Stethoscope, Bowles	11.05

Studying Heart Function Using Electrocardiograms—Super Value Kit

FLINN EXCLUSIVE



By: The Flinn Staff

In this activity, students take on the role of cardiologists as they review four case studies to determine the heart rate and analyze other characteristic patterns. The patterns are then used to identify how the electrical signal corresponds to the mechanical action of the heart and to determine if any irregularities are present. Reproducible student worksheet includes thought-provoking questions with detailed answers in the Teacher Notes.

Super Value Kit is complete for 30 students working in pairs. All materials are reusable.

Catalog No.	Description	Price/Each
FB2020	Studying Heart Function Using Electrocardiograms—Super Value Kit	$27.45

ANATOMY AND PHYSIOLOGY—CIRCULATORY SYSTEM STUDY KITS continued on next page.

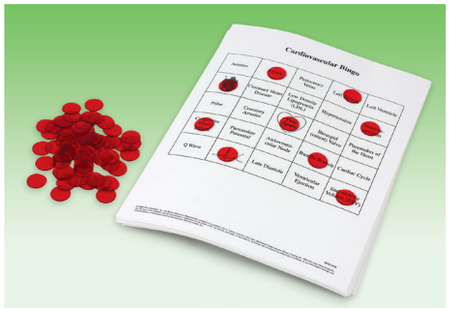
Anatomy and Physiology—Circulatory System Study Kits, continued

Cardiovascular System Bingo—Super Value Game

FLINN EXCLUSIVE

By: The Flinn Staff

Advanced-level game reinforces terminology and understanding of cardiovascular anatomy and physiology using descriptions, names and diagrams. Game includes 30 preprinted bingo cards, 750 bingo chips and Bingo Choice Sheets to call out selections as well as informative Teacher's Notes.



Super Value Game is complete for 30 students playing individually. All materials are reusable.

Catalog No.	Description	Price/Each
FB1958	Cardiovascular System Bingo—Super Value Game	$35.25

Anatomy and Physiology—Circulatory System Equipment



Blood Pressure Set, Latex-Free
FB2106



Blood Pressure Set, Teaching
AB1212

Aneroid Sphygmomanometer

Non-mercury sphygmomanometer. Dial reads up to 300 mm Hg. Complete with comfortable fitting cotton cuff with Velcro® closure, gauge, rubber tubing and bulb with air release valve. Gauge is pinless, ensuring correct calibration.

Catalog No.	Description	Price/Each
AB1246	Aneroid Sphygmomanometer	$45.50

Blood Pressure Set, Student

This unit has a high-sensitivity Bowles stethoscope and an aneriod sphygmomanometer. Includes a vinyl storage case.

Catalog No.	Description	Price/Each
AB1211	Blood Pressure Set, Student	$47.95

Blood Pressure Set, Latex-Free

Includes cotton cuff, stethoscope, latex-free tube bladders, and zippered carrying bag. Pressure measurement from 20 to 300 mmHg.

Catalog No.	Description	Price/Each
FB2106	Blood Pressure Set, Latex-Free	$43.85

⚠ **WARNING:** Cancer and Reproductive Harm – www.p65warnings.ca.gov

Blood Pressure Set, Teaching

Allows simultaneous listening by the teacher with the student or by two students.

Catalog No.	Description	Price/Each
AB1212	Blood Pressure Set, Teaching	$82.20

Digital Blood Pressure/Pulse Monitor



Measures both diastolic and systolic pressure (in mm Hg) and pulse with digital precision. Manual inflation and automatic deflation with pressure release valve. Features include: on/off switch, five-minute auto shutoff, easy-to-read angled LCD, vinyl carrying case, and an instruction manual. Requires four AA batteries (not included).

Catalog No.	Description	Price/Each
AB1247	Digital Blood Pressure/Pulse Monitor	$100.95

Digital Blood Pressure/Pulse Monitor, Automatic



Provides systolic, diastolic (in mm Hg) and pulse readings. Start button activates built-in air pump for automatic inflation and pressure release. Has an easy-to-read LCD, "battery low" indicator, on/off switch, and five-minute auto shutoff. Includes vinyl carrying case and instruction manual. Requires four AA batteries (not included).

Catalog No.	Description	Price/Each
AB1248	Digital Blood Pressure/Pulse Monitor, Automatic	$155.50

EKG Sensors See page 537.



AB1249



AB1250



AB1251



AB1252



FB2105

Stethoscopes

Catalog No.	Description	Price/Each	Price/Each 1-9	Price/Pkg. of 10
AB1249	Stethoscope, Bowles	$11.05	$11.05	—
AB1250	Stethoscope, Economy Choice	8.75	8.75	$8.53
AB1251	Stethoscope, Ford, 2⅞", Bell-Shaped Head	18.05	—	—
AB1252	Stethoscope, Teaching, Dual Earpieces, Bowles Chestpiece	33.70	—	—
FB2105	Stethoscope, Latex-Free*	9.25	—	—

*⚠ **WARNING:** Cancer and Reproductive Harm – www.p65warnings.ca.gov

ANATOMY AND PHYSIOLOGY—CIRCULATORY SYSTEM EQUIPMENT continued on next page.

Anatomy and Physiology—Circulatory System Equipment, continued

Pulse Oximeter



Just place the pulse oximeter on a fingertip, press the button, and read both heart rate and blood oxygen saturation level in seconds. Can be switched to show perfusion index. Heart rate range is 30–240 beats per minute; oxygen saturation range is 35–99%; and perfusion index is 0–20%. Alarm will beep if oxygen saturation is below 90% and if the heart rate is above 120 bpm or below 50 bpm. Automatic shut-off. Includes lanyard, fabric storage case, two AAA batteries, and instructions.

Catalog No.	Description	Price/Each
FB1940	Pulse Oximeter	$162.90

Disposable Blood Typing Slides

Specifically designed for blood testing, these plastic spot plates will increase accuracy when blood typing. The separate A, B, and Rh wells are clearly labeled, thus decreasing the chances of mixing test results. Box of 144 slides.

Catalog No.	Description	Price/Box
FB1356	Disposable Blood Typing Slides	$43.86

Alcohol Pads

Disposable alcohol pads. Individually wrapped. Packages of 100.

Catalog No.	Description	Price/Pkg. 1–9 Pkgs.	Price/Pkg. 10 or more
AB1222	Alcohol Pads, Pkg. 100	$9.40	$8.97

Lancets, Spring-Loaded, Pkg. of 100
FB1947





Body Fluid/ Biohazard Spill Kit
FB0061

Protex™ Ultra Disinfectant Wipes

Eliminate 99.9% of bacteria in 15 seconds and disinfect in just 4 minutes. Free of alcohol, bleach and solvents. 7" x 10". Package of 75.

Catalog No.	Description	Price/Pkg.
AP10032	Protex™ Ultra Disinfectant Wipes	$16.21

Lancets, Blood, Sterile

Disposable. Individually wrapped and sterilized. Package of 100.

Catalog No.	Description	Price/Pkg. 1–4 Pkgs.	Price/Pkg. 5–9 Pkgs.	Price/Pkg. 10 or more Pkgs.
AB1223	Lancets, Blood, Sterile, Pkg. of 100	$6.85	$6.57	$6.43

Lancets, Spring-Loaded

Sterile, single-use, spring-loaded lancets.

Catalog No.	Description	Price/Each
FB1947	Lancets, Spring-Loaded, Pkg. of 100	$85.60

Lancet Safety Pouch

Made of 10-mil thick paperboard that opens to an oval shape. After inserting used lancets, the top flaps are closed and locked in place. Pouch measures 12" x 5½" flat. The optional stand provides support to keep pouches open and upright. Epoxy-coated steel wire, measures 4" x 5⅛" x 8".

Catalog No.	Description	Price/Each	Price/Each 10 or more
AB1224	Lancet Safety Pouch	$2.64	$2.44

Body Fluid/Biohazard Spill Kit

An inexpensive and fully self-contained kit for cleaning up after spills or incidents involving blood or bodily fluids. All materials fit into the biohazard bag for disposal.

Catalog No.	Description	Price/Each
FB0061	Body Fluid/Biohazard Spill Kit	$11.76

Biohazard Disposal Bags

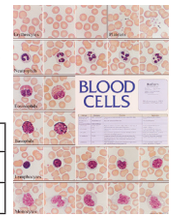
Bag and contents are then sterilized at 121 °C (250 °F) prior to disposal. An indicator patch turns color to note the completion of autoclaving. Printed in high-visibility red with the standard biohazard symbol and disposal directions. Bags measure 12" x 24".

Catalog No.	Description	Price/Each
FB0060	Biohazard Disposal Bags, Package of 25	$28.80

Anatomy and Physiology—Circulatory System and Posters

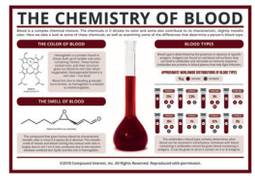
Blood Cells and ABO Blood Typing Charts

Laminated charts are composed of vivid, full-color photomicrographs depicting important features of blood cells or ABO blood typing. Individual images are captioned with source, magnification, and significance. Explanatory text and diagrams explaining ABO blood typing appears on FB1144. 18" x 24".



Catalog No.	Description	Price/Each
FB0368	Blood Cells	$32.39
FB1144	ABO Blood Typing	33.05

Anatomical Charts See page 414.



Compound Interest™ The Chemistry of Blood

Explore the properties of blood and blood types! Laminated, 24" x 36".

Catalog No.	Description	Price/Each
AP9905	Compound Interest™ The Chemistry of Blood	$27.05

Anatomy and Physiology—Digestive and Excretory Systems Study Kits

Digestion Connection—Flinn STEM Design Challenge™

STEM INTEGRATED

By: The Flinn Staff



Students begin by discovering the inner workings of the stomach and its digestive capabilities. Then your students will love the challenge of designing a pill coating that can withstand the stomach's harsh acidic environment, with a pH so low it can dissolve iron nails! By applying relevant concern, such as medicine degradation, students engage in a fun activity that integrates biological and engineering skills.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB2122	Digestion Connection—Flinn STEM Design Challenge	$47.00

ANATOMY AND PHYSIOLOGY—DIGESTIVE AND EXCRETORY SYSTEMS STUDY KITS continued on next page.

Anatomy and Physiology—Digestive and Excretory Systems Study Kits, continued

Digestive Enzymes at Work—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



The lab starts with amylase, which catalyzes the initial breakdown of starch molecules in the mouth. Students then observe the reaction of the enzyme pepsin with protein molecules in an acid environment, just like in the stomach. Finally students analyze the "digestion" of milk by lipase, which catalyzed the hydrolysis of milk fat into fatty acids in the small intestine. Iodine, Benedict's reagent, biuret test solution and litmus are included in the kit along with the enzymes to test for the end products of digestion.

Complete for 30 students in pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs. Boiling water baths are required for the Benedict's test.

Catalog No.	Description	Price/Each
FB1862	Digestive Enzymes at Work—Student Laboratory Kit	$ 55.90
FB2051	Digestive Enzymes at Work—Super Value Laboratory Kit	101.75

Kidney Function Model—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students build a model of the nephron, the filtering unit of the kidney and investigate its ability to filter various substances out of simulated blood. The simulated urine is then analyzed using common urinalysis tests for color, clarity, pH, salt crystals and glucose. Includes reproducible student handouts, Teacher Notes and all necessary chemicals and equipment.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB1859	Kidney Function Model—Student Laboratory Kit	$73.55

Simulated Urinalysis—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Safely learn the basics of urinalysis using simulated urine samples. Students test five different simulated urine samples for five different common urinalysis factors. Results are then compared. Preliminary indications about the health of the tested individuals are explored.

Complete for 30 students working pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs. One urine hydrometer is included in the kit and must be shared by the class. No actual body fluids are included in the kit.

Catalog No.	Description	Price/Each
FB0438	Simulated Urinalysis—Student Laboratory Kit	$ 73.57
FB2060	Simulated Urinalysis—Super Value Laboratory Kit	145.40

Artificial Urine, Normal

FLINN EXCLUSIVE



This 1-L bottle of artificial urine can be used to perform hundreds of urinalysis tests. Recipes are provided so you can create urine samples with different compositions for testing.

Very Safe—Contains no real body fluids or components.

Catalog No.	Description	Price/Each
FB1444	Artificial Urine, Normal	$23.65

Urine Test Strips—Multipurpose



By simple color comparison with the reference chart on the package, values can be obtained for ketones (mmol/L), glucose (mg/dL), protein (g/L), pH, and blood. Development times range from 10 seconds to 3 minutes. 100 strips per vial.

Catalog No.	Description	Price/Each
FB0440	Urine Test Strips—Multipurpose	$45.15



T0004



FB1293



FB1292

Glucose Test Strips

Box of 100 strips, measuring in the range of 0 to >110 mmol/L. Color chart has six color-coded increments.

Catalog No.	Description	Price/Each
T0004	Glucose Test Strips	$25.49

Hydrometer Jar

Used with urine hydrometer to obtain the specific gravity of urine. Straight side walls and pour spout lip. Overall height 13.5 cm.

Catalog No.	Description	Price/Each
FB1293	Hydrometer Jar	$22.55

Urine Hydrometer

Range 1.000–1.060 with subdivisions of 0.001. Overall length, 13 cm. Use with hydrometer jar (FB1293) to obtain the specific gravity of urine.

Catalog No.	Description	Price/Each
FB1292	Urine Hydrometer	$20.10

Anatomy and Physiology—Digestive and Excretory Systems and Posters

Anatomical Charts See page 414.

Prepared Microscope Slides See page 484.

NewPath Visual Learning Guides, Set of 10

NEW!



The Digestive System Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic. AP11752

Catalog No.	Description	Price/Each
AP11752	The Digestive System—NewPath Visual Learning Guide, Set of 10	$43.32
AP11757	The Excretory System—NewPath Visual Learning Guide, Set of 10	43.32
AP11755	The Immune System—NewPath Visual Learning Guide, Set of 10	43.32

Anatomy and Physiology—Muscular and Skeletal Systems Study Kits

Gingerbread Anatomy—Student Laboratory Kit

FLINN EXCLUSIVE

By: Deborah Sachs and Hattie Hatfield, Brebeuf Jesuit Preparatory School, Indianapolis, IN



Students practice anatomical terminology by correctly following the dissection instructions. Specific cuts along the medial and transverse planes are made to obtain highly visual cross-sections. In order to obtain and sketch the correct cross sections students learn terms such as superior, inferior, anterior, posterior, transverse and frontal among others. Includes detailed Teacher Notes and student worksheet with answers.

Complete for 16 student groups. Items that simulate internal organs are recommended but not provided.

Catalog No.	Description	Price/Each
FB2010	Gingerbread Anatomy—Student Laboratory Kit	$52.35

ANATOMY AND PHYSIOLOGY—MUSCULAR AND SKELETAL SYSTEMS STUDY KITS continued on next page.

Anatomy and Physiology—Muscular and Skeletal Systems Study Kits, continued

Broken Bones—Flinn STEM Design Challenge™

FLINN EXCLUSIVE



By: The Flinn Staff

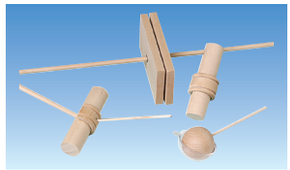
In this activity, students observe X-rays of femoral fractures in order to determine what type of break has occurred. Using biomedical engineering tactics, students design and construct a medical device to repair the break and then perform "surgery" to repair a model broken femur with their device.

Full-size kits are complete for eight student groups. Small-size kits are complete for 4 student groups. Refill kits contain materials only.

Catalog No.	Description	Type	Price/Each
FB2131	Broken Bones—Flinn STEM Design Challenge	Full-Size Kit	$117.30
AP10103		Full-Size, Refill Kit	101.00
AP10181		Small-Size Kit	69.12

Joint Models—Demonstration Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Increase student understanding of how joints move and the sizes and shapes of the major synovial joints with these creative models. Wooden joint models can be physically examined and manipulated to see how different joints rotate and allow us to move. Ball-and-socket, hinge, gliding and pivot joints are all represented. Kit contains complete instructions with Teacher Notes and reproducible student handouts and worksheets.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
FB1909	Joint Models—Demonstration Kit	$39.05

Levers of the Body—Demonstration Kit

FLINN EXCLUSIVE



By: The Flinn Staff

A great deal can be learned about the human body when it is analyzed as a simple machine—a lever. The human body is made up of levers (bones) with applied forces (muscles) to move body parts. The principles of the various lever types are first taught using a meter stick lever and then dramatically demonstrated using the arm-tube lever. The strongest person in your class will be humbled when a little leverage is applied to the arm tube. All materials are reusable.

Note: Slotted weights are required and available separately.

Catalog No.	Description	Price/Each
FB1631	Levers of the Body—Demonstration Kit	$ 80.00
OB2067	Slotted Weight Set, Economy Choice	105.00

Muscle Bingo—Super Value Game

FLINN EXCLUSIVE



By: The Flinn Staff

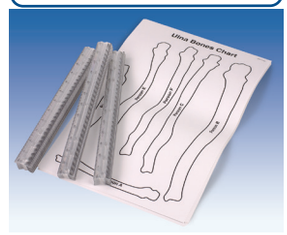
Help students learn the names, locations and functions of the muscles in the human body. Game includes 30 preprinted bingo cards, lots of bingo chips and "bingo choice sheets" to call out the selections. Bingo choice sheets list the names, descriptions, locations and functions of 74 muscles.

Super Value Game is complete for 30 students playing individually. All materials are reusable.

Catalog No.	Description	Price/Each
FB1874	Muscle Bingo—Super Value Game	$35.95

Forensic Bones—Super Value Kit

FLINN EXCLUSIVE



By: The Flinn Staff

In this activity, students consider the correlation between the length of the ulna (the long bone of the lower arm) and total body height. Scaled drawings of ulna bones are provided, and students develop their own correlation of height and ulna length. After graphing their measurements, students use the graphed results to make predictions about who-dun-it!

Full-size kits are complete for 30 students. Small-size kits are complete for 10 students. Refill kits contain materials only. All materials are reusable.

Catalog No.	Description	Type	Price/Each
FB1559	Forensic Bones—Super Value Kit	Full-Size Kit	$35.60
AP10150		Full-Size, Refill Kit	27.85
AP10228		Small-Size Kit	23.55
AP10306		Small-Size, Refill Kit	14.46

Skeletal Bingo—Super Value Game

FLINN EXCLUSIVE



By: The Flinn Staff

Enjoy the fun of traditional bingo while reviewing the structure of bones as well as the names and locations of major bones. Game includes 30 preprinted bingo cards, lots of bingo chips and "bingo choice sheets" to call out the selections. Nine bone diagrams, 21 bone structures and 46 proper or common names of bones and descriptions are listed on the bingo choice sheets. Teacher Notes with helpful teaching tips are also provided.

Super Value Game is complete for 30 students playing individually. All materials are reusable.

Catalog No.	Description	Price/Each
FB1875	Skeletal Bingo—Super Value Game	$33.80

Anatomy and Physiology—Muscular and Skeletal Systems Equipment

Bathroom Scale

See page 108.

Palm-Size Handheld Body Fat Analyzer

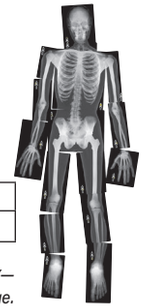


The palm-size device uses bioelectrical impedance analysis (BIA) to measure body fat percentage in a 5–50% range with 0.1% resolution. It features an eight-person memory, clock and alarm. 3-V battery included. Dimensions: 4" x ¼" x 2¼".

Catalog No.	Description	Price/Each
FB2325	Palm-Size Handheld Body Fat Analyzer	$14.90

Anatomy and Physiology—Muscular and Skeletal Systems Posters

X-Rays, Human



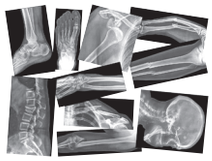
Connect textbook diagrams to the real thing with these young-adult-sized X-rays. Includes a teacher's guide with labels. Approximately 5' tall.

Catalog No.	Description	Price/Each
FB2109	X-Rays, Human	$42.40

ANATOMY AND PHYSIOLOGY—MUSCULAR AND SKELETAL SYSTEMS STUDY KITS continued on next page.

Anatomy and Physiology—Muscular and Skeletal Systems Posters, continued

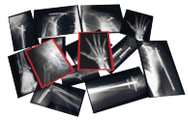
X-Rays, Broken Bones



Real X-rays of broken bones depict some of the most common breaks. Includes 15 X-rays.

Catalog No.	Description	Price/Each
FB2110	X-Rays, Broken Bones	$34.80

X-Rays, Fixed Bones



Authentic X-ray images printed on durable transparent plastic show the hardware (plates, screws, nails, pins and wires) used to fix a broken bone. Fourteen additional images of the fractures correspond to X-rays of the repairs.

Catalog No.	Description	Price/Each
FB2234	X-Rays, Fixed Bones	$23.48

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Skeleton Wall Graphic



Powered by the well-known Fathead® technology, this BodyPartChart™ wall graphic is safe and easy to apply to walls without fear of damage. Graphic is a movable and dry-erasable interactive tool that is sure to inspire and motivate students. Made of high-quality vinyl that is fade resistant, the vivid detail and high-definition colors deliver a clean three-dimensional look. Detailed graphic is 13" wide and 37" tall. Includes large-print mini-graphics to get students thinking about the skeletal system and healthy lifestyles. Sticks best on smooth, nonporous, and nontextured wall surfaces.

Catalog No.	Description	Price/Each
FB2035	Skeleton Wall Graphic	$108.55

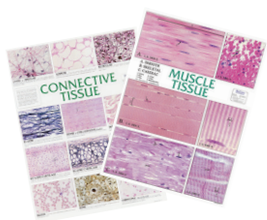
Muscular System Wall Graphic



Powered by the well-known Fathead® technology, this BodyPartChart™ wall graphic is safe and easy to apply to walls without fear of damage. Graphic is a movable and dry-erasable interactive tool that is sure to inspire and motivate students. Made of high-quality vinyl that is fade resistant, the vivid detail and high-definition colors deliver a clean three-dimensional look. Detailed graphic is 26" wide and 39½" tall. Includes large-print mini-graphics to get students thinking about the muscular system and healthy lifestyles. Sticks best on smooth, nonporous, and nontextured wall surfaces.

Catalog No.	Description	Price/Each
FB2076	Muscular System Wall Graphic	$116.60

Tissue Charts



Laminated charts are composed of vivid, full-color photomicrographs. Connective tissue chart includes twelve different tissues. Muscle tissue chart includes labeled cellular micrographs of smooth, skeletal and cardiac muscle. Individual images are captioned with source, magnification and significance. Each chart measures 18" x 24".

Catalog No.	Description	Price/Each
FB0530	Connective Tissue	$31.26
FB0370	Muscle Tissue	31.26

Bones, Muscles & Skin—NewPath Visual Learning Guide, Set of 10

NEW!



Bones, Muscles & Skin Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11751	Bones, Muscles & Skin—NewPath Visual Learning Guide, Set of 10	$43.32

Anatomy and Physiology—Respiratory System Study Kits

Exercise, CO_2 and Respiration—Student Laboratory Kit

FLINN EXCLUSIVE



By: Diane Sweeney, Punahou School, Honolulu, HI

Students determine the relative amount of carbon dioxide in exhaled air before and after exercise using an acid-base indicator. Which sample contains a greater concentration of CO_2? How and why do athletes train to increase their breathing efficiency? Students will answer these questions and explore the complex biofeedback mechanism by which the body uses the production of CO_2 and pH to regulate breathing.

Complete for 30 students working in pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs.

Catalog No.	Description	Price/Each
FB1975	Exercise, CO_2 and Respiration—Student Laboratory Kit	$39.80
FB2050	Exercise, CO_2 and Respiration—Super Value Laboratory Kit	82.40

Lung Model—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students construct a working lung model and demonstrate how differential air pressure causes inspiration and expiration of air from the lungs. Plastic cups, rubber stoppers and balloons are used to simulate body parts. Detailed instructions and background information are provided.

Complete with enough materials for 30 working lung models.

Catalog No.	Description	Price/Each
FB1442	Lung Model—Student Laboratory Kit	$46.35

Lung Bag Activity



The lung volume bag set allows students to measure lung capacity, while also being able to see if there is a relationship between lung capacity and a person's height. Set contains 4 bags, 4 rubber bands, 4 mouthpieces, 1 instruction manual, and 4 mouthpiece holders.

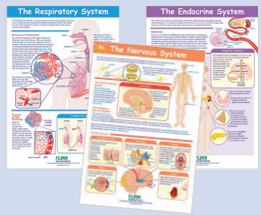
Catalog No.	Description	Price/Each
AB1242	Lung Bag Activity	$53.30

ANATOMY AND PHYSIOLOGY—RESPIRATORY SYSTEM STUDY KITS continued on next page.

Anatomy and Physiology—Respiratory System Study Kits, continued

NewPath Visual Learning Guides, Set of 10

NEW!



The Digestive System Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11756	The Respiratory System—NewPath Visual Learning Guide, Set of 10	$43.32
AP11758	The Nervous System—NewPath Visual Learning Guide, Set of 10	43.32
AP11759	The Endocrine System—NewPath Visual Learning Guide, Set of 10	43.32

Functioning Lung Model—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Extra large, unbreakable, clear plastic housing makes this functioning lung model the best available. The use of rubber stoppers on the ends of the bronchus makes replacing worn out lungs much easier than traditional models using string or rubber bands. The handle on the durable, latex diaphragm allows for easier expansion of the balloon lungs during operation. Measures 5¾" x 11", comes assembled with instructions.

Catalog No.	Description	Price/Each
FB1110	Functioning Lung Model—Demonstration Kit	$49.20
AP4573	Latex Sheeting, 12" x 12"	9.35

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM

Anatomy and Physiology—Nervous System Study Kits

The Nervous System Bingo—Super Value Game

FLINN EXCLUSIVE

By: The Flinn Staff



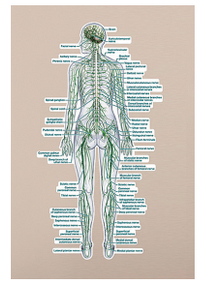
An ideal game for upper level biology and physiology classes. Students play a game of bingo to gain a greater understanding of nervous system organization, types of nervous system cells, electrical signals and cell-to-cell communication. Kit includes 30 preprinted bingo cards, 750 bingo chips and Bingo Choice Sheets to call out selections as well as informative Teacher Notes.

Super Value Game is complete for 30 students playing individually. All materials are reusable.

Catalog No.	Description	Price/Each
FB1957	Nervous System Bingo—Super Value Game	$34.65

Anatomy and Physiology—Nervous System and Posters

Nervous System Wall Graphic



Powered by the well-known Fathead® technology, this BodyPartChart™ wall graphic is safe and easy to apply to walls without fear of damage. Graphic is a movable and dry-erasable interactive tool that is sure to inspire and motivate students. Made of high-quality vinyl that is fade resistant, the vivid detail and high-definition colors deliver a clean three-dimensional look. Detailed graphic is 26" wide and 39½" tall. Includes large-print mini-graphics to get students thinking about the nervous system and healthy lifestyles. Sticks best on smooth, nonporous, and nontextured wall surfaces.

Catalog No.	Description	Price/Each
FB2077	Nervous System Wall Graphic	$114.93

Anatomy and Physiology—Reflexes and Reactions Study Kits

Human Reflex Study—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



The body has numerous reflexes that are designed to protect us from harm. Students perform five tests to observe the innate reflexes the body performs in order to maintain homeostasis. Reflex tests include the patellar, Achilles, Babinski, pupillary and blink reflexes.

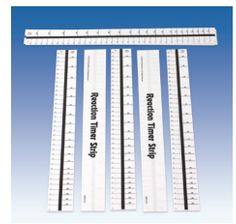
Super Value Kit is complete with enough materials for 15 student groups and five reflex hammers to be shared. All materials are completely reusable!

Catalog No.	Description	Price/Each
FB1988	Human Reflex Study—Super Value Laboratory Kit	$49.65

Measuring Reaction Time—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



This activity uses a unique reaction time strip that allows students to measure one type of reaction time. Students learn that reaction time varies naturally from one person to the next and that there is a limit to how fast reaction time can become. Students experiment with the effect of sight and sound on reaction time. Other reaction time experiments can be performed after establishing the basics with this hands-on kit.

Super Value Kit is complete for 30 students working in pairs. All materials are reusable.

Catalog No.	Description	Price/Each
FB1571	Measuring Reaction Time—Super Value Laboratory Kit	$27.25

Anatomy and Physiology—Reflexes and Reactions Equipment

Reflex Hammer



Heavy chrome-plated steel handle with red rubber triangular head for testing reflexes. Also known as a percussion hammer.

Catalog No.	Description	Price/Each
AB1245	Reflex Hammer	$8.60

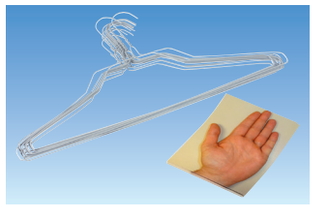
ANATOMY AND PHYSIOLOGY continued on next page.

Anatomy and Physiology—Senses Study Kits

Rewiring the Brain—Super Value Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In this activity, students perform hands-on experiments that demonstrate the brain's remarkable ability to "rewire" itself. In the first activity, students will feel like their noses are two feet long. When students are shown a picture of a hand being touched, they will sense their own hand moving and being touched.

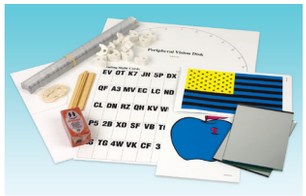
Super Value Kit is complete for 15 student groups. All materials are reusable.

Catalog No.	Description	Price/Each
FB1743	Rewiring the Brain—Super Value Kit	$34.80

Visual Perception—Super Value Activity-Stations Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Four "out of sight" activities that!

- In the first activity, students explore their depth perception skills and discover the advantages of binocular vision.
- Then they test their hand-eye coordination and learn about visual-motor feedback.
- Relate peripheral vision to the properties of rods and cones using a "vision disk" and special reading cards.
- Finally, discover how afterimages are produced.

Includes complete instructions with reproducible student handouts and valuable Teacher Notes with teaching tips, lab hints, and sample data.

Super Value Kit is complete for 12 student groups. All materials are completely reusable!

Catalog No.	Description	Price/Each
FB1872	Visual Perception—Super Value Activity-Stations Kit	$55.95

Peripheral Vision—Super Value Laboratory Kit

FLINN EXCLUSIVE



Students investigate their own peripheral vision and relate it to the properties of rods and cones. Your students will literally "see" the difference as they perform activities with the vision disks and special reading and color cards provided with the kit. Vision disks and cards are made of durable, heavy card stock and are completely reusable.

Super Value Kit is complete for 30 students working in groups of three. All materials are reusable.

Catalog No.	Description	Price/Each
FB1871	Peripheral Vision—Super Value Laboratory Kit	$29.50

Astigmatism—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In this lab activity, students learn to identify and determine the cause of astigmatism using a set of realistic eye-test charts. The test charts allow students to detect corneal irregularities that cause blurry vision. Gray shadows appear next to solid black lines in the test charts when the shape of the cornea causes light rays to focus on different parts of the retina.

Super Value Kit is complete for 30 students working in pairs. All materials are reusable.

Catalog No.	Description	Price/Each
FB1936	Astigmatism—Super Value Laboratory Kit	$55.00

Anatomy and Physiology—Senses Study Kits, continued

Understanding Sound and Hearing—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students perform tests with a vibrating tuning fork to observe how sound waves travel through air and how they affect liquids and solids. Students even perform the Weber and Rinne tests to analyze their own hearing followed by thought-provoking questions that force them to think about their own auditory health.

Super Value Kit is complete for 5 student groups. All materials are reusable.

Catalog No.	Description	Price/Each
FB1994	Understanding Sound and Hearing—Super Value Laboratory Kit	$58.35

Human Senses—Student Laboratory Kit

FLINN EXCLUSIVE



Taste, smell, hearing, sight and touch are all explored in a series of fun, safe activities. Students will be amazed when they determine their dominant eye, find their blind spot, are unable to sense things on their skin and are not able to taste some common food items.

Full-size kits are complete for 30 students in pairs. Small-size kits are for 10 students in pairs. Refill kits contain materials only. Food items will need to be provided locally.

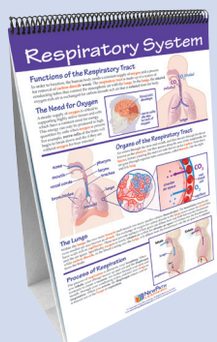
Catalog No.	Description	Description	Price/Each
FB0439	Human Senses—Student Laboratory Kit	Full-Size Kit	$106.40
AP10126		Full-Size, Refill Kit	102.00
AP10204		Small-Size Kit	64.75
AP10282		Small-Size, Refill Kit	54.85

ANATOMY AND PHYSIOLOGY continued on next page.

NewPath Learning Flip Charts for Anatomy and Physiology

The NewPath Learning Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP9930	Human Body I: Moving & Controlling the Body	$39.50
AP9931	Human Body II: Providing Fuel & Transportation	39.50
AP9932	Human Body III: Maintaining Life	38.05



Human Body II: Providing Fuel & Transportation
AP9931

Anatomy and Physiology—Senses Equipment

Eye Test Chart



Printed on a durable, non-reflective plastic material with eyelet-reinforced holes for hanging. Chart measures 22" x 11" and is designed for a 20-foot test distance. Horizontal green and red color bars test color perception and direct attention to specific portions of the chart.

Catalog No.	Description	Price/Each
AB1240	Eye Test Chart	$13.60

⚠ **WARNING:** Cancer and Reproductive Harm – www.p65warnings.ca.gov

Color Blindness Test Cards, 10-Plate Edition



Red/green color blindness is an inherited condition in which certain colors of red and green cannot be distinguished. In 1917 Dr. Shinobu Ishihara developed a simple and accurate method to test for red/green color deficiency using a pattern of dots within a circle. Still regarded as the most reliable and accurate method to test for color blindness, this hardcover book is published with permission from the foundation established by Dr. Ishihara.

Catalog No.	Description	Price/Each
FB1942	Color Blindness Test Cards, 10-Plate Edition	$286.95

⚠ **WARNING:** Cancer and Reproductive Harm – www.p65warnings.ca.gov

Otoscope



Clinical quality, this otoscope features a removable 4X viewing lens; 2.5-mm, 3.5-mm and 4.5-mm specula; and a leatherette carrying case. Requires two C batteries, available separately.

Catalog No.	Description	Price/Each
FB1941	Otoscope	$141.75
AP1424	Batteries, Alkaline, Single, C	3.70

Penlight Flashlight See page 151.

Two-Point Discriminator



Made of stainless steel, this clinical quality discriminator has calibrated markings from 1 to 10 to ensure reliable and consistent measurements.

Catalog No.	Description	Price/Each
FB1938	Two-Point Discriminator	$85.35

Thermometers, Single-Use



Single-use thermometers provide accurate and reliable results from 96.0 °F to 104.8 °F with color-changing indicator dots. The thermometers may be used to determine the oral or axillary temperature of any individual. Great to use as part of a unit on homeostasis or as part of "clinical" studies involving mock patients. Thermometers are sterile and latex-free.

Catalog No.	Description	Price/Each
FB1939	Thermometers, Single-Use, Pkg. of 100	$44.10

UV Intensity Meter and Lens Tester



Use this pocket-size UV intensity meter to demonstrate UV. Rating of the intensity is revealed on the card as low, medium or high and correlates to SPF ratings from 15 to 40+.

Catalog No.	Description	Price/Each
AP6412	UV Intensity Meter and Lens Tester	$3.90

Anatomy and Physiology—Senses Equipment, continued

Ultraviolet Detection Beads



These colorful beads turn to various bright colors when exposed to UV light and return to white when stored away from UV light. Approximately 240 beads per package.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
FB1147	Ultraviolet Detection Beads	$16.05

Anatomy and Physiology—Senses Posters

Epithelial Tissue Chart



Laminated chart is composed of vivid, full-color photomicrographs depicting twelve different types of epithelial cells. Individual images are captioned with source, magnification, and significance. 18" x 24".

Catalog No.	Description	Price/Each
FB0369	Epithelial Tissue Chart	$31.90

My Senses—NewPath Visual Learning Guide



My Senses NewPath Visual Learning Guide provides comprehensive coverage of the five senses. Each 11" x 17" guide includes four panels of helpful information, including an overview, practice exercises, a graphic organizer and assessment and review questions. Each laminated Write-On/Wipe-Off guide provides an engaging way to study the five human senses. Set of 10.

Catalog No.	Description	Price/Each
AP10755	My Senses—NewPath Visual Learning Guide	$44.19

Five Senses Poster Series

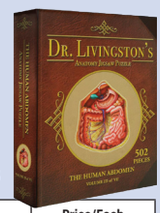


This set of ten laminated posters features stunning three-dimensional illustrations and detail internal cutaways. Concise text describes the processes involved in sensory reception and interpretation. Sense organs and their parts are illustrated and clearly labeled. The series includes posters on the following topics: Sight, Taste, Touch, Hearing, Smell, Hearing Loss, Eye Disorders, Color and Light, Nearsightedness & Farsightedness, and An Overview of the Senses. All posters measure 17" x 22" and are laminated.

Catalog No.	Description	Price/Each
FB1704	Five Senses Poster Series	$186.10

Prepared Microscope Slides See page 484.

Dr. Livingston's Anatomy Puzzle



Dr. Livingston's Anatomy Puzzles challenge you to assemble cross-cut sections of the human body. You'll see how the various parts within the body connect, providing a fun and engaging experience.

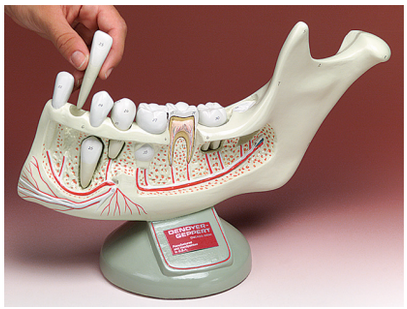
AP10233

Catalog No.	Description	Price/Each
AP10233	Dr. Livingston's Anatomy Puzzle – Abdomen	$26.55
AP10234	Dr. Livingston's Anatomy Puzzle – Thorax	26.55
AP10235	Dr. Livingston's Anatomy Puzzle – Head	26.55

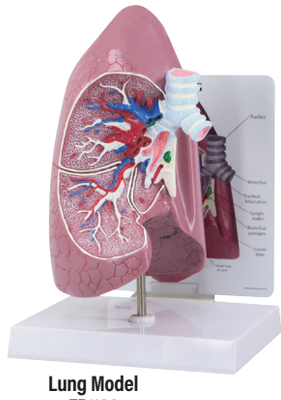
ANATOMY AND PHYSIOLOGY—SENSES POSTERS continued on next page.

Anatomy and Physiology Models

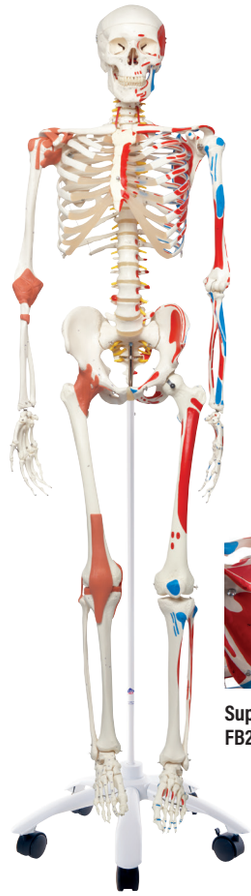
FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM



Youth Jaw with Removable Teeth
FB1264



Lung Model
FB1136





Human Skull, Economy Choice
FB1286



Super Skeleton Sam
FB2235, etc.



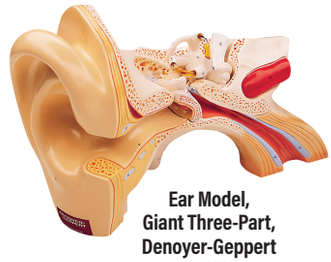
Functional Knee Joint
FB2245



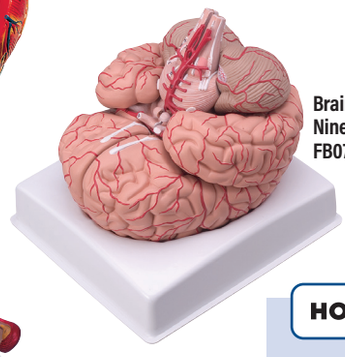
Eye Model, Giant Six-Part
FB0762



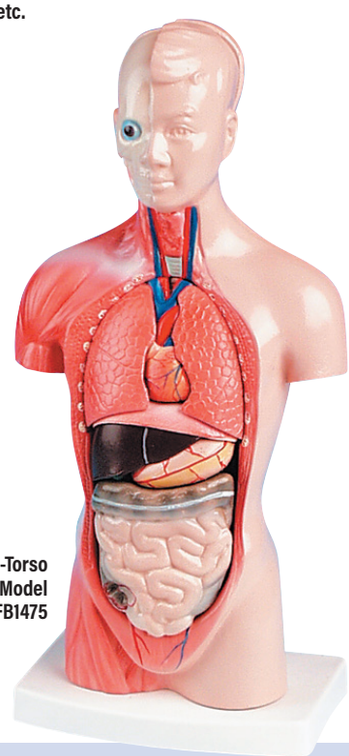
Heart Model, The Heart of America™
FB0177



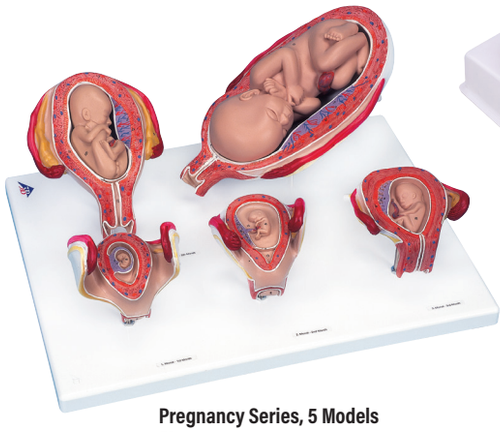
Ear Model, Giant Three-Part, Denoyer-Geppert
FB0174



Brain Model, Nine-Part
FB0758



Mini-Torso Model
FB1475



Pregnancy Series, 5 Models
FB2264

HOW TO

Care for Skeletons and Models...

Skeletons and models are great classroom teaching aids for visual and kinesthetic learners. Here are a few tips on their care.

- Keep models covered when they are not in use.
- Only touch models with clean hands.
- For storage, consider laying skeletons (or other hanging models) flat.
- Wash with a damp cloth or soft toothbrush using only mild soap.

Anatomy and Physiology—Body System Posters

Human Body Systems



This set of four laminated posters feature stunning three-dimensional illustrations and detailed internal cutaways. Each image includes labeled illustrations of the system and its components, detailed close-ups of key organs and processes, and text describing the main functions of the system and its parts. All posters measure 18" x 24" and are laminated.

Catalog No.	Description	Price/Each
FB1709	Human Body Systems	$74.45

Thin Man Chart and Stand

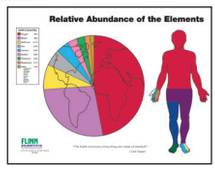


Life-size "see through" chart series for human anatomy. The full frontal view has clear, full-color illustrations of the body's musculature, skeletal and nervous systems. Four transparent mylar overlays allow the viewing of progressive depth layers down through the human body organs. This allows for easy viewing of complete organ systems or individual organs. More than 200 anatomical parts are named, indexed and keyed on the Thin Man. The durable transparencies can be marked with a grease pencil or washable inks during teaching sessions. A sturdy, lightweight stand makes the Thin Man very mobile.

Catalog No.	Description	Price/Each
FB1277	Thin Man Chart and Stand	$588.70

Relative Abundance of the Elements

FLINN EXCLUSIVE



By: The Flinn Staff

Do you know how much iron is in the Earth's crust versus in your body? Bring these "dry" facts to life with this colorful poster showing the relative abundance of the top 20 elements on the Earth and in the human body.

Catalog No.	Description	Price/Each
FB1897	Relative Abundance of the Elements	$19.35

Biology Periodic Table



FB0810

FB1101

The first periodic table of the elements designed specifically for biology. Elements, compounds, bonding, ions and ionic interactions are fundamental chemistry concepts essential to all levels of biology instruction. Consider these benefits:

- Students can quickly identify the key elements vital to life and biochemistry.
- For each element, the table details common cellular roles, primary medical uses, daily intake levels and the relative percentage of human body mass.
- Elements are color-coded to denote macro-, micro- and trace nutrients, inert elements, biotoxins and radioactive elements.

Three styles are available. FB0810 is printed on medium-weight glossy paper. FB1100 is UV-coated front and back with aluminum rails for easy hanging. Both poster sizes are 41" x 29". The Student Edition is 11" x 25" for easy readability, printed on durable paper for reusability year after year and sold in packages of 30.

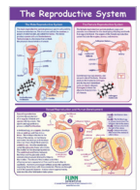
See free video at flinnsci.com.

Catalog No.	Description	Pkg. Size	Price/Pkg.
FB0810	Biology Periodic Table	Poster	$47.75/each
FB1100		UV-coated	65.75/each
FB1101		Student Edition	49.36/pkg. 30

Prepared Microscope Slides See page 484.

The Reproductive System—NewPath Visual Learning Guide, Set of 10

NEW!



The Reproductive System Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

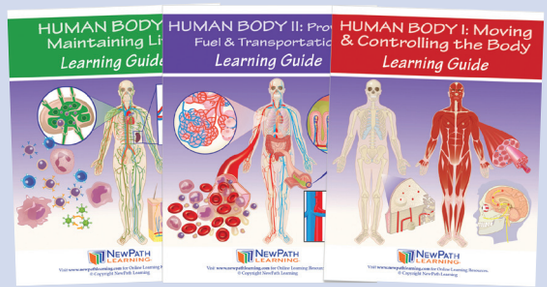
Catalog No.	Description	Price/Each
AP11760	The Reproductive System—NewPath Visual Learning Guide, Set of 10	$43.32

ANATOMY AND PHYSIOLOGY—BODY SYSTEM POSTERS continued on next page.

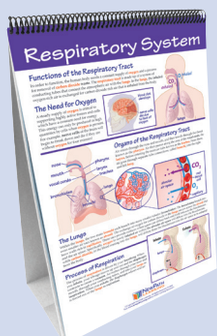
NewPath Learning Guides and Flip Charts for Anatomy and Physiology

The NewPath Learning Guides and Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

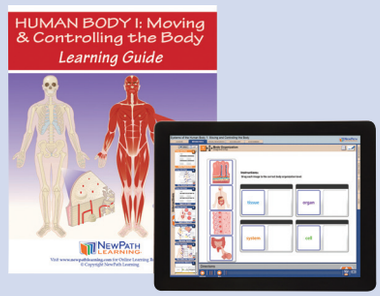
Catalog No.	Description	Price/Each
AP11521	Human Body Student Learning Guides with Online Lessons, Set of 3	$31.22
AP9930	Human Body I: Moving & Controlling the Body Flip Chart	39.50
AP11492	Moving & Controlling the Body Student Learning Guide with Online Lesson	14.95
AP11540	Moving & Controlling the Body Student Learning Guide with Online Lesson, Set of 10	99.00
AP9931	Human Body II: Providing Fuel & Transportation Flip Chart	39.50
AP11493	Providing Fuel & Transportation Student Learning Guide with Online Lesson	14.95
AP11541	Providing Fuel & Transportation Student Learning Guide with Online Lesson, Set of 10	99.00
AP9932	Human Body III: Maintaining Life Flip Chart	38.05
AP11494	Maintaining Life Student Learning Guide with Online Lesson	14.95
AP11542	Maintaining Life Student Learning Guide with Online Lesson, Set of 10	99.00



Human Body Student Learning Guides with Online Lessons, Set of 3
AP11521

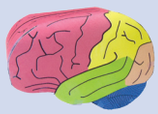


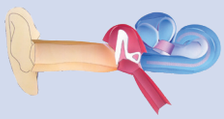
Human Body II: Providing Fuel & Transportation
AP9931

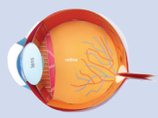


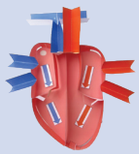
Moving & Controlling the Body Student Learning Guide with Online Lesson
AP11492

Anatomy and Physiology—Body System Posters, continued

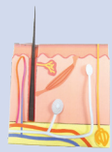

AP11695


AP11696


AP11697


AP11698


AP11699


AP11701

NewPath 3-D Model Kits

NEW!

Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11694	Digestive System 3-D Model Kit	$34.95
AP11695	Human Brain 3-D Model Kit	34.95
AP11696	Human Ear 3-D Model Kit	34.95
AP11697	Human Eye 3-D Model Kit	34.95
AP11698	Human Heart 3-D Model Kit	34.95
AP11699	Lungs 3-D Model Kit	34.95
AP11701	Skin 3-D Model Kit	34.95

Anatomy and Physiology—Books See page 543.

Anatomy and Physiology—Pathology Slide Set

Human Diseases—Pathology Slide Set



Set includes six slides of diseased tissue, three colorful overhead transparencies, and student worksheets. Students can see how alcohol damages liver cells and how smoking damages lung tissue. Also included are slides that show tuberculosis of the lung, goiter, bleeding of the kidney, and tissue infected with the bacteria that causes typhoid fever. Use these slides to compare against healthy tissue.

Catalog No.	Description	Price/Each
ML1437	Human Diseases—Pathology Slide Set	$99.65

Animals—Living, Vertebrates

Aquarium Supplies See page 422.

Aquarium Plants See page 497.

Fertile Chicken Eggs





Fertility varies by season. Please allow 10 days for delivery. Package of 12 eggs. A hatch rate of 40 to 70% is considered successful. Shipped only on Monday and Tuesday. Delivery during extremely cold weather should be avoided.

★**MAINTENANCE:** Eggs must be turned 3 to 4 times per day making an egg turner necessary for a school/weekend setting. Strict temperature and humidity control are also essential for success. The incubator should be stable for three days prior to egg arrival. Eggs will hatch about three weeks after they arrive. After the eggs hatch, the live chicks will require care. After the six to eight week brooding period, you will need to make arrangements for chick placement.

Catalog No.	Description	Price/Pkg.
LM1265	Fertile Chicken Eggs, Package of 12	$40.40

Grass Frogs, Live


© Ken Lucas/Visuals Unlimited

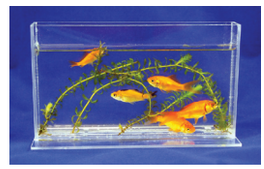
Lithobates (formerly *Rana*) *pipiens*, also known as the northern leopard frog. These distinctive amphibians have brownish-green skin with dark, irregular spots. Frogs are not sexed. *A state permit is required to ship to Utah and Arizona. Not available for Alaska, Hawaii and Puerto Rico. Only available November–March.*

★**MAINTENANCE:** Maintain frogs in a mixed "land" and water environment. The frogs should have access to water just deep enough to submerge themselves completely. To guard against disease and infection the water must be well filtered and partially exchanged (50%) twice a week. Frogs will thrive on a diet of crickets, flies, mealworms and earthworms.

Catalog No.	Description	Size	Price/Pkg.
LM1171	Grass Frogs, Live, Pkg. of 12	2–2.5"	$71.00
LM1172		2.5–3"	85.00
LM1173		3–3.5"	96.00

Many states require a permit to import live wildlife and possess it in a classroom. Please call or email us with any questions and request Publication No. 11063, Understanding State Wildlife Requirements. Call 1-800-452-1261 or email flinn@flinnsci.com.

Goldfish



★**MAINTENANCE:** Goldfish thrive in water temperatures between 65° F and 75° F. Goldfish should eat high-quality dry flake food. They also enjoy live food such as brine shrimp, but that should only be given on occasion. Feed fish only what they can eat in five minutes. Obesity is the most common cause of death in goldfish.

Catalog No.	Description	Price/Pkg.
LM1264	Goldfish, Package of 12	$25.80
FB0244	Fish Food	30.35

Frog—NewPath Science 3-D Model Kits

NEW!


AP11830


AP11685

Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Pkg.
AP11830	Frog Life Cycle—Newpath Science 3-D Model Kit	$40.00
AP11685	Frog Dissection 3-D Model Kit	34.95

NewPath Visual Learning Guide, Set of 10

NEW!



Introduction to Animals Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Pkg.
AP11723	Introduction to Animals—NewPath Visual Learning Guide, Set of 10	$43.32
AP11719	Diversity of Life—NewPath Visual Learning Guide, Set of 10	43.32

Animals—Living, Invertebrates

NewPath Science 3-D Model Kit

NEW!


AP11828


AP11829

Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11828	Amoeba—Newpath Science 3-D Model Kit	$45.00
AP11829	*Euglena*—Newpath Science 3-D Model Kit	40.00

ANIMALS—LIVING, INVERTEBRATES continued on next page.

Animals—Living, Invertebrates

Snails



Live, active (relatively) snails for the classroom. Representing the phylum Mollusca and demonstrating key characteristics of the group—a muscular foot, and a mantle-secreted shell. Snails are shipped moist in shallow "bait" containers. Sold by the dozen.

★**MAINTENANCE:** Pond snails kept in aquaria will eat leafy green vegetables anchored to the tank bottom and will also scavenge flaked fish food.

Catalog No.	Description	Price/Pkg. of 12
LM1106	Pond Snails (Nerites). Freshwater, algae eating snails.	**$17.10**
LM1179	Ramshorn Snails. Herbivorous, freshwater snails with beautiful spiral-shaped shells.	**16.75**

Isopods



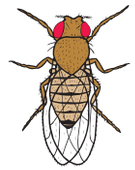
Commonly known as "roly-polies" and "sow bugs" these small, harmless isopods are convenient for classroom studies. They are easy to care for and fun to observe. Supplied in two convenient package sizes. *A state permit is required to ship to Utah. Not available for Alaska, Hawaii and Puerto Rico.*

★**MAINTENANCE:** Prepare a layer of peat moss or dead leaves and twigs in the bottom of a waterproof, covered container. Keep substratum damp by sprinkling water on the bottom layer when necessary. Punch air holes in the cover of the container. Feed small slices of potato or carrot every 3–4 days. Remove old food to avoid molding. Animals are prolific and can be maintained for long periods of time.

Catalog No.	Description	Pkg. Size	Price/Each
LM1217	Isopods	30	**$24.00**
LM1218		100	**79.95**

Many states require a permit to import live wildlife and possess it in a classroom. Please call or email us with any questions and request Publication No. 11063, Understanding State Wildlife Requirements. 1-800-452-1261 flinn@flinnsci.com.

Drosophila



***Drosophila*, Male**

Drosophila melanogaster. Wild-type flies have red eyes, a grayish body and long, full wings. All mutants deviate, with respect to one or more characteristics, from wild-type flies. *Drosophila* are shipped with carefully formulated medium in 4" x 1¼" shatterproof plastic vials that include netting and foam plugs. Cultures arrive containing adult *Drosophila.* Allow adults at least one week to reproduce before removal. It can take up to 14 days for *Drosophila* eggs to result in viable adults, so order accordingly (3 weeks before intended use date is recommended). Shipment during extreme cold periods may be delayed at our discretion. Please, if possible, avoid scheduling deliveries and experiments during the coldest months in your area. A state permit is required to ship to Alaska, Hawaii and Puerto Rico.

Catalog No.	Description	Chromosome No.	Price/Each
LM1115	Wild-type (+) Red eyes, gray body, long full wings.		**$10.00**
LM1117	White-eyed (w) Recessive.	1 (Sex-linked)	**10.00**
LM1118	Yellow-body (y) Recessive.		**10.00**
LM1119	Apterous (ap) Recessive. Wings absent.	2	**10.00**
LM1120	Black body (b) Recessive. Black body, tarsi and wing veins. Pigment darkens over time.		**10.00**
LM1123	Vestigial (vg) Recessive. Underdeveloped, stumpy wings and halters.		**10.00**
LM1244	Brown-eyed (bw) Recessive.		**10.00**
LM1125	Sepia-eyed (se) Recessive. Red-brown eyes at emergence darken to sepia and ultimately to black.	3	**10.00**
LM1245	Scarlet-eyed (st) Recessive.		**10.25**
LM1129	*Drosophila virilis.* Used for chromosome study due to giant salivary gland chromosomes.		**12.22**

Allow 1 week for delivery of *Drosophila.* Large orders (10 or more) of the same type may require extra delivery time. Once received, please allow 2 weeks to culture.

Mealworms



© John D. Cunningham/Visuals Unlimited

Larvae of the beetle *Tenebrio*. Popular in biology classrooms for observation of insect metamorphosis. Also an excellent food source for amphibians and reptiles. Shipped in shallow bait containers with bran meal medium.

★**MAINTENANCE:** Maintain mealworms in containers with screens or ventilated covers at 25 to 30 °C. Mealworms thrive on any type of grain—including bran meal, oat flakes, or corn meal. Provide moisture by adding slices of carrot, potato or apple.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1112	Mealworms. *Tenebrio* larvae	30	**$12.00**
LM1113		100	**14.60**

Hissing Cockroach



The Madagascar Hissing Cockroach or *Gromphadorhina portentosa* is quickly becoming a classroom favorite. The hissing noise these animals are known for is produced by forcefully exhaling air through abdominal spiracles. These excellent low-maintenance pets don't fly or bite. An ideal organism to study metamorphosis, behavioral modification, population effects and many other topics. *A state permit is required to ship to California, Arizona, Florida and Tennessee.*

★**MAINTENANCE:** Maintain Hissing Cockroaches in a clear habitat with a tight fitting lid, plenty of places to hide and a temperature of 75 ºF. They will eat fresh fruits, vegetables or dry dog or cat food. Moldy food should be removed promptly. Maintain moisture and humidity by misting the habitat daily using a spray bottle filled with distilled water.

Catalog No.	Description	Price/Each
LM1277	Hissing Cockroach	**$13.15**

Daphnia



© Neo Sci

The "water-flea." *Daphnia* has long been popular for simple physiology studies because its heartbeat is easily viewed under the microscope. The effect on heartbeat caused by changes in temperature and by the application of specific drugs to the culture water are readily reproduced experiments. *Daphnia* is also popular as a food organism for Hydra and other invertebrates.

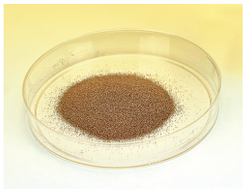
★**MAINTENANCE:** Maintain Daphnia in indirect light at 18 to 24 °C. Large cultures can be set up in 5- or 10-gallon aquariums in aged tap water. Feed by adding 100 mL of a rich culture of a unicellular algae three times a week. Daphnia also eat yeast from suspension—prepare by adding a pinch of active dry yeast to 100 mL of warm water and let stand 2–3 hours.

Catalog No.	Description	Class Size	Price/Each
LM1107	*Daphnia* sp. Selected smaller species. This would be the choice for use as a food organism for Hydra and others.	30	**$15.95**
LM1108		100	**49.00**
LM1109	*Daphnia magna.* Two or more times the size of other species. The choice for physiological studies and observation under the microscope.	30	**13.90**
LM1110		100	**53.10**
LM1111	*Daphnia* Culture Kit. Includes culture of *D. magna,* culture of unicellular algae (food organism), bag of timothy hay (for preparing medium), and complete instructions. For five-gallon tank or aquarium.	30	**44.40**

ANIMALS—LIVING, INVERTEBRATES continued on next page.

Animals—Living, Invertebrates, continued

Brine Shrimp Eggs



Raise your own fish food or keep the hatchlings as pets. Eggs (cysts) are guaranteed 100% *Artemia franciscana*—the Sea Monkey of popular fiction. Approximately 325,000 cysts per gram. Hatch at the ratio of 3 grams of eggs per liter of medium—larvae emerge in 24–48 hours. Instructions on package. For a hatching medium, use the salts listed.

Catalog No.	Description	Price/Each
FB0564	Brine Shrimp Eggs, 6 g	$ 7.55
FB0421	Brine Shrimp Hatching Salts	15.10

Termites



Termites (*Reticulitermes flavipes*) are often used as excellent organisms for an inquiry-based scientific method lab to investigate pheromone communication among social insects. Termites are also useful for the study of symbiotic relationships due to the *Trichonympha* and *Pyrsonympha* protozoa that digest cellulose inside the termites' digestive tract. *A state permit is required to ship to Alaska, Arizona, California, Iowa, Maine, Ohio and Nevada.*

★**MAINTENANCE:** Maintain termites on moist, untreated wood in a plastic container with pin-sized air holes. Not suitable for the culture of a long-term colony.

Catalog No.	Description	Pkg. Size	Price/Each
LM1247	Termites	30	$26.25

Painted Lady Caterpillars



A classroom classic! Painted ladies (*Vanessa cardui*) undergo complete metamorphosis from caterpillar to butterfly over the course of several weeks. These beautiful butterflies are one of the most widely distributed species in the world. Shipped with food and complete care instructions. Organisms raised in the classroom should not be released into the wild. *A state permit is required to ship to Hawaii, Alaska and Puerto Rico.*

★**MAINTENANCE:** Maintain caterpillars on the food they are shipped with. Adult butterflies can be kept in a net house away from direct sunlight. Contact us for a free care guide with detailed instructions on the care of adult butterflies.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1248	Painted Lady Caterpillars	5	$36.50
LM1249		33	64.80
FB2092	Butterfly Habitat		26.10

Redworms

Eisenia foetida. The number-one worm of choice for vermicomposting—the art of employing worms to convert garbage into rich, organic fertilizer. *A state permit is required to ship to Utah. Not available for Alaska, Hawaii and Puerto Rico.*

★**MAINTENANCE:** Redworms are common in manure piles, compost piles, and in soils with high levels of organic material. They love garbage and love to turn it into compost. Worm bins can be maintained right in the classroom since, when properly maintained, they are completely odorless.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1177	Redworms (*Eisenia foetida*)	50	$19.15

Earthworms



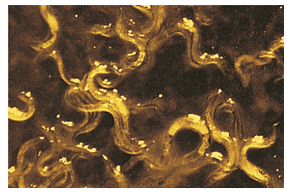
© Visuals Unlimited

An animal that everyone has seen but may not know much about. Members of the phylum Annelida—the segmented worms. The common earthworm (*Lumbricus* sp.) is a vital component of moist soil ecosystems, aerating and enriching enormous quantities of material annually. Earthworms in the classroom can be used as food for amphibians and reptiles and as participants in various behavioral studies.

★**MAINTENANCE:** Easy to culture and maintain although they must be kept relatively cool (temperatures much over 15 °C should be avoided). Normally shipped in a wax-lined box, earthworms may require special shipping and handling requirements during extreme weather.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1103	Earthworms, Live (*Lumbricus* sp.)	30	$40.40
LM1104		100	105.25
LM1266	Earthworms, Live, Large (*Lumbricus* sp.)	25	29.50
LM1267		50	60.60

Nematodes—Eels



The roundworms. *Turbatrix aceti* (also called *Anguillula aceti*) is the common laboratory specimen from this group. Known as the "vinegar eel" because it is usually found living in the sediment of unpasteurized vinegar where it feeds on bacteria and fungi.

★**MAINTENANCE:** Maintain vinegar eels in moderate light at room temperature, in virtually any kind of glass or plastic container. Culture in apple cider vinegar (200 mL or more) to which a few cubes of apple have been added.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1101	Vinegar Eels *(Turbatrix aceti).* Nearly transparent, it bears live young which can often be seen developing within the uterus of the larger females. Its complete, one-way digestive tract is also readily visible.	30	$16.75
LM1102		100	52.00

Planaria



© Neo Sci

The common freshwater representative of the phylum *Platyhelminthes*—the flatworms. The phylum also includes the medically important parasitic tapeworms and flukes. The flatworms are of anatomical interest for two primary reasons—the development of three distinct germ layers (ectoderm, endoderm, and mesoderm), and as examples of the acoelomates (animals lacking a body cavity). Planaria has been widely studied for its regenerative capacity, its response to basic stimuli, and for simple learning experiments. *A state permit is required to ship to Alaska and Hawaii.*

★**MAINTENANCE:** Maintain Planaria in dim, diffuse light at 20 °C to 22 °C, in a shallow tray or culture dish. Culture in filtered pond or spring water. Feed once a week with pea-sized portions (one piece per 50 Planarians) of fresh beef liver or hard-boiled egg yolk. Remove uneaten food after one or two hours.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1094	Brown Planaria *(Dugesia tigrina).* Hardier and more durable. This is the species for any manipulative study—regenerational or behavioral.	30	$17.00
LM1095		100	52.50
LM1096	Black Planaria *(Dugesia dorotocephala).* Offered for interspecific comparison with its brown congener. Large and darkly pigmented.	30	17.15
LM1097		100	46.50
LM1098	Mixed Planaria. A single culture of both species. A convenient option if comparative studies will be performed.	30	17.60

Drosophila Laboratory Equipment Kit

FLINN EXCLUSIVE

By: The Flinn Staff



All the basic material requirements for conducting experiments with *Drosophila*. A convenient and economical package including 30 vials, 30 foam plugs, 30 pieces of vial netting, instant culture medium, sorting brushes and a copy of the *Flinn Drosophila Guide*. Live cultures and etherizers/anesthetizers must be purchased separately.

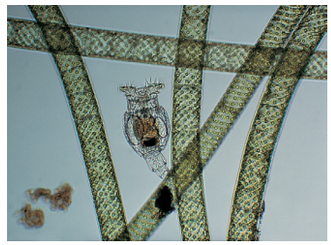
Materials provided for 24 to 30 students working individually or in pairs.

Catalog No.	Description	Price/Each
FB0751	*Drosophila* Laboratory Equipment Kit	$93.95

ANIMALS—LIVING, INVERTEBRATES continued on next page.

Animals—Living, Invertebrates, continued

Rotifers

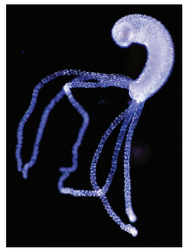

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Also known as "wheel animalcules" because of the ring of cilia surrounding the mouth. Common inhabitants of fresh water from lakes, ditches and puddles. Transparent, so that internal anatomy can be examined in the living organism, several species have rings in their outer body covering giving the false impression of being segmented. Hardy and active, they are fascinating to observe.

★**MAINTENANCE:** Maintain Rotifers in culture dishes, in moderate light at room temperature. Culture in wheat seed infusion medium which has been prepared and left uncovered 48–72 hours. Supplement with a green algae, such as *Chlorella* or *Chlamydomonas*.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1099	Mixed Rotifers. Several freshwater species in a single culture.	30	$19.15
LM1100		100	51.00

Hydra


© Neo Sci

This widely distributed genus can be used to demonstrate several important concepts and processes as well as its own intriguing habits. A freshwater cnidarian, Hydra is by far the most easily cultured and studied member of the phylum. *Daphnia* can be used as food to observe the prey capture behavior of Hydra which uses its nematocyst-laden tentacles to ensnare the prey and sting it into submission. Hydra reproduces both sexually, and asexually by budding—a process which is often ongoing in the cultures we supply.

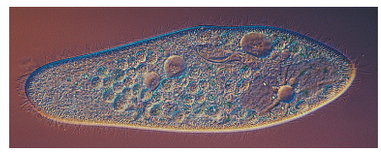
★**MAINTENANCE:** Keep *Hydra* in a small aquarium or large culture dish, in dim light at approximately 21 °C. Green *Hydra* requires 8–10 hours of light per day. Feed *Hydra* once a day on small *Daphnia* or brine shrimp.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1089	Brown Hydra (*Hydra* sp.). The larger and more durable of the types commonly available. This would be the choice for behavioral studies and predator/prey studies with *Daphnia.*	30	$18.00
LM1090		100	51.05
LM1091	Green Hydra (*Chlorohydra viridissima*). Smaller and more delicate than brown hydra. Their green color is imparted by symbiotic green algae (usually *Chlorella*).	30	15.53
LM1092		100	45.74

Animals—Living, Protists

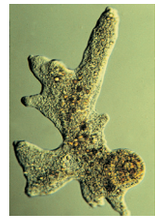
Protists, Ciliates

Unicellular organisms characterized by movement using cilia or ciliary-derived structures. This group is commonly studied in feeding behavior and simple response experiments. Ciliates have two, or more, nuclei—a macronucleus (typical cell functions) and at least one micronucleus (reproduction). Internal organelles are easily visible using a compound microscope with a 40X objective. Possession of cilia is the only common characteristic. Some are typically mobile while others prefer attachment to a substrate. Feeding behaviors also vary. Vital stained cultures have a dye added that stains the internal organelles for easier observation. Ciliates prefer calm water, room temperature and dim light. They will move away from a microscope's field of view. Culture contains enough live food to last several days. Aerate daily using included pipet.


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Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1159	*Paramecium aurelia.* The smallest of the commonly studied paramecia (120–180 µm). With one macronucleus and two micronuclei.	30	$ 9.95
LM1160		100	29.30
LM1076	*Paramecium caudatum.* Possesses one micronucleus and one macronucleus. Osmoregulatory action of contractile vacuole can be observed by exposing organism to hypo- and hypertonic solutions.	30	14.88
LM1077		100	47.85
LM1175	*Paramecium caudatum*—Vital Stained. Prestained living culture. Stain highlights internal structures and organelles, making observations easy and saving time.	30	14.40
LM1078	*Paramecium multimicronucleatum.* The largest of the commonly studied paramecia (200–350 µm). With one macronucleus and three or four micronuclei.	30	10.35
LM1079		100	28.74
LM1082	*Stentor.* Distinctive trumpet-shaped cells with vivid blue-green coloration due to the pigment stentorin. With a large, beaded macronucleus it may be up to two millimeters in length.	30	14.90
LM1083		100	46.95
LM1084	*Vorticella.* Sessile, bell-shaped ciliate anchored to the substrate by a contractile stalk. The stalk will coil up like a spring when the organism is disturbed. With an elongate, curved acronucleus.	30	14.90
LM1085		100	46.95
M0171	Slowing Solution for Protozoa, 100 mL		10.55

Protists, Pseudopods


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Unicellular organisms characterized by movement using pseudopods, which act in both locomotion and feeding behaviors (phagocytosis). Internal organelles are easily visible using a compound microscope with a 40X objective. These slow movers are easy for students to follow and observe organelles and behavior. *A. proteus* contains a single nucleus. *C. carolinesis* is multinucleate. *A. proteus* vital stained are living proteus that have been stained for easier observation. Pseudopods prefer stagnant water, room temperature, dim light or darkness and tend to move away from a microscope's field of view. Culture contains enough live food to last several days. Aerate daily using included pipet.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1062	*Amoeba proteus.* Common in freshwater lakes, ponds and slow-moving streams. Popular for the study of basic animal cell structure, major organelles and the process of phagocytosis. Single nucleus.	30	$14.75
LM1063		100	47.00
LM1174	*Amoeba proteus*—Vital Stained. Prestained living culture. Easy to locate and ready for microscopic examination.	30	10.85
LM1064	*Chaos carolinensis.* The giant amoeba, also known as Chaos chaos. Visible to the naked eye, it is readily observable under low magnification. Multinucleate.	30	10.50
LM1065		100	28.65

Protists, Flagellates


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Unicellular organisms characterized by movement using one or more flagella. Flagella act in locomotion. Below flagellates are all photosynthetic species with red eyespots. Internal organelles are easily visible using a compound microscope with a 40X objective. Flagellates prefer calm, room temperature water. Culture contains enough live food to last several days. Aerate daily using included pipet.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1039	*Euglena.* Extremely active organism moves by means of single flagellum. Popular for behavioral studies involving responses to light, temperature and pH (taxes). Also used for vitamin B_{12} assay.	30	$14.90
LM1040		100	47.85
LM1041	*Chlamydomonas.* Unicellular, biflagellate organism.	30	14.90
LM1042		100	47.00
LM1055	*Volvox.* Large, photactic colonies of *Chlamydomonas*-like cells surrounded by a common gelatinous matrix. Reproduces asexually via the development of daughter colonies within the hollow sphere of the parent colony.	30	14.90
LM1056		100	47.85

★**MAINTENANCE:** Protist cultures are shipped in clear, two- to eight-ounce polystyrene jars. Immediately upon receipt, loosen caps and aerate cultures with clean pipet (included). Protozoans should be kept in diffuse, indirect light at temperatures from 18 °C to 22 °C.

Long-term cultures should be maintained in clean culture dishes containing medium to a depth of one inch. Dishes should be stacked or loosely covered to limit evaporation and contamination. Subculture protozoans (inoculate fresh medium) once a month.

ANIMALS—LIVING, PROTISTS continued on next page.

Animals—Living, Protists, continued

Protozoan Sets



These sets are composed of five of our most popular specimens. Species typically included are: *Amoeba, Paramecium, Euglena, Stentor*, and *Blepharisma*. Substitutions may, on occasion, be necessary depending on availability of individual species. All three major subdivisions are represented so that any one of these sets can serve as a convenient introduction to the protozoa.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1086	Protozoan Set—Mixed. Numerous specimens of all five species in a single container. Simulated "pond mixture."	30	$26.60
LM1087	Protozoan Set—Individual. Set includes five individual cultures of the organisms listed above.	30	69.10

Instant Protozoan Mix

FLINN EXCLUSIVE

By: The Flinn Staff



Just add water and, after a week or so, your "mini-pond" will come to life. The dry mixture of encysted and dormant protists included in this kit contains a range of organisms likely to include diatoms, ciliates, dinoflagellates, euglenoids, rotifers, algae and others. Use your microscope to view the diverse array of organisms up close over several days to view the ever-changing ecosystem. Includes dry protist mix, tank, food, identification key and instructions. Dry mixture has a one- to two-year shelf life.

Catalog No.	Description	Price/Each
FB1230	Instant Protozoan Mix	$17.10

Animals—Care Supplies, Vertebrates

Hova-Bator™ Incubator



The next best thing to a hen. Large capacity incubator with a digital readout. High-density insulating foam construction with two clear windows on top allows for the temperature to remain stable and the hatching process easily viewed. Thermostatically controlled heater permits a wide range of temperature settings. Incubator uses a fan to hold a more uniform temperature even and also allows for various egg sizes to be incubated at the same time. Includes power cord, plastic bottom liner and thermometer. Incubator will hold 50 large chicken or duck eggs or up to 130 smaller (quail, partridge) eggs. An optional automatic egg turner performs the tedious function of turning the eggs, six times daily. Turner holds 42 eggs in six racks, and its universal design accommodates eggs ranging in size from large chicken to small partridge.

Catalog No.	Description	Price/Each
FB2100	Hova-Bator Incubator	$161.20
FB0537	Automatic Egg Turner	66.00
LM1265	Fertile Chicken Eggs, Pkg. of 12	40.40

Animal Cages, Plastic



The impact-resistant plastic cages feature rounded corners so cleanup is a breeze. Each includes a self-locking, fully vented lid. Lids feature convenient snap-seal access hatches for feeding and maintenance. Knockouts in lids allow for routing aquarium airline tubing—facilitating use of airstones, filters and other air-driven accessories.

Catalog No.	Description	Size	Dimensions (L x W x H)	Price/Each
FB0509	Animal Cages, Plastic	Mini	7⅛" x 4¾" x 5½"	$ 7.60
FB0510		Small	9⅛" x 6" x 6⅝"	11.00
FB0511		Medium	11¾" x 7¾" x 8"	16.70
FB0512		Large	14½" x 8¾" x 9¾"	31.95

Cage Litter, Natural Pine



The natural pine oil effectively suppresses microorganisms and masks odors—providing a clean, fresh aroma and a healthy environment. Compressed, 800 cu. in. bag expands to 3,000 cu. in. when opened.

Catalog No.	Description	Price/Each
FB0517	Cage Litter, Natural Pine	$12.40

Cage Litter, Reptile



An ultra-absorbent cage litter for all types of reptiles. Litter is heat treated to eliminate infectious bacteria and parasites. Derived from a renewable, annually harvested plant, it is completely non-toxic and easily digested when swallowed. Use as a primary substrate for desert, forest, and tropical species or as a ground cover in terrariums. For tropical species, mist bedding daily—excess moisture will be absorbed and gradually released to maintain humidity. Eight-quart bag.

Catalog No.	Description	Price/Each
FB0698	Cage Litter, Reptile	$13.30

Naturebed™ Compressed Bedding



This 8" x 4" "brick" of super-compressed bedding expands in water and produces enough bedding to cover a 40-gallon terrarium. The compressed bedding is 100% natural coconut fiber which is ideal for iguanas, lizards, snakes, turtles, chameleons, tarantulas and other reptiles. It also works well for egg incubation studies, worm compost and hermit crab bedding.

Catalog No.	Description	Price/Each
FB1352	Naturebed Compressed Bedding	$10.35

Animals—Care Supplies, Fish

Aquariums, All-Glass®



Constructed of high-quality glass of unsurpassed clarity, strength and finish. Glass is bonded with clear, leak-proof sealing cement that will retain its clarity, pliability and strength for years. Top and bottom edges are protected by high-impact plastic moldings. Upper molding also secures hoods or screen covers and allows firm attachment for accessories.

Catalog No.	Description	Size (gal.)	Dimensions (L x W x H)	Price/Each
FB0210	Aquariums, All-Glass	5½	16" x 8" x 10"	$ 103.21
FB0211		10	20" x 10" x 12"	103.21
FB0212		20 (High)	24" x 12" x 16"	151.16
FB0213		29	30" x 12" x 18"	203.29

NOTE: Care must be taken to ensure installation of the aquarium on a strong, level surface. A full 29-gallon aquarium weighs well over 300 pounds! Installation on an uneven surface may result in stress-cracking of the glass.

Aquarium/Terrarium, Economy



Economical, clear plastic tanks for use as aquariums or terrariums. Molded foot pegs prevent scratching and temperature transfer. Rounded corners provide for easy cleanup. No-drip cover design channels condensation back into the tank. All sizes are available with flat, vented covers. The 1½-gallon tank is also available with a domed cover with a dial-type ventilator that regulates humidity for housing larger plants.

Catalog No.	Description	Capacity & Dimensions	Price/Each
FB0267	Aquarium/Terrarium, Economy	½ gal with Cover 5⅜" x 7" x 3¾"	$ 9.95
FB0268		1 gal with Cover 7" x 7" x 5"	11.65
FB0269		1½ gal with Cover 11" x 7" x 5"	17.55

ANIMALS—CARE SUPPLIES, FISH continued on next page.

Animals—Care Supplies, Fish, continued

Aquarium, Two-Gallon



Clear, heavyweight mini-aquarium of polished flint glass. Approximately two-gallon capacity. Drum aquarium measures 10½" x 6½" x 11".

Catalog No.	Description	Price/Each
FB0265	Aquarium, Drum, Two-Gallon	$31.25

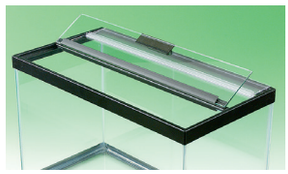
Aquarium Hoods



Constructed of a two-piece, precision molded, durable plastic frame that will not corrode or degrade. Full-length hinged panel provides access for routine maintenance, feeding, or manipulation of fish and plants. The removable strip light rests securely on the rear portion of the frame. Below the light is a fixed glass panel which protects the electrical components from splashes and allows for bulb changes without permitting fish to escape. At the rear of the hood are several cut-outs, designed for easy removal, which provide openings for various accessories (power filter, feeder, heater, etc.). Supplied with an instant-start, wide-spectrum fluorescent bulb.

Catalog No.	Description	Size	Fits Tank Size	Price/Each
FB0215	Aquarium Hoods	20"	10-, 15-gal (high)	$68.75
FB0216		24"	15-, 20-gal (high)	77.00
FB0217		30"	20- (long), 29-gal	96.49

Glass Canopy, Hinged



A glass canopy placed inside the rim of your aquarium/terrarium will greatly reduce evaporation, maintain humidity, provide support for accessories, and prevent escapes. The super-flex vinyl hinge will stay open by itself and permit easy access for feeding and maintenance. Clear vinyl back strip can be cut and trimmed to accommodate power cords and rim-mount accessories.

Catalog No.	Description	Length*	Tank Sizes	Price/Each
FB0682	Glass Canopy, Hinged	20"	10, 15H, 20X	$20.40
FB0683		24"	15, 20H, 25, 30X	29.11

*Glass measures ¾" less than outside dimension of aquarium.

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM

Strip Lights—Fluorescent



As a replacement light fixture for an existing aquarium hood or as a primary light source for Terrasets, terrariums, and reptile cages. Strip lights feature protected, internally-mounted ballasts, instant-start circuits, and include wide-spectrum fluorescent bulbs. Strip lights should only be placed over a screen top or glass canopy—never over open water.

Catalog No.	Description	Length	Price/Each
FB0687	Strip Lights—Fluorescent	20"	$59.95
FB0688		24"	58.87

Aquarium Kits



Available for 10-gallon and 20-gallon (High) aquariums. Basic Kits include:

10-Gallon Basic Kit: undergravel filter, twin-outlet air pump, 8" 50-watt heater, 3-gang valve, 4" air bar, 4" x 3" net, 8' tubing, thermometer, and beginner's handbook

20-Gallon (H) Basic Kit: undergravel filter, twin-outlet air pump, 10" 100-watt heater, 4-gang valve, 6" air bar, 6" x 5" net, 8' tubing, thermometer, and beginner's handbook

For maximum convenience, Complete Kits—including All-Glass® aquarium and full, fluorescent hood—are also available. Aquariums and hoods are the same as those listed elsewhere in this section.

Catalog No.	Description	Size and Type	Price/Each
FB0278	Aquarium Kits	10-Gallon, Basic	$141.75
FB0280		10-Gallon, Complete With Tank and Hood	255.20
FB0279		20-Gallon (High), Basic	124.41
FB0281		20-Gallon (High), Complete With Tank and Hood	345.60
FB0232	Replacement Cartridges, Pkg 2		9.27

NOTE: For immediate setup you will also need aquarium gravel, water conditioner/detoxifier, and food. See separate listings for each in this section.

Undergravel Filter



Twin lift tubes and a unique wavy plate design resist clogging and evenly draw water through the gravel bed—ensuring that the entire bed is available for bacterial breakdown of toxins. Gravel guards at the base of each lift tube and high collars prevent gravel and fish from getting beneath the plate. Also features long-lasting air diffusers for high-volume flow of bubbles and strong circulation. Includes two carbon cartridges for immediate setup. Requires an air pump for operation. Replacement cartridges are available. Monthly cartridge changes are recommended.

Catalog No.	Description	Tank Size	Dimensions	Price/Each
FB0231	Undergravel Filter	29-, 20-gal (Long)	12" x 30"	$51.75
FB0232	Replacement Cartridges for Undergravel Filters, Pkg. of 2			9.27

Power Filter with BIO-Wheel



Installed in conjunction with undergravel filters in tanks larger than 15 gallons and also in 10- or 15-gallon tanks with large fish populations. This unit filters aquarium water three ways—mechanically, chemically and biologically—and greatly improves overall circulation. The built-in pump first forces water through a layer of dual-density filter floss for removal of excess food and other particulates. Water next passes through a layer of activated charcoal for removal of discoloration, noxious odors and numerous chemical contaminants. The water-driven BIO-Wheel is the final step in the process. Alternately wet and dry as it rotates, the BIO-Wheel harbors cultures of aerobic bacteria which reduce potentially toxic ammonia and nitrite on contact.

Filter cartridges, which contain the filter floss and charcoal, are quickly and easily replaced. The unit housing is designed with an overflow window which operates as a visual indicator of when a new cartridge is needed. Replacement cartridges are listed below.

Catalog No.	Description	Price/Each
FB0233	Power Filter with BIO-Wheel	$68.80
FB0234	Power Filter Cartridges, Pkg. of 3	16.50

Hard Water Problems?

Mineral and scale building up on the inside of aquaria is an indicator of excessively hard (high mineral content) water. To offset this, tap water should be mixed with distilled water (or softened water) before putting it in the tank. Try a ratio of 1 part distilled to 2 parts tap. When replacing evaporative loss, always use distilled water only. Scale and mineral deposits can be removed from glass surfaces by scraping carefully with a razor blade.

ANIMALS—CARE SUPPLIES, FISH continued on next page.

Animals—Care Supplies, Fish, continued

Aquarium Filter Carbon



100 percent pure granular carbon for corner filters and anywhere loose-fill carbon is used. Supplied in a 14 oz package.

Catalog No.	Description	Price/Each
FB0258	Aquarium Filter Carbon, 14 oz	$16.75

Aquarium Air Pumps



The thick, rubber base and feet dampen vibrations for smooth, quiet, no-slip operation and elevate the housing for added electrical insulation and protection from spilled water. These pumps also feature unique silicone polymer (Silaflex®) flapper valves. Air pollutants cause standard valves to curl and deteriorate—resulting in a gradual loss of airflow and pressure. Super resistant polymer valves offer much longer life and little or no decrease in performance over time.

NOTE: Pumps operate on standard 115 AC current, accept standard tubing and carry a limited 2-year warranty.

Catalog No.	Description	Model	Tank Size	Price/Each
FB0218	Aquarium Air Pumps	Whisper® 40 Single Outlet	Up to 40 gal	$37.50
FB0220		Whisper® 100 Dual Outlet	Up to 100 gal	66.85

Airline Tubing



Vinyl-plastic tubing in the standard size for all aquarium pumps and accessories. Wall thickness of 1⁄16" and an inside diameter of 1⁄8".

Catalog No.	Description	Length	Price/Each
AP8373	Tubing, Plastic	10 feet	$ 8.25
AP1161		50 feet	31.85

Air Stone



The best choice for supplementary aeration in large tanks and primary aeration in small (five gallon or less) tanks. The cylindrical stone can also be used as a diffuser/circulator in undergravel filter lift tubes.

Catalog No.	Description	Type/Size	Price/Each
FB0262	Air Stone	Cylindrical 7⁄16" Diam	$2.39

Bubble Wall Aerator



Improve aeration, circulation and appearance with this easy-to-install aquarium accessory. Place it just above gravel level at the rear or side of the aquarium to produce an attractive "wall" of bubbles. Made of porous tubing that is virtually non-clogging, can be effectively cleaned, and will outlast every other type of aerator. 10" in length.

Catalog No.	Description	Price/Each
FB0264	Bubble Wall Aerator	$13.70

Aquarium Heater, Submersible Type



Compared to rim-mount heaters, submersible heaters offer accuracy (±1 °F vs. ±3 °F), safety, tamper resistance, and greater versatility in placement. A directly adjustable control stem allows you to dial in the temperature setting you want. Limiting stops prevent accidental adjustments to extremely low or high temperatures. Internal and external seals provide outstanding protection from leakage.

Engineered for either fresh- or saltwater aquariums with an operating range of 18–32 °C (65–89 °F). Supplied with two secure suction mounting clamps. Powered by 115 V AC. Select the proper wattage for your size aquarium, allowing a minimum of five watts per gallon.

Catalog No.	Description	Watts	For Tank Size	Price/Each
FB0226	Aquarium Heater, Submersible Type	50	5–10 gal	$51.87
FB0227		100	15–20 gal	55.00
FB0228		200	20–40 gal	61.58

Aquarium Thermometer



Accurate liquid crystal thermometer offers an excellent alternative to floating or inside-mount instruments. Thermometer measures over a range from 65–85 °F with an accuracy of ±1 °F. Peel-and-stick backing permits you to mount the thermometer anywhere on the outside surface of glass aquariums. Recommended placement below the water line on the front of the aquarium opposite the heater. Can be repositioned. 5¼" x ¾".

Catalog No.	Description	Tank Size	Price/Each
FB0238	Aquarium Thermometer	Large	$7.35

Aquarium Gravel



An attractive, natural-look gravel for aquariums. Coated and sealed—it will not bleach, leach or produce any particles or cloudiness in your tank. Supplied in convenient five-pound bags. You should allow for a minimum of one pound of gravel per gallon.

Catalog No.	Description	Price/Each
FB0261	Aquarium Gravel, 5 lb Bag	$7.65

Aquarium Plants, Live See page 497.

Aquarium Nets



Extra soft nylon nets. The extra-long, three-wire, vinyl-coated handle/grip is fully protected from corrosion and will not scratch glass or plastic. Nets are equipped with a device for hanging on the rim of the aquarium.

Catalog No.	Description	Size	Price/Each
FB0247	Aquarium Nets	5"	$ 5.85
FB0248		10"	11.00

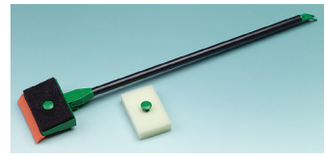
Aquarium Breeding and Isolation Net



Isolate fry as well as injured or aggressive fish within your aquarium. Frame attaches to the side of the aquarium, with the top above the waterline so that the isolated fish will be inaccessible to the rest of the fish. The frame can be dismantled for easy storage.

Catalog No.	Description	Price/Each
FB1943	Aquarium Breeding and Isolation Net	$14.95

Aquarium Scraper/Cleaner



An effective cleaner, a non-scratching scraper, and a planting tool—all in one! The extra-long 38-cm handle keeps hands dry and permits access to all corners of the tank. Supplied with a coarse sponge for tough cleaning and a soft sponge for routine cleaning—both are reversible for extended wear. Extra wide molded-in scraper makes algae removal a breeze.

Catalog No.	Description	Price/Each
FB0245	Aquarium Scraper/Cleaner	$13.50

Aquarium Siphon/Cleaner



The aquarium siphon/cleaner can remove water for exchange, and clean aquarium gravel at the same time. The siphon action of the water flowing out will draw the gravel halfway up the large plastic barrel. As the gravel is suspended and agitated, accumulated debris and waste are pulled off. Fast, efficient and effective. The medium size siphon is appropriate for tanks up to 20 gallons. For larger tanks, the large model is the best choice.

Catalog No.	Description	Size	Price/Each
FB0240	Aquarium Siphon/Cleaner	Medium	$17.25
FB0241		Large	26.50

ANIMALS—CARE SUPPLIES, FISH continued on next page.

Animals—Care Supplies, Fish, continued

Aquarium Sealant



A clear, 100% silicone rubber sealant formulated specifically for freshwater and marine aquariums. Formulation is completely non-toxic to fish, plants and invertebrates. For bonding glass, metal or plastic. Supplied in a tube with an applicator nozzle that can be trimmed to desired bead size.

Catalog No.	Description	Price/Each
FB0260	Aquarium Sealant, 2.8 oz Tube	$16.75

Fish Food, TetraMin



Non-clouding flakes provide your fish with a vitamin-enhanced, balanced diet.

Catalog No.	Description	Size	Price/Each
FB1267	Fish Food, TetraMin®	100 g (3.53 oz)	$17.71
FB0244		200 g (7.1 oz)	30.35

Automatic Fish Feeder



Automatic feeder will deliver a measured quantity of flake food twice daily for up to four weeks. Powered by one AA battery—not included.

Catalog No.	Description	Price/Each
FB0239	Automatic Fish Feeder	$46.00

Vacation Feeders

Blocks contain food pellets and freeze-dried fish in a calcium sulfate matrix. Seven-day feeder will feed up to 20 average sized fish in a 10 gallon tank for 7 to 8 days. Ten-day feeder is for 15 average sized fish, in 10–15 gallon tanks, for 10 to 14 days.

Catalog No.	Description	Size	Price/Each
FB0605	Vacation Feeder	Ten-day	$6.70

Aquarium Test Strips



Test for alkalinity, chlorine, hardness, nitrate, nitrite, and pH, all with one single, easy-to-use test strip. Each bottle contains 25 test strips plus color comparison charts.

Catalog No.	Description	Price/Each
FB1944	Aquarium Test Strips	$25.75

Aquarium Water Conditioner



Stress Coat® with aloe vera. Use it at any time fish are subjected to thermal, chemical or environmental stress. Four-ounce container treats 240 gallons of fresh or salt water.

Catalog No.	Description	Price/Each
FB0250	Aquarium Water Conditioner, 4 oz	$11.00

Aquarium Water Detoxifier



Ammo-Lock® will remove the two chemicals most commonly used to treat municipal water supplies—chlorine and chloramine—both of which are highly toxic to fish and invertebrates. Ammo-Lock® will also convert ammonia produced by fish waste to a harmless compound. Four-ounce bottle treats 240 gallons of fresh or salt water.

Catalog No.	Description	Price/Each
FB0249	Aquarium Water Detoxifier, 4 oz	$10.31

Algae Control



Formulated for use in freshwater aquariums and ponds that contain live plants and fish.

Catalog No.	Description	Price/Each
FB1945	Algae Control	$19.22

Animals—Care Supplies, Invertebrates

Brine Shrimp *(Artemia)* Hatchery



A single hatching will produce hundreds of thousands of brine shrimp larvae for use as fish food, feeding experiments with Hydra, or simply observing a crustacean and its life cycle. Includes one-liter hatchery, collecting vial, three packets of hatch mix, and instructions.

Catalog No.	Description	Price/Each
FB0562	Brine Shrimp Hatchery	$30.50

Marine Salts—Instant Ocean



Instant Ocean® marine salt mixture. Uniform particle size ensures consistency and permits preparation of any volume of water. Solution is crystal clear, the proper pH, and is ready to use immediately. Package prepares 38 liters (10 gallons).

Catalog No.	Description	Price/Each
FB0421	Marine Salts—Instant Ocean	$15.10

Choice Chambers



Study animal behavior with this affordable choice chamber! A connecting tunnel between two chambers allows small invertebrates to move back and forth, demonstrating habitat selection and preference influenced by abiotic and biotic factors. Each dish is 3¼" diameter and ½" deep, and the passageway is ½" wide.

Catalog No.	Description	Price/Pkg.
FB2069	Choice Chambers	$5.90

Worm Composting Kit



Start an agricultural revolution in your classroom with the equipment and instructions in this kit. The cycle begins when students prepare the bin, introduce the worms and add the first food scraps. Bin maintenance is simple and, if proper conditions are met, the system remains odorless. The cycle is complete when students grow plants in the rich, organic soil they harvest from the bin.

Kit includes a tough, recycled plastic bin (19" x 18" x 12") with snap-on lid, ventilation tubes, vent covers, garden fork and a copy of the book *Worms Eat My Garbage*. Redworms and compressed bedding are required and available separately.

Catalog No.	Description	Price/Each
FB2209	Worm Composting Kit	$110.50
LM1178	Redworms (*Eisenia foetida*), Pkg. of 100	37.20
FB1352	Naturebed™ Compressed Bedding	10.35

Worm Farm



All the materials necessary for maintaining healthy worms are included. An insulated, eight quart container with built-in ventilation plugs maintains proper temperature and prevents suffocation. The worm bedding provides optimal consistency and water retention capacity and the worm food meets all dietary needs. Bedding will support 100 nightcrawlers per pound or roughly twice as many smaller worms. Worms can be kept for several months. Food requirements will depend on number of worms being maintained. Bedding and food are also available separately.

The complete kit includes the 8⅝" x 12" x 7⅜" container with sturdy built-in handle, 1½ pounds of bedding and 4 ounces of food, with complete instructions.

Catalog No.	Description	Price/Each
AB1414	Worm Farm—Complete	$23.81
AB1415	Worm Bedding—1½ lb Pkg.	5.45

ANIMALS—CARE SUPPLIES, INVERTEBRATES continued on next page.

Animals—Care Supplies, Invertebrates, continued

Vials, *Drosophila* Culture



Clear, polystyrene vials. Vials measure 4" H x 1¼" W—the standard size for *Drosophila* culture. Foam plugs (available separately) fit snugly in place, allowing cultures to breathe. Vials can be sterilized with a dilute bleach solution if desired. Supplied in packages of 10.

Catalog No.	Description	Price/Pkg. of 10
AB1423	Vials, *Drosophila* Culture	$10.05

Plugs, Foam, White

Plastic foam plugs are autoclavable and reusable. Plugs throw no fibers or lint and allow cultures to breathe. Will fit containers with mouth diameters of 1" to 1⅜" (27–34 mm). Supplied in packages of 10.

Catalog No.	Description	Container Diam.	Price/Pkg. of 10
AB1392	Plugs, Foam, White	27–34 mm	$6.25

Anesthetizer, Lull-A-Fly™ Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Lull-A-Fly will anesthetize *Drosophila* for up to 45 minutes without killing or sterilizing them. Besides working like a charm, Lull-A-Fly is a much safer alternative than ether. The small-tipped applicator allows anesthetization right in culture bottles, and the amount required is minimal and, therefore, less expensive.

Each kit contains 15 mL of Lull-A-Fly (150 doses), 15 anesthetic wands, a morgue container and complete directions for use.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
FB1438	Lull-A-Fly Kit	$13.65

Animals—Care Supplies, Protists

Protozoan Culture Media



Catalog No.	Description	Package Size	Price/Each
FB1820	Bristol's Algae Media Concentrate	100 mL	$10.20

Quieting/Slowing Solution for Protozoa



Nontoxic methyl cellulose (3.0%) solution for slowing the movements of protozoa. The high viscosity of a drop of this solution added to a wet-mount preparation will slow (or cease) movement while students make careful observations.

Catalog No.	Description	Pkg. Size	Price/Each
M0171	Quieting/Slowing Solution for Protozoa	100 mL	$10.55

NewPath Learning Guides for Life Science



The NewPath Learning Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11529	Life Science Student Learning Guides with Online Lessons, Set of 10	$104.00

Animals—Animal Study Kits

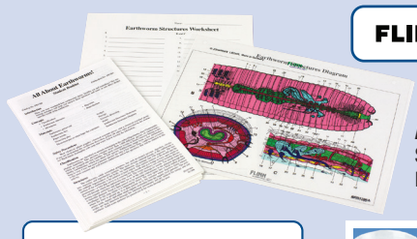
FLINN360science™: Fruit Fly Behavior



This kit presents the essential concepts of animal behavior, chemotaxis, geotaxis, and phototaxis through hands-on science activities designed to engage all your students, regardless of level. By completing this investigation students gain a better understanding of the group of behavioral responses called taxis. By developing understanding taxis students can start considering more advanced questions on how a behavior impacts fitness and consider the evolutionary history of the behavior. Teachers can extend learning through guided inquiry into associated phenomena including "animal behavior."

Catalog No.	Description	Digital Access	Price/Each
AP10674	360Science: Fruit Fly Behavior	1-Year	$112.00
AP10774		3-Year	123.63

FLINN EXCLUSIVE



All About Earthworms! Super Value Laboratory Kit FB1786

FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM



Stuck-on *Artemia*—Student Laboratory Kit FB1605

Catalog No.	Description	Price/Each
FB0751	*Drosophila*—Laboratory Equipment Kit	$ 93.95
FB1257	Metabolism Experiment Kit	109.46
FB0571	Antopia Rainforest Ant Farm Kit	39.50
FB1669	Nematode Study Kit	114.68
FB2098	Follow Those Pheromones—Super Value Guided-Inquiry Kit	47.25
FB1605	Stuck-on *Artemia*—Student Laboratory Kit	66.55
FB1627	LD_{50} Bioassay for Measuring Toxicity—Student Laboratory Kit	32.05
FB1786	All About Earthworms!—Super Value Laboratory Kit	31.50
FB2002	Studying Heart Rate Using *Daphnia*—Student Laboratory Kit	45.35
FB1929	Characteristics of Protists—Student Laboratory Kit	78.75

3D Bug Specimen Kit #1



A set of 4 real, 3D insect specimens perfectly preserved in resin. These specimens are ideal for observing with a stereoscope or magnifying glass. Crystal clear resin lets you observe the insects from all angles. Includes: scorpion with pincers and a stinger, blackish stag beetle, longhorn beetle with dramatic antennae, and bright red fire bug.

Catalog No.	Description	Price/Each
AP11631	3D Bug Specimen Kit #1	$12.95

ANIMALS—ANIMAL STUDY KITS continued on next page.

Animals—Animal Study Kits, continued

3D Bug Specimen Kit #3



A set of 4 real, 3D insect specimens perfectly preserved in resin. These specimens are ideal for observing with a stereoscope or magnifying glass. Crystal clear resin lets you observe the insects from all angles. Includes: jewelled frog beetle, golden cicada with large wings, small stag beetle, and ant preserved with a red bean.

Catalog No.	Description	Price/Each
AP11633	3D Bug Specimen Kit #3	$15.95

3D Bug Specimen Kit #4



A set of 4 real, 3D insect specimens perfectly preserved in resin. These specimens are ideal for observing with a stereoscope or magnifying glass. Crystal clear resin lets you observe the insects from all angles. Includes: Chinese Scorpion (*Buthus martensi Karsch*), Golden Cicada (*Proretinata vemacula*), Spiny Orb-weaver (*Gasteracantha sp.*), and Golden Spotted Leaf Beetle (*Oides duporti Laboissiere*).

Catalog No.	Description	Price/Each
AP11634	3D Bug Specimen Kit #4	$15.95

3D Bug Specimen Kit #5



A set of 4 real, 3D insect specimens perfectly preserved in resin. These specimens are ideal for observing with a stereoscope or magnifying glass. Crystal clear resin lets you observe the insects from all angles. Includes: Asian Giant Hornet (*Vespa mandarinia Smith*), Cupreous Chafer (*Anomala cuprea*), Ant (no common name) (*Camponotus pseudoirritans*), and Jewelled Frog Beetle (*Sagra femorata purpurea Lichtenstein*).

Catalog No.	Description	Price/Each
AP11635	3D Bug Specimen Kit #5	$15.95

PaperFin Printing Kit

NEW!



The PaperFin Printing Kit revolutionizes the traditional art of fish printing (Gyotaku) by eliminating ink and introducing a safe, non-toxic alternative. This kit allows you to create lifelike replicas of fish specimens, leaves, and other biological treasures. Whether you're teaching marine biology, ecology, or simply fostering creativity, our ink-free process provides an engaging and educational experience.

Contains 4 sheets of 11¼" x 17¼" specially coated printing paper. Four inkless printing towelettes. Comes with detailed instructions, and mailed in stay flat envelope.

Catalog No.	Description	Price/Each
AP11762	PaperFin Printing Kit	$28.00

Sponge Spicule Lab

NEW!



This two-part classroom activity comes with six distinct sponge samples, each with a unique spicule type. Each kit has enough tissue for approximately 80 students working in pairs. A written procedure for set-up and teacher preparation is included, along with a student worksheet and key. The lab requires only simple lab tools (tweezers, microscope and slides) and household bleach.

Catalog No.	Description	Price/Each
AP11761	Sponge Spicule Lab	$45.95

Turtle Dichotomous Key Activity

NEW!



This activity is a great introduction to using a dichotomous key for species identification. The kit includes eight distinct sea turtle models. Each turtle is 2" length the kit comes complete with all the paperwork needed for background information.

Catalog No.	Description	Price/Each
AP11763	Turtle Dichotomous Key Activity	$16.95

Animals—Insect Study Supplies

Beginning Entomology Kit

FLINN EXCLUSIVE



This introductory kit includes a Peterson insect guide that discusses all the basic entomology techniques. Complete kit includes all materials needed to start right away: collecting jars, vials, preserving bottles, insect pinning forceps, student insect collecting net, insect preserving kit with all necessary chemicals, insect pinning board, insect pins and field magnifying bug boxes.

Catalog No.	Description	Price/Each
FB1579	Beginning Entomology Kit	$147.45

Butterfly Habitat



Lightweight and easy-to-hang. See-through mesh with a zippered entry allows for easy care and feeding. 24" tall.

Catalog No.	Description	Price/Each
FB2092	Butterfly Habitat	$26.10

Insect Net, Student

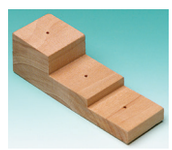


A practical, inexpensive and durable aerial net for beginning entomologists. The net bag is 12" in diameter and is made of strong polyester netting with muslin reinforcing band around the top. The smooth maple handle is 18" long. Other construction features are identical to those described for the Standard Sweep insect net.

Catalog No.	Description	Price/Each
FB0019	Insect Net, Student	$34.40

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Insect Pinning Block



Increase student success pinning small insects using predrilled pinning blocks. Pins stand straight and insects are held upright during the drying process. The three steps on the one-piece block allow for various sizes of insects to be pinned simultaneously.

Catalog No.	Description	Price/Each
FB1652	Insect Pinning Block	$5.75

Insect Pins



Spring steel pins with extremely fine, sharp points and nylon heads. Pins are coated with a very smooth, corrosion-resistant black enamel finish. Packages of 100 pins; length of all sizes is approximately 38 mm.

Catalog No.	Description	Size	Price/Pkg.
FB0667	Insect Pins	00	$15.52
FB0668		0	15.52
FB0669		1	15.85
FB0670		2	15.85
FB0671		3	15.52

ANIMALS continued on next page.

Animals—Owl Pellets

Owl Pellets



Each pellet is individually wrapped and sterilized. Flinn publishes a unique exercise, one of our BSCS Bio-Labs™, using owl pellets called *The Mysterious Yuk*, which is available separately.

Catalog No.	Description	Package Size	Price/Each
FB0095	Owl Pellets	15	$ 80.00
FB1469		50	230.50

Owl Pellet—NewPath Resource Guides and Flip Chart Set

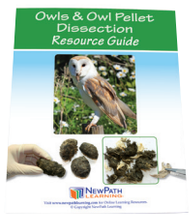


This is perfect for the classroom as well as group and independent learning. Spiral-bound in a stable, freestanding easel, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Set of 10 charts.

Catalog No.	Description	Price/Each
AP10744	Owl Pellet—NewPath Science Flip Chart Set	$49.07
AP11658	Owl Pellet Flip Chart with Online Multimedia Lesson	56.05
AP11659	Owl Pellet Dissection Resource Guide with Online Multimedia Lesson	22.00

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM

Owl Pellet Dissection & Prey Identification—NewPath Visual Learning Guide



Owl Pellet Dissection & Prey Identification Visual Learning Guide provides comprehensive coverage of owl pellets and how they form. Each 11" x 17" guide includes four panels of helpful information, including an overview, practice exercises, a graphic organizer and assessment and review questions. Each laminated Write-On/Wipe-Off guide provides an engaging way to study owl pellets. Set of 10.

Catalog No.	Description	Price/Each
AP10745	Owl Pellet Dissection & Prey Identification—NewPath Visual Learning Guide	$44.19

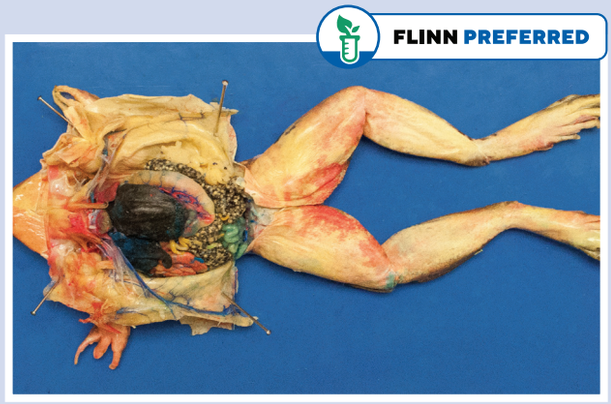
Owl Pellet Poster Set



Eight full-size posters for classroom display. The set includes: a food web diagram, a bone sorting chart, a vole skeleton, a shrew skeleton, a mole skeleton, a bird skeleton, a pellet formation diagram, and a human/vole skeleton comparison chart. Skeletal posters have all major bones clearly identified. Clearly printed in black ink on bright white paper, each chart measures 17" x 23".

Catalog No.	Description	Price/Each
FB0428	Owl Pellet Poster Set	$42.37

Flinn-Preferred™ Preserved Specimens



Flinn-Preferred Preserved Specimens are safe, non-toxic alternatives to formaldehyde preparations. These specimens retain a more lifelike and natural appearance and have not been exposed to formaldehyde at any point. Look for the Flinn-Preferred symbol!

- Flinn offers a wide variety of preserved specimens from fetal pigs and mink to rats, pigeons, worms, turtles, mollusks, grasshoppers and much more!
- We stand behind our products with a 100% satisfaction guarantee.
- Specimens are available plain or injected with latex. Single injected specimens highlight the arterial system with red latex. Double injected specimens show the arterial system with red latex and the venous system with blue latex. Triple injected specimens have the same red and blue, but also show the hepatic-portal system with yellow latex.
- We have a large selection of classroom kits, explorer labs and survey sets also available. See page 334.



Flinn-Preferred™ Fetal Pigs

These non-toxic specimens have not been exposed to formaldehyde at any point in their processing.

Catalog No.	Description	Size	Vascular System	Price/Each 1-32	Price/Each 33-64	Price/Each 65 or more
PM4060*	Flinn-Preferred Fetal Pig	Medium 7"–11"	Plain	$30.75	$29.19	$27.71
PM5460			Single	33.66	31.98	30.24
PM4070*			Double	34.00	32.30	30.70
PM4090		Large 11"–13"	Plain	33.66	31.98	31.88
PM5465			Single	37.75	35.87	34.04
PM5000			Double	37.75	35.87	35.70
PM5470		Extra-Large 14"+	Plain	39.25	37.29	35.33
PM5475			Single	42.00	39.92	37.80
PM5480			Double	45.00	42.75	40.50

*Availability is limited. Please contact Flinn for estimated delivery times.

ANIMALS—PRESERVED SPECIMENS continued on next page.

Animals—Preserved Specimens, continued

Complete Pack™ Fetal Pig Dissection Set

FLINN EXCLUSIVE

Contains everything you need to perform a fetal pig dissection in a single product—save valuable lab preparation time! Includes:

- Fetal pig, double-injected, 7"–10"
- Polystyrene dissection tray
- Disposable dissection probes, 2
- Scalpel, auto-retractable
- Dissection pins, 20
- Cotton string
- Resealable bag
- *Flinn Fetal Pig Dissection Guide*
- Scissors, surgical, sharp/blunt, straight, 4½"

Complete for one student group. All materials are reusable with the exception of the preserved specimen.

Catalog No.	Description	Price/Each
FB1977	Complete Pack Fetal Pig Dissection Set	$57.05

Fetal Pigs

Sus scrofa. The preferred specimen for the study of mammalian anatomy due to its size, economy, availability and anatomical similarities to humans. Measured from snout to base of tail.

Catalog No.	Description	Size	Vascular System	Price/Each 1–32	Price/Each 33–64	Price/Each 65 or more
PM5450	Fetal Pig, Preserved	Small 5"–7"	Plain	$21.42	$20.34	$19.25
PM3025		Medium 7"–10"	Plain	25.65	24.37	24.26
PM3030*			Single	26.00	24.68	24.52
PM3035*			Double	28.30	26.90	25.55
PM3055		Large 10"–13"	Plain	26.20	24.92	24.81
PM3060			Single	29.60	28.11	28.06
PM3065			Double	30.50	28.98	28.87
PM5110*		Extra Large 14"+	Plain	34.43	32.72	32.61
PM5115			Single	35.96	34.17	34.06
PM5120			Double	36.50	34.68	34.57

*Availability is limited. Please contact Flinn for estimated delivery times.

Fetal Pig Digital Bundles

Enhance the student dissection experience by bundling 10 preserved fetal pigs with Flinn's exclusive Digital Dissection Labs. Digital content includes detailed background information, diagrams, videos, quick quizzes and drag-and-drop interactive content. Kits includes 10 preserved fetal pigs and digital access for 1 year.

Catalog No.	Description	For Specimen	Price/Each
AP10984	Fetal Pig Digital Bundles	7–10"	$279.00
AP10985		10–13"	365.80



Rabbits

Oryctolagus cuniculus. Great alternative to cat dissection.

Catalog No.	Description	Type	Vascular System	Price/Each	Price/Each 10 or More
PM5220	Rabbit, Preserved	Male	Plain	$60.10	$57.10
PM5225		Female	Plain	60.10	57.10
PM5230		Male	Double	47.98	45.59
PM5235		Female	Double	68.20	64.78
PM5240		Male	Triple	25.39	—
PM5245		Female	Triple	23.41	—
PM5760		Skinned	Plain	67.86	64.48
PM5815		Skinned, Pregnant	Double	95.00	90.25

Cat

Felis domesticus. Good specimen for the detailed study of mammalian anatomy and the careful examination of muscular, circulatory and nervous systems. Carefully embalmed and well-extended. Measured from nose to base of tail. Sizes as indicated.

Availability is limited. Please contact Flinn for estimated delivery times.

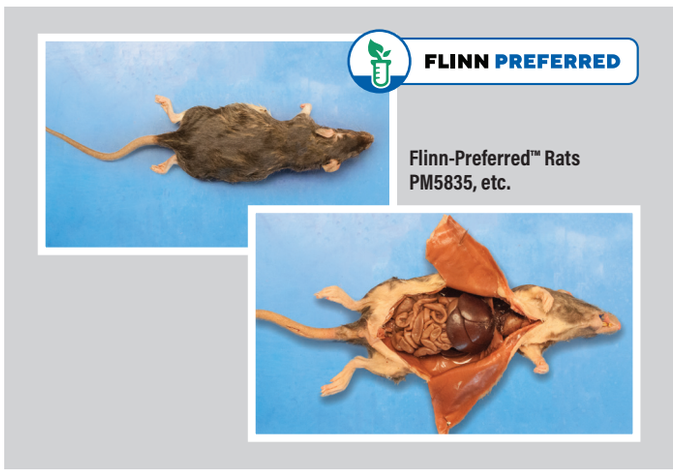
Catalog No.	Description	Size	Type	Vascular System	Price/Each	Price/Each 10 or More
PM5025	Cat, Preserved	14"–19"	—	Plain	$73.00	$69.34
PM5080				Double	97.00	—
PM5020		19"–23"		Plain	82.60	78.45
PM3070				Double	89.00	—
PM3075				Triple	95.43	90.65
PM5030		19"–23"	Skinned	Plain	85.00	80.76
PM3085				Double	99.00	94.06
PM3090				Triple	94.36	89.64

NOTE: Our cats are obtained only from licensed animal shelters following euthanasia. At Flinn, it is our intent to be ethical in our choice of sources and responsive to our customers' concerns. Careful attention is given to each order to ensure that the majority of specimens you receive are neither neutered nor spayed.

Rats

Popular for the study of basic mammalian anatomy, compact and readily available.

Catalog No.	Description	Vascular System	Price/Each	Price/Each 10 or More
PM3005	Rat, Preserved 7" and up	Plain	$11.50	$10.92
PM3010		Single	15.30	14.56
PM3015		Double	15.50	14.74
PM3020		Triple	18.10	17.19
PM5855	Rat, Preserved, Pregnant, 7"–9"	Double	20.00	18.98



Flinn-Preferred™ Rats

These non-toxic specimens have not been exposed to formaldehyde at any point in their processing.

Catalog No.	Description	Type	Vascular System	Price/Each 1–9	Price/Each 10 or More
PM5835	Flinn-Preferred Rat, 7"–9", Vacuum Packed	—	Plain	$12.25	$11.62
PM5840			Single	16.00	15.21
PM5845			Double	16.00	15.20
PM5850			Triple	18.00	17.09
PM5865		Pregnant	Double	21.00	19.97
PM5870		Pregnant	Triple	21.80	20.70

Rat, Sectioned, Pro-Sect™

This permanent safe-to-handle display includes an 8"–9" partially-dissected rat with arteries color-coded in red and veins color-coded in blue. One kidney has been dissected. Includes a comprehensive instructional guide, transparent identification overlay, test overlay, and reproducible test sheet.

Catalog No.	Description	Price/Each
PM5090	Rat, Sectioned, Pro-Sect	$209.25

ANIMALS—PRESERVED SPECIMENS continued on next page.

Animals—Preserved Specimens, continued

Mink
Mustela vison. In comparison to cats, mink possess more complex musculature and a simpler digestive system.

Catalog No.	Description	Vascular System	Price/Each	Price/Each 10 or more
PM5005	Mink, Preserved, 13"–17"	Plain	$35.85	$34.06
PM5010		Double Injected	62.00	58.89
PM5015		Triple Injected	45.40	43.17

Mink Dissection Guide
A complete dissection guide for the mink for classes in general and vertebrate biology. 60 pages, spiral bound.

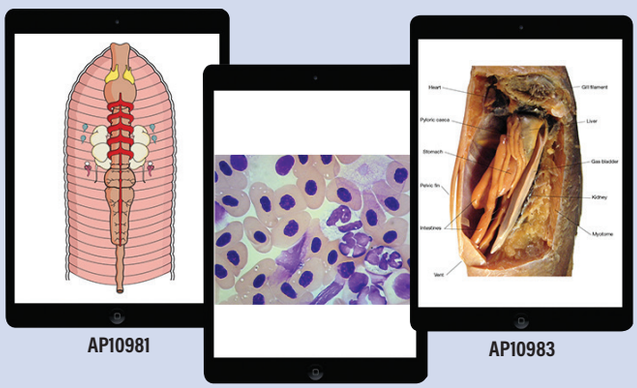
Catalog No.	Description	Price/Each
AP10177	Mink Dissection Guide	$20.80

Flinn-Preferred™ Rabbits
These non-toxic specimens have not been exposed to formaldehyde at any point in their processing.

Catalog No.	Description	Type	Vascular System	Price/Each 1-9	Price/Each 10 or More
PM5740	Flinn-Preferred Rabbits	—	Plain	$ 61.45	$58.39
PM5745			Double	69.40	65.93
PM5780		Skinned	Plain	72.67	69.06
PM5785		Skinned	Double	81.28	77.20
PM5805		Pregnant	Double	102.30	97.20
PM5825		Skinned, Pregnant	Double	107.07	—

Mouse
Vacuum-packed packages of 10. Plain.

Catalog No.	Description	Price/Each
PM5630	Mouse, Preserved	$34.05



AP10981 AP10982 AP10983

Complete Classroom Dissection Kits
Step up the dissection game and save with Flinn's complete classroom dissection kits! Each kit comes with all of the consumable dissection items you need for the whole class—ten preserved specimens, dissection trays and resealable bags—plus 10 copies of the informative, step-by-step Flinn Scientific dissection guide and access to Flinn's digital Dissection Lab for up to 30 users for 1 year.

Catalog No.	Description	Animal	Price/Each
AP10981	Complete Classroom Dissection Kits	Earthworm	$135.00
AP10982		Grass Frog	88.90
AP10983		Fish	91.85

Pigeons, Preserved
Vacuum packed specimens. Sold in packages of 10, except for the triple-injected, which is sold individually.



Catalog No.	Description	Vascular System	Price/Pkg.
PM5720	Pigeons, Preserved	Plain	$139.00/10
PM5725		Single	148.54/10
PM5730		Double	181.75/10
PM5735		Triple	20.60/1



Sheep Brain
PM3095



Sheep Heart
PM4000



Pig Kidney
PM4025



Cow Eye
PM4030

Sheep Organs

Catalog No.	Description	Price/Pkg.
PM3095	Sheep Brain with Cranial Nerve Roots	$18.80/1
PM5070	Sheep Half Brain	89.00/10
PM4000	Sheep Heart	14.70/2
PM4010	Sheep Eye	14.50/10
PM5935	Sheep Heart with Pericardium	11.63/1
PM5940	Sheep Brain, Sagittal	15.30/1
PM5945	Sheep Brain with Eyes	42.84/1
PM5950	Sheep Brain without Dura Mater or Hypophysis	26.85/1
PM5960	Sheep Brain, Fully Extracted with Dura Mater and Hypophysis	25.50/1
PM5970	Sheep Kidney, Plain	7.30/1
PM5975	Sheep Pluck, Plain	20.20/1

Cow Organs

Catalog No.	Description	Price/Pkg.
PM4030	Cow Eye	$21.50/5
PM5075	Heart (Calf)	31.80/1

Pig Organs

Catalog No.	Description	Price/Pkg.
PM4015	Pig Heart	$22.44/2
PM4020	Pig Heart with Pericardium	24.30/2
PM4025	Pig Kidney	35.00/5
PM5710	Pig Kidney, Double	10.45/1
PM5715	Pig Kidney, Triple	11.90/1

ANIMALS—PRESERVED SPECIMENS continued on next page.

Animals—Preserved Specimens, continued

Bullfrogs

Rana catesbeiana or *Rana grylio*, the bullfrog presents a larger alternative to the grass frog. Measurements from nose to cloaca.

Catalog No.	Description	Size	Vascular System	Price/Each 1-9	Price/Each 10 or More
PM2070	Bullfrog, Preserved	Large 5"–6"	Plain	$16.32	$15.53
PM2075			Single	17.81	17.01
PM2080			Double	20.00	18.99
PM5315			Triple	20.80	19.77
PM2085		Extra Large 6"–7"	Plain	19.38	18.41
PM2090			Single	22.35	21.22
PM2095			Double	24.50	23.28
PM3000			Triple	25.27	23.98





Flinn-Preferred™ Bullfrogs

These non-toxic specimens have not been exposed to formaldehyde at any point in their processing.

Catalog No.	Description	Type	Vascular System	Price/Each 1-9	Price/Each 10 or More
PM5275	Flinn-Preferred Bullfrogs	Large 5"–6"	Plain	$15.60	$14.83
PM5280			Single	16.50	15.66
PM5285			Double	19.11	18.14
PM5295		Extra Large 6"–7"	Plain	19.75	18.75
PM5300			Single	23.00	21.83
PM5305			Double	24.25	23.06
PM5310			Triple	26.00	24.68





Complete Pack™ Frog Dissection Set

FLINN EXCLUSIVE

By: The Flinn Staff

Contains everything you need to perform a frog dissection in a single product! Includes 5"–6" frog, double-injected, polystyrene dissection tray, 2 disposable dissection probes, scalpel, auto-retractable, 20 dissection pins, cotton string, resealable bag, *Flinn Frog Dissection Guide,* and 4½" scissors, surgical, sharp/blunt, straight.



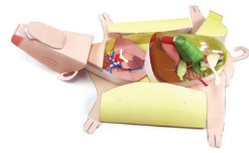
Complete for one student group. All materials are reusable with the exception of the preserved specimen.

Catalog No.	Description	Price/Each
FB2297	Complete Pack Frog Dissection Set	$42.25

Fetal Pig Dissection 3-D Model Kit

NEW!

Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.



Catalog No.	Description	Price/Each
AP11689	Fetal Pig Dissection 3-D Model Kit	$69.95



Grass Frogs
PM2035, etc.



Flinn-Preferred Grass Frogs
PM5545, etc.

Grass Frogs

Lithobates (formerly *rana*) *pipiens*. Presented as an intermediate between fish and mammals. Sizes as indicated.

Catalog No.	Description	Size	Vascular System	Price/Pkg. 1-9 Pkgs.	Price/Pkg. 10 or More Pkgs.
PM2035	Grass Frog, Preserved Package of 10	3"–4"	Plain	$ 42.00	$ 39.89
PM2040			Single	55.00	52.23
PM2045			Double	65.00	61.76
PM2050		4"–5"	Plain	67.35	62.98
PM2055			Single	83.50	79.32
PM2060			Double	93.00	88.36
PM2065			Triple	114.30	108.46
PM5505		5"+	Plain	89.00	—
PM5510			Single	102.00	—
PM5515			Double	112.00	—
PM5520			Triple	120.00	—
PM5035	Grass Frog, Preserved Pail of 100	3"–4"	Plain	$476.64/pail	
PM5040			Single	500.00/pail	
PM5045			Double	600.00/pail	
PM5050	Grass Frog, Preserved Pail of 50	4"–5"	Plain	361.00/pail	
PM5055			Single	410.00/pail	
PM5060			Double	493.85/pail	
PM5525		5"+	Plain	540.00/pail	
PM5530			Single	501.00/pail	
PM5535			Double	550.00/pail	
PM5540			Triple	569.00/pail	

NOTE: Due to a shortage of grass frogs, bullfrogs may be subsituted in their place.

Flinn-Preferred™ Grass Frogs

These non-toxic specimens have not been exposed to formaldehyde at any point in their processing.

Catalog No.	Description	Type	Vascular System	Price/Each
PM5545	Flinn-Preferred Grass Frogs, Pkg. of 10	3.5"–4"	Plain	$ 58.56
PM5550			Single	65.75
PM5565			Double	78.50
PM5555		4"–5"	Plain	76.12
PM5580			Single	80.00
PM5570			Double	86.60
PM5595			Triple	95.33
PM5560		5"+	Plain	106.30
PM5585			Single	123.00
PM5575			Double	135.00
PM5590			Triple	150.00

ANIMALS—PRESERVED SPECIMENS continued on next page.

Animals—Preserved Specimens, continued

Turtles

Vacuum-packed. Available individually.

Catalog No.	Description	Type	Vascular System	Price/Each 1-9	Price/Each 10 or More
PM6080	Turtles, Preserved	6"–8"	Single	$15.20	$14.46
PM6085			Double	17.65	16.76
PM6090		8"–10"	Plain	17.30	16.41
PM6095			Single	20.79	19.76
PM6105			Triple	25.50	24.21

Dogfish Sharks



Squalus sp. Key features beautifully demonstrated by these relatively large animals include the lack of a bony skeleton and having a two-chambered heart and spiral valve—an intestinal feature that greatly increases the absorptive surface and efficiency of the digestive system. Measurements from snout to tip of tail.

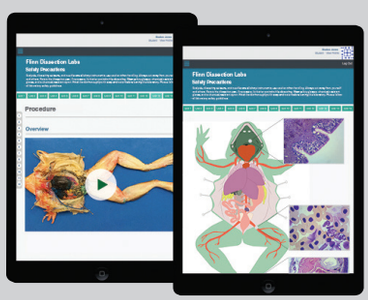
Catalog No.	Description	Size	Vascular System	Price/Each 1-9	Price/Each 10 or More
PM1090*	Dogfish, *Squalus*, Preserved	Small 18"–22"	Plain	$16.00	$15.21
PM5895			Single	20.20	19.22
PM5900			Double	21.00	19.95
PM1095		Medium 22"–27"	Plain	18.57	17.64
PM5905			Single	19.00	18.06
PM2000			Double	22.40	21.27
PM2005			Triple	24.25	23.03
PM5910		Large 27"+	Plain	30.60	29.51
PM5915			Single	32.65	30.98
PM2010			Double	34.68	32.93
PM2015			Triple	36.72	34.87
PM5920		Pregnant	Plain	35.65	33.85
PM5925			Double	37.00	35.15
PM5930			Triple	40.50	38.46

*Availability is limited. Please contact Flinn for estimated delivery times.

Garter Snake

Vacuum-packed. Plain. 18"–22".

Catalog No.	Description	Price/Pkg.
PM5495	Garter Snake, Preserved	$23.60



Flinn Digital Dissection Labs EL7001, etc.

Flinn Digital Dissection Labs

Digitally explore the anatomy of 6 common specimens with comprehensive diagrams, drag-and-drop content and video tutorials. Flexible learning options include anytime online access and quizzes. Includes 1 year of access for 30 users.

Catalog No.	Description	Price/Each
EL7001	Grass Frog	$ 64.45
EL7002	Fetal Pig	64.45
EL7003	Perch	64.45
EL7004	Sea Star	64.45
EL7005	Earthworm	64.45
EL7006	Crayfish	64.45
EL7000	6-Animal Bundle	325.00

Anolis Lizards

Vacuum-packed packages of 10.

Catalog No.	Description	Price/Pkg.
PM5265	Anolis Lizards, Preserved, Pkg. of 10	$33.15

Skate

Vacuum-packed. Available individually.

Catalog No.	Description	Price/Each
PM5980	Skate, Preserved	$10.45





Flinn-Preferred Perch PM5685

Flinn-Preferred™ Perch

These non-toxic specimens have not been exposed to formaldehyde at any point in their processing.

Catalog No.	Description	Size	Vascular System	Price/Pkg. 1-9	Price/Pkg. 10 or More
PM5685	Flinn-Preferred Perch, Pkg. of 10	9"–12"	Double	$95.30	$90.52

Perch, Gray

Pomadasys macracanthus. The gray perch is a less expensive alternative to the yellow perch. Dissection manuals for the yellow perch can be used. Measured from the tip of the head to the tip of the tail.

Catalog No.	Description	Size	Vascular System	Price/Pkg. 1-9 Pkgs.	Price/Pkg. 10 or More
PM4045	Gray Perch, Preserved, Pkg. of 10	Medium 5"–7"	Plain	$14.55	$13.80
PM4050		Large 7"–9"	Plain	24.95	23.68
PM4055		Extra Large 9"–12"	Plain	52.00	49.42
PM5690			Single	56.75	53.90

Crayfish



Cambarus sp. All individuals measured from tip of tail (uropod) to base of antennae.

Catalog No.	Description	Size	Vascular System	Price/Pkg. 1-9	Price/Pkg. 10 or More
PM5340	Crayfish, Southern, Preserved Pkg. of 10	Medium 3"–4"	Plain	$16.83	$15.99
PM1060		Large 4"–6"	Plain	27.80	26.39

Sea Stars

Careful dissection of this specimen will give the student an understanding of the general features of the Echinoderm phylum. Of particular interest is the unique water-vascular system—noted for its dual functions of respiration and locomotion.

Catalog No.	Description	Size	Vascular System	Price/Pkg. 1-9	Price/Pkg. 10 or More
PM1085*	Sea Stars, Preserved Pkg of 10	Large 6"–8"	Plain	$27.00	$25.66

*Availability is limited. Please contact Flinn for estimated delivery times.

Sea Urchins

Plain. Packages of 10.

Catalog No.	Description	Price/Pkg.
PM5885	Sea Urchins, Preserved, Pkg. of 10	$25.40

Sand Dollars

Plain. Packages of 10.

Catalog No.	Description	Price/Pkg.
PM5875	Sand Dollars, Preserved, Pkg. of 10	$12.95



ANIMALS—PRESERVED SPECIMENS continued on next page.

Animals—Preserved Specimens, continued

Complete Pack™ Squid Dissection Set

FLINN EXCLUSIVE

By: The Flinn Staff



Contains everything you need to perform a squid dissection in a single product! Save valuable lab preparation time with the Complete Pack™ Squid Dissection Set. Includes 8"–12"squid, single-injected, polystyrene dissection tray, 2 disposable dissection probes, scalpel, auto-retractable, 20 dissection pins, cotton string, *Flinn Squid Dissection Guide*, resealable bag, and 4½"scissors, surgical, sharp/blunt, straight.

Complete for one student group. All materials are reusable with the exception of the preserved specimen.

Catalog No.	Description	Price/Each
FB2298	Complete Pack Squid Dissection Set	$37.15

Squids

Genus *Loligo*. The evolution of a closed circulatory system and an advanced nervous system have enabled the squid to adopt a highly mobile existence—unusual among the molluscs.

Catalog No.	Description	Size	Vascular System	Price/Each 1–9	Price/Each 10 or More
PM5985	Squid, Preserved	5"–8"	Plain	$ 7.15	$ 6.79
PM5990			Single	9.50	9.03
PM1025		8"–12"	Plain	9.00	8.51
PM1030			Single	10.85	10.31
PM5995		11"–16"	Plain	10.63	10.05
PM6000			Single	11.65	11.04
PM6005			Double	13.75	13.05

Octopuses

Vacuum-packed. Packaged individually.

Catalog No.	Description	Size	Vascular System	Price/Each
PM5660	Octopus, Preserved	4"–6"	Plain	$15.20
PM5665		6"–8"	Plain	17.60

Marine Clams

Catalog No.	Description	Price/Pkg.
PM5625	Marine Clams, Preserved, Pkg. of 10	$28.85

Clams

Vacuum-packed packages of 10.

Catalog No.	Description	Size	Price/Pkg. 1–9 Pkgs.	Price/Pkg. 10 or More Pkgs.
PM1020	Clams, Preserved Pkg. of 10	Large 4"–5"	$29.05	$27.61

Mytilus

Catalog No.	Description	Price/Pail
PM5655	Mytilus, Preserved, Pail of 10	$17.55

Jellyfish

Catalog No.	Description	Size	Price/Pkg.
PM5610	Jellyfish (*Aurelia*), Preserved, Pkg. of 10	3"–4"	$43.40
PM5615		4"–6"	58.78

Crabs

Catalog No.	Description	Price/Pkg.
PM5270	Crabs, Preserved, Pkg. of 10	$44.80

Scypha (*Grantia*)

Small, cylindrical, sycon-type sponges common in shallow marine waters. Sycon-type sponges are intermediate—in terms of morphological complexity—between the simplest bag-like sponges and the intricate architecture of the leuconoid sponges. The phylum Porifera can be viewed as occupying middle ground between the colonial flagellates and the true multicellular animals. Evolutionarily, however, they probably represent a dead end. Size range is ½" to ¾" in length.

Catalog No.	Description	Price/Pkg.
PM1005	*Scypha* (*Grantia*), Preserved, Pkg. of 10	$22.35



Earthworms
PM1040, etc.

Earthworms

Lumbricus terrestris, the common earthworm.

Catalog No.	Description	Size	Vascular System	Price/Pkg. 1–9	Price/Pkg. 10 or More
PM1040	Earthworms, Preserved Pkg. of 10	8"–10"	Plain	$ 9.75	$ 9.26
PM5365		10"+	Plain	14.80	14.09

ANIMALS—PRESERVED SPECIMENS continued on next page.

Complete Pack™ Five Specimen Dissection Set

FLINN EXCLUSIVE

By: The Flinn Staff

Contains everything you need to perform dissection of five common specimens in a single product! Save valuable lab preparation time with the Complete Pack™ Five Specimen Dissection Set. Includes:

- 1 Clam, 4"–5"
- 1 Crayfish, 3½"–5"
- 1 Earthworm, 8"–10"
- Disposable dissection probes, 2
- Dissection pins, 20
- Flinn Dissection Guides, 1 per specimen
- Scissors, surgical, sharp/blunt, straight, 4½"
- 1 Grass frog, 3"–4"
- 1 Perch, 7"–9"
- Polystyrene dissection trays, 5
- Scalpel, auto-retractable
- Cotton string
- Resealable bags, 5

Complete for one student group. All materials are reusable with the exception of the preserved specimen.

Catalog No.	Description	Price/Each
FB2299	Complete Pack Five Specimen Dissection Set	$54.00



Complete Pack Five Specimen Dissection Set
FB2299

Animals—Preserved Specimens, continued

Roundworms, Pig

Ascaris lumbricoides. Intestinal parasite of hogs and humans and representative of the Nematode phylum. *Ascaris* has separate sexes with the male being shorter and thinner with a sharply curved posterior. Specimens supplied are approximately ten percent male. Sizes range 6"–10" for males and 8"–12" for females.

Catalog No.	Description	Price/Pkg. 1–9	Price/Pkg. 10 or More
PM1010	*Ascaris lumbricoides*, Preserved, Pkg. of 10	$23.45	$22.30

Grasshoppers



Romalea microptera, the lubber grasshopper.

Catalog No.	Description	Size	Vascular System	Price/Pkg. 1–9	Price/Pkg. 10 or More
PM1070	Grasshopper, Preserved, Pkg. of 10	2½"–3"	Plain	$ 9.40	$ 8.97
PM5600		3"+	Single	26.25	24.95

Anatomy Explorer Kits with Dissection Tools

Everything you need to explore anatomy with preserved specimens in one convenient kit! Includes specimens, disposable dissecting tray, plastic storage bag, 4 nitrile gloves, 2 disposable aprons, a basic dissecting kit (ruler, forceps, scissors, probe and hand lens in case) and a student instruction sheet. Refills are available; see below.

Catalog No.	Description	Specimens Included in Kit	Price/Each
PM5380	Frog Anatomy	Frog, Plain	$29.25
PM5395	Brain Anatomy	Sheep Brain	44.00
PM5400	Eye Anatomy	Sheep Eyes, 2	22.87
PM5405	Heart Anatomy	Sheep Heart	33.36

Classroom Dissection Kits

FLINN EXCLUSIVE

Do you have the tools to perform a dissection, but not the specimens nor any idea where to start? Flinn's exclusive classroom dissection kits are the perfect solution! Each kit comes with all of the consumable items you need for the whole class—ten preserved specimens, dissection trays and resealable bags. Each kit also includes ten copies of the informative, step-by-step Flinn Scientific dissection guide with straightforward instructions to perform the dissection, detailed diagrams and helpful tips along the way.

Complete for ten student groups.

Catalog No.	Description	Price/Each
FB1978	Earthworm Classroom Dissection Kit	$41.00
FB1979	Grass Frog Classroom Dissection Kit	95.00
FB1980	Fish Classroom Dissection Kit	45.50

Specimen Survey Sets

Save time and money with these dissection sets. Moist-packed in vapor-barrier bag with extra reclosable storage bag. See chart for package details. All species are subject to availability so substitution may occur.

Catalog No.	Description	Specimens Included in Kit	Price/Each
PM5195	Animal Survey Set, 5 Specimens	Clam, grass frog, crayfish, perch, earthworm	$ 15.37
PM5200	Animal Survey Set, 7 Specimens	Clam, grass frog, crayfish, perch, earthworm, grasshopper, scypha	18.20
PM6070	Animal Survey Set, 12 Specimens	Commerical sponge, sea anemone, tapeworm, ascaris, clam, earthworm, crayfish, grasshopper, starfish, amphioxus, grass frog, mouse	139.50
PM6075	Animal Survey Set, 48 Specimens	See flinnsci.com	395.00

Arthropod Survey Set

These representative specimens from four classes of arthropods can be used to teach classification and taxonomy as well as arthropod phylum characteristics. Each specimen is provided in its own labeled, screw-top jar. The holding fluid is safe and non-toxic. Includes Class Crustacea—crayfish, fiddler crab; Class Chilopoda—centipede; Class Arachnida—garden spider, tarantula, scorpion, tick; Class Insecta—grasshopper, green June beetle, sulfur butterfly.

NOTE: Availability of organisms often dictates the need to provide alternative representative organisms.

Catalog No.	Description	Price/Each
FB1591	Arthropod Survey Set	$82.40



Arthropod Survey Set FB1591

Preserved Animal Survey Sets

Outstanding specimens for teaching animal diversity and classification. Each preserved organism is supplied in its own individual, labeled, screw-cap jar. The specimens are preserved in a safe, non-toxic holding fluid.

Animal Survey Set B (FB1592)

(Anolis) chameleon	*(Hippocampus)* sea horse	Pig embryo
(Arbacia) sea urchin	*(Lepas or Balanus)* barnacle	*(Rana)* frog
Butterfly	*(Limulus)* horseshoe crab or dog tick	*(Romalea)* Lubber grasshopper
(Chiton) Atlantic mollusk	*(Loligo)* squid	*(Scolopendra sp.)* centipede
Cockroach	Marine clam	Scorpion
(Cucumaria sp.) sea cucumber	Moth	Shinners
(Halichondria) sponge	Newt	*(Spirobolus sp.)* millipede
(Harpalus) ground beetle	*(Passer domesticus)* sparrow	*(Uca sp.)* fiddler crab
(Helix) edible snail	*(Pecten)* scallop	

Combination Survey Set (FB1593)

Save with this all-inclusive set that contains all of the specimens in Sets A and B. This total collection illustrates an impressive diversity of life.

NOTE: Availability of organisms often dictates the need to provide alternative representative organisms. Based on availability, set will include at least 25 specimens.

Catalog No.	Description	Price/Pkg.
FB1592	Animal Survey Set B	$280.50
FB1593	Combination Survey Set (Includes Both A and B)	345.59

Flinn Dissection and Photo Guides

See the top-notch Flinn Dissection and Photo Guides on page 543. Guaranteed to enhance your classroom dissection experience!



ANIMALS continued on next page.

Animals—Dissection Supplies

Dissection Instruments—Classroom Set

FLINN EXCLUSIVE

Designed for 30 students working in pairs, the set consists of:

- 1 Sorting Tray
- 500 Dissecting Pins
- 15 Scalpels
- 15 Fine-point Forceps
- 15 Probe and Seekers
- 15 Scissors
- 15 Teasing Needles

Catalog No.	Description	Price/Each
FB1632	Dissection Instruments—Classroom Set	$199.00
FB1633	Instrument Sorting Tray	14.87

Budget Dissecting Kit

Contents:

- Forceps, polypropylene
- Dissecting pins
- Pipet
- Scalpel, student quality*
- Scissors, dissecting*
- Ruler, 6"
- Plastic Case

*Stainless steel

Catalog No.	Description	Price/Each
FB1357	Budget Dissecting Kit	$10.55

Economy Dissecting Kit

Contents:

- Forceps, straight, 4½"*
- Needle, teasing, bent
- Needle, teasing, straight
- Ruler, 6"
- Scalpel, student quality, 1½" blade
- Scissors, dissecting, 4½"*
- Pipet

*Stainless steel

Catalog No.	Description	Price/Each	Price/Each 10 or more
AB1021	Economy Dissecting Kit	$13.75	$13.06

Basic Dissecting Kit

Contents:

- Forceps, straight, 4½"*
- Needle, teasing, bent
- Needle, teasing, straight
- Ruler, 6"
- Scalpel, No. 22 blade
- Scissors, dissecting, 4½"*
- Pipet

*Stainless steel

Catalog No.	Description	Price/Each	Price/Each 10 or more
AB1019	Basic Dissecting Kit	$15.55	$14.80

General Biology Dissecting Kit

Contents:

- Forceps, straight, 4"*
- Needle, teasing, curved
- Scalpel, screw-lock, No. 22 blade
- Probe and seeker
- Needle, teasing, straight
- Scissors, dissecting, 4½"*
- Pipet
- Ruler, 6"

*Stainless steel

Catalog No.	Description	Price/Each	Price/Each 10 or more
AB1023	General Biology Dissecting Kit	$16.10	$15.30

Advanced Biology Dissecting Kit

Contents:

- Forceps, curved, 4"*
- Forceps, straight, 4¾"*
- Needle, teasing, bent
- Needle, teasing, straight
- Probe and seeker
- Ruler, 6"
- Scalpel blades, three No. 22 and three No. 23
- Scalpel handle, surgical, No. 4*
- Scissors, Iris, 4½", straight*
- Scissors, sharp/blunt, 4½"*
- Pipet

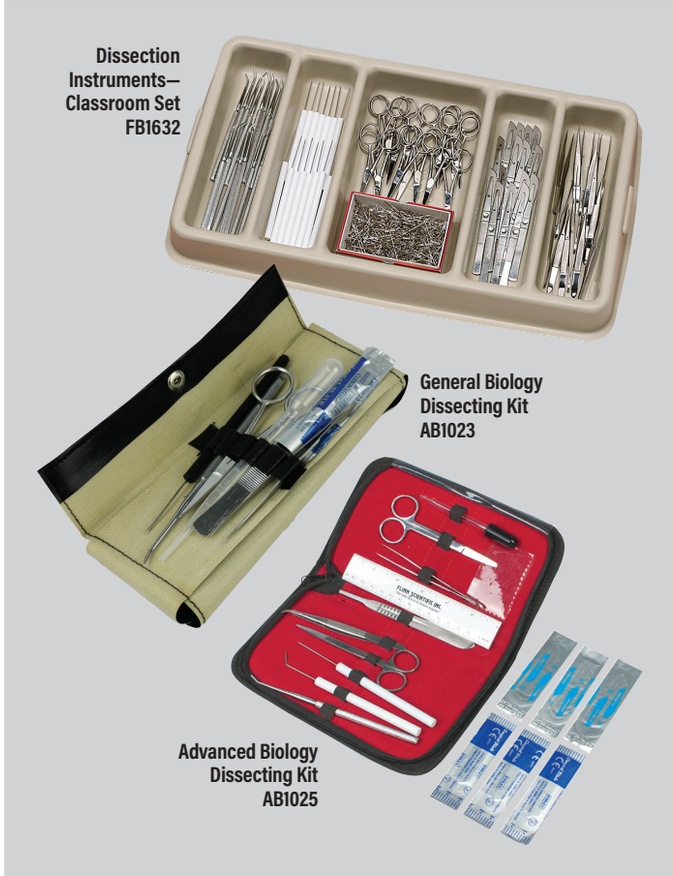
*Stainless steel

Catalog No.	Description	Price/Each	Price/Each 10 or more
AB1025	Advanced Biology Dissecting Kit	$31.35	$29.81

Case, Dissection Instrument

Padded case with velvet lining and 10 elastic loops. Measures 8³⁄₁₆" x 4¾" x 1⅛" closed.

Catalog No.	Description	Price/Each
AB1008	Case, Dissection Instrument	$12.60



Forceps, Dissecting

Straight forceps are 4⅛" long. Curved forceps are 4½" long.

Catalog No.	Description	Finish	Tip	Price/Each
AB1013	Forceps, Dissecting	Stainless Steel	Straight	$3.20
AB1015		Stainless Steel	Curved	4.72

Forceps, Polypropylene

Medium point with serrated tips, length 5½".

Catalog No.	Description	Price/Each
AB1018	Forceps, Polypropylene	$1.17

Forceps, Mosquito, Halstead

Stainless steel, hemostat-type forceps with straight tips and an adjustable box-joint lock. 5" long.

Catalog No.	Description	Price/Each
AB1017	Forceps, Mosquito, Halstead	$10.65

Forceps, Specimen

Stainless steel, 10" long.

Catalog No.	Description	Price/Each
AB1093	Forceps, Specimen	$12.60

Scalpels, Disposable

Hospital surgeons may consider these scalpels disposable, but we know you'll want to use them over and over again. Scalpel blade is made from high-quality surgical steel and permanently attached to a comfortable, easy-to-hold plastic handle.

Catalog No.	Description	Finish	Blade Size	Price/Each
AB1044	Scalpels, Disposable	Fine dissection	10	$2.20
AB1045		Micro dissection	11	2.15
AB1046		Gross dissection	22	2.20

ANIMALS—DISSECTION SUPPLIES continued on next page.

Animals—Dissection Supplies, continued

Scalpels, Auto-Retractable
Sterile scalpels with blades that retract into the handles. Made of surgical steel. Package of 5.

Catalog No.	Description	Price/Pkg.
FB2083	Scalpels, Auto-Retractable	$25.50

Scalpel, Student Quality
One-piece stainless steel scalpel is 6" long. Blade length is 1½". Silver handle. Blade is not replaceable.

Catalog No.	Description	Price/Each	Price/Each 12 or more
AB1047	Scalpel, Student Quality	$4.05	$3.96

Scalpel Safety Reminders:
- Hold a scalpel as you would a pencil.
- Cut with a downward motion but never push down very hard to make a cut. (If extreme pressure is required, you have a dull scalpel or require a different instrument.)
- Watch the placement of your specimen-holding hand. Do not cut toward your holding hand.
- Scalpels are not appropriate for bone or cartilage tissue work.

Scalpel, Screw-lock, with Replaceable Blade
Screw-lock firmly holds blade in place. Blade is very easy to replace. Scalpel handle accepts blade sizes 20, 21, 22 or 23. One size 22 blade is provided.

Catalog No.	Description	Price/Each	Price/Each 12 or more
AB1048	Scalpel, Screw-lock with Replaceable Blade	$6.60	$6.26

Scalpel Handle, Surgical Quality
High quality, stainless steel scalpel handle. Special locking device firmly holds blade in place, yet requires no screws. Blades are easy to change. Blades not included.

Catalog No.	Description	Handle Length	Accepts No.	Blade Sizes	Price/Each	Price/Each 12 or more
AB1049	Scalpel Handle, Surgical Quality	4⅞"	3	10, 11, 12, 15	$6.57	$6.20
AB1050		5¼"	4	20, 21, 22, 23	6.75	6.38

Scalpel Blades, Stainless Steel

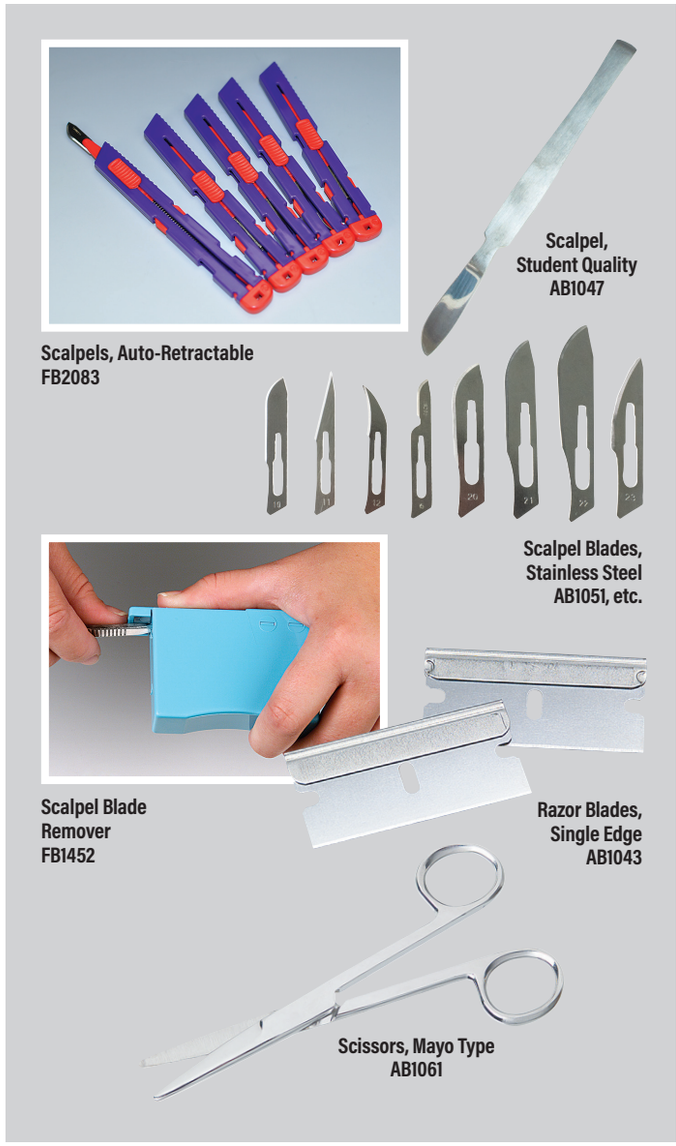
Catalog No.	Description	Fits Handle No.	Blade Size	Price/Pkg. of 10
AB1051	Scalpel Blades, Stainless Steel	3 AB1049	10	$4.00
AB1052			11	4.00
AB1053			12	4.00
AB1054			15	3.90
AB1055		4 AB1050 AB1048 (screw-lock)	20	3.90
AB1056			21	4.00
AB1057			22	4.20
AB1058			23	4.00

Scalpel Blade Remover
Simply insert the scalpel into the end of the remover, push down on the tab, and pull out the handle. The sharp scalpel blades are safely retained in the disposable unit. Works only with metal lock-on scalpel handles.

Catalog No.	Description	Price/Each
FB1452	Scalpel Blade Remover	$6.00

Razor Blades, Single Edge
Single edge, package of 100.

Catalog No.	Description	Price/Pkg. of 100
AB1043	Razor Blades, Single Edge	$16.10



Knife, Cartilage
High-quality stainless steel, blade length is 2". Handle is textured for secure grip.

Catalog No.	Description	Price/Each
AB1094	Knife, Cartilage	$5.25

Scissors, Dissecting
Straight blade, fine point, open shank, 4½" long.

Catalog No.	Description	Finish	Price/Each	Price/Each 12 or more
AB1060	Scissors, Dissecting	Stainless Steel	$5.40	$5.15

Scissors, Iris Type
Straight scissors are 4¼" long. Curved scissors are 4½" long.

Catalog No.	Description	Blade Shape	Price/Each	Price/Each 12 or more
AB1068	Scissors, Iris Type	Straight	$9.25	$8.83
AB1069		Curved	9.11	8.70

Scissors, Mayo Type
Stainless steel, with straight blades and semi-blunt points. 5½" long.

Catalog No.	Description	Price/Each	Price/Each 12 or more
AB1061	Scissors, Mayo Type	$10.40	$9.83

ANIMALS—DISSECTION SUPPLIES continued on next page.

Animals—Dissection Supplies, continued

Scissors, Surgical, Stainless Steel

Catalog No.	Point Style	Blade Shape	Length	Price/Each	Price/Each 12 or more
AB1062	Sharp/Sharp	Straight	4½"	$7.15	$6.76
AB1063	Sharp/Sharp	Curved	5½"	8.19	7.78
AB1064	Sharp/Blunt	Straight	4½"	7.75	7.37
AB1065	Sharp/Blunt	Straight	5½"	8.70	8.17
AB1066	Sharp/Blunt	Curved	4½"	6.05	5.74
AB1067	Sharp/Blunt	Curved	5½"	8.35	7.98
FB1453	Sharp/Blunt	Curved	6½"	8.00	7.61

Shears, Bone-Cutting, Small

Stainless steel. Ideal for cutting small bones. When not in use, handle locks together for safety and to protect cutting surfaces. 5" long.

Catalog No.	Description	Price/Each
AB1070	Shears, Bone-Cutting, Small	$33.05

Shears, Bone-Cutting, Large

Stainless steel. Ideal for cutting larger bones. Spring handle, 7" long.

Catalog No.	Description	Price/Each
AB1092	Shears, Bone-Cutting, Large	$40.90

Needle, Teasing

Solid plastic handle eliminates absorption of contaminants, such as mold, fungus or fixatives. Stainless steel needle eliminates rust and corrosion. Total length is 5¾".

Catalog No.	Description	Needle Style	Price/Each
AB1028	Needle, Teasing	Straight	$ .55
AB1029		Bent	.54

Probe and Seeker

Hexagonal handle for easy grip. Body is tapered to a semi-blunt, bent tip. 6" length.

Catalog No.	Description	Price/Each	Price/Each 12 or more
AB1042	Probe and Seeker	$3.95	$3.76

Probe and Hook

One end is a sharp-pointed probe. The other end is a hook with a sharpened inner edge that can serve as a knife or scraper. 6" length.

Catalog No.	Description	Price/Each	Price/Each 12 or more
AB1041	Probe and Hook	$4.95	$4.70

Probes, Disposable

Smooth wooden disposable probes for dissection. Tapered to a blunt end. 4½" length.

Catalog No.	Description	Price/Each
FB2090	Probes, Disposable, Pkg. of 100	$9.05

Pins, Dissection, Straight Type

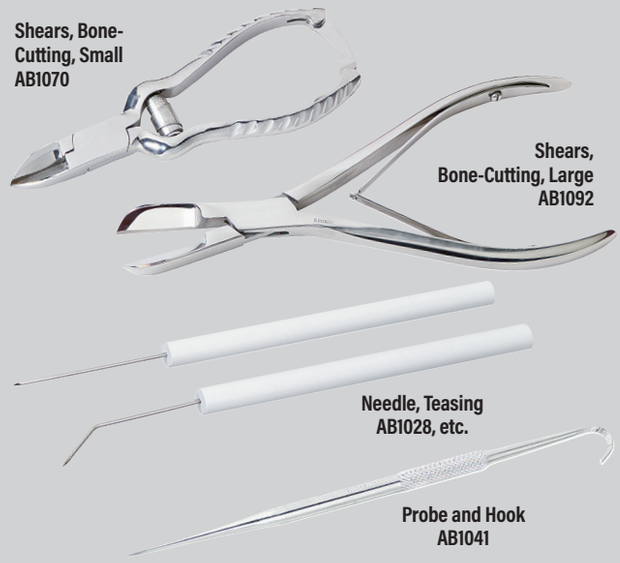
Sturdy steel construction with smooth, sharp points and accurately formed heads.

Catalog No.	Description	Length	Approx. Pins/Pkg.	Price/Pkg.
AB1038	Pins, Dissection, Straight Type	1¾"	600	$14.80
AB1039		2"	500	15.72

Pins, Dissection, "T" Type

Approximately 360 pins per package.

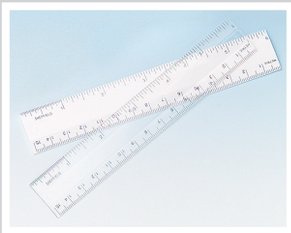
Catalog No.	Description	Length	Price/Pkg. of 360
AB1040	Pins, Dissection, "T" Type	1½"	$16.30
AB1084		2"	16.80





Pins, Dissection, Straight Type
AB1038, etc.

Pins, Dissection, "T" Type
AB1040, etc.



Rulers
AP8290, etc.



String
AB1085

Rulers

Metric/English, 15 cm/6" in length.

Catalog No.	Description	Finish	Price/Each	Price/Pkg. of 10
AP8290	Ruler	Non-transparent	$1.25	$11.40
AP1872		Transparent	1.25	11.40

String

Cotton string used for tying specimens to dissecting pan. 400 feet per roll.

Catalog No.	Description	Price/Each
AB1085	String	$4.45

Dissection Trays, Disposable

Each polystyrene tray is 9¼" x 11¼". Package of 10.

Catalog No.	Description	Price/Pkg.
FB2093	Dissection Trays, Disposable, Pkg. of 10	$10.70

ANIMALS—DISSECTION SUPPLIES continued on next page.

Animals—Dissection Supplies, continued

Pans, Dissecting, Metal or Aluminum without Wax or Pad

Constructed of aluminum with tapered sides. Does not include wax or pad.

Catalog No.	Description	Pan Size	Price/Each
AB1035	Dissecting Pans, Metal, without Wax or Pad	10½" x 7½" x 1½"	$ 9.75
AB1078	Dissecting Pans, Aluminum, without Wax or Pad	14" x 10½" x 1½"	16.60

Pans, Dissecting, Aluminum with Wax

Constructed of aluminum with tapered sides. Black wax included.

Catalog No.	Description	Pan Size	Price/Each
AB1034	Pans, Dissecting, Aluminum with Wax	11" x 7" x 1½"	$21.00
AB1077		13⅛" x 9⅜" x 2¼"	29.60

Wax, Replacement, Black, for Dissecting Pan

11" x 7" pans will require approximately 12 oz (by weight) and 13⅛" x 9⅜" pans will require 18 oz.

Catalog No.	Description	Size	Price/Each
AB1036	Wax, Replacement, Black, for Dissecting Pan	1 Pound	$ 8.95
AB1037		5 Pound	32.45

Pans, Dissecting, with Flex-Pad

Flex-Pads are made of a special odorless, rubber-like plastic. Upon removing your dissecting pin, the Flex-Pad automatically "heals" itself, leaving no pin marks or tears. Flex-Pads are 1.1 cm thick, reusable and easily removed from the pan for cleaning. Set includes pan, Flex-Pad and cover.

Catalog No.	Description	Pan Size	Price/Each
AB1072	Pan, Dissecting, with Flex-Pad and Cover; Standard Size	11½" x 7" x 1½"	$26.00

Flex-Pad, Replacements

Flex-Pads are blue in color and 1.1 cm thick.

Catalog No.	Description	To Fit Pan Size	Price/Each
AB1073	Flex Pad, Standard Size	11½" x 7" x 1½"	$10.00
AB1075	Flex Pad, Large Size	12¾" x 9½" x 2¼"	18.00
AB1076	Flex-Pad, Bulk Sheet	17" x 24", Easily cut with scissors to fit any pan size	52.10

Pans, Dissecting, Large Animal, with Flex-Pad

Recommended for specimens over 12" in length (dogfish, cats). This polyethylene 16" x 30" tray holds a 10" x 23" Flex-Pad. Corner pegs are included. Replacement Flex-Pads and a clear plastic cover are available separately.

Catalog No.	Description	Price/Each
AB1079	Pan, Dissecting, Large Animal, with Flex-Pad	$99.00
AB1083	Pan, Replacement, without Flex-Pad	42.25
AB1081	Flex-Pad Replacement	32.00

Bags, Specimen, Large

Large, 2-mil poly bags are seamless and can be heat-sealed. Bag size is 20" W x 42" L.

Catalog No.	Description	Price/Each
FB1472	Bags, Specimen, Large	$1.51

Bags, Specimen, Reclosable Type

Ideal for short-term storage of preserved specimens.

Catalog No.	Description	Usage	Size	Price/Pkg. of 50
AB1003	Bags, Specimen, Reclosable Type	Crayfish, Grassfrog, Perch	4" x 8"	$ 8.20
AB1004		Rat, Bullfrog, Large Perch	6" x 12"	9.40
AB1005		Fetal Pig, Large Bullfrog	12" x 15"	17.10



Tags, Name, Specimen

Waterproof. Metal eyelet with wire for attaching. White in color. Printed one side with space for student name and class period.

Catalog No.	Description	Price/Pkg. of 50
AB1071	Tags, Name, Specimen	$8.90

Pail Opener

Easy to use. Lids go back on easily.

Catalog No.	Description	Price/Each
AB1033	Pail Opener	$22.08

ANIMALS continued on next page.

Animals—Models

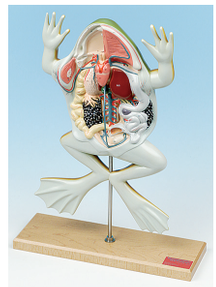
Plastinated Specimens
See flinnsci.com.

Frog Model
This large, accurately colored model will be an excellent student reference during their frog dissection laboratory. Model is mounted on a durable plastic base for easy display and transport. A detailed key card for identification of key anatomical features is provided.



Catalog No.	Description	Price/Each
FB1674	Frog Model	$202.35

Bullfrog Model
Constructed of a molded non-breakable vinyl plastic with more than 150 labeled structures. The bullfrog model can be easily handled or can be rotated on its stand to allow 360° viewing without fear of breakage. There are no removable parts to get lost and the vivid hand-painted colors provide anatomical accuracy. Model comes complete with stand and anatomical key of labeled parts. Model measures 43 x 30 x 10 cm.



Catalog No.	Description	Price/Each
FB1146	Bullfrog Model	$674.45

4D Vision™ Animal Anatomy Models
4D puzzles are a unique way to build knowledge, dexterity and mental acuity. Also includes an illustrated assembly guide, description of the anatomy, a detailed description of the life cycle and eating habits along with some fun Q&As.



Catalog No.	Description	Price/Each
AP9810	Dog	$33.79
AP9811	Great White Shark	33.79
AP9965	Frog	32.69
AP9966	Pig	34.45
AP9985	Cow	34.45
AP9986	Chicken	33.79

Animals—NewPath Visual Learning Guides
The Grouping of Animals NewPath Visual Learning Guide provides comprehensive coverage of animal grouping. Each 11" x 17" guide includes four panels of helpful information, including an overview, practice exercises, a graphic organizer and assessment and review questions. Each laminated Write-On/Wipe-Off guide provides an engaging way to study animals. Set of 10.



AP10746

Catalog No.	Description	Price/Each
AP10746	All About Animals	$32.49
AP10934	Animal Growth & Reproduction	45.68
AP10939	Grouping of Animals	32.49
AP10748	Birds & Mammals	33.59
AP10931	Reptiles, Amphibians & Fish	33.59
AP10947	Vertebrates—Animals With Backbones	32.49

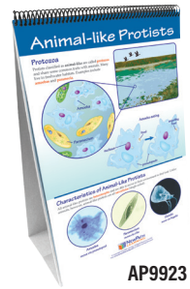
Animals—Posters

X-Rays, Animals
Each X-ray is paired with a highly detailed photo—lay the X-ray over the photo to make connections between structure and function. Animals include the common marmoset, European rabbit, baby kangaroo, pumpkinseed sunfish, frontosa cichlid, green tree python, diamondback rattlesnake, baby green iguana, dwarf crocodile eggs, veiled chameleon, box turtle, red-tailed hawk, turkey vulture and a leaf frog. X-rays were gathered from veterinarian clinics and zoos. Printed on clear plastic with a scratch-resistant coating. Includes a detailed information sheet and 14 X-ray and photo pairs.



Catalog No.	Description	Price/Each
FB2111	X-Rays, Animals	$26.30

Protists: Pond Microlife—NewPath Learning Guide and Flip Chart Set
This is perfect for the classroom as well as group and independent learning. Spiral-bound in a stable, freestanding easel, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Set of 10 charts.



AP9923

Catalog No.	Description	Price/Each
AP9923	Protists: Pond Microlife—NewPath Learning Flip Chart Set	$39.50
AP11485	Protists: Pond Microlife Student Learning Guide with Online Lesson	14.95
AP11533	Protists: Pond Microlife Student Learning Guide with Online Lesson, Set of 10	99.00

Mammals & Birds—NewPath Visual Learning Guide, Set of 10
NEW!

Mammals & Birds Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.



Catalog No.	Description	Price/Each
AP11737	Mammals & Birds—NewPath Visual Learning Guide, Set of 10	$43.32

Ecosystem—A Habit Building Card Game
NEW!

Ecosystem is a biologically derived card drafting game. Player choose, pass, and arrange eleven different card types consisting of organisms ranging from bees to bears and environments like streams and meadows. Earn points by aligning animals with habitats where they most flourish. Biodiversity is rewarded while monocultures are penalized. Each time you play, you build a one-of-a-kind ecosystem, striving to balance the delicate connections between all living things.



Catalog No.	Description	Price/Each
AP9442	Ecosystem—A Habit Building Card Game	$16.99

ANIMALS continued on next page.

Biochemistry—Carbohydrates, DNA, Fats and Proteins

FLINN360science™: Food Analysis



This kit presents the essential concepts of macromolecules, vitamins and minerals, and volume metric analysis through hands-on science activities designed to engage all your students, regardless of level. By completing this investigation students will learn about food components and the role scientists have in designing and running tests to check for the presence or absence of these components. Teachers can extend learning through guided inquiry into associated topics including "Farm to Table."

Catalog No.	Description	Digital Access	Price/Each
AP10659	360Science: Food Analysis	1-Year	$62.00
AP10759		3-Year	80.00

FLINN360science™: Peroxidase Enzyme Activity



This kit presents the essential concepts of enzyme structure and function, kinetics and rate laws, and enzyme–substrate binding through hands-on science activities designed to engage all your students, regardless of level. Students will observe varying enzyme-catalyzed reaction rates using peroxidase extract from turnips or other foods, hydrogen peroxide and guaiacol. Students will learn that environmental conditions can impact catabolic reaction rates. Teachers can extend learning through guided inquiry into associated phenomena including, "Curing Disease".

Catalog No.	Description	Digital Access	Price/Each
AP10668	360Science: Peroxidase Enzyme Activity	1-Year	$85.75
AP10788		3-Year	80.00

FLINN EXCLUSIVE

FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Catalog No.	Description	Price/Each
FB2201	Flinn Modeling, Inquiry and Analysis: Biochemistry—Student Laboratory Kit	$59.40
AP1766	Introduction to Carbohydrates—Structure and Properties—Student Laboratory Kit	66.25
AP6120	Milk Is a Natural—Biology, Chemistry and Nutrition—Student Laboratory Kit	44.40
AP7582	Milk Is a Natural—Biology, Chemistry and Nutrition—Super Value Laboratory Kit	97.60
FB1982	Chemical Testing of DNA—Student Laboratory Kit	92.05
AP1773	Properties of Lipids—Student Laboratory Kit	135.00
AP1769	Identifying Proteins and Amino Acids—Student Laboratory Kit	91.35
FB1873	Isolation of a Protein—Student Laboratory Kit	49.95
AP1768	Physical Properties of Proteins—Student Laboratory Kit	70.55
AP6692	pH and Protein Solubility—A Reversible Demonstration Kit	26.85
FB1974	Determining Protein Concentration—Student Laboratory Kit	67.80
AP7199	Amino Acid Chromatography—Student Laboratory Kit	104.90
FB1946	Amino Acid Starter Kit	93.75
AP7238	Amino Acid Collection, 20 x 1 g	96.95

FLINN360science™: Cellular Respiration



This kit presents the essential concepts of respiration and cellular energetics through hands-on science activities designed to engage all your students, regardless of level. By completing this investigation students gain a better understanding of how environmental factors like temperature, germination and other conditions influence the rate in which cellular respiration occurs. Teachers can extend learning through guided inquiry into associated phenomena including, "Cellular Energy."

Catalog No.	Description	Digital Access	Price/Each
AP10672	360Science: Cellular Respiration	1-Year	$74.30
AP10772		3-Year	91.45

Biochemistry—Enzymes

Enzymes—The Catalysts of Life—Student Laboratory Kit



By: The Flinn Staff

Activities include the examination of a digestive enzyme reaction, the measurement of the effect of enzyme concentration on reaction rate, the effect of temperature on reaction rate, and the effect of pH on reaction rate.

Complete for 30 students working in pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs.

Catalog No.	Description	Price/Each
FB0436	Enzymes—The Catalysts of Life—Student Laboratory Kit	$ 85.00
FB2061	Enzymes—The Catalysts of Life—Super Value Laboratory Kit	117.75

Enzyme Optimization—pH and Temperature Guided-Inquiry Kit



By: The Flinn Staff

Kit includes four digestive enzymes—amylase, lipase, pepsin and trypsin—along with the appropriate buffers and testing solutions to test the progress or products of their respective digestion reactions. Students design individual experiments to find optimum conditions for a particular enzyme.

Complete for 24 students working in groups of 4.

Catalog No.	Description	Price/Each
FB1867	Enzyme Optimization—pH and Temperature Guided-Inquiry Kit	$93.75

Catalase Investigation—Guided-Inquiry Kit



By: The Flinn Staff

The laboratory investigations in this kit allow students to conduct experiments of their own design while studying the chemical reactions of a key cell enzyme, catalase. The unique "floating-disk" assay system will provide a new and fun alternative.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB1432	Catalase Investigation—Guided-Inquiry Kit	$78.00

Enzyme Catalysis Model—Super Value Laboratory Kit



By: Debbie Richards, Bryan H.S., Bryan, TX

Students design and build their own working model of a functioning enzyme. The polyethylene foam used in this activity allows the flexibility needed to make a working enzyme/substrate model.

Super Value Kit is complete for 30 students working in pairs. Enough foam material is provided for additional student experimentation and design. All materials are reusable!

Catalog No.	Description	Price/Each
FB1576	Enzyme Catalysis Model—Super Value Laboratory Kit	$39.90

BIOCHEMISTRY continued on next page.

Biochemistry—Enzymes, continued

Catalase Investigation with Purified Enzyme—Super Value Guided-Inquiry Kit



By: The Flinn Staff

In the introductory activity, students precisely control the concentration of catalase while varying the concentration of the substrate. After refining the floating disk assay protocol, students design experiments to test other variables.

Super Value Kit is complete for 5 classes of 30 students working in pairs.

Catalog No.	Description	Price/Each
FB2134	Catalase Investigation with Purified Enzyme—Super Value Guided-Inquiry Kit	$120.05

Digestive Enzymes at Work—Student Laboratory Kit



By: The Flinn Staff

The lab starts with amylase; then students observe the reaction of the enzyme pepsin; and then students analyze the "digestion" of milk by lipase.

Complete for 30 students in pairs. Super Value Kit is complete for 5 classes of 30 students working in pairs. Boiling water baths are required for the Benedict's test.

Catalog No.	Description	Price/Each
FB1862	Digestive Enzymes at Work—Student Laboratory Kit	$55.90
FB2051	Digestive Enzymes at Work—Super Value Laboratory Kit	101.75

Evolution of Yeast—Guided-Inquiry Kit



By: The Flinn Staff

Students investigate artificial selection and adaptation of three varieties of yeast used in the food industry—baker's, brewer's and wine.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB2135	Evolution of Yeast—Guided-Inquiry Kit	$141.75

Biochemistry—Nutrient Cycles

Carbon Cycle Adventure—Student Activity Kit



By: The Flinn Staff

As they follow a single carbon atom throughout the cycle, students will gain insight into the ongoing process occurring around them. After traveling through the cycle, students compare and contrast their experiences and find that no two adventures are alike!

Complete for 30 students working individually.

Catalog No.	Description	Price/Each
FB2206	Carbon Cycle Adventure—Student Activity Kit	$23.75

Nutrition—NewPath Visual Learning Guide, Set of 10

NEW!



Nutrition Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11753	Nutrition—NewPath Visual Learning Guide, Set of 10	$43.32

Biochemistry—Physiology

Help from MOM—Biochemistry of Antacids Demonstration Kit



By: The Flinn Staff

With a little help from MOM—milk of magnesia—and universal indicator, students see the neutralizing effect of magnesium hydroxide on stomach acid. Includes detailed instructions with discussion of the chemical and biological processes, student worksheet and enough materials for seven demonstrations.

Catalog No.	Description	Price/Each
FB1857	Help from MOM—Biochemistry of Antacids Demonstration Kit	$24.80

Lactose Intolerance—Demonstration Kit



By: The Flinn Staff

Flasks containing various sugar combinations with and without Lactaid are compared for gas production by yeast cells. Balloons inflate quickly when digestible sugars are available to the lactose-intolerant yeast cells. Enough materials are provided in this kit to perform the demonstration seven times.

Catalog No.	Description	Price/Each
FB1570	Lactose Intolerance—Demonstration Kit	$80.95

Chemicals of Life—Super Value Laboratory Kit



By: David Brock, Roland Park Country School, Baltimore, MD

Students will learn and perform standard tests for carbohydrates, proteins, lipids and nucleic acids.

Super Value Kit is complete for 5 classes of 30 students working in pairs. Perform this experiment in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
FB1435	Chemicals of Life—Super Value Laboratory Kit	$80.88

Buffers Keep the Balance—Properties of Biological Buffers—Student Laboratory Kit



By: The Flinn Staff

Explore the properties of biological buffers in this two-part kit. In Part 1, students examine the acid–base balance in a model carbonate "blood" buffer. In Part 2, students prepare two different phosphate buffers that reflect the physiological role of buffers within cells.

Complete for 30 students working in pairs. Fifteen reusable 24-well reaction plates are recommended and available separately.

Catalog No.	Description	Price/Each
AP6121	Buffers Keep the Balance—Properties of Biological Buffers—Student Laboratory Kit	$61.25
AP1447	Reaction Plate, 24-well	4.75

Cholesterol Determination of Simulated Blood—Student Laboratory Kit



By: The Flinn Staff

Simulated blood of five different individuals will be tested before and after treatment for cholesterol. The components in this cholesterol simulation are safe and contain no actual blood products.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB1637	Cholesterol Determination of Simulated Blood—Student Laboratory Kit	$97.05

BIOCHEMISTRY—PHYSIOLOGY continued on next page.

Biochemistry—Physiology, continued

Sodium Alginate Respiration—Student Laboratory Kit



By: Pam Bryer, Bowdoin College, Brunswick, ME

Students will be completely engaged as they see their slurry of yeast coalesce into perfect spheres. Expose the spheres to different conditions and measure the metabolism of the yeast inside.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB2124	Sodium Alginate Respiration—Student Laboratory Kit	$70.15

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Aerobic Respiration and Fermentation Made Easy—Student Laboratory Kit



By: The Flinn Staff

Students grow yeast cells in fermentation tubes and observe the formation of metabolic by-products. Graphing the data allows students to compare the rate of glucose consumption to the rate of carbon dioxide formation as the yeast culture grows.

Complete for 30 students working in groups of three.

Catalog No.	Description	Price/Each
FB1750	Aerobic Respiration and Fermentation Made Easy—Student Laboratory Kit	$65.45

Anatomy and Physiology See page 406.

Alcohol Fermentation—Demonstration Kit



By: The Flinn Staff

As fermentation occurs, the depletion of the oxygen in the flask causes a dramatic color change in the indicator in the flask. Simultaneously, the carbon dioxide produced from the reaction causes a color change in a different indicator solution in the collecting chamber.

Catalog No.	Description	Price/Each
FB1626	Alcohol Fermentation—Demonstration Kit	$32.25

Effect of Drugs Kit



This kit will provide the students with an understanding of what a drug is and how it affects a living organism.

The kit requires the use of a microscope and living Daphnia *(ordered separately). The materials provided are sufficient for 30 students working in pairs. All drugs are safe, over-the-counter drugs in dilute solutions.*

Catalog No.	Description	Price/Each
FB1259	Effect of Drugs Kit	$128.05
LM1110	*Daphnia magna,* Class 100	53.10

Biochemistry—Consumer

Analysis of Over-the-Counter Drugs—Student Laboratory Kit



By: The Flinn Staff

Students test a variety of physical and chemical properties of actual OTC drug samples and then use their test results to analyze unknown pain reliever and antacid samples.

Complete for 30 students working in pairs. Fifteen 24-well reaction plates are needed and may be purchased separately.

Catalog No.	Description	Price/Each
AP5603	Analysis of Over-the-Counter Drugs—Student Laboratory Kit	$70.00
AP1447	Reaction Plates, 24-well	4.75

Using Bacteria to Clean Clothes? Genetic Engineering in Action—Super Value Laboratory Kit



By: The Flinn Staff

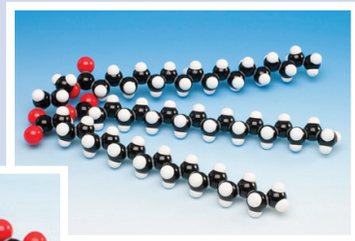
In this easy-to-use kit, students investigate whether detergents that list GMO-derived enzymes as ingredients will "clean clothes" better than detergents that might not contain enzymes.

Super Value Kit is complete for 5 classes of 30 students working in pairs. Balances with 0.1-g precision, hot plate(s) and pH paper or handheld pH meters are required, but not included.

Catalog No.	Description	Price/Each
FB1767	Using Bacteria to Clean Clothes? Genetic Engineering in Action—Super Value Laboratory Kit	$60.15

BIOCHEMISTRY—CONSUMER continued on next page.

Fat Molecular Model Student Set AP10023





Starch Molecular Model Set AP10029

Molymod Molecular Model Set for Biological Sciences

The Molymod Molecular Model Set for Biological Sciences can be used to build a range of simple organic molecules, including carbohydrates, sugars, proteins, amino acids, lipids, fats and DNA/RNA. Additional concepts, such as organic functional groups, isomerism and condensation reactions, can be demonstrated with this set. Includes 34 atoms and 38 links:

- 14 Hydrogen
- 7 Oxygen
- 6 Carbon
- 3 Nitrogen
- 2 Sulfur
- 1 Copper
- 1 Phosphorous
- 1 R group
- 50 Single bonds
- 12 Multiple bonds
- 1 Short-link remover tool

Catalog No.	Description	Price/Each
FB2321	Molymod Molecular Model Set for Biological Sciences	$ 25.77
AP10030	Biochemistry Molecular Model Teacher Set	129.00
AP10023	Fat Molecular Model Set	50.00
AP10025	Sucrose Molecular Model Set	17.10
AP10029	Starch Molecular Model Set	22.53

Biochemistry—Consumer, continued

Juicing Enzymes—Enzymes Used in the Food Industry—Student Laboratory Kit



By: The Flinn Staff

In this controlled experiment, students investigate the effects of two enzymes, pectinase and cellulase, on the amount of juice obtained from an apple.

Complete for 30 students working in pairs. A 0.1-g precision balance and apples are required but not provided.

Catalog No.	Description	Price/Each
FB1869	Juicing Enzymes—Enzymes Used in the Food Industry—Student Laboratory Kit	$74.05

Vitamin C Analysis—Student Laboratory Kit



By: The Flinn Staff

Students will perform tests to determine Vitamin C content in their favorite fruit juices. The microscale procedure uses 2,6-dichloroindophenol, which is an indicator that changes color as it is reduced by ascorbic acid.

Complete for 24 students working in pairs. Fifteen reusable 24-well reaction plates are required and available separately.

Catalog No.	Description	Price/Each
AP7506	Vitamin C Analysis—Student Laboratory Kit	$46.95
AP1447	Reaction Plate, 24-well	4.75

Cheese-Making—Student Laboratory Kit



By: The Flinn Staff

Cheese-making is a real art form. Get your students involved in their own cheese creations! Students can experiment to determine what can be done to produce other variations of their cheese.

Complete with enough materials for 30 students working in pairs. Materials include powdered dry milk, chymosin, cheesecloth and complete teaching instructions.

Catalog No.	Description	Price/Each
FB0442	Cheese-Making—Student Laboratory Kit	$64.80

Sun Protection Factor—Student Laboratory Kit



By: The Flinn Staff

Students use sun print paper to measure the relative effectiveness of sunscreens of varying SPF ratings. After preliminary results, further experimentation can be done to compare brands or test other variables affecting the effectiveness of sunscreens.

Complete with enough materials for 60 trials of the experiment. This allows for student-designed experiments beyond the basic procedure.

Catalog No.	Description	Price/Each
FB1561	Sun Protection Factor—Student Laboratory Kit	$52.05

Biotechnology—Introductory Kits

Bio-Rad Kits See page 449.

Who's the Daddy? DNA Profiling—Super Value Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Students solve a paternity case as they re-create each step of the DNA fingerprinting process. After assembling double-stranded DNA "molecules," students cut them into fragments to simulate restriction enzyme digestion and then separate the fragments by size in a simulated gel. Next the DNA fragments are "denatured" (cut into single strands), "blotted" (pattern copied onto a sheet of paper) and treated with simulated radioactive probes that combine with only specific base sequences. The resulting simulated autoradiograph identifies target DNA fragments, which are used to match the unidentified parent. Includes black-line masters of simulated DNA segments, "radioactive probe" locators, electrophoresis gel blotter, magnetic tape and zipper-lock bags.

Super Value Kit is complete for 30 students working in groups of six. All materials are reusable.

Catalog No.	Description	Price/Each
FB1758	Who's the Daddy? DNA Profiling—Super Value Kit	$23.30

DNA Fingerprinting—Electrophoresis at Work—Super Value Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Once the students have read the case reports, they are provided with photo-reproductions of actual electrophoresis gels. Students will interpret the evidence against a list of possible suspects and attempt to solve the mystery. The design of the activity affords the teacher the flexibility to alter case outcomes from class to class and even manipulate evidence. Kit includes in-depth background material, teacher preparation and instruction tips, student copies of case descriptions and investigation reports, and reproductions of evidence and suspect electrophoresis gels.

Super Value Kit is complete for 30 students working in pairs. All materials are reusable.

Catalog No.	Description	Price/Each
AB1370	DNA Fingerprinting—Electrophoresis at Work—Super Value Kit	$67.79

DNA and Electrophoresis Simulation—Super Value Kit

FLINN EXCLUSIVE

By: Sue Whitsett, Fond du Lac H.S., Fond du Lac, WI



Every student in your class becomes a coded nucleotide, and together the entire class will form a giant DNA molecule. Students will personally experience the antiparallel and coding structure of DNA. Once built, the giant DNA molecule is cut by a restriction enzyme. Then the challenge for each DNA fragment team is to run an obstacle course simulating gel electrophoresis. Includes base pair connecting rods and complete teaching instructions.

Super Value Kit is complete for 30 students. All materials are reusable.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
FB1228	DNA and Electrophoresis Simulation—Super Value Kit	$67.00

BIOTECHNOLOGY—INTRODUCTORY KITS continued on next page.

Biotechnology—Introductory Kits, continued

Gel Electrophoresis Simulation—Super Value Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students build models of DNA fragments with pop beads and then place them on a paper simulated agarose gel. Based upon the fragment length and migration distance, students calculate the Rf values and draw a standard curve plot for their sample. From the standard curve plot they can deduce the length of an unknown fragment. Includes over 600 pop beads. The provided masters allow students to complete the standard curve plots individually. Six different sets of fragment data are provided so student groups can be working on different samples during the lab.

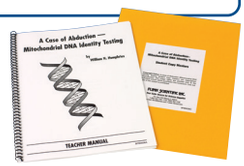
Super Value Kit is complete for 30 students in pairs. All materials are reusable.

Catalog No.	Description	Price/Each
FB1434	Gel Electrophoresis Simulation—Super Value Kit	$55.60

A Case of Abduction—DNA Identity Testing Simulation

FLINN EXCLUSIVE

By: William Humphries, Richardson H.S., Richardson, TX



In the course of their investigation, students "digest" short, 60 base-pair sequences of mitochondrial DNA using Hae III restriction enzyme; determine the sizes of the resulting "fragments" and use a standard curve to plot the migration distance for each fragment on a paper "gel"; label the separated fragments with a "radioactive probe sequence"; and interpret the results to determine the true parentage of a child allegedly abducted as an infant.

Includes extensive background information, objectives, reproducible student copy masters, detailed results, study and follow-up questions, glossary and extension ideas. The activity is designed to be conducted by cooperative teams and can be completed in two class periods.

Catalog No.	Description	Price/Each
FB0506	A Case of Abduction—DNA Identity Testing Simulation	$45.10

A Murder Mystery—DNA Fingerprinting—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students match "pop bead" DNA fingerprints of the suspects with samples collected at the scene of the crime. Students learn the basics of DNA fingerprinting, DNA structure and extraction, gel electrophoresis and autoradiography and the accuracy of DNA fingerprinting.

Full-size kits are complete for 30 students in groups of 10 students. Small-size kits are complete for 15 students in groups of 5. Refill kits contain materials only. All materials are reusable.

Catalog No.	Description	Type	Price/Each
FB1566	A Murder Mystery—DNA Fingerprinting—Super Value Laboratory Kit	Full-Size Kit	$147.45
AP10331		Full-Size, Refill Kit	134.50
AP10332		Small-Size Kit	100.10
AP10333		Small-Size, Refill Kit	92.00

PCR Simulation—Student Activity Kit

FLINN EXCLUSIVE

By: The Flinn Staff



With this great introductory activity, students will gain an in-depth understanding of the polymerase chain reaction (PCR) by performing this exciting hands-on activity. A simulated DNA molecule will be physically duplicated over and over again to allow your students to gain a better understanding of the steps involved in PCR. Includes an informative background, DNA and primer cutout sheets, teacher tips and extensions.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB1749	PCR Simulation—Student Activity Kit	$33.00

Plasmid Simulation—Super Value Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students will simulate an important part of the engineering process as they manipulate simulated plasmids. Following specific restriction enzyme cuts in their plasmid models, they consider all of the possible recombination patterns that can result from their plasmid pieces. All of the combinations represent potential newly-engineered plasmids with unique characteristics. The key concepts related to recombinant DNA will be visible and manipulated by students during this activity. Teacher Notes, reproducible student handouts and more than 1,800 colored pop-beads are provided.

Super Value Kit is complete for 30 students in pairs. All materials are reusable.

Catalog No.	Description	Price/Each
FB1635	Plasmid Simulation—Super Value Kit	$68.40

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Recombinant DNA—Super Value Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students will construct plasmid DNA using chenille wire and four different colored pony beads—each representing a different nitrogenous base. Students will manipulate the plasmid by locating restriction sites and cutting the chenille wire as the restriction enzyme would do to the plasmid. They will then insert genes of interest using pony beads, and twist the wire back together to simulate ligating the plasmid. Includes a prelab, paper-and-pencil activity to familiarize students with the process of forming recombinant DNA molecules before beginning the activity. Includes reproducible student handouts as well as detailed Teacher Notes.

Super Value Kit is complete for 30 students working in pairs. All materials are reusable.

Catalog No.	Description	Price/Each
FB1921	Recombinant DNA—Super Value Kit	$49.75

A Process to Dye for: Gel Electrophoresis—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students learn how biological molecules are separated during electrophoresis by comparing the charge, size and molecular formulas of five dyes. Students observe the direction and measure the rate of migration of the dyes and then use the results to identify an unknown mixture of dyes. The use of dyes eliminates the need for staining the samples, which means the entire process can be completed in one class period. Materials provided include agarose gel in a melt-and-pour bottle (sufficient to make 10 gels) TAE buffer, dye samples, microcentrifuge tubes, needle-tip pipets and rulers plus complete student and teacher instructions.

Complete for eight student groups. Super Value Kit is complete for 40 student groups. Electrophoresis chambers and power supplies are required and available separately.

Catalog No.	Description	Price/Each
FB1736	A Process to Dye for: Gel Electrophoresis—Student Laboratory Kit	$ 68.00
FB2062	A Process to Dye for: Gel Electrophoresis—Super Value Laboratory Kit	148.60

BIOTECHNOLOGY—INTRODUCTORY KITS continued on next page.

Biotechnology—Introductory Kits, continued

Dyeing for Forensics—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Hidden treasure is found in an old mansion and students are challenged to find the rightful owner. Along with the treasure are some personal mementos that will help solve the mystery. Six simulated DNA samples are analyzed using gel electrophoresis to determine which family described in the scenario is entitled to receive the mementos and money. This activity is a simulation of the type of analysis made using DNA fingerprinting with two special cases of relatedness testing—Y chromosome and mitochondrial DNA testing—newer methods often used on old or degraded DNA. Since simulated DNA is used, the dyeing step is not necessary. Colorful bands are visible after the gel has run for 15–20 minutes, and results are read during the same lab period.

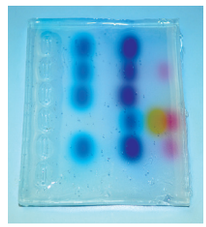
Complete for 20 gels. Requires electrophoresis apparatus and power supply.

Catalog No.	Description	Price/Each
FB2023	Dyeing for Forensics—Super Value Laboratory Kit	$78.85

Why Do People Look Different? Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students determine what members of a family—a father, mother, and three children—look like by running simulated DNA samples in agarose gel. Traits investigated include hair color, eye color, and the presence or absence of freckles. Simulated DNA is separated by electrophoresis and colorful bands immediately appear in the gel, eliminating the need for messy stains. Includes agarose, buffer needle-tip pipets, five simulated DNA samples, complete instructions and student worksheets.

Complete for six student groups. Super Value Kit is complete for 30 student groups. Requires electrophoresis apparatus and power supply.

Catalog No.	Description	Price/Each
FB1817	Why Do People Look Different? Student Laboratory Kit	$ 56.35
FB2056	Why Do People Look Different? Super Value Laboratory Kit	130.30

*The DNA contained in these kits must be kept frozen prior to use. Orders will only be shipped between September 15 and May 15 unless we are told otherwise. Upon receipt, this kit should be stored in the freezer until just before it is to be used.

DNA Forensics—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students become forensic scientists and use biotechnology to solve a crime by analyzing DNA samples collected at the "crime scene." The DNA samples are run through a gel electrophoresis "maze" and distinct bands separate—clearly leading to the guilty person. Use this nonviolent scenario to teach your students about DNA electrophoresis! Includes student and teacher instructions plus a crime report and all the materials necessary to run six gels.

*Super Value Kit is complete for 30 student groups. Requires electrophoresis apparatus and power supply. DNA source is Lambda phage.**

Catalog No.	Description	Price/Each
FB2054	DNA Forensics—Super Value Laboratory Kit	$275.50

DNA Paternity Testing—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Perform a paternity test using enzyme-restricted DNA to determine the descendant of one of the greatest thinkers of the Renaissance. The DNA is ready to load into student-prepared electrophoresis gels. After electrophoresis, students will clearly see the resulting DNA bands and be able to easily identify each band to solve the mystery. Students learn about restriction enzymes, DNA inheritance and important electrophoresis techniques with this engaged lab experience. This kit contains comprehensive background information about paternity testing and DNA analysis plus step-by-step procedures, questions and Teacher Notes.

*Complete with enough materials to run six gels. Requires electrophoresis apparatus and power supply. DNA source is Lambda phage.**

Catalog No.	Description	Price/Each
FB1799	DNA Paternity Testing—Student Laboratory Kit	$131.46

The Genetics of Cancer—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students use biotechnology to determine who carries the BRCA-1 and BARD-1 genes for hereditary breast–ovarian cancer (HBOC). Students must identify the unique DNA bands that form during gel electrophoresis analysis and compare the bands to see who is a carrier. The four samples of enzyme-restricted DNA are ready to load into student-prepared gels. This kit contains comprehensive background information about germline mutations and DNA analysis plus step-by-step procedures, questions and Teacher Notes.

*Complete with enough materials to run six gels. Required electrophoresis apparatus and power supply. DNA source is Lambda phage.**

Catalog No.	Description	Price/Each
FB1800	The Genetics of Cancer—Student Laboratory Kit	$113.75

Roles of Restriction Enzymes—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



First students simultaneously run two identical DNA samples, one cut with EcoRI and the other cut with HindIII, using gel electrophoresis. Then the banding patterns produced are analyzed to see how the use of different restriction enzymes results in changes in the number and size of the bands. This lab helps students understand the theory of how restriction enzymes digest DNA. It also enhances laboratory skills, such as preparing an agarose gel, loading and running DNA samples and staining and destaining the gel to observe the separated bands of DNA.

*Materials provided include sufficient agarose to make 6 gels, DNA samples cut with EcoRI and HindIII, TAE buffer and methylene blue for staining the gel as well as needle-tip pipets and large weighing dishes. Complete for 6 student groups. DNA source is Lambda phage.**

Catalog No.	Description	Price/Each
FB1960	Roles of Restriction Enzymes—Student Laboratory Kit	$63.50

Bio-Rad Kits See page 449.

BIOTECHNOLOGY—INTRODUCTORY KITS continued on next page.

Biotechnology—Introductory Kits, continued

Pipetting Practice—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students often have a very difficult time loading samples into agarose gel wells. Improperly loading will adversely affect the experiment. In this kit, the wells are constructed of a unique gel material that is not easily destroyed by micropipet tips. The tough polymer material can also be rinsed and reused many times. The well holes are slightly oversized so students will be successful with their first pipet transferring experience. The reusable quality makes them a real bargain!

Super Value Kit is complete for 10 student groups. All materials are reusable. Micropipets are available separately.

Catalog No.	Description	Price/Each
FB1649	Pipetting Practice—Super Value Laboratory Kit	$43.45

Biotechnology—Advanced Kits

FLINN360science℠: DNA Forensics



This kit presents the essential concepts of gel electrophoresis, DNA, Restriction Fragment Length Polymorphism (RFLP), and variable number of tandem repeats (VNTR) through hands-on science activities designed to engage all your students, regardless of level. Students have the opportunity to work with gel electrophoresis and discover the importance of such techniques to solve a variety of real-world mysteries—from medical to criminal! Each lane (the three suspects and the crime scene) will produce four different, visible fragment bars. Teachers can extend learning through guided inquiry into associated topics including "genetic mysteries."

Catalog No.	Description	Digital Access	Price/Each
AP10661	**360**Science: DNA Forensics	1-Year	$102.90
AP10761		3-Year	118.00

FLINN360science℠: Gene Expression in Bacteria



This kit presents the essential concepts of microbiology, gene expression, transcription, translation and enzymes through hands-on science activities designed to engage all your students, regardless of level. Students will discover that the Serratia marcescens bacteria grown at room temperature or about 25 °C will result in smooth, dark red bacterial colonies. The bacteria at 5°C are grown at a temperature in which the genes are expressed, and the enzymes responsible for the synthesis of prodigiosin are produced. The cultures grown at 37°C will display white or pale pink colonies. Teachers can extend learning through guided inquiry into associated phenomena including, "Environmental Inpacts on Genes."

Catalog No.	Description	Digital Access	Price/Each
AP10665	**360**Science: Gene Expression in Bacteria	1-Year	$45.75
AP10765		3-Year	62.00

Biotechnology—Equipment

Flinn Economy Electrophoresis Kit

FLINN EXCLUSIVE

By: John Fedors, Retired, San Diego, CA



Budget tight? This low-cost do-it-yourself kit allows you to quickly assemble your own gel electrophoresis apparatus that is guaranteed to perform like the more expensive units. Its easy-to-use design is perfect for the first-time electrophoresis user. This apparatus was teacher-designed and developed and has been thoroughly classroom tested. This innovative instrument operates on batteries and is actually safer than models using power supplies. Best of all, you save money by not having to purchase expensive power supplies. Kit contains detailed instructions and materials necessary to construct the apparatus.

Electrophoresis chemicals, aquarium sealer and batteries are not included. Requires three to five 9-volt batteries for operation.

Catalog No.	Description	Price/Each
FB0830	Flinn Economy Electrophoresis Kit	$60.00

Protein Electrophoresis—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Take agarose electrophoresis to the next level by separating and analyzing proteins. This advanced biotechnology kit provides stepwise instructions for extracting proteins from plant or animal tissues and visualizing them using electrophoresis. Kit includes special protein lysing, staining and destaining solutions. Proteins obtained from smooth, cardiac and skeletal tissue within one species allow students to see the variation in the type and quantity of proteins that may be expressed by the same genome. Protein tissue samples extracted from different classes of plants or animals reveal variation between species. Note that protein electrophoresis produces broad bands like chromosomal DNA rather than discrete bands observed with DNA fragments.

Complete for 24 students in groups of four. Electrophoresis equipment, power supply, microcentrifuge and tissue samples are required but not included in the kit.

Catalog No.	Description	Price/Each
FB1927	Protein Electrophoresis—Student Laboratory Kit	$79.80

Flinn Six-Gel Electrophoresis Apparatus

FLINN EXCLUSIVE



Save time and money by running six gel electrophoresis trays all at once! This oversized, seamless, injection-molded tank is safe and easy to use. The UV transparent chamber is made from thick acrylic, making it durable and leak-proof while the lid fits securely in place and can be easily removed. The adjustable leveling feet allow the fluid level to be uniform and assure better experimental results. Electrophoresis units feature recessed electrical wires and a safety stop that prevents the gel from running when the cover is not securely fitted. Each casting tray with embossed gel ruler has rubber end caps and multiple slots for easy and versatile comb placement. The apparatus comes with six 7 × 7-cm gel casting trays, six 6-tooth combs, one transparent cover and one injection-molded UV transparent base. Requires a power supply such as FB0316.

Catalog No.	Description	Price/Pkg.
FB2153	Flinn Six-Gel Electrophoresis Apparatus	$393.00
FB0316	Dual Power Supply	297.65

Time Required for Electrophoresis

Time requirements for experiments requiring electrophoresis are variable. Typically, gel preparation and setup requires 20 to 30 minutes—after which gels may be stored, under buffer, for up to three days. Gel running times, for standard gels, average two hours at 50 volts. Running times are longer at lower voltage and shorter at higher voltage. Running times are also shorter if using split trays. Gel staining requires approximately 30 minutes. Destaining will be complete in 2–4 hours—although gels may remain in destaining solution overnight if necessary.

Electrophoresis Lab Station



All the basic equipment you need to run your first experiment is included in this carefully designed package. The electrophoresis chamber included is a double-gel unit that features state-of-the-art design and safety features to prevent shocks. The variable voltage power supply can accommodate two double-gel chambers simultaneously. Includes:

- 1 double-gel electrophoresis chamber
- 1 variable voltage power supply
- 1 agarose Gel Electrophoresis Lab Investigation including all of the necessary reagents
- 1 fixed volume micropipet, 25-µL

Catalog No.	Description	Price/Each
FB1731	Electrophoresis Lab Station	$597.00

BIOTECHNOLOGY—EQUIPMENT continued on next page.

Biotechnology—Equipment, continued

Biotechnology Laboratory System



The electrophoresis chambers are double-gel units and feature state-of-the-art design and safety features to prevent shocks. The variable voltage power supply can easily run all three electrophoresis chambers simultaneously. The microcentrifuge will allow you to spin down your samples and efficiently complete your pre-lab preparation. The transluminator will help your students see the bands on their gels to get the most from their experimental results. The complete system includes 3 double-gel electrophoresis chambers, 1 variable voltage power supply, 3 fixed volume micropipets, 25-µL, 1 white light transilluminator, 1 agarose Gel Electrophoresis Lab, and 1 microcentrifuge Investigation including all of the necessary reagents.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
FB1732	Biotechnology Laboratory System	$2040.00

Power Supplies



Dual Power Supply FB0316

Safe, economical power supplies designed for educational use. The mini power supply is designed to power one electrophoresis apparatus at 70 volts. The dual power supply is designed to power one or two electrophoresis apparatus at either 70 or 125 volts. The durable, non-metal, non-conductive housing elevates the units from the table surface as a guard against shock hazards. Each power supply is equipped with a power-on red indicator light, an easily replaceable 0.5 Amp, slow burn fuse, 3-wire grounded cords, and operates on standard 110/120 volt input. Designed to work with any electrophoresis apparatus with banana jack connectors.

Specifications

Description	MiniPower Pack	Dual Power Pack
Voltage Output	70 Volts Only	70 or 125 Volts
Max. Current	250 Milliamps	
Type Output	Constant Voltage	
Output Leads	2 Sets, Recessed	

Catalog No.	Description	Price/Each
FB0315	Mini Power Supply	$217.86
FB0316	Dual Power Supply	297.65

White Light Illuminator



This white light illuminator provides the perfect amount of light for student viewing or photography of stained electrophoresis gels. Students will see the bands in their stained gels more clearly and make more accurate measurements when the gels are illuminated from beneath.

Shatter-resistant Plexiglas top gives maximum light diffusion and minimum glare with no "hot spots" that are so detrimental for clear viewing or photography. The stainless steel frame will maintain its attractive appearance for years. The viewing surface measures 10" x 12" and can easily display multiple gels at one time. LED.

Catalog No.	Description	Price/Each
AP6395	White Light Illuminator	$144.00

Flinn Mini Centrifuge



Compact and affordable mini centrifuge is perfect for everyday use in the prep room or laboratory. Simply place the samples in the rotor, close the lid, and the rotor reaches 6,000 rpm in seconds. Unit quietly spins samples and instantly decelerates to a stop when the lid is opened. Includes two rotors and 0.5- and 0.2-mL adapters. Microtube rotor holds eight 1.5- to 2.0-mL tubes. PCR rotor holds up to 16 0.2-mL PCR tubes. Unique built-in storage compartment keeps the PCR rotor safe and secure when not in use. Conserve valuable lab bench space and money with this economical mini centrifuge. 1.1 lbs, 4½" x 5.9" x 4½".

Catalog No.	Description	Price/Each
FB2073	Flinn Mini Centrifuge	$332.00

Biotechnology—Equipment, continued

Centrifuges and Microcentrifuges See page 129.

PCR Thermo Cycler



The PCR Thermo Cycler is an essential laboratory instrument in the fields of biotechnology, cloning, genotyping, mutagensis and sequencing, to name a few. Combining high performance with an intuitive 7" color touch-screen panel for easy programming, the Thermo Cycler features innovative heating/cooling elements with precise control and fast rates, high-performance DSP and temperature-control algorithm, power off protection and an aluminum adapter block.

Catalog No.	Description	Price/Each
AP9545	PCR Thermo Cycler	$4386.00

Vortexer



Quickly mix all kinds of solutions with the affordable vortexer. Sturdy, quiet unit is efficient, minimizing excessive vibration and noise. Operate continuously or by touch with a "push top to start" feature. Suction feet keep the vortexer stable, eliminating any "walking" across the lab bench. Variable speed control from 200 to 3200 rpm. Compatible for cold rooms or incubators and has spill-proof electronic controls. 13 cm x 16 cm x 17 cm. 2-year warranty.

Catalog No.	Description	Price/Each
FB2072	Vortexer	$189.00

Biotechnology—Supplies

Bio-Rad Kits See page 449.

Microcentrifuge Tubes



High-quality, autoclavable polypropylene "reaction" tubes. The snug-fitting shield-shape hinged caps are readily manipulated with one hand, yet will stay closed during use. Added thickness at tubes' conical bottoms prevents failure and leakage. The standard 1.5-mL (10.6 mm x 39.5 mm) tubes have frosted writing areas. Available in three colors in dispenser boxes of 500.

Catalog No.	Description	Color	Price/Pkg. of 500
FB0002	Microcentrifuge Tubes	Natural	$24.00

PCR Tubes



Perform micro reactions in these micro testing tubes. Explore genetics and perform DNA experiments. Attached cap. Natural color.

Catalog No.	Description	Price/Each
FB2104	PCR Tubes, 0.5-mL, Pkg. of 100	$22.05

Floating Microcentrifuge Tube Rack



These handy racks assure the continuous proper treatment of delicate biotechnology samples and help assure the experimental results you desire. The tough, polypropylene racks are steam autoclavable. Each circular rack holds eight microcentrifuge tubes and fits perfectly into a standard 400-mL beaker.

Catalog No.	Description	Price/Each
FB1671	Floating Microcentrifuge Tube Rack	$15.85

Microcentrifuge Storage Box

Sturdy polypropylene storage boxes hold vials in place. Inspect, reference, and identify samples through the and clear lid and easy-to-read numeric grid. 49 x 4 mL vials.

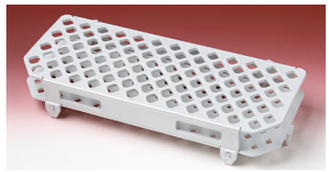
Catalog No.	Description	Price/Each
AP10220	Microcentrifuge Storage Box	$44.88

Micropipets See page 176.

BIOTECHNOLOGY continued on next page.

Biotechnology—Supplies, continued

Microcentrifuge Tube Rack



Durable polypropylene rack holds up to 100 microcentrifuge tubes. Will not become brittle when frozen or melt when autoclaved! Stackable rack has an alpha-numerical grid reference that allows you to store samples efficiently and find them quickly when needed. Holds 2-mL or smaller centrifuge tubes. 263 x 109½ x 45 mm.

Catalog No.	Description	Price/Each
FB1908	Microcentrifuge Tube Rack, 100-Place	$21.45

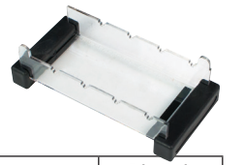
Needle Tip Disposable Pipets



The end needle point holds approximately 10 microliters of liquid. Other divisions on the pipet can be calibrated if desired. Package of 400.

Catalog No.	Description	Price/Pkg. of 400
FB1260	Needle Tip Disposable Pipets	$59.32

Electrophoresis Gel Casting Tray



This product is for replacement or addition to your existing supply. Includes one molded plastic gel casting tray and end caps. Requires well combs and an electrophoresis apparatus with power supply.

Catalog No.	Description	Price/Each
FB2295	Electrophoresis Gel Casting Tray, 7 x 14 cm	$44.78

Gel Staining Trays, Pkg. of 6



A white polypropylene base with a clear, tight-fitting, polypropylene lid, ideal for gel staining and many other uses. Resistant to commonly used solvents and stains. Measures 8⅛" x 5½" x 1½" with a capacity of 28 ounces. Package of six.

Catalog No.	Description	Price/Pkg.
FB2028	Gel Staining Trays, Pkg. of 6	$15.75

SYBR Safe® DNA Gel Stain



This DNA stain detects small amounts of DNA and fluoresces with a bright green color when excited with UV light. Like Ethidium Bromide, SYBR Safe binds specifically to the DNA double helix. However, SYBR Safe is less mutagenic than Ethidium Bromide, making it much safer for classroom use. Requires a midrange UV illuminator. 400 µL. 10,000X concentrate in DMSO.

Catalog No.	Description	Price/Pkg.
FB2232	SYBR Safe DNA Gel Stain	$78.55

Biotechnology—DNA and Restriction Enzymes

Ready-to-Run DNA



Digests and ladder are ready-to-run. The 80 µL volume is enough for 6 separate wells or about 13 µL per well. If necessary, 72 µL of glycerin may be added to each microcentrifuge tube. Once blended, 25 µL of the resulting solution can be added to each well. Ready-to-run DNA should be stored in the freezer. Available September 15 to May 15.

Catalog No.	Description	Price/Each
FB1887	Lambda DNA EcoRI digest, 80 µL	$13.85
FB1888	Lambda DNA HindIII digest, 80 µL	13.65
FB2084	Lambda DNA Mixed digest, 80 µL	20.45
FB1901	DNA 1kb ladder, 80 µL	22.15

Electrophoresis Reagent Package



Contains reagents sufficient to perform 20 DNA electrophoresis experiments with the MiniGel apparatus. Includes 10 g of electr phoresis-grade agarose, 10 mL of 6X gel-loading solution, 100 mL of 50X concentrate electrophoresis buffer and 100 mL of 10X concentrate methylene blue electrophoresis staining solution.

Catalog No.	Description	Price/Each
FB0324	Electrophoresis Reagent Package	$80.05

Agarose, Electrophoresis Grade

Catalog No.	Description	Price/Each
A0132	Agarose, Electrophoresis Grade, 10 g	$29.14

Agarose Solution

Convenient and trouble-free. Simply melt in a hot water bath or microwave, cool to about 60 °C and pour! The 400 mL of preprepared electrophoresis grade agarose is sufficient for six gels. The agarose is 0.8% concentration and made in a buffered solution ready for use.

Catalog No.	Description	Price/Each
FB0323	Agarose Solution	$33.80

Electrophoresis Buffer, Concentrated

Tris-acetate buffer at pH 7.8 has been optimized for agarose gel electrophoresis of DNA and RNA. 100 mL of 50X concentrate buffer solution to make five liters of working solution. Compatible with all the DNA kits listed in this section requiring the use of agarose gels.

Catalog No.	Description	Price/Each
FB0325	Electrophoresis Buffer, Concentrated	$27.26

Gel Loading Solution

Combine the gel loading Solution with DNA digests to both visualize the sample run and to make the sample sink into the well. This dense, buffered solution contains two dyes. Bromphenol blue migrates at the same rate as a 200–400 base pair DNA fragment, at the beginning of a typical run. Xylene cyanole migrates at the same rate as a 4,000 base pair DNA fragment and helps visualize the middle to end. Usually add 1 µL of the gel loading Solution for every 5 µL of digest.

Catalog No.	Description	Price/Each
FB2067	Gel Loading Solution, 6X, 100 mL	$13.90

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Methylene Blue Electrophoresis Stain

Methylene blue electrophoresis staining solution interacts with both RNA and DNA—and does not require ultraviolet light for visualization. Bands will appear dark blue on a light blue background. This bottle contains 300 mL of 10X concentrate and will make three liters of working solution.

Catalog No.	Description	Price/Each
FB0326	Methylene Blue Electrophoresis Stain	$30.75

Reagents for Protein Electrophoresis



Tris-Glycine-SDS Buffer is optimized for separation of proteins (as opposed to nucleic acids) during agarose gel electrophoresis. The Protein Staining Solution binds to protein molecules so the protein bands will be visible in the gel.

Catalog No.	Description	Price/Each
FB1933	Protein Staining Solution, 500 mL	$18.77

BIOTECHNOLOGY—DNA AND RESTRICTION ENZYMES continued on next page.

BIO-RAD

BIO-RAD Explorer

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Bio-Rad Explorer

Educational Kits, Equipment, and Consumables

Bio-Rad Laboratories is a global leader in the development and manufacture of products for life science research and clinical diagnostics. Understanding its responsibility to support life science education, the company established the Bio-Rad Explorer Program, the mission of which is to make science accessible and to keep students at the center of instruction.

For over 25 years, the Bio-Rad Explorer program has leveraged the technical expertise within Bio-Rad and partners with teachers, researchers, and industry leaders to bring engaging and relevant real-world science into high school, CTE, community college, and four-year university classrooms:

- Innovative kits and lessons bring concepts like biotechnology, conservation biology, and biomedical science into the context of real-world applications that are engaging and relevant for students.
- Industry-quality instruments and reagents allow your students to learn by using the same tools scientists use in their research.
- Manufactured in the same facilities and backed by the same stringent quality control as other Bio-Rad products, our kits and activities are guaranteed to work and make scientific discovery accessible.

Biotechnology—Bio-Rad Books

Biotechnology: A Laboratory Skills Course—Textbook

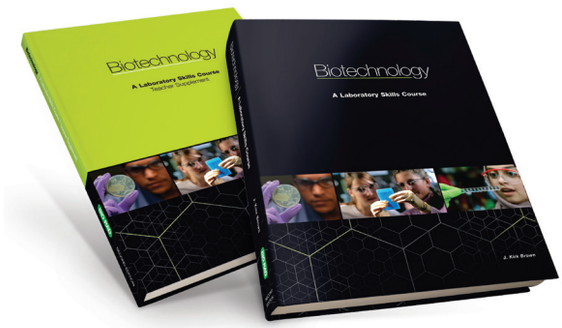
This laboratory textbook blends theory with hands-on laboratory activities and real-world applications for your biotechnology course, and it incorporates Bio-Rad Explorer kits for easy implementation.

This textbook:

- Develops key skills with multiple activities.
- Encourages students to consider the implications of biotechnology with bioethics case studies.
- Broadens occupational awareness with profiles of careers in biotech.
- Lets students answer a research question using independent research.

The teacher supplement provides a thorough background on preparation, setup, results analysis, and assessment. It also provides guidance on how to implement and build a biotechnology course.

Catalog No.	Description	Material No.	Price/Each
FB2503	Biotechnology: A Laboratory Skills Course, Second Edition, Teacher Supplement	12008527EDU	$ 41.00
FB2562	Biotechnology: A Laboratory Skills Course, Second Edition, Student Edition	12008528EDU	116.00



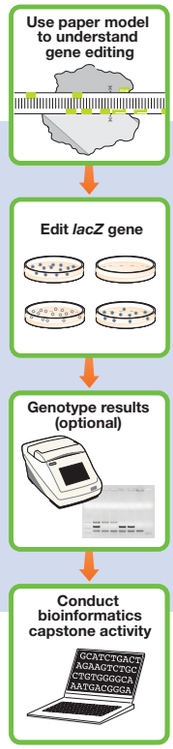
Chapters include:

- The Biotechnology Industry
- Laboratory Skills
- Microbiology and Cell Culture
- DNA Structure and Analysis
- Bacterial Transformation and Plasmid Purification
- Polymerase Chain Reaction
- Protein Structure and Analysis
- Immunological Applications
- Research Projects

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad Classroom Kits

Bio-Rad Explorer kits address the critical need for inquiry-based activities—an important component of scientific literacy and a launch point of experience and practical training for students interested in careers in life science. The kits range from introductory to advanced topics, including courses guiding students through entire molecular biology workflows.



Out of the Blue CRISPR Kit and Genotyping Extension

Use CRISPR-Cas9 gene editing to edit the genomic *lacZ* gene in *E. coli*. Visualize results with blue-white screening and confirm them by PCR. Deepen your understanding of CRISPR, its promise and risks, and the ethics behind its many applications.

Perform true CRISPR gene editing in your laboratory class!

CRISPR gene editing is revolutionizing scientific research. Now your students can do real CRISPR-Cas9 gene editing in the classroom using Bio-Rad's educational CRISPR gene editing kits.

The Out of the Blue CRISPR and Genotyping Kits earned the 2020 Science Educators' Best of Show award for "Best New Technology Innovation for Science" from the National Science Teaching Association (NSTA).

- **Hands-on, true CRISPR gene editing** – Students get direct experience with this powerful technology.
- **Visible phenotype** – Results can be observed with the naked eye in as little as 22 hours.
- **Safe** – Familiar and common reagents and non-pathogenic, non-biofilm-forming bacteria generate a phenotype that is common to molecular biology.
- **Accessible** – Does not require specialized equipment or techniques.
- **Comprehensive, supportive curriculum** – Includes background about the components of a CRISPR-Cas9 system, the science and math behind its accuracy and flexibility, and the guide bioinformatic analysis of CRISPR targets students design themselves.

Out of the Blue CRISPR Kit and Genotyping Extension

The Bio-Rad Out of the Blue CRISPR Kit enables students to perform true genomic CRISPR gene editing as they apply CRISPR-Cas9 technology to disrupt the lacZ gene in E. coli and produce a phenotype visualized through blue-white screening. The optional Out of the Blue CRISPR Genotyping Extension allows them to confirm the edit at the molecular level using PCR and agarose gel electrophoresis.

Catalog No.	Description	Material No.	Price/Each
FB2579	Out of the Blue CRISPR Kit and Genotyping Extension	**17006081EDU**	**$490.00**
FB2442	Out of the Blue CRISPR Kit	**12012608EDU**	**342.00**
FB2504	Out of the Blue Genotyping Extension	**12012607EDU**	**234.02**
FB2332	Out of the Blue CRISPR Kit Refill Pack	**12012620EDU**	**244.00**
FB2333	Out of the Blue Genotyping Extension Refill Pack	**12012708EDU**	**220.00**



FB2579, etc.
Out of the Blue CRISPR Kit and Genotyping Extension

Out of the Blue CRISPR Kit

Kit contains sufficient materials for 8 student workstations (2–4 students per workstation).

Description	Qty
E. coli HB 101-pBRKan, Lyophilized	1
Donor Template DNA (pLZDonor)	1
Donor Template DNA and Guide RNA (pLZDonorGuide)	1
KIX Mix	1
Spectinomycin Powder	1
Arabinose, Lyophilized	1
Sterile Transformation Solution	1
LB Nutrient Agar Powder	1
LB Broth Capsule, Makes 50 mL LB Broth	1
Inoculation Loops, Sterile	80
Petri Dishes, Sterile	60
2.0 mL Microcentrifuge Tubes, Sterile	90
Easy Start Guide	1
Instructor Answer Guide	1

Out of the Blue Genotyping Extension

Kit contains sufficient materials for 8 student workstations (2–4 students per workstation).

Description	Qty
Out of the Blue Primer Mix (50x)	1
Out of the Blue PCR Positive Control DNA	1
PCR Master Mix (Taq DNA Polymerase, dNTPs, Buffers), 1.2 mL	1
PCR Molecular Weight Ruler	1
Orange G Loading Dye	1
InstaGene Matrix, 20 mL	1
PCR Tubes, 0.2 mL	100
Microentrifuge Tubes, 1.5 mL with Caps	60
Conical Tubes, 1.5 mL, Sterile	50
Instructor Answer Guide	1

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad Kits

pGLO™ Bacterial Transformation Kits

Bio-Rad's pGLO Bacterial Transformation Kits offer unforgettable lab activities in which students engineer bacteria to express the Green Fluorescent Protein (GFP) and glow green under UV light. They enable hands-on learning about the central dogma, genetic engineering, and the regulation of gene expression.

These kits are available in three formats to support your teaching needs. Each kit contains the reagents and consumables required for the number of workstations indicated below.

Catalog No.	Description	Material No.	Price/Each
FB2565	pGLO Bacterial Transformation Kit	**1660003EDU**	**$124.00**
FB2354	Bacterial Transformation Kit for General Biology	**17006991EDU**	**128.80**
FB2516	Transformation and Inquiry Kit for AP Biology	**1660335EDU**	**223.12**
FB2345	Transformation Reagent Refill Kit	**1660555EDU**	**85.00**
FB2517	Inquiry Reagent Refill Pack	**1660336EDU**	**116.30**



FB2565, etc.
pGLO Bacterial Transformation Kit

	pGLO Bacterial Transformation Kit	pGLO Bacterial Transformation Kit for General Biology	pGLO Transformation and Inquiry Kit for AP Biology
Overview	Teach the basics of genetic engineering and the roles that external and internal factors play in gene regulation	Teach the basics of genetic engineering and the roles that external and internal factors play in gene regulation	Students design their own inquiry investigations to examine the roles that external and internal factors play in bacterial transformation and gene regulation
# Workstations (Up to 4 Students per Workstation)	8	12	8
Laboratory Activities	1	2	5
Class Periods (50 min)	2	3–5	Flexible to fit a range of class periods

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FB2508, etc.
Secrets of the Rainforest Kit

pGLO GFP Extension Kits

Take your pGLO transformation lab to the next level and explore the structure and function of the expressed GFP. The bacterial proteome contains thousands of proteins, but only the cloned GFP glows!

Each kit contains the reagents and consumables required for the number of workstations indicated below.

Catalog No.	Description	Material No.	Price/Each
FB2566	Green Fluorescent Protein Chromatography Kit	**1660005EDU**	**$134.00**
FB2512	pGLO SDS-PAGE Extension	**1660013EDU**	**123.00**
FB2508	Secrets of the Rainforest Kit	**1660006EDU**	**233.00**
FB2513	Lyophilized Components Refill Pack	**1660015EDU**	**89.00**
FB2514	GFP Chromatography Buffers Refill Pack	**1660016EDU**	**75.00**



FB2512, etc.
pGLO SDS-PAGE Extension

	pGLO SDS-PAGE Extension*	Green Fluorescent Protein Chromatography Kit*	Secrets of the Rainforest Kit
Overview	Use protein electrophoresis (SDS-PAGE) to view expression of proteins in pGLO bacteria	Use chromatography to purify glowing GFP from pGLO bacteria	Simulate the drug discovery process in your classroom with a glowing protein (GFP)
Concepts	Protein expression, electrophoresis	Protein expression, protein structure and function, chromatography	Bacterial libraries, protein purification, chromatography, process and ethics of drug development
# Workstations (Up to 4 Students per Workstation)	8	8	8

*** Requires purchase of a pGLO bacterial transformation kit.**

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad DNA Extraction and Electrophoresis Kits

Designed to help teachers introduce students to the exciting world of molecular biology, these educational kits explore DNA structure and function, cell structure, restriction digestion, and agarose gel electrophoresis.

Genes in a Bottle Kit

In this activity, students employ the same real-world laboratory procedure used in biotechnology research applications as they extract genomic DNA from their own cheek cells, then precipitate and bottle it in a cool helix-shaped necklace.

Kit contains buffer, protease and salt, conical tubes, disposable pipets, curriculum, and all materials to make DNA necklaces for 36 students.

Catalog No.	Description	Material No.	Price/Each
FB2571	Genes in a Bottle Kit	**1662300EDU**	**$172.00**
FB2535	Genes in a Bottle DNA Extraction Module	**1662000EDU**	**122.00**
FB2539	Genes in a Bottle DNA Helix Necklace Module	**1662250EDU**	**89.00**



FB2571, etc.
Genes in a Bottle Kit

Restriction Digestion Kits

With the Restriction Digestion and Analysis of Lambda DNA Kit, students learn the procedures and principles of DNA restriction digestion as they digest phage lambda DNA and analyze the fragments by agarose gel electrophoresis. With the Analysis of Precut Lambda DNA Kit, students move straight to electrophoretic analysis of lambda DNA that has already been digested. The Forensic DNA Fingerprinting Kit enables students to examine the use of RFLPs in the context of crime scene investigations.

Each kit includes DNA, standard, buffers, (enzymes), agarose, Fast Blast DNA stain, test tubes, curriculum, and more for 32 students. Reagent refills are also available.

Catalog No.	Description	Material No.	Price/Each
FB2507	Restriction Digestion and Analysis of Lambda DNA Kit	**1660002EDU**	**$133.00**
FB2506	Analysis of Precut Lambda DNA Kit	**1660001EDU**	**127.00**



FB2507, etc.
Restriction Digestion and Analysis of Lambda DNA Kit

Virus Detection and Transmission Kit

Students use pre-amplified DNA samples (no thermal cycler needed) and gel electrophoresis to solve the mystery of how a novel virus spread throughout a restaurant. Using molecular data and evidence from the restaurant, students deduce the mode of transmission and chain of infection. The kit design covers two viruses, each with two modes of transmission, for a total of four possible activities to choose from.

This kit includes DNA samples, molecular weight ruler, loading dye, and microcentrifuge tubes for 32 students. See website for cost-saving bundles with electrophoresis reagents.

Catalog No.	Description	Material No.	Price/Each
FB2561	Virus Detection and Transmission Kit	**17005316EDU**	**$114.00**



FB2561
Science of Opioid Dependence Kit

Virus Disease Detection and Transmission Kit

Two patients stumble into a hospital with severe symptoms associated with a newly emerging virus. Doctors diagnose the patients and find that one is, in fact, infected with the novel virus. This person had eaten lunch at a local restaurant earlier that day, so public health officials track down others who were also at the restaurant in an effort to determine how the virus spreads.

Based on published viral transmission cases studies, this hands-on lab activity puts your students into the roles of an emergency room (ER) doctor, medical laboratory scientist, epidemiologist, and public health official as they analyze patient samples and use patient information to determine how a novel virus strain spread through a restaurant. In an optional activity, students consider what might need to be done to prevent further spread of the virus.

Catalog No.	Description	Material No.	Price/Each
FB2707	Virus Disease Detection and Transmission Kit	**17008261EDU**	**$108.85**
FB2708	Virus Disease Detection and Transmission Kit plus Fast Blast Electrophoresis Reagents	**17008251EDU**	**121.15**
FB2709	Virus Disease Detection and Transmission Kit plus Uview Electrophoresis Reagents	**17008241EDU**	**128.40**



FB2707
Virus Disease Detection and Transmission Kit

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad PCR and Real-Time PCR Kits

DNA Barcoding Kits

With these kits, students determine the species of fish, mammals, insects, or fungi based on the DNA sequence of a standard reference gene or internal transcribed spacer. Students extract DNA, amplify the gene by PCR, verify PCR products by agarose gel electrophoresis, sequence the gene, and then use the sequence obtained and bioinformatics to identify the species. The unique sequence produced for a given sample is considered to be its DNA barcode.

Sequencing service is not included but refill modules are available. Each kit includes reagents and consumables for extraction and PCR amplification of up to 16 DNA and control samples (8 student workstations, 2 samples per workstation, 2–4 students per workstation). See website for cost-saving bundles with electrophoresis reagents.

Catalog No.	Description	Material No.	Price/Each
FB2355	Fish DNA Barcoding Kit	**17007432EDU**	**$306.00**
FB2367	Mammals, Insects, and Fungi DNA Barcoding Kit	**17007366EDU**	**324.00**
FB2356	Fish, Mammals, Insects, and Fungi DNA Barcoding Kit	**17007154EDU**	**612.00**



FB2355, etc.
Fish DNA Barcoding Kit

PV92 PCR Informatics Kit

Students use real-world forensic techniques to extract DNA from their hair follicles or cheek cells, and then use PCR amplification and electrophoresis to fingerprint their own DNA at a specific genetic locus. Using their results, they test the Hardy-Weinberg equilibrium theory within their classroom population, then go online to compare their classroom results to genetic data of populations worldwide.

Kit includes positive controls, PCR master mix, primers, extraction matrix, Fast Blast DNA stain, test tubes/holders, curriculum, and more for 32 students. PV92 PCR Kit TS (1662119EDU) and RT (1662139EDU) Refill Packs are available. See website for cost-saving bundles with electrophoresis reagents.

Catalog No.	Description	Material No.	Price/Each
FB2570	PV92 PCR Informatics Kit	**1662100EDU**	**$268.00**
FB2346	Protease for PV92 PCR Informatics Kit	**1662003EDU**	**46.50**



FB2570, etc.
PV92 PCR Informatics Kit

Crime Scene Investigator PCR Basics Kit

Students become crime scene investigators as they conduct real-world forensic DNA analyses. Using PCR and agarose gel electrophoresis, they analyze the provided DNA samples — from a hypothetical crime scene and suspects — to learn how DNA profiling can distinguish one person from another. This powerful tool assists in investigations of crime scenes, missing persons, mass disasters, immigration disputes, and even paternity testing.

Use the real-time PCR version of this kit (1662660EDU) as a starting point to become familiar with qPCR techniques using premade DNA samples and activities that examine factors that impact sensitivity and accuracy.

Kit includes crime scene and suspect samples, PCR master mix, primers, allele ladder, test tubes, curriculum, and more for 32 students. See website for cost-saving bundles with electrophoresis reagents.

Catalog No.	Description	Material No.	Price/Each
FB2574	Crime Scene Investigator PCR Basics Kit	**1662600EDU**	**$190.00**
FB2543	Crime Scene Investigator PCR Basics Kit Reagent Refill Pack	**1662601EDU**	**156.00**



FB2574, etc.
Crime Scene Investigator PCR Basics Kit

GMO Investigator Kit

Students engage in a complete investigation in which they gather sample food items from the grocery store, extract DNA from the samples, amplify the DNA using polymerase chain reaction (PCR), and use agarose gel electrophoresis to test for the presence of two DNA sequences that are present in >85% of genetically modified (GM) crops.

Use the real-time PCR version of this kit to quantitate and determine what fraction of the food product is made with genetically modified ingredients, in the same manner as standard testing laboratories do.

Kit includes positive control, InstaGene matrix, master mix, primers, dye, test tubes/holders, curriculum, and more for 32 students. See website for cost-saving bundles with electrophoresis reagents.

Catalog No.	Description	Material No.	Price/Each
FB2573	GMO Investigator Kit	**1662500EDU**	**$240.00**
FB2541	GMO Investigator Kit Reagent Refill Pack	**1662501EDU**	**167.00**
FB2542	GMO Real-Time PCR Starter Kit	**1662560EDU**	**699.00**



FB2573, etc.
GMO Investigator Kit

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad ELISA and Photosynthesis and Cellular Respiration Kits

ELISA Immuno Explorer Kit

This kit provides a hands-on way to learn about antibodies and how their unique properties have revolutionized medicine, epidemiology, and life science research. Select one of three different ELISA-based protocols that use real antibodies to teach your students how protein structure and enzyme-substrate interactions help detect HIV, bird flu, genetically modified organisms (GMOs), and the molecular markers of cancer, pregnancy, or drug use.

Kit includes antigen, antibodies, HRP enzyme substrate, 10x PBS, 10% Tween, disposable plastic transfer pipets, test tubes, microplates, and curriculum for 48 students.

Catalog No.	Description	Material No.	Price/Each
FB2572	ELISA Immuno Explorer Kit	1662400EDU	$177.00
FB2540	ELISA Kit Reagent Refill Pack	1662401EDU	133.00



FB2572, etc.
ELISA Immuno Explorer Kit

Giant Panda Problem Kit for AP Biology

Put students in the role of conservation scientists as they learn about the natural and human forces that have contributed to declining giant panda populations and the current efforts to restore them. They also learn how the unique properties of antibodies have revolutionized diagnostics as they apply two variations of an enzyme-linked immunosorbent assay (ELISA): the first checks simulated panda urine samples for biomarkers of a pregnancy complication, and the second predicts ovulation times.

Kit includes simulated hormone, antibodies, HRP enzyme substrate, 10x PBS, 10% Tween, disposable plastic transfer pipets, micro test tubes, micro strip plates, and curriculum for 32 students.

Catalog No.	Description	Material No.	Price/Each
FB2558	Giant Panda Problem Kit	17002878EDU	$177.00
FB2540	ELISA Kit Reagent Refill Pack	1662401EDU	133.00



FB2558, etc.
Giant Panda Problem Kit

Photosynthesis and Cellular Respiration Kit for General Biology

This kit uses premade algae beads and a CO_2 (pH) indicator solution to help dispel the common misconception that plants only photosynthesize and only animals perform cellular respiration—these unicellular algae do both! Students investigate both processes together and design their own experiments to determine the conditions under which each process is dominant. Engage in 3-dimensional learning as students delve into lessons and content designed for the NGSS.

With this kit, students use 3 algae beads in 0.2 ml PCR tubes. Each kit includes answer key, algae beads, 10x CO_2 indicator solution, debeading solution, PCR tubes, disposable plastic transfer pipets, and indicator color guides for 24 student workstations.

Catalog No.	Description	Material No.	Price/Each
FB2502	Photosynthesis and Cellular Respiration Kit for General Biology	12005534EDU	$173.93
FB2501	Photosynthesis and Cellular Respiration Reagent Refill Pack	12002353EDU	148.72



FB2502, etc.
Photosynthesis and Cellular Respiration Kit for General Biology

Photosynthesis and Cellular Respiration Kit for AP Biology

With this kit, students use premade algae beads to explore photosynthesis and cellular respiration and focus on learning quantitative data collection and experimental design. This kit is designed to make students think through scientific discovery and includes 3 pre-lab activities and 6 inquiry investigations.

With this kit, students use 10 algae beads in cuvettes, so results can be quantified with spectrophotometry. Each kit includes algae beads, 10x CO_2 indicator, debeading solution, disposable cuvettes (with caps), disposable plastic transfer pipets, indicator color guides, and inquiry-driven curriculum for 32 students.

Catalog No.	Description	Material No.	Price/Each
FB2578	Photosynthesis and Cellular Respiration Kit for AP Biology	17001238EDU	$181.33
FB2501	Photosynthesis and Cellular Respiration Reagent Refill Pack	12002353EDU	148.72



FB2578, etc.
Photosynthesis and Cellular Respiration Kit for AP Biology

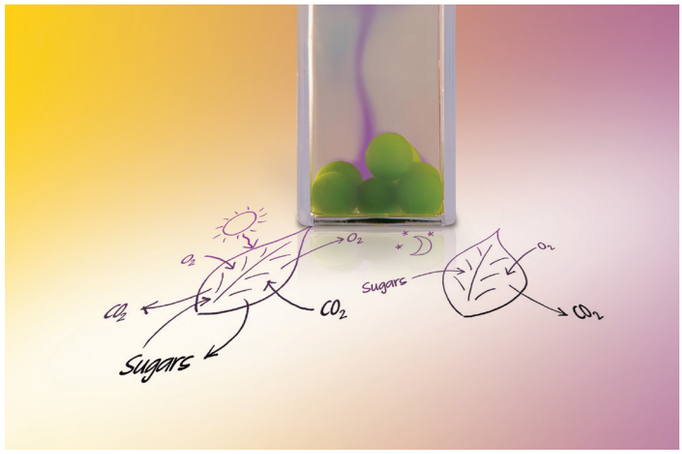
BIOTECHNOLOGY—BIO-RAD continued on next page.

ThINQ! Kits
Designed for Inquiry-Based Learning



Inquiry-based learning emphasizes the student's role in the learning process. Students are encouraged to explore the material, ask questions, and share ideas.

Bio-Rad's ThINQ! investigations offer materials and curricula that help teachers to incorporate an inquiry approach in their classroom. Developed in collaboration with master life science teachers, ThINQ! Investigation Kits guide students through real-world inquiry investigations, encourage them to think like real scientists, and put them at the center of learning.





Photosynthesis and Cellular Respiration

Photosynthesis and Cellular Respiration Kit for AP Biology

Design quantitative experiments to discover how environmental conditions impact both photosynthesis and cellular respiration—with algae beads!

Photosynthesis and Cellular Respiration Kit for General Biology

Create models and design qualitative experiments with algae beads to explore photosynthesis and cellular respiration.

Enzymes and ELISA

Biofuel Enzyme Reactions Kit for AP Biology

Connect mushroom ecology and enzyme activity as students assume the role of bioengineer to optimize the function of cellobiase for biofuel production.

Giant Panda Problem Kit for AP Biology

Explore reproductive endocrinology in the context of giant panda conservation. Design hormone assays to monitor fertility using the power of ELISA.

pGLO Bacterial Transformation

pGLO Transformation and Inquiry Kit for AP Biology

Investigate the functional elements of pGLO™ bacterial transformation, including heat shock, antibiotic selection, promoters, and satellite colony formation.

ThINQ! Inquiry-Based Kits

Catalog No.	Description	Material No.	Price/Each
FB2516	pGLO Transformation and Inquiry Kit for AP Biology	1660335EDU	$223.12
FB2502	Photosynthesis and Cellular Respiration Kit for General Biology	12005534EDU	173.93
FB2672	Biofuel Enzyme Reactions Kit for AP Biology	17001235EDU	175.00
FB2578	Photosynthesis and Cellular Respiration Kit for AP Biology	17001238EDU	181.33
FB2558	Giant Panda Problem Kit	17002878EDU	177.00



FB2502, etc.
Photosynthesis and Cellular Respiration Kit for General Biology

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad Explorer Classroom Kits

Introductory Kits

Catalog No.	Description	Material No.	Price/Each
FB2565	pGLO™ Bacterial Transformation Kit	1660003EDU	$124.00
FB2509	Size Exclusion Chromatography Kit	1660008EDU	116.00
FB2571	Genes in a Bottle Kit	1662300EDU	172.00
FB2572	ELISA Immuno Explorer Kit	1662400EDU	177.00
FB2549	Got Protein? Kit	1662900EDU	232.00
FB2550	Microbes and Health Kit	1665030EDU	127.00
FB2554	IDEA Kit—Inquiry Dye Electrophoresis Activity	1665075EDU	71.00
FB2349	STEM Electrophoresis Classroom Set	1665090EDU	379.00
FB2578	Photosynthesis and Cellular Respiration Kit	17001238EDU	181.33
FB2560	Engineering Solutions for Global Health Kit	17005278EDU	126.85
FB2354	pGLO™ Bacterial Transformation Kit for General Biology	17006991EDU	128.80



FB2565, etc.
pGLO™ Bacterial Transformation Kit

Intermediate Kits

Catalog No.	Description	Material No.	Price/Each
FB2561	Virus Detection and Transmission Kit	17005316EDU	$114.00
FB2506	Analysis of Precut Lambda DNA Kit	1660001EDU	$127.00
FB2507	Restriction Digestion and Analysis of Lambda DNA Kit	1660002EDU	133.00
FB2566	Green Fluorescent Protein Chromatography Kit	1660005EDU	134.00
FB2508	Secrets of the Rainforest Kit	1660006EDU	233.00
FB2567	Forensic DNA Fingerprinting Kit	1660007EDU	176.75
FB2512	pGLO Kit SDS-PAGE Extension	1660013EDU	123.00
FB2545	Comparative Proteomics Kit I: Protein Profiler	1662700EDU	227.00
FB2577	Biofuel Enzyme Kit	1665035EDU	175.00
FB2557	*C. elegans* Behavior Kit	1665120EDU	215.00
FB2561	Science of Opioid Dependence Kit	17005316EDU	114.00



FB2506, etc.
Analysis of Precut Lambda DNA Kit

Advanced Kits

Catalog No.	Description	Material No.	Price/Each
FB2579	Out of the Blue CRISPR Kit and Genotyping Extension	17006081EDU	$490.00
FB2504	Out of the Blue Genotyping Extension	12012607EDU	234.02
FB2505	Out of the Blue CRISPR Kit	12012608EDU	306.00
FB2570	PV92 PCR Informatics Kit	1662100EDU	268.00
FB2573	GMO Investigator Kit	1662500EDU	240.00
FB2542	GMO Real-Time PCR Starter Kit	1662560EDU	699.00
FB2574	Crime Scene Investigator PCR Basics Kit	1662600EDU	190.00
FB2544	CSI PCR Basics Real-Time PCR Starter Kit	1662660EDU	643.40
FB2547	Comparative Proteomics Kit II: Western Blot Module	1662800EDU	260.00
FB2546	Cloning and Sequencing Explorer Series	1665000EDU	94.08
FB2551	Protein Expression and Purification Series—Centrifugation Purification Process	1665040EDU	707.95
FB2552	Protein Expression and Purification Series—Hand-Packed Purification Process	1665045EDU	896.11
FB2553	Protein Expression and Purification Series—Prepacked Purification Process	1665050EDU	897.29
FB2356	Fish, Mammals, Insects, and Fungi DNA Barcoding Kit	17007154EDU	612.00
FB2367	Mammals, Insects, and Fungi DNA Barcoding Kit	17007366EDU	324.00



FB2570, etc.
PV92 PCR Informatics Kit

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad Laboratory Equipment

Classroom
Laboratory Equipment

Why teach with technology look-alikes when you can use the same industry-quality laboratory equipment that scientists use in their research? Bio-Rad offers a wide range of general laboratory instruments as well as cutting-edge equipment for electrophoresis, gel documentation, blotting, PCR, and real-time quantitative PCR (qPCR).



UView™ Mini Transilluminator

Visualize your agarose gels using the compact UView mini transilluminator. Featuring an auto safety shutoff that activates when the lid is removed, the UView 6x mini transilluminator is best for fluorescent applications that require excitation at 365 nm.

Catalog No.	Description	Material No.	Price/Each
FB2344	UView Mini Transilluminator	1660531EDU	$1108.29



FB2344
UView Mini Transilluminator

Centrifuges

- **Mini Centrifuge** – Includes microtube and PCR strip tube rotors and 0.5/0.6 mL, 0.4/0.25 mL, and 0.2 mL tube adaptors; the maximum speed is 6,000 rpm (2,000 x g). Includes a power adaptor for U.S./Canada, EU, UK, and Australia.
- **Model 16K Microcentrifuge** – Accommodates 1.5 or 2.0 mL tubes and has a quick-spin feature; the maximum speed is 14,000 rpm (16,000 x g). Safe for coldroom operation.
- **PCR Tube Adaptor for Model 16K Microcentrifuge** – Holds two PCR 8-tube strips or 16 individual 0.2 mL tubes.

Catalog No.	Description	Material No.	Price/Each
FB2563	Mini Centrifuge, 100–240 V	12011919	$ 367.00
FB2569	Model 16K Microcentrifuge, 120 V	1660602	2492.32
FB2434	PCR Tube Adaptor, for Model 16K Microcentrifuge	1660620	124.87



FB2563, etc.
Mini Centrifuge, 100–240 V

QUESTIONS? CALL US AT
1-800-452-1261
WE ARE ALWAYS READY TO HELP

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad Laboratory Equipment, continued

Mixing Devices

Our mixing devices feature a compact footprint that requires minimal benchspace.

Catalog No.	Description	Material No.	Price/Each
FB2627	Mini Rocker, 120 V	1660710EDU	$ 552.00
FB2628	Tube Roller, 120 V	1660711EDU	676.00
FB2532	BR-2000 Vortexer, 120 V	1660610EDU	380.00
FB2533	UltraRocker™ Rocking Platform, 120 V	1660709	1080.00



FB2627
Mini Rocker, 120 V

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WWW.FLINNSCI.COM



FB2673, etc.
Benchtop Shaking Incubator
Starter Set

Temperature Control Equipment

- **Benchtop Shaking Incubator** – Handles small batch culture needs easily, for example, growing bacteria or yeast up to 4 L. The incubation temperature can be set in 0.1° increments up to 65 °C. The shaker speed is adjustable between 20 and 300 rpm for periods up to 99 hours or continuous operation. It features outstanding temperature uniformity and stability. Secure a wide variety of vessels with many available accessories.
- **Digital Dry Bath** – Digitally controlled dry bath that is ideal for a multitude of laboratory procedures where incubation of samples is needed. It is accurate, built for safe continuous operation, economical, and versatile. Comes with one aluminum alloy 1.5 ml heating block (24 x 1.5 mL capacity). Additional 0.5, 2.0, and 15 mL heating blocks with 24 x 0.5, 24 x 2.0, and 12 x 15 mL capacity, respectively, can be purchased separately; 15 ml dry bath block not shown.
- **Mini Incubation Oven** – Can accommodate up to eighty 6.5 cm plates and operates at temperatures up to 60 °C. Contains a rear port to allow insertion of our tube roller or mini rocker for temperature-controlled mixing.
- **Water Bath** – Temperature controlled, dependable, affordable water bath that includes stainless steel tank and lid, electrostatically applied finish that resists rust, corrosion, and scratches, over-temperature protection, and thermometer.

Catalog No.	Description	Material No.	Price/Each
FB2673	Benchtop Shaking Incubator Starter Set, 120 V (Includes 6 Flask Clamps)	17002944EDU	$3743.00
FB2559	Benchtop Shaking Incubator Expanded Set, 120 V (Includes 34 Flask Clamps and 1 Petri Dish Shelf)	17002945EDU	4487.62
FB2531	Digital Dry Bath with 4 Heating Blocks, 120 V (Includes 0.5, 1.5, 2.0, and 15 mL Blocks)	1660571EDU	987.00
FB2521	Mini Incubation Oven, 120 V	1660501EDU	533.00
FB2568	Temperature-Controlled Water Bath, 120 V	1660504EDU	735.30



FB2531
Digital Dry Bath with
4 Heating Blocks



FB2521
Mini Incubation Oven



FB2568
Temperature-Controlled
Water Bath

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad Electrophoresis Equipment

PowerPac Power Supplies

- **PowerPac Basic Power Supply** – Designed for horizontal DNA electrophoresis in agarose gels and vertical acrylamide gel electrophoresis of proteins; offers timer control, constant voltage or constant current output, real-time monitoring of both voltage and current, and pause/resume run capability.
- **PowerPac HC Power Supply** – Provides 3.0 A of current and 300 W of power to handle standard horizontal agarose and vertical polyacrylamide gels, as well as blotting applications; provides fully adjustable voltage, current, and power controls.
- **PowerPac Universal Power Supply** – Fits all power requirements, from mini vertical and high-throughput electrophoresis to blotting.
- **PowerPac HV Power Supply** – Designed for high-voltage applications, can run up to four DNA sequencing cells at once; optional temperature probe (1645059EDU) allows automatic and precise control of temperatures between 30 and 90 °C during electrophoresis.

Catalog No.	Description	Material No.	Price/Each
FB2564	PowerPac Basic Power Supply	**1645050EDU**	**$ 415.00**
FB2595	PowerPac HC Power Supply	**1645052EDU**	**1048.00**
FB2598	PowerPac Universal Power Supply	**1645070EDU**	**2962.00**
FB2596	PowerPac HV Power Supply	**1645056EDU**	**2765.91**



FB2564, etc.
PowerPac Basic Power Supply

Mini-Sub® and Wide Mini-Sub Cell GT Cells

Fast and flexible, the Mini-Sub cell GT cell is our most popular classroom gel box. The Min-Sub cell GT cell will hold either a 7 x 7 cm or a 7 x 10 cm gel tray. A 10 cm gel poured with two 8-well combs accommodates two student teams at a time. The wide Mini-Sub cell GT cell provides a larger (15 cm) platform to handle more samples. Using the 15- or 20-well combs, this cell has two to four times more sample capacity than the Mini-Sub® cell. Put a whole class on one gel!

Catalog No.	Description	Material No.	Price/Each
FB2348	Mini-Sub Cell GT with 8-Well Combs and Caster	**1664288EDU**	**$397.40**
FB2455	Wide Mini-Sub Cell GT Cell, with 15 x 10 cm Tray, 15-Well and 20-Well Combs, Gel Caster	**1704469EDU**	**601.48**



FB2455, etc.
Wide Mini-Sub Cell GT Cell

Mini-PROTEAN® Tetra Cell

With the Mini-PROTEAN Tetra cell, running protein or DNA on polyacrylamide gels in your teaching lab is easy. This cell is durable, versatile, and easy to assemble. It can run either precast or handcast polyacrylamide gels in 30 minutes. Please see website for other ordering configurations.

- Runs one to four mini gels (7 cm H x 8.5 cm W).
- Exclusive sample loading guides direct pipet tips into sample wells.
- Leak-free electrophoresis and gel casting.

Catalog No.	Description	Material No.	Price/Each
FB2366	Mini-PROTEAN Tetra Cell for 4 Handcast or Precast Gels	**1658001EDU**	**$1164.00**
FB2337	Mini-PROTEAN Tetra Cell for 2 Precast Gels	**1658005EDU**	**510.75**



FB2337, etc.
Mini-PROTEAN Tetra Cell for 2 Precast Gels

Trans-Blot® Turbo™ Transfer System

The Trans-Blot Turbo system provides innovation in protein transfer and reduces transfer protocols for gels to as little as 3 minutes while maintaining high efficiency, high throughput, and the flexibility to run turbo or traditional semi-dry protocols.

- Rapid transfer – Transfers mini or midi gels in as little as 3 min.
- High throughput – Can transfer 1–4 mini or 1–2 midi gels in a single run.
- Environmentally friendly – Environmentally safe consumables eliminate disposal cost.

Catalog No.	Description	Material No.	Price/Each
FB2360	Trans-Blot Turbo Transfer System for Rapid Semi-Dry Transfer	**1704150EDU**	**$3574.11**



FB2360
Trans-Blot Turbo Transfer System for Rapid Semi-Dry Transfer

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad Other Classroom Laboratory Equipment

T100™ Thermal Cycler

With its 96-well sample capacity and rapid heating and cooling technology, this compact thermal cycler provides high sample throughput in less time. This classroom-scale instrument also features a large 5.7" touch screen, intuitive programming, and real-time graphical display of your PCR protocol at an economical price.

Catalog No.	Description	Material No.	Price/Each
FB2580	T100 Thermal Cycler	1861096EDU	$3570.10



FB2580
T100 Thermal Cycler

GelDoc Go Imaging System

The GelDoc Go Imaging System is small and easy to use with a large UV transilluminator that offers the flexibility to image many different types of gels of varying sizes. With just three clicks to capture, the onboard Image Lab Touch Software is as easy to use as your smartphone. Available trays include a UV tray (for stain-free protein gels, ethidium bromide gel staining, and fluorescence imaging), a white tray (for Coomassie, copper, silver, and zinc stains), and a blue tray (for nucleic acid applications that use SYBR stains).

Catalog No.	Description	Material No.	Price/Each
FB2330	GelDoc Go Gel Imaging System with UV/Stain-Free Tray	12009077EDU	$12631.74



FB2330
GelDoc Go Gel Imaging System with UV/Stain-Free Tray

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM

ZOE™ Fluorescent Cell Imager

The ZOE Fluorescent Cell Imager is a complete digital imaging system that allows students to view samples, capture and store images, and create multicolor overlays. Thanks to the built-in light shield, it does not require a darkroom for fluorescence imaging. The ZOE Cell Imager uses an intuitive touch-screen interface to control the brightfield, three fluorescence channels, and the integrated digital camera. Any student that has used a personal tablet or smartphone will be able to easily navigate the ZOE Imager's controls.

The ZOE Imager's 10.1" (26 cm) screen and HDMI projector connectivity allows all your students to see the same live image at the same time. With a compact 13" x 12.6" (33 x 32 cm) footprint, you can easily transport the ZOE™ Imager from a research lab to a teaching lab or a classroom.

Catalog No.	Description	Material No.	Price/Each
FB2334	ZOE Fluorescent Cell Imager	1450031EDU	$12883.90



FB2334
ZOE Fluorescent Cell Imager

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad Electrophoresis and Blotting

DNA Electrophoresis Reagent Packs

Catalog No.	Description	Material No.	Price/Each
FB2339	Small Fast Blast DNA Electrophoresis Reagent Pack	1660450EDU	$ 79.00
FB2424	Medium Fast Blast DNA Electrophoresis Reagent Pack	1660455EDU	295.00
FB2425	Large Fast Blast DNA Electrophoresis Reagent Pack	1660460EDU	757.00
FB2340	Small UView DNA Electrophoresis Reagent Pack	1660462EDU	123.00



FB2339, etc.
Small Fast Blast DNA Electrophoresis Reagent Pack

DNA Loading Dyes, Stains, and Rulers

Catalog No.	Description	Material No.	Price/Each
FB2441	UView™ 6x Loading Dye and Stain, 200 µl	1665111EDU	$ 32.00
FB2350	UView 6x Loading Dye and Stain, 1 mL	1665112EDU	101.00
FB2338	Fast Blast DNA Stain	1660420EDU	30.65
FB2359	EZ Load 20 bp Molecular Ruler	1708351EDU	644.00
FB2460	EZ Load 100 bp Molecular Ruler	1708352EDU	145.00
FB2461	EZ Load 100 bp PCR Molecular Ruler	1708353EDU	146.00
FB2462	EZ Load 500 bp Molecular Ruler	1708354EDU	145.00
FB2463	EZ Load 1 kb Molecular Ruler	1708355EDU	114.00



FB2338, etc.
Fast Blast DNA Stain

Protein Gel Stains and Standards

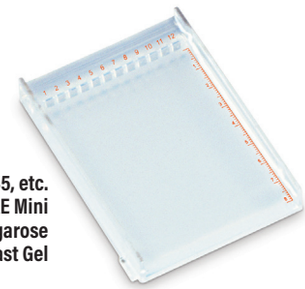
Catalog No.	Description	Material No.	Price/Each
FB2389	Coomassie Brilliant Blue R-250 Staining Solutions Kit	1610435EDU	$ 170.00
FB2585	Bio-Safe™ Coomassie Stain, 1 L	1610786EDU	100.00
FB2586	Bio-Safe Coomassie Stain, 5 L	1610787EDU	385.80
FB2383	Precision Plus Protein™ All Blue Standards	1610373EDU	119.00
FB2384	Precision Plus Protein Dual Color Standards	1610374EDU	155.95
FB2385	Precision Plus Protein Kaleidoscope Standards	1610375EDU	160.00



FB2389, etc.
Coomassie Brilliant Blue R-250 Staining Solutions Kit

Precast Gels

Catalog No.	Description	Material No.	Price/Each
FB2335	1% TAE Mini ReadyAgarose™ Precast Gel, 7.1 x 10 cm, 8-well	1613015EDU	$ 13.75
FB2412	3% TAE Mini ReadyAgarose Precast Gel, 7.1 x 10 cm, 8-well	1613017EDU	15.00
FB2413	1% TAE Mini ReadyAgarose Precast Gel, 7.1 x 10 cm, 2 x 8-well	1613057EDU	15.50
FB2480	7.5% Mini-PROTEAN® TGX™ Precast Gel, 10-Well	4561023EDU	126.55
FB2481	7.5% Mini-PROTEAN TGX Precast Gel, 15-Well	4561026EDU	132.00
FB2482	10% Mini-PROTEAN TGX Precast Gel, 10-Well	4561033EDU	132.00
FB2483	10% Mini-PROTEAN TGX Precast Gel, 15-Well	4561036EDU	132.00
FB2484	12% Mini-PROTEAN TGX Precast Gel, 10-Well	4561043EDU	132.00
FB2485	12% Mini-PROTEAN TGX Precast Gel, 12-Well	4561045EDU	133.00
FB2486	12% Mini-PROTEAN TGX Precast Gel, 15-Well	4561046EDU	133.00
FB2487	4–15% Mini-PROTEAN TGX Precast Gel, 10-Well	4561083EDU	133.00
FB2488	4–15% Mini-PROTEAN TGX Precast Gel, 15-Well	4561086EDU	132.00
FB2364	4–20% Mini-PROTEAN TGX Precast Gel, 10-Well	4561093EDU	132.00
FB2489	4–20% Mini-PROTEAN TGX Precast Gel, 15-Well	4561096EDU	126.55
FB2492	Any kD™ Mini-PROTEAN TGX Precast Gel, 10-Well	4569033EDU	132.00



FB2335, etc.
1% TAE Mini ReadyAgarose Precast Gel



FB2364, etc.
4–20% Mini-PROTEAN TGX Precast Gel, 10-Well

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad Reagents and Supplies

Electrophoresis Reagents

Catalog No.	Description	Material No.	Price/Each
FB2386	Bromophenol Blue, 10 g	1610404EDU	$ 49.00
FB2390	Dithiothreitol, 1 g	1610610EDU	33.00
FB2393	Tris, 500 g	1610716EDU	66.00
FB2394	Glycine, 250 g	1610717EDU	30.00
FB2395	Urea, 250 g	1610730EDU	33.00
FB2411	TEMED, 5 mL	1610800EDU	22.00
FB2587	Certified Molecular Biology Agarose, 25 g	1613100EDU	74.00
FB2336	Certified Molecular Biology Agarose, 125 g	1613101EDU	224.00
FB2588	Certified PCR Low-Melt Agarose Powder, 25 g	1613113EDU	187.00
FB2589	Certified PCR Low-Melt Agarose Powder, 125 g	1613114EDU	542.70
FB2457	Blotting Grade Blocker, 300 g	1706404EDU	58.00



FB2587, etc.
Certified Molecular Biology Agarose

Premixed Buffers

Catalog No.	Description	Material No.	Price/Each
FB2399	2x Laemmli Sample Buffer, 30 mL	1610737EDU	$ 14.00
FB2400	Native PAGE Sample Buffer, 30 mL	1610738EDU	21.00
FB2387	10% SDS Solution, 250 mL	1610416EDU	60.75
FB2408	10% Tween 20, 1 L	1610781EDU	44.00
FB2438	10% Tween 20, 5 mL	1662404EDU	44.65
FB2396	10x Tris/Glycine/SDS Buffer, 1 L	1610732EDU	34.00
FB2405	10x Tris/Glycine/SDS Buffer, 5 L	1610772EDU	115.95
FB2398	10x Tris/Glycine Buffer, 1 L	1610734EDU	34.00
FB2404	10x Tris/Glycine Buffer, 5 L	1610771EDU	116.00
FB2402	10x Tris/Tricine/SDS, 1 L	1610744EDU	108.99
FB2397	10x Tris/Boric Acid/EDTA (TBE), 1 L	1610733EDU	45.00
FB2436	50x Tris/Acetic Acid/EDTA (TAE), 100 mL	1660742EDU	19.50
FB2401	50x Tris/Acetic Acid/EDTA (TAE), 1 L	1610743EDU	105.00
FB2437	10x Phosphate Buffered Saline (PBS), 100 mL	1662403EDU	21.00
FB2407	10x Phosphate Buffered Saline (PBS), 1 L	1610780EDU	52.00
FB2410	1x Phosphate Buffered Saline (PBS) + 1% Casein, 1 L	1610783EDU	116.00
FB2458	10x Tris Buffered Saline (TBS), 1 L	1706435EDU	48.00
FB2409	1x Tris Buffered Saline (TBS) + 1% Casein	1610782EDU	111.21



FB2401, etc.
50x Tris/Acetic Acid/EDTA (TAE)



FB2397, etc.
10x Tris/Boric Acid/EDTA

Bacterial Transformation and Culture

Catalog No.	Description	Material No.	Price/Each
FB2518	pGLO™ Plasmid, 20 µg	1660405EDU	$ 50.00
FB2607	Arabinose, 600 mg	1660406EDU	37.00
FB2608	Ampicillin	1660407EDU	26.00
FB2519	*E. coli* Strain HB101 K-12	1660408EDU	25.00
FB2520	Transformation Solution	1660409EDU	27.00
FB2423	LB Broth Tablet	1660412EDU	36.25
FB2611	LB Nutrient Broth, Sterile, 10 mL	1660421EDU	22.00
FB2343	LB Nutrient Agar Powder, 500 g	1660472EDU	118.00



FB2343, etc.
LB Nutrient Agar Powder, 500 g

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad Reagents and Supplies, continued

PCR

Catalog No.	Description	Material No.	Price/Each
FB2465	iTaq™ DNA Polymerase	1708870EDU	$301.00
FB2466	$MgCl_2$ Solution, 50 mM, 1.25 mL	1708872EDU	34.51
FB2467	dNTP Mix, 10 mM, 200 µm	1708874EDU	159.00

DNA Sample Preparation

Catalog No.	Description	Material No.	Price/Each
FB2365	InstaGene™ Matrix	7326030EDU	$ 66.00
FB2493	Quantum Prep® Plasmid Miniprep Kit	7326100EDU	236.00
FB2494	PCR Kleen® Spin Purification Module	7326300EDU	116.00
FB2495	Aurum™ Plasmid Mini Purification Kit	7326400EDU	221.00



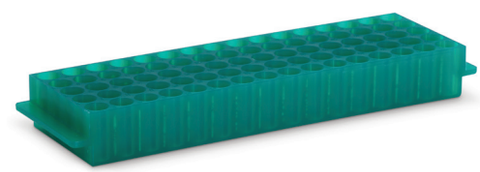
FB2493, etc.
Quantum Prep Plasmid Miniprep Kit

Biotechnology—Bio-Rad Laboratory Supplies

Cell Culture, Tubes, Cuvettes, Racks, etc.

Catalog No.	Description	Material No.	Price/Each
FB2341	Petri Dishes, Sterile, Pkg. of 500	1660470EDU	$167.00
FB2342	Inoculation Loops, Pkg. of 100	1660471EDU	25.75
FB2426	Disposable Plastic Transfer Pipets, Sterile, Pkg. of 500	1660474EDU	146.00
FB2427	Culture Tubes, 17 x 100, Pkg. of 25	1660476EDU	23.25
FB2428	Gel Staining Trays, Pkg. of 4	1660477EDU	23.25
FB2429	Jellyfish Foam Floating Racks, Pkg. of 8	1660479EDU	41.25
FB2431	Green Microcentrifuge Tube Racks, Pkg. of 5	1660481EDU	69.00
FB2612	Multicolored Storage Boxes, Pkg. of 5	1660482EDU	104.00
FB2613	Tube Racks, 15 mL, Pkg. of 5	1660483EDU	111.00
FB2614	Tube Racks, 50 mL, Pkg. of 5	1660484EDU	111.00
FB2689	Disposable Polystyrene Cuvettes, Pkg. of 100	2239950EDU	20.00
FB2690	Semimicrovolume Disposable Polystyrene Cuvettes, Pkg. of 100	2239955EDU	19.00
FB2615	Cuvette Racks, Pkg. of 5	1660485EDU	80.00

FB2426, etc.
Disposable Plastic Transfer Pipets



FB2431, etc.
Green Microcentrifuge Tube Racks

Pipet Tips

Catalog No.	Description	Material No.	Price/Each
FB2468	Xcluda Style A Aerosol Barrier Tips	2112001EDU	$224.00
FB2469	Xcluda Style B Aerosol Barrier Tips	2112006EDU	224.00
FB2470	Xcluda Style D Aerosol Barrier Tips	2112016EDU	204.00
FB2471	Xcluda Style E Aerosol Barrier Tips	2112021EDU	195.58
FB2472	BR-14 Pipet Tips	2239014EDU	46.00
FB2363	BR-35 Pipet Tips	2239035EDU	46.00
FB2474	TBR-35 Pipet Tips	2239347EDU	72.00
FB2475	TBR-40 Pipet Tips	2239350EDU	75.00
FB2476	TBR-14 Pipet Tips	2239354EDU	72.00
FB2479	Prot/Elec Tips, 5 Racks of 200	2239917EDU	112.00



FB2363, etc.
BR-35 Pipet Tips

BIOTECHNOLOGY—BIO-RAD continued on next page.

Biotechnology—Bio-Rad Laboratory Supplies, continued

PCR Tubes

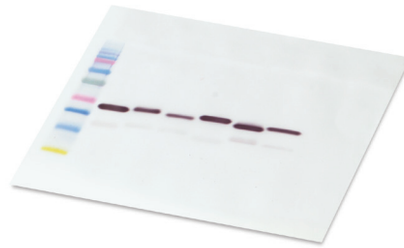
Catalog No.	Description	Material No.	Price/Each
FB2693	0.2 mL 8-Tube PCR Strips and Domed Cap Strips (High Profile, Clear)	TBC0802EDU	$271.00
FB2694	0.2 mL 12-Tube PCR Strips and Domed Cap Strips (High Profile, Clear)	TBC1202EDU	231.05
FB2695	0.5 mL PCR Tubes with Flat Caps (High Profile, Clear)	TBI0501EDU	67.00
FB2696	0.5 mL PCR Tubes with Flat Caps (High Profile, Clear)	TBI0502EDU	51.00
FB2706	0.2 mL PCR Tubes with Domed Caps	TWI0201EDU	72.00
FB2705	96-Place Racks	TRC0501EDU	47.00



FB2693, etc.
0.2 mL 8-Tube PCR Strips and Domed Cap Strips

Western Blotting

Catalog No.	Description	Material No.	Price/Each
FB2414	Precut Nitrocellulose Membrane, 0.45 µm, 7 x 8.4 cm, Pkg. of 10	1620145EDU	$ 76.00
FB2439	Nitrocellulose/Filter Paper Pack, 0.45 µm, 7 x 8.4 cm, 8 Packs	1662807EDU	77.00
FB2451	Mini Trans-Blot Filter Paper, 7.5 x 10 cm	1703932EDU	60.00
FB2452	Foam Pads	1703933EDU	50.00
FB2361	Trans-Blot® Turbo™ Mini PVDF Transfer Packs	1704156EDU	217.00
FB2362	Trans-Blot® Turb™ Midi PVDF Transfer Packs	1704157EDU	265.00



FB2439, etc.
Nitrocellulose/Filter Paper Pack

Catalog No.	Description	Material No.	Price/Each
FB2579	Out of the Blue CRISPR Kit and Genotyping Extension	17006081EDU	$490.00
FB2504	Out of the Blue Genotyping Extension	12012607EDU	234.02
FB2505	Out of the Blue CRISPR Kit	12012608EDU	306.00
FB2506	Analysis of Precut Lambda DNA Kit	1660001EDU	127.00
FB2507	Restriction Digestion and Analysis of Lambda DNA Kit	1660002EDU	133.00
FB2561	Virus Detection and Transmission Kit here	17005316EDU	114.00
FB2567	Forensic DNA Fingerprinting Kit	1660007EDU	176.75
FB2516	pGLO™ Transformation and Inquiry Kit for AP Biology	1660335EDU	223.12
FB2570	PV92 PCR Informatics Kit	1662100EDU	268.00
FB2572	ELISA Immuno Explorer Kit	1662400EDU	177.00
FB2573	GMO Investigator Kit	1662500EDU	240.00
FB2574	Crime Scene Investigator PCR Basics Kit	1662600EDU	190.00
FB2545	Comparative Proteomics Kit I: Protein Profiler	1662700EDU	227.00
FB2557	*C. elegans* Behavior Kit	1665120EDU	215.00
FB2672	Biofuel Enzyme Reactions Kit for AP Biology	17001235EDU	175.00
FB2578	Photosynthesis and Cellular Respiration Kit for AP Biology	17001238EDU	181.33
FB2558	Giant Panda Problem Kit	17002878EDU	177.00
FB2561	Science of Opioid Dependence Kit	17005316EDU	114.00
FB2356	Fish, Mammals, Insects, and Fungi DNA Barcoding Kit	17007154EDU	612.00
FB2367	Mammals, Insects, and Fungi DNA Barcoding Kit	17007366EDU	324.00
FB2355	Fish DNA Barcoding Kit	17007432EDU	306.00

Cells—Cell Structure Study Kits

FLINN360science™: Cell Membrane Permeability



This kit presents the essential concepts of cell membrane, diffusion, active transport and acid-base indicators through hands-on science activities designed to engage all your students, regardless of level. The students will conclude that the cell membrane of yeast is indeed semi-permeable and that environmental factors can impact the functionality of the membrane. Teachers can extend learning through guided inquiry into associated phenomena including, "Curing disease".

Catalog No.	Description	Digital Access	Price/Each
AP10660	360Science: Cell Membrane Permeability	1-Year	$51.45
AP10760		3-Year	67.25

FLINN360science™: Rate of Transpiration



This kit presents the essential concepts of transpiration, adhesion, cohesion, osmotic potential, and turgor/pressure potential through hands-on science activities designed to engage all your students, regardless of level. Students will strengthen microscope skills, calculate the number of stomata by determining the field of view size, and calculate the surface area of a full leaf. Students will discover that environmental conditions can directly impact the rate of transpiration. Teachers can extend learning through guided inquiry into associated phenomena such as, "Farm to Table."

Catalog No.	Description	Digital Access	Price/Each
AP10666	360Science: Rate of Transpiration	1-Year	$ 89.65
AP10766		3-Year	102.13

Cells—Diffusion and Osmosis Study Kits

FLINN360science™: Water Potential



This kit presents the essential concepts of water potential, diffusion, osmosis and turgor pressure through hands-on science activities designed to engage all your students, regardless of level. Students will discover that the water potential is higher inside the cell than the surrounding environment and the water will exit the cell because water moves from an area of higher potential to lower potential. They will discover that the body works to maintain electrolyte homeostasis and that our water intake can impact this. Teachers can extend learning through guided inquiry into associated phenomena including, "Curing Disease."

Catalog No.	Description	Digital Access	Price/Each
AP10667	360Science: Water Potential	1-Year	$62.85
AP10767		3-Year	78.45

FLINN360science™: Diffusion and Osmosis



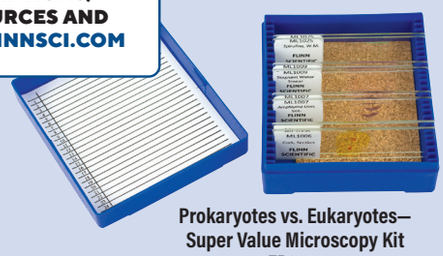
This kit presents the essential concepts of osmosis, diffusion, cellular transport, and surface area to volume ratio through hands-on science activities designed to engage all your students, regardless of level. By completing this investigation, students gain a better understanding of how a cell's surface area to volume ratio influences the rate at which diffusion occurs. A cell's ability to efficiently exchange materials with the environment is critical to its function and survival. Teachers can extend learning through guided inquiry into associated phenomena such as, "homeostasis."

Catalog No.	Description	Digital Access	Price/Each
AP10670	360Science: Diffusion and Osmosis	1-Year	$112.05
AP10770		3-Year	131.45

CELLS continued on next page.

FLINN EXCLUSIVE

FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM



Prokaryotes vs. Eukaryotes—Super Value Microscopy Kit FB2013

Catalog No.	Description	Price/Each
FB1612	Make Your Own Cell—Student Laboratory Kit	$59.00
FB1823	Mitochondria in Action—Student Laboratory Kit	35.95
FB2013	Prokaryotes vs. Eukaryotes—Super Value Microscopy Kit	58.32
FB2149	Phospholipid and Membrane Transport Kit	61.22
FB1436	Yeast On the Job—Student Laboratory Kit	76.00
FB1910	Plant and Animal Cell Mystery—Super Value Laboratory Kit	59.11
FB1788	Exploring Plant and Animal Cells—Student Laboratory Kit	57.45
FB2055	Exploring Plant and Animal Cells—Super Value Laboratory Kit	90.20
FB1966	Electron Capture and Photosynthesis—Super Value Laboratory Kit	40.50



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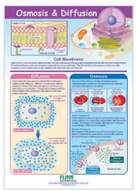
Diffusion and Osmosis—Student Laboratory Kit AP8638

Catalog No.	Description	Price/Each
FB1870	Introduction to Osmosis and Diffusion—Student Laboratory Kit	$ 53.55
AP8638	Diffusion and Osmosis—Student Laboratory Kit	57.25
AP7568	Diffusion and Osmosis—Super Value Laboratory Kit	122.30
FB1638	Cell Size and Diffusion—Student Laboratory Kit	57.00
FB2052	Cell Size and Diffusion—Super Value Laboratory Kit	95.15
AP7273	Exploring the Rate of Diffusion—Student Laboratory Kit	57.50
FB1906	Concentrating on Equilibrium—Super Value Laboratory Kit	29.95
FB0435	Dialysis Fundamentals—Student Laboratory Kit	57.95
FB0752	Membrane Diffusion—Student Laboratory Kit	46.50

Cells—Diffusion and Osmosis Study Kits, continued

Osmosis & Diffusion—NewPath Visual Learning Guide, Set of 10

NEW!



Osmosis & Diffusion Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11739	Osmosis & Diffusion—NewPath Visual Learning Guide, Set of 10	$43.32

Osmosis & Diffusion 3-D Model Kit

NEW!



Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11686	Osmosis & Diffusion 3-D Model Kit	$34.95

Cells—Diffusion and Osmosis Supplies

Disposable Dialysis Tubing Clamps



Finally, an inexpensive dialysis tubing clamp that works! Just twist the end of the wet dialysis tubing a few times, place the clamp over the twisted area, and squeeze the vise-like clamp together. It will not pull off nor will any molecules diffuse through the clamped area. Dispose of the clamps along with the used dialysis tubing. Package of 100 clamps.

Catalog No.	Description	Price/Pkg.
FB1232	Disposable Dialysis Tubing Clamps	$16.80

Dialysis Tubing



Dialysis Tubing Clamp AP4349 — Dialysis Tubing AP4351, etc.

Regenerated, seamless cellulose membrane tubing for dialysis demonstrations. Normal molecular weight cut-off is 12,000 to 16,000, and pore size is approximately 25 Angstroms. Tubing can be boiled or autoclaved and has a pH stability range of 5 to 9. Choose from three widths, each in three lengths.

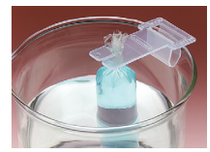
Catalog No.	Description	Flat Width	Open Diameter	Length	Price/Each
AP4351	Dialysis Tubing	25 mm (1")	16 mm (⅝")	3 m (10')	$10.70
AB1229				15 m (50')	36.92
AB1230				30 m (100')	74.50
AP4352		33 mm (1⅓")	22 mm (⅞")	3 m (10')	9.80
AB1231				15 m (50')	33.50
AB1232				30 m (100')	67.20
AP4353		45 mm (1¾")	29 mm (1⅛")	3 m (10')	10.24
AB1233				15 m (50')	41.30
AB1234				30 m (100')	73.66

Dialysis Tubing Clamp

One-piece polypropylene clamp eliminates tying knots in dialysis tubing. Unique, reusable clamp locks over ends of tubing to form a bag ensuring a leakproof seal. Fits tubing with flat width up to 45 mm.

Catalog No.	Description	Price/Each
AP4349	Dialysis Tubing Clamp	$3.22

Dialysis Bag Holder



Strong plastic clip designed to fasten over the rim of a large beaker to easily suspend dialysis tubing bag. Holder may be marked for sequencing. Six per package.

Catalog No.	Description	Price/Pkg.
AP4348	Dialysis Bag Holder, Pkg. of 6	$29.70

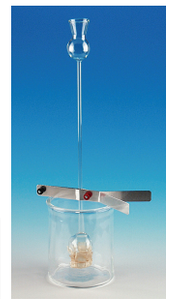
Dialysis Funnel/Holder



The dialysis funnel/holder attaches to dialysis tubing with a rubber band and requires a separate tubing clamp or knot for the other end. The funnel/holder will accommodate tubing up to 45 mm flat-width and will attach to the rim of any appropriate vessel.

Catalog No.	Description	Price/Each
AB1235	Dialysis Funnel/Holder	$10.60

Double Thistle Tube, Osmosis Apparatus



Molecules diffuse through the semi-permeable membrane at the bottom of the double thistle tube. The thin column of the thistle tube magnifies the volume and color changes.

This easy-to-use set includes a 16" double thistle tube, an aluminum thistle tube support stand, a battery jar, a semi-permeable membrane and instructions.

Catalog No.	Description	Price/Each
AP6019	Double Thistle Tube, Osmosis Apparatus	$63.04

Cells—Models

Diffusion Demonstration Model

FLINN EXCLUSIVE

By: The Flinn Staff



The semipermeable membrane in the center of the model allows the passage of "small" molecules while keeping the "large" molecules trapped on one side of the membrane. Randomly shake the model and watch what happens! The dramatic increase in volume on one side will help students visualize difficult concepts of diffusion and membrane permeability.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
FB1573	Diffusion Demonstration Model	$26.80

Animal Cell Model Kit



This model is made of resilient, non-toxic, damage-proof EVA foam. A detailed teacher's guide includes five inquiry-based activities, reproducible worksheets, background information, cross-curriculum extension activities, assessment ideas and more. Topics covered include cell structure and function, osmosis, eukaryotes and bacteria.

Catalog No.	Description	Price/Each
FB1370	Animal Cell Model Kit	$99.00

Cells—Posters and Games

Plant and Animal Cell Anatomy Permachart



All of the major cell parts are graphically illustrated and clearly labeled. A generalized animal cell with its detailed anatomy is shown on one side of the chart, while the other side shows the generalized plant cell. The heavy-duty lamination protects the chart from spills and other abuses. Chart is 8½" x 11", full color.

Catalog No.	Description	Price/Each
FB1655	Plant and Animal Cell Anatomy Permachart	$11.35

CELLS continued on next page.

Cells—Posters and Games, continued

Cell Types Chart



Laminated chart is composed of vivid, full-color photomicrographs depicting prokaryotes, protists, fungi, plant and animal cells. Individual images are captioned with source, magnification and significance. Important features are labeled in the plant and animal photos. 18" W x 24" H.

Catalog No.	Description	Price/Each
FB1145	Cell Types Chart	$28.95

Cytosis: A Cell Building Game



Cytosis is a biologically accurate worker placement game about the human cell. Players take turns directing the cellular action, collecting resources and building enzymes. Cytosis complies with NGSS standards and STEM principles. Gameplay takes 60–90 minutes and accommodates 2–5 players.

Catalog No.	Description	Price/Each
AP10537	Cytosis: A Cell Building Game	$46.12

NewPath Learning Guides and Flip Charts for Cells



AP9920

The NewPath Learning Guides and Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, free-standing easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP9920	Cells Flip Chart	$39.50
AP11482	All About Cells Student Learning Guide with Online Lesson	14.95
AP11530	All About Cells Student Learning Guide with Online Lesson, Set of 10	99.00
AP9921	Mitosis: Cell Growth & Division Flip Chart	39.50
AP11483	Mitosis Student Learning Guide with Online Lesson	14.95
AP11531	Mitosis Student Learning Guide with Online Lesson, Set of 10	99.00
AP9922	Osmosis Flip Chart	38.05
AP9924	Meiosis: Creating Sex Cells Flip Chart	39.50
AP11486	Meiosis Student Learning Guide with Online Lesson	14.95
AP11534	Mitosis Student Learning Guide with Online Lesson, Set of 10	99.00
AP11484	Osmosis & Diffusion Student Learning Guide with Online Lesson	14.95
AP11532	Osmosis & Diffusion Student Learning Guide with Online Lesson, Set of 10	99.00

Cells—The Building Blocks of Living Things—NewPath Visual Learning Guide



Cells—The Building Blocks of Living Things NewPath Visual Learning Guide provides comprehensive coverage of the cells that make up plants and animals. Each 11" x 17" guide includes four panels of helpful information, including an overview, practice exercises, a graphic organizer and assessment and review questions. Each laminated Write-On/Wipe-Off guide provides an engaging way to study the building blocks of life. Set of 10.

Catalog No.	Description	Price/Each
AP10935	Cells—The Building Blocks of Living Things—NewPath Visual Learning Guide	$44.19

Cells—The Basic Units of Life—NewPath Visual Learning Guide, Set of 10

NEW!



Cells – The Basic Units of Life Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11720	Cells—The Basic Units of Life—NewPath Visual Learning Guide, Set of 10	$43.32

NewPath 3-D Model Kit

NEW!



AP11687

Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11687	Cell Organization 3-D Model Kit	$34.95
AP11688	Cell Structure 3-D Model Kit	34.95
AP11690	Meiosis 3-D Model Kit	34.95
AP11691	Cell Cycle & Mitosis 3-D Model Kit	34.95
AP11702	Blood Type Testing 3-D Model Kit	34.95

Classification and Taxonomy—Study Kits

Classification and Taxonomy Study Kits

Lesson planning in biology classification and taxonomy is easier and fun with the study kits and games that Flinn Scientific has developed. Classification of living things posters and dichotomous keys are also available.

FLINN EXCLUSIVE



Leaf Identification, Set B—Super Value Kit
FB2304



Classification and Phylogenetic Trees—Super Value Laboratory Kit
FB1565

Catalog No.	Description	Price/Each
FB1789	Classifying Living Things—Super Value Kit	$ 46.85
FB0475	Principles of Classification—Super Value Kit	73.65
FB0476	Taxonomic Keys—Super Value Kit	19.80
FB1565	Classification and Phylogenetic Trees—Super Value Kit	32.00
FB1783	Fun with Classification—Super Value Kit	88.65
FB0765	Arthropod Classification—Super Value Kit	43.75
FB0490	Leaf Identification—Super Value Kit, Set A	70.85
FB2304	Leaf Identification—Super Value Kit, Set B	71.40
FB2000	Macroinvertebrate Identification—Super Value Kit	57.05
FB0489	Seed Identification—Super Value Kit	62.00
FB2112	Plant Kingdom Survey Set	402.35

CLASSIFICATION AND TAXONOMY—STUDY KITS continued on next page.

Classification and Taxonomy—Study Kits, continued

FLINNeverydayscience™

NEW!

Energy Flow in an Ecosystem



With this FlinnEverydayScience™ lab, students observe various organisms in their assigned habitat (either Desert, Hardwood Forest, Marine, Rainforest, or Swamp) and select the appropriate organisms to produce a food chain, representing the flow of energy in their habitat. They will then work with their group to combine their food chains to create a food web that more accurately represents the flow of energy in their assigned habitat. They will learn about various trophic levels and how some organisms (such as omnivores) can be in two trophic levels at the same time.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes desert food web sheet, yellow desert habitat card set, hardwood forest food web sheet, red hardwood forest habitat card set, marine food web sheet, blue marine habitat card set, rainforest food web sheet, green rainforest habitat card set, swamp food web sheet, and purple swamp habitat card set.

Complete for 20 students working in groups of 4.

Catalog No.	Description	Price/Each
AP11817	Energy Flow in an Ecosystem	$65.15

FLINNeverydayscience™

NEW!

Natural Selection and Adaptation



With this FlinnEverydayScience™ lab, students model natural selection in peppered moths by acting as the predator, selecting moths to eat from two different backgrounds. They then will create their own moth that can camouflage into the provided background.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 3 2' x 2' sheet of leaves, 15 light/dark tree bark, and 15 peppered moth sheets.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP11812	Natural Selection and Adaptation	$46.35

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM

Classification and Taxonomy—Games

Animal Kingdom—Super Value Card Games

FLINN EXCLUSIVE

By: The Flinn Staff



Three exciting and easy-to-play games in one! A fun and effective way to teach students the characteristics of eight different animal phyla, including three classes of arthropods and six chordate classes. Students can play Classification Concentration, Don't Get Hooked! or Go Fish! using one deck of 52 colorful animal cards. Kit includes five decks of Animal Kingdom cards, instructions with reproducible student handouts and valuable Teacher Notes.

Complete for 30 students playing in groups of six. All materials are reusable.

Catalog No.	Description	Price/Each
FB1877	Animal Kingdom—Super Value Card Games	$33.45

Habitat Hold 'Em—Super Value Game

FLINN EXCLUSIVE

By: The Flinn Staff



Students will use a deck of "creature cards" and follow the basic rules of the very popular game—Texas Hold 'Em—to learn more about "who eats whom" in a habitat. After the game has been played, the resulting food chains will be analyzed and food webs formed. Complete with 5 decks of Habitat Hold 'Em creature cards and bingo chips.

Super Value Game is complete for five groups of six students playing at the same time. Replacement and additional card decks are available. All materials are reusable.

Catalog No.	Description	Price/Each
FB1805	Habitat Hold 'Em—Super Value Game	$47.60
FB1821	Habitat Hold 'Em Card Deck	6.38

Go Extinct! Board Game



Playing this game allows participants to learn basic facts about evolution and the relationships among various species. Our science board game turns a simple card game into an educational evolution game. With evolving rule variations of our strategy board games, your game night will never be a bore! To achieve victory, players must learn when and how to play certain cards, and adapt to rule changes as the game progresses. Our board game trains kids to value sportsmanship while honing their critical thinking. For children aged 8 years and up.

Catalog No.	Description	Price/Each
FB2207	Go Extinct! Board Game	$23.75

How a Food Web is Formed—Super Value Game

FLINN EXCLUSIVE

By: The Flinn Staff



Students will view illustrations of more than 120 organisms, study their characteristics and determine "who eats whom" as they assemble a food chain from the organisms selected from a deck of special habitat cards. Eventually the food chain will develop into a complex food web as more organisms are selected. Once formed, the food web will be analyzed and further studied. Included 5 decks of habitat cards—Marine, Desert, Rainforest, Hardwood Forest and Swamp—and student worksheets.

Super Value Kit is complete for 20 students playing in groups of four. All materials are reusable.

Catalog No.	Description	Price/Each
FB1797	How a Food Web is Formed—Super Value Game	$72.39

NewPath Learning Guides and Flip Charts for Classification and Taxonomy



AP9929

The NewPath Learning Guides and Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP9928	The Six Kingdoms Flip Chart	$ 39.50
AP11490	Six Kingdoms of Life Student Learning Guide with Online Lesson	14.95
AP11538	Six Kingdoms of Life Student Learning Guide with Online Lesson, Set of 10	103.21
AP9929	Food Chains & Food Webs Flip Chart	39.50
AP11491	Food Chains & Food Webs Student Learning Guide with Online Lesson	14.95
AP11539	Food Chains & Food Webs Student Learning Guide with Online Lesson, Set of 10	103.21

CLASSIFICATION AND TAXONOMY—GAMES continued on next page.

Classification and Taxonomy—Games, continued

The Relationship Game

FLINN EXCLUSIVE

By: The Flinn Staff



Build a relationship! This interactive and educational game teaches students about the interconnection between plants, animals and their environment. A change in one organism can have drastic effects on another organism. Students use game cards to build relationship chains to learn how certain organisms are related to one another. The group with the longest chain wins! Write-up also includes instructions to play relationships rummy and concentration.

Super Value Game is complete with eight sets of relationship game cards. All materials are reusable.

Catalog No.	Description	Price/Each
FB1654	The Relationship Game	$49.25

DNA—Models

DNA Study Kits

Help your students explore and understand the blueprint of life. The study of genetics and DNA are enhanced with the study kits, models and other reference aids that Flinn Scientific has carefully developed and chosen to enhance your students learning and engagement in the classroom.

FLINN EXCLUSIVE



Flinn Modeling, Inquiry and Analysis—DNA Structure Laboratory Kit FB2202, etc.

Catalog No.	Description	Price/Each
FB2202	Flinn Modeling, Inquiry and Analysis: DNA Structure—Student Laboratory Kit, Full-Size Kit	$136.05
AP10146	Flinn Modeling, Inquiry and Analysis: DNA Structure—Student Laboratory Kit, Full-Size, Refill Kit	128.00
AP10224	Flinn Modeling, Inquiry and Analysis: DNA Structure—Student Laboratory Kit, Small-Size Kit	96.80
AP10302	Flinn Modeling, Inquiry and Analysis: DNA StructureStudent Laboratory Kit, Small-Size, Refill Kit	89.49
FB1562	DNA Isolation—Student Laboratory Kit	45.55
FB2065	DNA Isolation—Super Value Laboratory Kit	90.75
FB1112	Codon Bingo—Super Value Game	21.60
FB1223	DNA in Action—Super Value Kit	134.20
FB2144	Protein Synthesis—Student Laboratory Kit	51.55
FB0661	Student DNA Model Kit	73.40

Ecosystems, Food Chains & Food Webs—NewPath Visual Learning Guide, Set of 10

NEW!



Ecosystems, Food Chains & Food Webs Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11724	Ecosystems, Food Chains & Food Webs—NewPath Visual Learning Guide, Set of 10	$43.32

Flinn DNA Molecular Model Sets

FLINN EXCLUSIVE

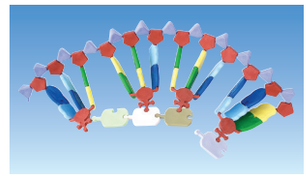


The bond angles are precise, the sugars are pentagonal, and the phosphates are pyramidal—the result is a model with perfect three-dimensional orientation. This model can be used to teach DNA replication. The 11-tier model illustrates one complete twist of the DNA ladder. The 22-tier model shows two complete twists of the ladder. Both model sets come complete with stand, parts storage case, and all model components.

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP6317	Flinn DNA Molecular Model Set, 11-tier	$55.50
AP6318	Flinn DNA Molecular Model Set, 22-tier	95.65

RNA Transcription/Translation Set



Outstanding protein synthesis model contains 30 durable, 3-D pieces representing the components of a 12-base mRNA sequence as well as two tRNA molecules and two amino acids. The mRNA sequence is first assembled (transcribed) using the DNA nitrogen base sequence of an existing DNA model. The completed mRNA is then combined with the tRNA and amino acid model pieces to demonstrate the process of translation.

Kit comes complete with all color-coded parts and connectors and pre-drilled to assist in the assembly of the models.

Catalog No.	Description	Price/Each
FB1670	RNA Transcription/Translation Set	$22.05

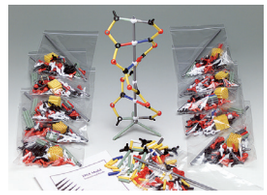
DNA Model



This three foot long strand of DNA demonstrates the twisted ladder-like arrangement of DNA. The ease of twisting and untwisting this large molecule will help students visualize the 3-dimensional structure of DNA. The brightly colored base pairs and the dark contrasting deoxyribose sugars and phosphates in the rungs of the ladder make the model visible to all students during your demonstration. Carefully handmade using rugged flexible vinyl and hard wooden dowels. When completely coiled, the model is less than a foot in length for easy storage.

Catalog No.	Description	Price/Each
FB1127	DNA Model	$90.75

DNA Model Kit



Your students will develop hands-on familiarity with the structure and function of the DNA molecule as they construct and interpret models of DNA segments. Reproducible worksheets also guide the students through a study of messenger RNA (mRNA) and transfer RNA (tRNA), and the process of protein synthesis.

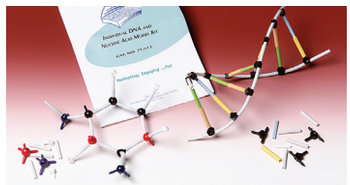
Materials provided for twelve-student teams.

Catalog No.	Description	Price/Each
FB0521	DNA Model Kit	$118.00

DNA—MODELS continued on next page.

DNA—Models, continued

Individual DNA and Molecular Model Kit



All of the features of the Molecular Model of DNA and its Replication Kit (FB0449) and the Nucleic Acid Molecular Structure Kit (FB0450) scaled down for an individual student. Components are sufficient to complete an eight base-pair segment of DNA and also to build models of the basic components of the RNA and DNA nucleotides.

Kit includes: 4 each of cytosine, thymine, adenine and guanine, 8 hydrogen bonds, 16 phosphate groups, 16 deoxyribose groups, 10 carbon centers, 19 hydrogen atoms, 1 oxygen center, 5 nitrogen centers, 1 pho phorus center, 49 covalent bonds, and a student manual. Materials are reusable.

Catalog No.	Description	Price/Each
FB0482	Individual DNA and Molecular Model Kit	$39.35

Molecular Model of DNA and Its Replication Kit

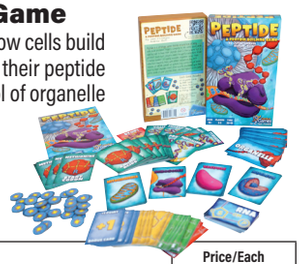


The assembled models are flexible enough to twist into the double helix structure and can be "unzipped"—allowing the students to simulate the replication process. 12 assemblies are included and when completed they can all be linked together to form a DNA segment more than nine feet long. Components are durable and reusable. Includes 12 complete sets of the following—four each of cytosine, thymine, adenine and guanine (color-coded), eight hydrogen bonds, 16 phosphate groups and 16 deoxyribose groups.

Materials provided for 24 students working in pairs.

Catalog No.	Description	Price/Each
FB0449	Molecular Model of DNA and Its Replication Kit	$125.00

Peptide: A Protein Building Game



Peptide is a strategic card game that explores how cells build proteins. Players link amino acid cards to build their peptide chain (protein) selecting from a communal pool of organelle cards each turn. Their selection is rewarded with either resources or actions. Peptide complies with NGSS standards and STEM principles. Gameplay takes 30–45 minutes and accommodates 2–5 players.

Catalog No.	Description	Price/Each
AP10538	Peptide: A Protein Building Game	$23.50

Nucleic Acid Molecular Structure Kit

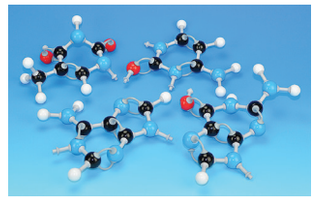


Students will have the opportunity to construct and study the basic components of the DNA and RNA molecules. They will assemble an individual nucleotide after first building its three component parts: a five-carbon sugar (ribose or deoxyribose), a phosphate group, and a nitrogen base. When each group has constructed their nucleotide they can link the models together. Components are durable and reusable. Includes 12 complete sets of the following—10 carbon centers, 11 oxygen centers, 5 nitrogen centers, 1 phosphorus center, 19 hydrogen atoms and 49 covalent bonds.

Materials provided for 24 students working in pairs.

Catalog No.	Description	Price/Each
FB0450	Nucleic Acid Molecular Structure Kit	$140.74

Nucleotide Model Kit



Build models of each of the nucleotide bases—adenine, cytosine, guanine, thymine—and then pair them up. Model allows students to actually see the molecular and geometric structures of DNA and the hydrogen bonding that holds everything together. Base pairs are brightly colored so everyone can easily see the chemical structure of this essential molecule. One kit includes instructions and materials to build one model of each of the four DNA bases.

Catalog No.	Description	Price/Each
FB2027	Nucleotide Model Kit	$49.05

DNA/RNA Protein Synthesis Kit



Students build a DNA molecule and then replicate, transcribe, and translate it. All of the steps and transitions involved in the synthesis of a protein molecule are illustrated by hands-on model building. The roles of DNA, messenger RNA (mRNA), ribosomes, transfer RNA (tRNA), codons, and anti-codons lead up to amino acids bonding to form a protein molecule.

Materials provided for 24 students working in pairs. Materials are reusable.

Catalog No.	Description	Price/Each
FB0483	DNA/RNA Protein Synthesis Kit	$260.00

Protein Synthesis Demonstration Model



Large, colorful models of DNA, mRNA, ribosome, tRNA, and amino acids ensure that even students in the back of the classroom will clearly see the demonstration. Simply attach the durable plastic pieces to a magnetic classroom board and move them around to show the steps involved in transcription and translation. Comes with smaller size student models allowing students to follow along at their desks during the demonstration. Rugged demonstration set will last for years to come! Includes a how-to CD, complete instructions, and enough materials for 20 students.

Catalog No.	Description	Price/Each
FB1718	Protein Synthesis Demonstration Model	$360.00

Flow of Genetic Information Kit



Learn all about the formation of DNA and RNA using this hands-on kit! Students witness the complete process from gene to protein in this one-of-a-kind activity. Includes over 300 color-coded, foam pieces that can be mixed and matched for different activities. Model DNA replication, transcription of DNA into RNA and translation of RNA into proteins with this durable 3-D kit.

Some assembly required. Student and instructor guides available online. Replacement DNA and RNA Nucleotide Set includes 160 DNA nucleotides and 40 RNA nucleotides and is available separately.

Catalog No.	Description	Price/Pkg.
FB2147	Flow of Genetic Information Kit	$135.00
FB2148	Replacement DNA and RNA Nucleotide Set	27.06

DNA—MODELS continued on next page.

DNA—Models, continued



Pop Beads/Accessories

Students simply pop the beads together to construct models of DNA and to simulate its molecular activities.

Catalog No.	Description	Quantity/Pkg.	Price/Pkg.
FB1239	White, 5-hole	300	$38.85
FB1240	Clear Plastic Connectors	100	13.20
FB1241	Red, 1-hole	300	11.40
FB1242	Yellow, 1-hole	300	11.40
FB1243	Orange, 1-hole	300	11.40
FB1244	Blue, 1-hole	300	11.40
FB1246	Green, 1-hole	300	11.40
FB1248	Black, 1-hole	300	11.95

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM

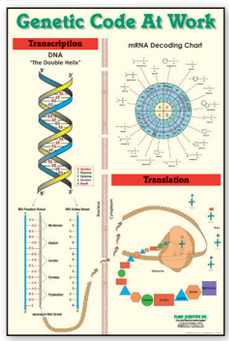
DNA—Posters

FLINN EXCLUSIVE

Genetic Code at Work Poster

By: The Flinn Staff

A unique teaching poster visually captures the basics of DNA structure and its dynamic role in the life of a cell. Display this over-sized poster during your genetics unit and it will become the focal point of instruction. Poster is full color and measures 24" x 36".



Catalog No.	Description	Price/Each
FB1663	Genetic Code at Work Poster	$15.95

Chromosomes, Genes & DNA—NewPath Learning Flip Chart Set

The NewPath Learning Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.



Catalog No.	Description	Price/Each
AP9926	Chromosomes, Genes & DNA—NewPath Learning Flip Chart Set	$39.50
AP11488	Chromosomes, Genes & DNA Student Learning Guide with Online Lesson	14.95
AP11536	Chromosomes, Genes & DNA Student Learning Guide with Online Lesson, Set of 10	99.00

Genetics—Study Kits

FLINN360science™: *Drosophila* Basics



This kit presents the essential concepts of genetics, monohybrid cross, and genotype vs. phenotype through hands-on science activities designed to engage all your students, regardless of level. Students are able to easily identify the differences between male and female flies as well as identify which ones are homozygous recessive for sepia and which are wild type fruit flies. They will gain an understanding of why scientists use fruit flies for genetic studies and how mutated traits are passed from generation to generation. Teachers can extend learning through guided inquiry into associated phenomena including, "Genetic Mysteries."

Catalog No.	Description	Digital Access	Price/Each
AP10657	360Science: *Drosophila* Basics	1-Year	$141.00
AP10757		3-Year	150.50

FLINN360science™: *Sordaria* Genetics



This kit presents the essential concepts of genetics, crossing over and meiosis through hands-on science activities designed to engage all your students, regardless of level. By completing this investigation students gain a better understanding of how the location of genes on a chromosome are mapped. By counting the frequency crossing over is occurring scientists are able to calculate how many map units a gene is away from the centromere of a chromosome. Teachers can extend learning through guided inquiry into associated phenomena such as, "Genetic Diversity."

Catalog No.	Description	Digital Access	Price/Each
AP10673	360Science: *Sordaria* Genetics	1-Year	$56.25
AP10773		3-Year	74.30

Corn, Segregating Ears



These are single full-size ears of corn from plants specially bred to demonstrate Mendelian probability ratios and fundamentals of heredity. Kernels are numerous enough to give results close to theoretical ratios, yet students will learn that those ratios are predictive and numerical variations are natural.

Catalog No.	Description	Price/Each
AB1443	3 Purple: 1 White. Monohybrid. F_2 ear resulting from a parental cross between a homozygous dominant (purple) plant and a homozygous recessive (white) plant.	$15.60
AB1444	1 Purple: 1 White. Monohybrid. Product of a test cross between an F_1 hybrid and the homozygous recessive (white) parent.	15.60
AB1445	9 Purple Dent: 3 White Dent: 3 Purple Sweet: 1 White Sweet Dihybrid. To demonstrate the assortment of two independent characteristics. F_2 generation resulting from a parental cross between a plant homozygous dominant for both alleles and a plant homozygous recessive for both alleles.	15.55
AB1446	1 Purple Dent: 1 White Dent: 1 Purple Sweet: 1 White Sweet Dihybrid. To demonstrate the assortment of two independent characteristics. Product of a test cross between an F_1 hybrid—heterozygous for both alleles—and the homozygous recessive (white, sweet) parent.	15.60

Corn, Segregating Seeds



These are viable seeds for germination. Seedlings developing from these seeds will demonstrate the phenotypic ratios described. Color characteristics are often indistinct initially and may require a few days to develop fully. Seeds are packaged in envelopes of 100 and germination rate should exceed 90 percent.

Catalog No.	Description	Price/Each
AB1447	3 Normal Green: 1 Albino. Monohybrid. F_2 seeds resulting from a parental cross between a homozygous dominant (green) plant and a homozygous recessive (albino) plant.	$16.95

GENETICS—STUDY KITS continued on next page.

Genetics—Study Kits, continued

The Genetics of *Drosophila* Eye Color—Inquiry Lab Kit for AP® Biology

By: Kathy Van Hoeck, York High School, Elmhurst, IL

In this kit, students determine which pigments are present or missing in the wild-type and mutant *Drosophila* by separating and identifying the pigments with paper chromatography chromatograms. Includes detailed teacher notes and reproducible student handouts.

FLINN EXCLUSIVE



Complete for 8 student groups. Wild-type, white-eyed, sepia-eyed and scarlet-eyed fruit flies are required; brown-eyed mutant flies an optional extension. Please order Drosophila *2–3 weeks before use because mature adults are required.*

Catalog No.	Description	Price/Each
FB2046	The Genetics of *Drosophila* Eye Color—Inquiry Lab Kit for AP Biology	$49.00
LM1115	Wild-type *Drosophila* (+)	10.00
LM1117	White (w) Recessive *Drosophila*	10.00
LM1125	Sepia (se) Recessive *Drosophila*	10.00
LM1245	Scarlet (st) Recessive *Drosophila*	10.25
LM1244	Brown (bw) Recessive *Drosophila*	10.00
AP1901	Ultraviolet Lamp, Handheld	45.70

Genetics—Supplies

Taste Test Papers



Used to test the inherited ability to taste various compounds. Popular in the study of human genetics, Mendelian genetics, and family pedigrees. Tests are harmless and easy to interpret. All are supplied in vials of one hundred 2" x ¼" strips.

Catalog No.	Description	Price	
		Per Vial	12 Vials
AP7989	PTC (phenylthiocarbamide). Used to test for the genetic ability to experience a bitter taste from PTC.	$3.55	$40.44
AP7891	Sodium Benzoate Taste Test. Used to test for genetic ability to taste sodium benzoate.	3.75	42.72
AP7892	Thiourea Taste Test. Used to test for genetic ability to experience a bitter taste from thiourea.	3.75	42.72
AP7990	Control Taste Paper. Used as an untreated control for taste tests with PTC, sodium benzoate, and thiourea.	1.65	18.60

Albino Tobacco Seeds



Easy to germinate and easy to grow. These classic genetic seeds display a Mendelian 3:1 ratio. Germinate them in Petri dishes and compare the phenotypic results in the light versus the dark. Can the genetics be altered? Reversing the seed locations will provide an answer for students. Approximately 800–1,000 seeds in 0.1-g sample.

Catalog No.	Description	Price/Each
FB1165	Albino Tobacco Seeds	$17.95

GENETICS continued on next page.



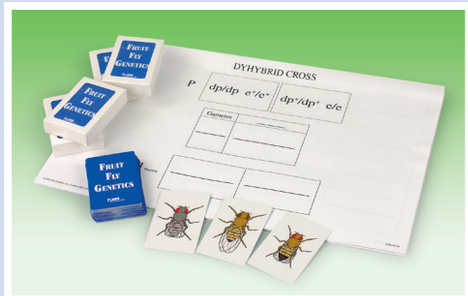
FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Corn Genetics—Super Value Laboratory Kit FB1429



Botheads Genetic Simulation—Super Value Kit FB1745

FLINN EXCLUSIVE



Fruit Fly Genetics Simulation—Super Value Kit FB1912

Catalog No.	Description	Price/Each
FB1745	Botheads Genetic Simulation—Super Value Kit	$39.50
FB1575	Baby Genes—Super Value Kit	25.50
FB2199	Sno-ball Sillies Genetic Simulation—Super Value Laboratory Kit	77.90
FB1431	Genetics of Taste—Student Laboratory Kit	23.75
FB2064	Genetics of Taste—Super Value Laboratory Kit	54.11
FB0485	Discover the Possibilities! A Genetics Probability Activity—Super Value Kit	47.05
FB1802	Understanding the Human Genome—Student Laboratory Kit	40.00
FB2059	Understanding the Human Genome—Super Value Laboratory Kit	77.00
FB1441	Genetic Code—Super Value Kit—Super Value Kit	45.50
FB1965	Tracking Traits with Pedigree Charts Demonstration Kit	68.60

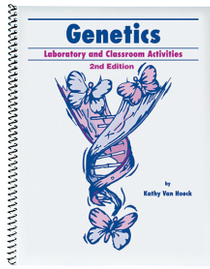
Catalog No.	Description	Price/Each
FB1918	Eye Color and Polygenic Inheritance—Student Laboratory Kit	$ 39.30
FB1858	Karyotyping with Ideograms—Super Value Kit	16.25
FB1976	Magnetic Karyotypes	45.85
FB1111	Human Karyotyping—Super Value Kit	27.35
FB1429	Corn Genetics—Super Value Laboratory Kit	240.00
FB1564	Heredity and Environment—Student Laboratory Kit	41.00
FB1594	Genetically Modified Food—Student Laboratory Kit	68.85
FB1912	Fruit Fly Genetics Simulation—Super Value Kit	56.00
FB1866	Transcription and Gene Expression in Bacteria—Student Laboratory Kit	49.85

Genetics—Book

Genetics—Laboratory and Classroom Activities

FLINN EXCLUSIVE

Author: Kathy Van Hoeck, York H.S., Elmhurst, IL



Whether you are teaching a genetics course or a short unit on genetics, you will want this laboratory manual. The author has carefully written the labs used in her high school genetics course in an easy-to-follow format. An introduction is provided explaining the use of the manual as well as a syllabus if you choose to use the manual in a complete genetics course. Labs are classified as basic or advanced and range from classic coin-tossing activities to more advanced genetic transformation activities. Topics covered include: the use of *Drosophila*, probabilities, pedigree analysis, monohybrid crosses, dihybrid crosses, karyotyping, DNA extraction, genetic engineering, electrophoresis, transformations, restriction enzymes, DNA profiling, genetic diseases and more. Each laboratory includes a statement of purpose, detailed background information, safety and disposal considerations, step-by-step directions, timeline teaching suggestions, numerous teaching tips and sample data.

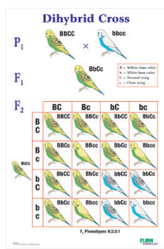
Catalog No.	Description	Price/Each
FB1553	Genetics—Laboratory and Classroom Activities 2nd Edition	$50.85

Genetics—Posters

Dihybrid Cross Poster

FLINN EXCLUSIVE

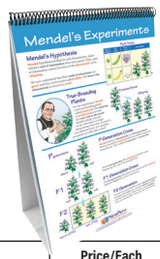
By: The Flinn Staff



Portrays common traits of base color and wing color for the familiar "budgie" bird. A pair of homozygous dominant and recessive parents is crossed to produce the heterozygous F1 generation. Chart of the possible offspring of the F2 generation clearly shows the expected 9:3:3:1 phenotypic ratio and includes the genotype of each. Printed on heavy-duty laminated stock. 24" x 36".

Catalog No.	Description	Price/Each
FB1990	Dihybrid Cross Poster	$24.45

Genetics: The Study of Heredity—NewPath Learning Guide and Flip Chart Set

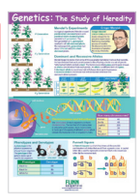


This is perfect for the classroom as well as group and independent learning. Spiral-bound in a stable, freestanding easel, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Set of 10 charts.

Catalog No.	Description	Price/Each
AP9927	Genetics: The Study of Heredity—NewPath Learning Flip Chart Set	$39.50
AP11489	Genetics: Study of Heredity Student Learning Guide with Online Lesson	14.95
AP11537	Genetics: Study of Heredity Student Learning Guide with Online Lesson, Set of 10	99.00

Genetics—The Study of Heredity—NewPath Visual Learning Guide, Set of 10

NEW!



Genetics - The Study of Heredity Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11721	Genetics—The Study of Heredity—NewPath Visual Learning Guide, Set of 10	$43.32

CRISPR—Newpath Science 3-D Model Kit

NEW!



Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11684	CRISPR—Newpath Science 3-D Model Kit	$34.95

Microbiology—Living

Bacteria, fungi and slime-molds. Unless otherwise noted, cultures are shipped in 16 x 125 mm screw-cap culture tubes, tightly sealed to prevent contamination and dehydration. All cultures are guaranteed pure strains of the organism and labeled with appropriate medium and incubation temperature. Shipped as slant cultures. Upon receipt, place cultures in a dark or dimly lit area or incubator at the appropriate temperature. Keep tubes sealed with caps or plugs. Bacterial cultures should be sub-cultured to fresh medium every 2–3 weeks to maintain active growth. New cultures require 24 to 48 hours for full development of colonies and pigmentation in pigmented strains. Although these are considered non-pathogenic, we strongly urge you to practice good microbiological laboratory aseptic technique. Flinn Scientific, Inc., assumes no responsibility for any infections resulting from using these materials. We recommend sterilization of cultures prior to disposal.



Aspergillus niger
LM1019

Fungal Cultures

Maintenance requirements for fungal cultures are similar to those for bacterial cultures. Fungal culture media are typically more acidic and higher in carbohydrates than bacterial media. Fungal cultures take five days to develop.

Catalog No.	Description	Incubation Temp. and Medium	Price/Each
LM1019	*Aspergillus niger.* Ascomycete. Black mold found on plants. Citric acid producer.	25 °C Potato Dextrose Agar	$13.60
LM1022	*Rhizopus stolonifer (nigricans).* Minus Zygomycete. Black bread mold. Used with plus strain for zygospore demonstration.	25 °C Potato Dextrose Agar	13.50
LM1023	*Saccharomyces cerevisiae.* Ascomycete. Baker's and brewer's yeast.	25–30 °C Potato Dextrose Agar	13.50
LM1150	*Sordaria fimicola.* Wild type. Ascomycete. Produces brown ascospores.	30 °C Cornmeal-Glucose-Yeast Agar	13.70
LM1219	*Sordaria fimicola.* Tan Mutant. Ascomycete. Produces tan ascospores.	30 °C Cornmeal-Glucose-Yeast Agar	13.70
LM1259	*Sordaria fimicola.* Wild/Tan Combination Plate.	30 °C Cornmeal-Glucose-Yeast Agar	31.45

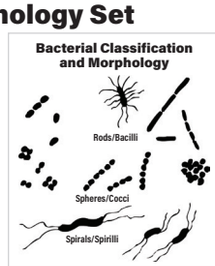
Allow 5 days for delivery of slime mold cultures. Large orders (5 or more) of the same type may require a few extra days.

Bacteria Strips for Autoclave Verification

Indicators consist of *Bacillus stearothermophilus* spores saturated on paper strips, individually placed into envelopes. To verify autoclave performance, simply place indicators in the autoclave so they are exposed to the steam. After the cycle is complete, inoculate the strip in tube of broth and incubate at 55–60 °C for at least 48 hours. If no growth occurs, your autoclave is functioning properly!

Catalog No.	Description	Price/Pkg.
FB2146	Bacteria Strips for Autoclave Verification	$43.15

Bacterial Classification and Morphology Set



Bacterial morphology, the shape of the individual cells, is the primary characteristic used to classify this enormously complex group. Set includes individual tube cultures of *Bacillus subtilis* (rods/bacilli), *Micrococcus luteus* (spheres/cocci) and *Rhodospirillum rubrum* (spirals/spirilli).

Catalog No.	Description	Price/Set
LM1017	Bacterial Classification and Morphology Set	$40.80

MICROBIOLOGY—LIVING continued on next page.

Microbiology—Living, continued

Bacterial Pigmentation Set

Demonstrate the diversity of pigments produced by bacteria with this set. Pigment formation (chromogenesis) can, in most cases, be easily influenced by the manipulation of incubation temperatures. Set includes individual tube-cultures of *Micrococcus roseus* (pink), *Serratia marcescens* (red), and *Micrococcus luteus* (yellow).

Catalog No.	Description	Price/Set
LM1018	Bacterial Pigmentation Set	$53.05



© David M. Phillips/Visuals Unlimited



© David M. Phillips/Visuals Unlimited

Allow 2 days for delivery of bacterial cultures. Large orders (10 or more) of the same type may require a few extra days.

Bacterial Cultures

Catalog No.	Description	Incubation Temp. and Medium	Gram Reaction	Price/Each
LM1000	*Bacillus cereus.* Chain-forming motile rods (bacilli) capable of forming endospores.	30 °C Nutrient Agar	Positive (+)	$13.55
LM1002	*Bacillus megaterium.* Large, easily observed, variably motile rods found in soil and water. Spore forming.	30 °C Nutrient Agar	Variable (±)	16.30
LM1003	*Bacillus subtilis.* Spore-forming motile rods. Source for antibiotics bacitracin and subtilin.	25–30 °C Nutrient Agar	Positive (+)	13.60
LM1005	*Enterobacter aerogenes.* Variably motile rods commonly found in the intestines.	30–37 °C Nutrient Agar	Negative (–)	13.60
LM1006	*Escherichia coli.* Variably motile rods found singly, paired and in short chains. Common intestinal organism. Lactose fermenter.	37 °C Nutrient Agar	Negative (–)	13.60
LM1148	*Escherichia coli.* Lactose negative (Lac –). Strain of *E. coli* unable to ferment lactose.	37 °C Nutrient Agar	Negative (–)	14.00
LM1149	*Escherichia coli.* Strain B. Host organism for T2 and T4 phages.	37 °C Nutrient Agar	Negative (–)	14.25
LM1007	*Micrococcus luteus (Sarcina lutea).* Non-motile spheres (cocci) found in milk products, produces yellow pigment.	25 °C Nutrient Agar	Positive (+)	13.55
LM1008	*Micrococcus roseus.* Non-motile spheres single, paired and clustered. Produces rose-red pigment.	25 °C Nutrient Agar	Positive (+)	13.55
LM1009	*Pseudomonas fluorescens.* Motile rods, single and paired. Associated with food spoilage. Produces fluorescent pigment.	25 °C Nutrient Agar	Negative (–)	13.55
LM1010	*Rhodospirillum rubrum.* Motile spirals (spirilli). Produces a reddish pigment. Photosynthetic under anaerobic conditions.	25–30 °C Tryptic Soy Agar	Negative (–)	13.60
LM1011	*Sarcina aurantiaca.* Non-motile spheres in packets. Produces an orange-yellow pigment.	25 °C Nutrient Agar	Positive (+)	13.60
LM1013	*Serratia marcescens.* Motile rods. Produces reddish pigment prodigiosin. Incubation at higher temperatures suppresses pigment formation.	25 °C Nutrient Agar	Negative (–)	13.60
LM1256	*Staphylococcus epidermidis.* Non-motile spheres arranged in grapelike clusters commonly found on skin. Recommended only for advanced high school and college microbiology courses.	37 °C Nutrient Agar or Tryptic Soy Agar	Positive (+)	13.55
LM1015	*Streptococcus lactis (Lactococcus lactis).* Variably motile spheres in pairs and short chains. A milk contaminant that causes souring.	25–30 °C Tryptic Soy Agar	Positive (+)	13.60
LM1257	*Streptococcus salivarius.* Non-motile, chain-forming spheres commonly found in the mouth. Recommended only for advanced high school and college microbiology courses.	30–37 °C Tryptic Soy Agar or Blood Agar	Positive (+)	14.90
LM1016	*Vibrio fischeri.* Curved motile rods. Bioluminescent.	25 °C Photobacterium Agar	Negative (–)	13.60

Microbiology—Media

BioPaddles®

Ready to use and no refrigeration required! BioPaddles have a longer shelf-life than traditional Petri dishes and are very easy to use. Flexible dual-agar paddles are enclosed in a sterile vial. Simply expose the media to the sample and then keep in a warm place (35 °C).



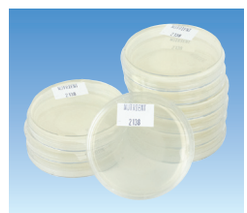
FB2113

Includes general instructions and access to detailed technical notes for each paddle type. Nutrient agar paddles have nutrient agar media on both sides. MacConkey/EMB paddles have MacConkey agar on one side and eosin methylene blue agar on the other side. Use MacConkey agar to differentiate between Gram negative bacteria while inhibiting the growth of most Gram positive bacteria. EMB agar inhibits growth of Gram positive bacteria while cultivating growth of Gram negative enteric microorganisms (bacilli). Package of 10 paddles.

Catalog No.	Description	Price/Each
FB2113	BioPaddles Nutrient Agar, Pkg. of 10	$53.20
FB2114	BioPaddles MacConkey and EMB Agar, Pkg. of 10	51.90

Culture Media, Prepared

Media prepared under carefully controlled conditions and inspected for sterility. Tubes are prepared as slants in standard 16 x 125 mm screw-cap culture tubes. Bottles contain 100 mL of media. Each bottle will pour 6–7 standard 15 x 100 mm Petri plates or 15–16 culture tubes. Plates are 15 x 100 mm polystyrene; sealed to prevent contamination and dehydration.



FB0526

Catalog No.	Description	Package	Price/Pkg.
FB1138	Blood Agar (TSA with 5% Sheep Blood)	10 plates	$30.40
N0064	Nutrient Agar	6 tubes	19.67
N0077		3 bottles	26.85
FB0526		10 plates	26.60
T0085	Tryptic Soy Agar	3 bottles	28.57
FB0528		10 plates	30.85

NOTE: Culture media should be ordered as close as possible to the use date for optimal results. Refrigerate upon receipt and use within one month. Not normally shipped during July and August. Please specify shipping date.

MICROBIOLOGY—MEDIA continued on next page.

Microbiology—Media, continued

Culture Media, Dehydrated

Highest quality dehydrated media for the culture of microorganisms. All are manufactured in standard formulations under carefully controlled conditions. To prepare volumes of less than one liter, use an amount in proper proportion to that given in the grams per liter column.



T0085

Catalog No.	Description	Package Size/Grams	Grams/ Liter	Liters/Pkg.	Price/Each
A0084	Agar, Bacteriological Grade, (Non-nutritive)	100	15 (plus enrich-ments)	6.7	$ 23.81
A0085		500		33.0	72.60
D0049	Dextrose Agar	100	43	2.3	89.00
E0021	EMB Agar	100	36	2.8	63.95
M0209	MacConkey Agar	100	50	2.0	56.80
M0203	Mueller Hinton Agar*	100	38	13.1	44.50
N0092	Nutrient Agar	23	23	1.0	14.01
N0019	Nutrient Agar	100	23	4.3	47.80
N0020		500		21.7	139.00
N0021	Nutrient Broth	100	8	12.5	40.00
P0098	Potato Dextrose Agar	100	36	2.8	42.00
P0099		500		13.9	145.69

***Standard medium for antibiotic sensitivity testing.**
†B0191 contains no blood.

Great Reference Material!
Recipes for Biological, Histological and Chemical Solutions
Page 619.

3M® Petrifilm™ Plates



Each Petrifilm "plate" consists of two plastic film sheets with the sterile culture media in between. The sheets are separated briefly for inoculation with the material of your choice and then resealed and incubated. Growth occurs on the super thin film of media just like it does on the surface of an agar plate. You can stack a class set in the same space as one Petri dish. Results are visible through the clear film, and colonies are readily viewed. Transfers are possible but not necessary. Disposal becomes easier. Once inoculated, the plates need never be opened again. Petrifilm can be kept for 18 months if refrigerated. Fifty plates take up as much space as one Petri dish. Ready to use with various media.

Petrifilm Aerobic Count Plates: Use in place of regular nutrient agar plates. Especially useful if conducting air sampling experiments or other air pollution studies.

Petrifilm Yeast and Mold Count Plates: Count yeast and mold colonies on these plates. An indicator dye stains yeast and mold colonies to provide contrast and facilitate counting.

Petrifilm *E. coli*/Coliform Count Plates: An indicator dye makes counting coliforms easy. The coliforms produce red colonies. These plates contain an additional indicator dye that forms blue around *E. coli* colonies. Counting red and blue colonies yields the total coliform count.

Yeast and Mold Spreader: Specially designed for Petrifilm Yeast and Mold Count Plates (FB1172). Simply press down on top of the spreader to create a circular pattern. Spreaders are reusable.

Petrifilm Spreader: Use with Aerobic Count Plates (FB1171) and Coliform Plates (FB1173). Spreaders are reusable.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Pkg.
FB1171	Petrifilm Aerobic Count Plate	$ 91.25/50
FB1172	Petrifilm Yeast and Mold Count Plate	102.40/50
FB1173	Petrifilm *E. coli* / Coliform Count Plates	93.40/25
FB1114	Yeast and Mold Spreader	1.59
FB1134	Petrifilm Spreader	1.75

Microbiology—Culture Supplies

Petri Dishes, Borosilicate



Tops and bottoms are marked with different colored enamels.

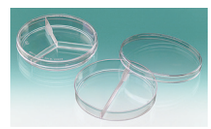
Catalog No.	Description	Price/Each
GP3020	Petri Dish, Borosilicate, 100 x 15 mm	$93.95

Petri Dish, Disposable, Sterile

Package of 20. Polystyrene.

Catalog No.	Description	Size (in mm)	Price/Each	Price/25 or More
AB1470	Petri Dish, Disposable, Sterile, Pkg. of 20	50 x 15	$8.16	$6.69
AP8170		90 x 15	9.54	8.01

Petri Dish, Disposable, Partitioned



These are standard size (90 x 15 mm), sterile, polystyrene dishes.

Catalog No.	Description	No. of Compartments	Price/Pkg.
AB1471	Petri Dish, Disposable, Partitioned	2	$11.15/20
AB1472		3	11.95/25
FB1651		4	11.70/25

Petri Dish Holder



Neoprene-coated wire holder. 18 dishes. Dimensions: 9⅛" W x 4⅜" D x 7⅛" H.

Catalog No.	Description	Price/Each
AP1276	Petri Dish Holder	$46.80

PetriStickers



Made with water-resistant ink, substrate and adhesives, sticker will remain firmly attached at temperatures from 4 to 42°C. Simply remove the label's protective backing and apply it to the back of a Petri dish. After labeling, the dish can be held in a comfortable position for streaking or colony transfer, stored in an incubator or refrigerator and photographed. Package of 36. 32-square grid, 3".

Catalog No.	Description	Price/Each
FB2308	PetriStickers	$53.00

Inoculating Loop, Nichrome Wire



Overall length of loop is 8"; wire portion is 25 gauge nichrome, 3" long.

Catalog No.	Description	Price/Each
AP1051	Inoculating Loop, Nichrome Wire	$3.85

Inoculating Loop and Needle



Available in two sizes that are color-coded, sterile and disposable. 20 per package.

Catalog No.	Description	Price/Pkg. of 20
FB1168	Inoculating Loop and Needle, Blue, 10 µL Capacity	$6.70
FB1169	Inoculating Loop and Needle, Clear, 1 µL Capacity	6.70

Swab Applicators, Sterile



Six-inch white cotton applicator in pull-apart package. Wrapped and sterilized. 200 total swabs.

Catalog No.	Description	Price/Pkg. of 200
AP7696	Swab Applicators, Sterile, Pkg. of 200	$30.60

MICROBIOLOGY—CULTURE SUPPLIES continued on next page.

Microbiology—Culture Supplies, continued



Sterile Graduated Pipets

Individually wrapped and sterilized. Package of 30.

Catalog No.	Description	Price/Pkg. of 30
FB2082	Sterile Graduated Pipets, Pkg. of 30	$9.40



Bacteria Spreader

Stainless steel. Bent-handle design.

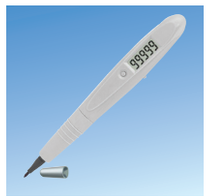
Catalog No.	Description	Price/Each
FB1175	Bacteria Spreader	$10.50



Counter, Hand Tally

The four digit (up to 9999) counter features highly visible white numerals on a black background, thumb switch, and a positive, click-stop reset dial. Durable chrome-steel construction. 4.5 cm in diameter and 3 cm thick.

Catalog No.	Description	Price/Each
FB0529	Counter, Hand Tally	$14.45

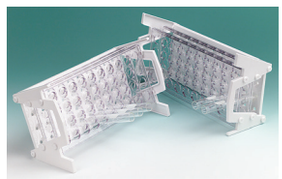


Digital Colony Counter Pen

The Digital Colony Counter Pen is a combination marker and digital counter that counts cell growth on Petri dishes, inventories parts and tallies samples received. To ensure an accurate tally, the counter beeps each time a mark is made, and the easy-to-read LCD displays the total (up to 99,999). Pen features on/off switch and comes with cap.

Catalog No.	Description	Price/Each
FB2322	Digital Colony Counter Pen	$31.75

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM



Rack, Slant

The end plates of this rack allow it to lie at either a 5 or 20 degree angle so that agar slants can be easily and consistently prepared. Holes are letter- and number-keyed. Rack is autoclavable.

Catalog No.	Description	Tube Size/mm	Price/Each
AB1260	Rack, Slant (40 tube)	15–16	$92.60



Syringe Filters

These quality syringe filters are excellent for cold sterilization of aqueous solutions, biological samples and cell culture media components. Filters feature sample volumes up to 50 mL, pore size and membrane type printed on the unit to eliminate mixups, blister pak packaging for indefinite sterile storage, surfactant-free cellulose acetate membrane to assure consistent filtration results, and Luer-Lok® fittings.

Catalog No.	Description	Price/Each
FB1157	Syringe Filter, Sterile, 0.2 µm Pore	$7.50



Antibiotic Sensitivity Disks, Difco

These disks are used to test the effectiveness of particular antimicrobial agents (antibiotics) against specific target organisms. The number given after the name of each agent is the dosage per disk in micrograms. An organism is considered sensitive if the resulting zone of inhibition is greater in diameter than the intermediate range given, and insensitive if less. A quantity of disks is supplied sterile-packed sleeves. Required disk dispenser sold separately. *Note:* Keep refrigerated, and use within six months of purchase.

Catalog No.	Description	Mode of Action	Intermediate Zone of Inhibition in mm	Price/Each
AB1400	Chloramphenicol 30 µg	Inhibits protein synthesis in gram variable bacteria.	13–17	$ 17.32
AB1401	Erythromycin 15 µg	Inhibits protein synthesis in gram positive bacteria.	14–17	17.32
AB1402	Kanamycin 30 µg	Inhibits protein synthesis in gram negative bacteria.	14–17	17.32
AB1403	Neomycin 30 µg	Inhibits DNA super-coiling in gram variable bacteria.	13–16	17.50
AB1404	Novobiocin 30 µg	Inhibits cell wall synthesis in gram positive bacteria.	18–21	17.32
AB1405	Penicillin G 10 units	Inhibits cell wall synthesis in gram positive bacteria.	12–21	17.65
AB1406	Streptomycin 10 µg	Inhibits protein synthesis in gram negative bacteria.	12–14	17.65
AB1407	Tetracycline 30 µg	Inhibits protein synthesis in gram variable bacteria.	15–18	17.65
FB1464	Antibiotic Disk Set: Contains all of the above disks.		12–21	100.00
FB1148	Blank Sterile Disks	Control	None	29.10



Fermentation Tube

Designed to verify and measure gas production in fermentation experiments. The borosilicate glass tube traps the gas (CO_2) as it is evolved. Use fermentation tubes to conduct comparative studies with different microorganisms or with a variety of fermentable sugars. Vertical tube is graduated up to 5 mL in 0.1 mL divisions—so gas volume can be precisely quantified.

Catalog No.	Description	Price/Each
FB0560	Fermentation Tube	$63.80



Gram Stain Set

Stains are formulated to meet the most widely accepted standards and are ready to use. Includes crystal violet (Hucker), 100 mL; iodine, 100 mL; safranin, 100 mL; 95% ethanol (decolorizer), 500 mL; and one package of 20 thin-stem polyethylene dropper pipets.

▶ See free How To video at flinnsci.com.

Catalog No.	Description	Price/Each
FB0124	Gram Stain Set	$35.35



Protex™ Ultra Disinfectant Wipes

Protex Ultra Disinfectant Wipes eliminate 99.9% of bacteria in 15 seconds and disinfect in just 4 minutes. Free of alcohol, bleach and solvents. 7" x 10". Package of 75.

Catalog No.	Description	Price/Pkg.
AP10032	Protex Ultra Disinfectant Wipes	$16.21



Anti-Bacterial Soap

This is the professional anti-microbiological soap used by health care professionals and medical facilities. 18 oz. Bottle has a built-in pump for easy dispensing at sink locations.

Catalog No.	Description	Price/Each
FB1155	Anti-Bacterial Liquid Soap	$23.60

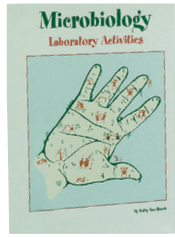
MICROBIOLOGY—CULTURE SUPPLIES continued on next page.

Microbiology—Books

Microbiology—Laboratory Activities Manual

FLINN EXCLUSIVE

By: Kathy Van Hoeck, York H.S., Elmhurst, IL



The laboratory exercises answer key organizing questions:

- What are microbes?
- Where can bacteria be found?
- How can we inhibit bacterial growth?
- What do bacteria need to grow?
- How can we tell one bacterium from another?

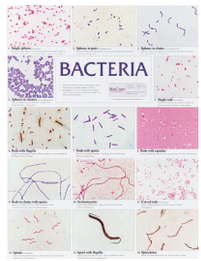
Each laboratory includes step-by-step directions, numerous teaching tips, detailed background information, safety and disposal considerations, timeline, teaching suggestions and sample data. 150 pages, 8½" x 11", spiral-bound.

Microbiology laboratory work does assume access to sterilizing equipment (autoclave or pressure cooker) as well as basic teacher skills in sterile technique.

Catalog No.	Description	Price/Each
FB1641	Microbiology—Laboratory Activities Manual	$50.20

Microbiology—Posters

Bacterial Morphology Chart



Beautiful full color micrographs depict basic bacteria shapes and also staphlo-, strepto-, and bacteria with flagellates. 18" x 24", laminated.

Catalog No.	Description	Price/Each
FB0362	Bacterial Morphology Chart	$30.43

Microbiology—Study Kits

Introductory Bacteria—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students will culture bacteria in simple infusion cultures and then prepare slides to observe and identify the bacteria through a microscope. Working individually, through self-paced experiments, students will gain vital and practical laboratory experience as they apply the classical Gram staining technique for bacterial identification. Detailed instructions are provided.

Complete for 30 students working in pairs. Microscopes with oil immersion lenses are required.

Catalog No.	Description	Price/Each
FB0480	Introductory Bacteria—Student Laboratory Kit	$58.60

Bacteria in Milk—Student Laboratory Kit

FLINN EXCLUSIVE

By: Jeannette Miller, Schalmont High School, Schenectady, NY



How much bacteria grows in refrigerated milk? What happens if milk stands out for a day or even for a few hours? Students test refrigerated milk, boiled milk and room-temperature milk to determine and compare their relative bacterial conditions. Students use the resazurin color reaction to demonstrate the relative amounts of bacteria in the various milk samples. Kit materials include the test tubes, powdered milk and the resazurin test solution.

Complete for 30 students working in pairs. Super Value Kit is complete for five classes of 30 students working in pairs.

Catalog No.	Description	Price/Each
FB2057	Bacteria in Milk—Super Value Laboratory Kit	$59.10

Bacteria Study Kit



Illustrate different bacteria using this informative study set. Includes six microscope slides in a plastic box, three overhead color transparencies, and detailed student worksheets. Two slides are carefully stained to show mouth bacteria and three smears of typical bacteria: cocci, bacilli, and spirilli. Other slides show *Staphylococcus aureus* and *Escherichia coli*. *Bacillus subtilis*, hay bacillus, is presented with a smear of bacilli and spores. *Spirillum volutans*, a large species from putrid water, is also part of the set. All materials come packaged in a convenient storage box.

Catalog No.	Description	Price/Each
ML1435	Bacteria Study Kit	$96.00

Bacteria Soil Ecology—Student Laboratory Kit

FLINN EXCLUSIVE

By: David Brock and Mariel Torres, Roland Park Country School, MD and Katie Loya, University of Maryland, MD



A great introduction to soil microecology and how soil influences all multi-cellular organisms in an ecosystem. How much bacteria is in your soil? What is the purpose of bacteria in soil? Students will use Petrifilm™ strips and serial dilutions of soil to answer these questions. This easy-to-perform experiment produces excellent results. Students will have the opportunity to create their own hypothesis, design and perform experiments and analyze and interpret data. Includes reproducible student handouts, complete Teacher Notes and all consumable supplies needed to perform the lab.

Complete for 24 students working in pairs.

Catalog No.	Description	Price/Each
FB1658	Bacteria Soil Ecology—Student Laboratory Kit	$116.60

Exploring the World of Soil Protozoa—Student Laboratory Kit

FLINN EXCLUSIVE

By: David Brock, Kate Brockmeyer, Kalyani Ravi and Leah Miller, Roland Park Country School, Baltimore, MD



The organisms that inhabit the soil are responsible for all of the ecological cycles that make life possible for plants and animals. In this kit, students will gain valuable insight on protozoans—the "lions and tigers" of the soil—as they explore soil samples and actually quantify the number of these organisms. An excellent way for students to extract and explore the exciting world of soil protozoa.

Comes complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB1785	Exploring the World of Soil Protozoa—Student Laboratory Kit	$64.80

Microbes Around Us—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Yuck! That's what your students will say when they see microbes growing on their agar plates. Students will be amazed at the microbes they find on "clean" surfaces! Once additional testing is completed, students will determine whether antibacterial products really work. The step-by-step directions provided will help you prepare for a safe and involving first microbiology laboratory.

Student experimental designs and lab group group size will determine how many kits you will need. The preparation of sterile agar-filled Petri dishes requires the use of an autoclave or pressure cooker.

Catalog No.	Description	Price/Each
FB1218	Microbes Around Us—Student Laboratory Kit	$52.85

MICROBIOLOGY—STUDY KITS continued on next page.

Microbiology—Study Kits, continued

The Glowing Germ Contamination—Demonstration Kit

FLINN EXCLUSIVE

By: Rhonda Reist, Olathe North H.S., Olathe, KS



It's amazing how fast germs can be spread around your classroom. Place a small quantity of glowing lotion on a frequently touched object without the students' knowledge. During a discussion of how disease causing microorganisms are transmitted, tell the students that you've contaminated one object in the lab before class and want to see how far the contamination has spread. Turn off the classroom lights and turn on one or more ultraviolet (black) lights. Anywhere that the fluorescent lotion has been spread it will glow. Students will be amazed at how contaminated the lab is. A perfect activity for illustrating the importance of good laboratory hygiene in biology, microbiology, and chemistry classes alike. You'll be guaranteed a classroom full of clean hands. Includes an eight-ounce container of the lotion (enough for many classes) and complete use instructions with presentation tips.

Concepts: Fluorescence, laboratory hygiene, ultraviolet light.

Time Required: One class period **Materials Provided:** Glowing Germ lotion.

Note: An ultraviolet light and a completely darkened room are necessary.

Catalog No.	Description	Price/Each
AP9080	The Glowing Germ Contamination—Demonstration Kit	$20.85
AP9030	Ultraviolet Lamp, 18"	53.85
AP6485	Ultraviolet Pen Light	25.45

Winogradsky Column: Biosphere in a Bottle—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students observe microbial growth in their personally constructed Winogradsky column with soil collected from their surroundings. Repeating the soil microbe-growing technique—made famous by the Russian microbiologist, Sergei Winogradsky—is fun and motivating. Over a several month incubation period, students will witness an array of protozoa, fungi, bacteria and algae as their Winogradsky column goes through its successive stages. Includes enough materials for 10 Winogradsky columns (chemical nutrients, wooden stirring sticks and teaching instructions).

Complete for 10 student groups. You supply the mud! The 10 columns included in the kit can be reused.

Catalog No.	Description	Price/Each
FB1574	Winogradsky Column: Biosphere in a Bottle—Student Laboratory Kit	$44.05

Microbe Hunting—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Reduce preparation time and provide a safe first microbiology experiment for your students. Let students safely culture microbes they collect and test factors affecting their growth. This kit contains the innovative 3M® Petrifilm™ plates. These ready-to-use paper-thin growth plates eliminate the need for sterilizing equipment and long hours of pouring agar plates. You and your students are ready to hunt for microbes the day the kit arrives.

Kit contains 50 Petrifilm plates. Includes directions for Petrifilm inoculation and incubation as well as experimental suggestions.

Catalog No.	Description	Price/Each
FB1219	Microbe Hunting—Student Laboratory Kit	$74.55

Bacteriology Simulation Lab



Now your students can conduct real bacteriology labs—without real bacteria. Ideal for middle-level students and for teachers lacking the facilities or the inclination to work with bacteria—and without the hassles of ordering, culturing and incubating. The simulated bacterial "cells" can be stored at room temperature, prepared when you need them, and engineered to function just like the real thing. Students will conduct the following experiments using standard microbiological techniques:

- Microscopic observation of bacterial morphology
- Smearing, heat fixing and Gram staining
- Biochemical assays for enzymatic activity

All of the exercises generate realistic results and prepare your students for more advanced work.

Materials provided for 24 students working in pairs.

Catalog No.	Description	Price/Each
FB0767	Bacteriology Simulation Lab	$62.55

Sam 'n Ella's Café—Simulated Food Poisoning Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Although microorganisms live very comfortably on and/or in almost everything imaginable, most people do not give that fact a second thought when they go out to eat. Initiate a lively discussion about the safe handling of food after students "eat" a buffet meal at Sam 'n Ella's Café and participate in a true-to-life simulation. Once food from each of six food categories has been selected by each student, the "food" (water) on their plates (cups) is tested to determine who and how many people are "sick." Then students play the role of food detectives to determine which food is contaminated and which "bacterium" may have caused the illnesses.

Complete for 30 students working individually. No living bacteria are used and no real food poisoning will result from this activity. Testing the "food" for contaminants involves detecting the presence of a base (the food "contaminant") using a pH color indicator.

Catalog No.	Description	Price/Each
FB1764	Sam 'n Ella's Café—Simulated Food Poisoning Laboratory Kit	$35.95

What's Living in YOUR Shower? Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



For many people, the thought of microorganisms all around us, all the time, is just *gross*—but it is a fact of life! Introduce your students to the diverse and fascinating world of environmental microbes "hiding in plain sight" with this hands-on culturing activity. Students develop sterile technique skills as samples are collected from different surfaces outside of class and cultured. The resulting microbial colonies are then carefully observed and diagrammed to compare and contrast their growth characteristics. Students discover that microbes, like people, come in all colors, shapes and sizes and indeed have unique "personalities."

Complete for 30 students working in pairs. An autoclave or pressure cooker is required. The availability of dissecting microscopes will make it easier for students to observe details in the growth patterns of the colonies.

Catalog No.	Description	Price/Each
FB1752	What's Living in YOUR Shower? Student Laboratory Kit	$52.65

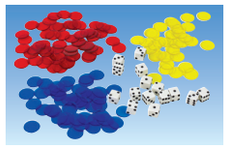
MICROBIOLOGY—STUDY KITS continued on next page.

Microbiology—Study Kits, continued

Antibiotic Resistance—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Many prescription bottles warn of the importance to take on time as directed and to finish the entire contents of the bottle. Students will obtain data by tracking the population of three different strains of bacteria, represented by three different colored bingo chips, throughout the antibiotic treatment. When the antibiotics are taken on time, every time, the bacteria will gradually become eliminated starting with the least resistant to most resistant. However, if a dose (or more) is missed the bacterial populations will grow. Students will construct a graph of their results and analyze the effects of the antibiotics on three strains having different antibiotic resistance levels. Watch as they finally understand the why the elusive prescription directions are so important! Includes preactivity questions, reproducible student worksheet and post lab questions and Teacher Notes. *Super Value Kit is complete for 30 students working in pairs. All materials are reusable!*

Catalog No.	Description	Price/Each
FB1928	Antibiotic Resistance—Super Value Laboratory Kit	$32.00

Antibiotic Sensitivity Testing—Student Laboratory Kit

FLINN EXCLUSIVE

By: Don Gage, John Stark High School, Weare, NH



The purpose of the lab is to expose students to the fundamental procedures used by microbiologists to inoculate, culture and analyze bacterial cultures. After learning basic bacteriological techniques, students determine whether a culture of *E. coli* is resistant, intermediately sensitive or sensitive to a series of five antibiotics. These are the same techniques originally used in hospital laboratories to determine the most effective treatment for infections. *Sufficient nutrient agar, sterile Petri dishes, sterile applicator swabs and antibiotic sensitivity disks are provided for 100 students working in pairs. An autoclave or pressure cooker and a live culture of* E. coli *are required and available separately.*

Catalog No.	Description	Price/Each
FB1935	Antibiotic Sensitivity Testing—Student Laboratory Kit	$134.90
LM1006	*E. coli*	13.60

Effects of Disinfectants and Antiseptics on Bacteria—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Provide your students with a hands-on look at the real-world effectiveness of various antibacterial substances on bacteria. Students thoroughly investigate and compare several antiseptic and disinfectant products, such as soap, alcohol and bleach. With the buzz in the media about bacterial resistance, you will definitely hold a captive audience while discussing this important topic! Student instructions, worksheets and Teacher's Notes included. *Complete for 30 students working in pairs.* Bacillus megaterium (*LM1002) is required and available separately.*

Catalog No.	Description	Price/Each
FB1793	Effects of Disinfectants and Antiseptics on Bacteria—Student Laboratory Kit	$89.95
LM1002	*Bacillus megaterium*	16.30

Bacterial Pollution (Coliform)—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students determine the presence or absence of coliform bacteria (indicative of untreated sewage and potentially pathogenic bacteria) in water supplies. By observing a dramatic color change that occurs in a lactose broth medium, students determine whether coliforms are present. Includes 25 tubes of lactose broth medium with chlorophenol red indicator, sterile transfer pipets and instructions. *Full-size kits are complete for 25 tests. Small-size kits are complete for 5 tests. Refill kits contain materials only.*

Catalog No.	Description	Type	Price/Each
AB1152	Bacterial Pollution (Coliform)—Student Laboratory Kit	Full-Size Kit	$75.75
AP10136		Full-Size, Refill Kit	67.00
AP10214		Small-Size Kit	41.20

Microscopes and Stereoscopes

Flinn Economy Digital Microscope, 1.3 MP Camera



An affordable and versatile tool that provides essential functionality for common microscopy applications in the classroom or laboratory. The digital-integrated head allows for simultaneous viewing through the eyepiece and on a computer, and the included Windows software allows for easy capture and editing of photos and video. The achromatic color-corrected optics provide sharp, clear images over a wide range of magnifications. The coaxial focus and mechanical stage-movements offer precision and ease of use.

Uses a monocular viewing head that can be rotated 360° to accommodate sitting or standing. Various eyepieces can be used to increase overall optical magnification without changing the camera's magnification. The objective turret provides instant access to four magnification levels, ranging from 40X to 1000X. For traditional viewing, an additional 20X eyepiece extends the maximum magnification to 2000X, and provides eight distinct levels of magnification. The achromatically corrected lenses improve resolution and color accuracy.

The 2-layer mechanical stage offers smooth and precise movement for examination of specimen slides. The stage's low-position controls are conveniently placed near the coaxial focus knobs for a streamlined workflow. The variable-intensity LED lighting provides bright, daylight-balanced illumination to produce high-contrast, color-correct images. Whether for education, research, or general laboratory use, it is an excellent value for those who need reliable performance at an affordable price.

Catalog No.	Description	Price/Each
MS1214	Flinn Economy Digital Microscope, 1.3 MP Camera	$720.00

Flinn Advanced Digital Microscope, 3 MP Camera



A versatile and ergonomic microscope designed for use in a variety of settings, from education and research to clinical applications. With its Siedentopf ocular-adjustment, easy-grip coaxial focusing, and reversed lens-turret, this microscope offers superior space-management and enhanced functionality. The integrated 3-megapixel camera and LED illumination provide daylight-balanced light for high-quality digital imaging.

The binocular viewing head allows for easy adjustment of eyepiece spacing using the precision Siedentopf mechanism. A diopter is available on the left ocular tube, and the ocular tubes are angled at 45° to accommodate both sitting and standing. The microscope can be customized with various eyepieces to increase overall optical magnification without changing the magnification of the camera.

The objective turret provides instant access to four magnification levels, ranging from 40X to 1000X. For traditional viewing, additional 20X eyepieces extend the maximum magnification to 2000X, and provide eight distinct levels of magnification. The achromatically corrected lenses improve resolution and color accuracy.

The 2-layer mechanical stage provides smooth and precise movement for examination of specimen slides. The stage's low-position controls are conveniently placed near the coaxial focus knobs for a streamlined workflow. The variable-intensity LED lighting offers bright, daylight-balanced illumination to produce high-contrast, color-correct images. Whether for research, education, or clinical use, it is an excellent choice for those who demand the best in performance and functionality.

Catalog No.	Description	Price/Each
MS1215	Flinn Advanced Digital Microscope, 3 MP Camera	$1025.00

MICROSCOPES AND STEREOSCOPES continued on next page.

Key Features and Benefits of Digital Microscopes







We asked teachers Key features and benefits of Flinn Scientific's microscopes:

- **Durable Construction:**

  Built with a chemical-resistant metal body, ensuring longevity for classroom use. Cordless design makes it versatile for both indoor labs and fieldwork.

- **Energy-Efficient LED Lighting:**

  LED illumination extends battery life, providing uninterrupted use throughout the day.

- **High-Quality Optics:**

  Achromatic DIN objective lenses deliver sharp, clear imaging for detailed study of specimens.

  Fixed eyepiece prevents loss and damage.

- **Smooth Focusing Mechanism:**

  Coarse and fine focus knobs on an all-metal rack and pinion system allow for precise adjustments.

  Rack stop helps prevent damage to slides and lenses.

- **Mechanical Stage and ABBE Condenser (on select models):**

  Mechanical stage allows precise slide control for scanning and measuring cells.

  ABBE condenser provides contrast adjustment, enhancing viewing at higher magnifications.

- **Dual-Head Option:**

  Enables simultaneous viewing for instructors and students, supporting collaborative learning.

  Can be upgraded to a digital microscope for under $500 with the addition of a digital imager.

- **Advanced Magnification:**

  Models available with up to 100X oil-immersion objective, ideal for studying bacteria and cellular structures.

These features make Flinn Scientific's microscopes suitable for a range of educational levels, from introductory biology to advanced studies involving detailed cellular analysis.

FLINN SCIENTIFIC Microscopes

Backed by the FLINN WARRANTY

Flinn Economy Microscopes

Stage Clips
40X (MS1121, MS1119 Dual Head)

Mechanical Stage
40X (MS1123)
100X Oil (MS1122)


MS1121


MS1119


AP11609S


MS1123


MS1122


MS11609

Flinn Advanced Microscopes

Color-Corrected Optics

Monocular
40X (MS1124)

Binocular
100X (MS1125 Digital)

PLAN Optics

Monocular
40X (MS1126)

Binocular
100X Oil
Standard Condensor

100X Oil
Koelher Illumination


MS1124


MS1125


MS1126


MS1127


MS1182



Flinn Digital Microscopes


MS1216


MS1215


MS1214

Microscopes and Stereoscopes, continued

Digital Monocular Microscope with Top Bracket, Mechanical Stage

NEW!



Discover the microscopic world with this digital monocular microscope. This microscope allows viewing at 4X, 10X, and 40X magnification.This microscope features the ability to connect a smartphone or computer to the built-in Wi-Fi, allowing you and your students to record or take images of what is being viewed in real-time. An attachable ipad bracket is included to mount a phone or tablet to the microscope for easy access as the sample is viewed.

Available with a mechanical stage or stage clips.

Specifications

- Monocular head with built-in camera
- Built-in Wi-Fi to connect to iOS, Android, and Chromebook
- PL10 x 18mm eyepiece
- Achromatic objective 4X, 10X, and 40X
- N.A. = 1.25 Abbe condenser
- LED illumination
- 100V–240V rechargeable with 3 rechargeable batteries

Catalog No.	Description	Price/Each	Price/5+ Each
AP11609	Digital Monocular Microscope with Top Bracket, Mechanical Stage	$710.00	$653.00

Flinn Infinity Digital Microscope, 5 MP Camera



A high-performance tool that combines the precision of infinity-corrected optics with the convenience of digital imaging. With four objective lenses and two pairs of eyepieces, this microscope offers a wide magnification range from 40X to 2000X. Its ergonomic design and smooth mechanics provide a comfortable and efficient experience, while the LED sub-stage lighting ensures cool and energy-efficient illumination.

Has an integrated 5-megapixel camera that allows for live video streaming and recording of still images and video with a single USB connection. The included Windows software features a range of measurement and editing tools, making it ideal for use in the classroom or clinic. Whether for research, education, or clinical applications, it is an excellent choice for those who demand the best in performance and functionality.

Catalog No.	Description	Price/Each
MS1216	Flinn Infinity Digital Microscope, 5 MP Camera	$1400.00

The Compound Microscope—NewPath Visual Learning Guide, Set of 10

NEW!



The Compound Microscope Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11736	The Compound Microscope—NewPath Visual Learning Guide, Set of 10	$43.32

Microscopes—Camera and Video

Document Camera



This high resolution document camera is an easy way to integrate technology into your classroom! See full specification details at flinnsci.com.

Catalog No.	Description	Price/Each
AP7641	Document Camera	$1459.50

Monocular Microscope with 7" Monitor



Discover the microscopic world with this monocular microscope with a 7 inch monitor. The digital head includes a high definition 7" LCD screen which allows you to record pictures and video and store it on a micro SD card. This microscope features a quadruple ball bearings revolving nosepiece with three objectives: achromatic 4x/0.10, achromatic 10x/0.25, and achromatic 40x/0.66 all with anti-fungus treatment. The stage is a 120x110 mm fixed stage. Focusing features a coaxial coarse and fine focusing mechanism with limit stop to prevent the contact between objective and specimen. The condenser is N.A 0.65 with iris diaphragm. The specimen is illuminated with a 1 W LED with brightness control and rechargeable batteries.

Catalog No.	Description	Price/Each
AP11613	Monocular Microscope with 7" Monitor	$820.00

Digital Binocular Microscope with Tablet



Digital binocular microscope ideal for teachers and secondary schools, with four N-PLAN objectives (1000x), FN 18 high eyepoint, finite optical system, coaxial focusing, mechanical stage, Abbe condenser and powerful, uniform, white color temperature 3 W X-LED2 illumination. The 3.1 MP CMOS camera ensures excellent colour reproduction and is connected to a Windows tablet PC with vivid color graphic display for unparalleled comfort and performance. The tablet represents a 2-in-1 solution as it can be disconnected and used as a real PC, being Windows based, with powerful Intel processor and large touch screen of 10.1" for fast, responsive and smooth control.

Catalog No.	Description	Price/Each
AP11614	Digital Binocular Microscope with Tablet	$1940.00

Celestron FlipView, 5MP LCD Portable Microscope



This compact yet powerful digital microscope is the perfect companion for up-close observation on the go. The onboard 3-inch, full color TFT LCD screen flips out when you need it, then folds back into the microscope body for portability. A rechargeable lithium ion battery provides hours of viewing time in the classroom or on a nature walk. FlipView, with its 10x to 120x magnification is a low-power microscope perfectly designed for viewing an array of 3D specimens, from beach sand to bugs, coins and currency, documents, circuit boards, and more. 3 ways to observe: use it in handheld mode for quick and easy observations; flip out the attached leg and FlipView sits on any flat surface. Perfect for viewing flat objects like stamps, currency, and more; and for longer observing sessions of 3D objects, mount FlipView to the included metal stand via the ¼-20 connector. The stand features two articulation points and can be adjusted to point it precisely at your subject.

Catalog No.	Description	Price/Each
AP11629	Celestron FlipView, 5MP LCD Portable Microscope	$239.95

Digital Microscope, Handheld



Innovative microscope design allows you to view specimens on a computer screen, capture images and record short videos—all at an affordable price! Simply press the button on the microscope or click the mouse to take a photo. Rugged metal stand holds the microscope steady at various positions while the curved ergonomic shape improves comfort in the hand. Narrow groove focus dial offers excellent grip and fine focusing with improved illumination control from the handset. Magnification is great for looking at textiles, insects, coins and other macroscopic items in detail.

- Powered by a USB cable that connects to a computer, laptop or tablet
- Built-in 2 megapixel digital camera with 10–200X magnification
- 8 white LEDs in ring configuration
- 4¼" x 1¼", weight 4 oz
- Celestron Capture Pro software with measurement and calibration functions. System requirements: Windows 7, 8 or 10; Mac 10.12 and later.

Catalog No.	Description	Price/Each
MS1101	Digital Microscope, Handheld	$140.00

MICROSCOPES—CAMERA AND VIDEO continued on next page.

Microscopes—Camera and Video, continued

MicroBrite Pro 60x–120x LED Lighted Zoom Pocket Microscope with Smartphone Digiscoping Clip

NEW!



The MicroBrite Pro LED lighted pocket microscope includes both the microscope and the smartphone digiscoping clip. This is a powerful 60x–120x power pocket microscope that is lightweight and portable. This hand-held microscope features a built-in LED light that provides a bright, clear image. It is pocket-sized so it can be brought anywhere. The smartphone digiscoping clip allows users to use the built-in camera application on their smartphone to take images and record video of their subject matter and share with students or teachers.

Catalog No.	Description	Price/Each
AP11604	MicroBrite Pro 60x–120x LED Lighted Zoom Pocket Microscope with Smartphone Digiscoping Clip	$22.00

MicroBrite Plus Smartphone Digiscoping Clip

NEW!



The MicroBrite Plus Smartphone Digiscoping Adaptor Clip is a separate accessory for users who already own the MicroBrite Pro Microscope. The smartphone digiscoping clip allows users to use the built-in camera application on their smartphone to take images and record video of their subject matter and then send the content to family, colleagues, and friends.

Catalog No.	Description	Price/Each
AP11605	MicroBrite Plus Smartphone Digiscoping Clip	$7.00

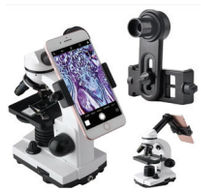
Universal Smartphone Optics Adapter



Fits most smart phones with or without a case. The adapter may be used with microscopes, binoculars and telescopes with an eyepiece diameter of 25–58 mm. Adapter is not compatible with larger phone tablets.

Catalog No.	Description	Price/Each
FB2150	Universal Smartphone Optics Adapter	$94.20

Gosky Microscope Lens Adapter

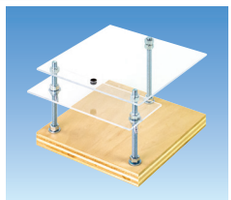


Capture beautiful microscope photography with this adapter and your smart phone. This smart phone camera adapter works to capture detailed pictures when connected to a microscope. Works on microscopes with 23.2 mm optical tube or 23.2 mm eyepiece barrel, Compatible with a variety of phones whose's width range from 2.2" to 3.9" such as iphone 4, 4s, 5, 5s, 6, 6s, 6plus,7,7p, Samsung Galaxy S5, S4, S3, S2, Moto Etc.

Catalog No.	Description	Price/Each
AP11610	Gosky Microscope Lens Adapter	$70.00

Smart Digital Microscope Stand

FLINN EXCLUSIVE



A convenient way for students to magnify objects and capture images or video using their own digital devices. Images may be used in lab reports and multimedia presentations, to create mini-posters or to study for a lab practical exam. This versatile product may be used in the laboratory and is also compatible enough to be taken out into the field.

Assembly required. Compatible with most smartphones and small tablets. Digital device not included.

Catalog No.	Description	Price/Each
FB2101	Smart Digital Microscope Stand	$37.50

Celestron Digital Microscope Imager



This 2MP microscope imager turns traditional microscopes into high-resolution digital imagers, using your personal computer. Record still images and take videos using the CMOS sensor. Imager replaces the eyepiece and connects directly to a PC with Windows 7, 8 or 10, streaming images of the specimens in view. Compatible with almost any microscope, both biological and stereo. Comes with an adjustable collar that fits eyepiece tubes from 23.2 to 30.5 mm in diameter. Improved digital software expands functionality to include measurement and notation features. Two-year warranty.

Catalog No.	Description	Price/Each
MS1116	Celestron Digital Microscope Imager	$100.00

Celestron 5MP Digital Imager



Celestron's 5MP Digital Microscope imager captures high resolution images and 30 fps video. Assemble the adjustment collar and the imager will replace any standard 23 mm or 30 mm eyepiece and plug directly in to your Mac (2MP max) or Windows (full 5MP) PC via standard USB. More robust software with new features like measurement, calibration, note taking and comparison feature which allows comparing two live streams.

Catalog No.	Description	Price/Each
AP10230	Celestron 5MP Digital Imager	$127.50

Microscopes—Storage

Microscope Cabinet, Mobile



Protect your school's microscopes in Flinn's Mobile Microscope Cabinet. Between 20 and 24 microscopes can easily and safely be stored depending on makes and models. Sliding doors with keyed locks located on each side of the cabinet allow quick and easy removal of the microscopes. Cabinet is constructed of ¾"-thick, high-density 7-ply plywood with a stained birch finish.

The cabinet glides smoothly on 3" heavy-duty rubber casters. The casters at one end swivel and lock for easy maneuverability and stability on uneven surfaces. Outside dimensions are 39⁵⁄₁₆" H x 22" W x 47" L. Shelves are 16" H x 9" D. Our microscope cabinet is built to last!

Catalog No.	Description	Price/Each
FB1031	Mobile Microscope Cabinet	$1466.76

* Cabinet must be shipped by motor truck freight.

Microscope Storage Cabinet



When you need permanent, fixed storage for a classroom set of microscopes, Flinn has the cabinet for you! Our Microscope Storage Cabinet is constructed of solid oak, hardwood and oak veneers with a natural clear UV-protected finish. Solid oak framed doors are hinged and include three-point locking handles and ³⁄₁₆"-thick tempered glass. Microscopes are stored on 1"-thick adjustable shelves. Adjustable and removable wire dividers on the shelves allow for storage of microscopes of various sizes. Maximum microscope size is 7¼" W x 14" D x 14" H. Available in two sizes: 36" W x 16" D x 84" H unit holds 20 microscopes and the 48" W x 16" D x 84" H unit holds 30 microscopes.

Catalog No.	Description	Size	Price/Each
AP7142	Microscope Storage Cabinet	36"	$1967.00
AP7133		48"	2340.00

* Cabinet must be shipped by motor truck freight.

Microscope Slides

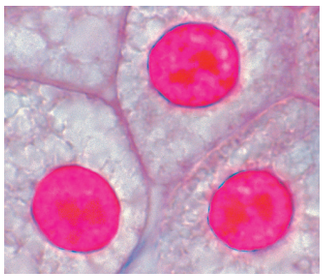
Flinn Prepared Slides

Outstanding quality and optical clarity. You'll always be pleased with Flinn-prepared microscope slides. We guarantee it!

Individually prepared slides are listed taxonomically and in categories designed to make any one slide easy to locate. Slide sets follow individual listings.

Slides are shipped in durable plastic containers ensuring arrival in good condition. Containers are reusable. Excellent for storing your slide collection.

Microscope Slide Abbreviations
c.s.: Cross Section
l.s.: Longitudinal Section
w.m.: Whole Mount



Beginning Microscopy—Compariset™

Build students' fundametal compound microscopy skills using this beautiful slide set. Includes five of the most common introductory slides: newsprint letter "e," colored threads, natural fibers, three hair types and salt crystals. See individual slide descriptions on this page for additional information.

Catalog No.	ML1426
Description	Beginning Microscopy—Compariset™
Price/Each	$25.80

BEGINNING MICROSCOPY

Catalog No.	Description	Price/Each
ML1000	**Letter "e,"** w.m. Demonstrate the fundamentals of reversal of direction and image with this simple slide.	$5.45
ML1001	**Colored threads,** w.m. Threads of three different colors cross each other in a variety of combinations. An effective means of teaching and practicing the concept of focusing on different "planes" of the slide.	8.23
ML1002	**Natural fibers,** w.m. Fibers of cotton, linen, silk and wool.	7.97
ML1003	**Hair—3 types,** w.m. Human, cat and sheep fibers for comparison.	8.25
ML1004	**Salt crystals,** w.m. A new perspective on an everyday substance. Shows the regularity of crystal structure.	6.25
ML1006	**Cork,** section. Examine the gross structure of a representative plant cell.	5.97
ML1007	**Animal cell,** section. A preparation of liver cells from the Congo eel, *Amphiuma*. Cell structure is readily seen under low to medium power.	7.70

BACTERIA

Catalog No.	Description	Price/Each
BACTERIA		
ML1008	**Mouth smear.** A preparation of mixed bacteria normally found in the mouth. Gram stain.	$ 8.75
ML1009	**Stagnant water smear.** Various species of free-living bacteria including common decomposers.	6.95
ML1010	**Bacteria—three forms.** Mixed smear of cocci, bacilli and spirilli. Gram stained.	9.35
ML1011	**Bacteria—three forms.** Separate smears of the three morphological forms. Gram stained.	10.60
ML1012	**Coccus.** Gram-positive.	8.75
ML1013	**Coccus.** Gram-negative.	10.00
ML1014	***Bacillus.*** Gram-positive.	8.70
ML1015	***Bacillus.*** Gram-negative.	9.37
ML1428	**Intestine bacteria,** Smear.	9.10
ML1016	***Spirillum.*** Gram-negative.	8.90
ML1427	**Spore stain,** Smear. Doubly stained with central spores.	11.50
ML1429	***Staphlococci,*** Smear. Fuchsin stained.	9.50
ML1017	***Escherichia coli.*** Smear preparation from culture. The common and occasionally pathogenic endosymbiont.	8.25
CYANOBACTERIA		
ML1019	***Anabaena,*** w.m. Coiled filaments with intercalary heterocysts and akinetes.	$7.97
ML1024	***Oscillatoria,*** w.m. Unbranched cylindrical filaments.	7.97

PROTISTS

Catalog No.	Description	Price/Each
ML1026	**Mixed protozoa,** w.m. Includes *Amoeba*, *Paramecium*, *Euglena*, and others.	$10.83
PSEUDOPODS		
ML1027	***Amoeba proteus,*** w.m. Included are both floating and crawling forms with readily visible pseudopods and intracellular structures.	$9.50
ML1031	***Foraminifera.*** The cleaned shells of several species from oceanic sediments.	7.95
CILIATES		
ML1034	***Paramecium caudatum,*** w.m. A number of individuals stained to show large macronucleus and single, small micronucleus.	$ 6.48
ML1036	***Paramecium multimicronucleatum,*** w.m. This large species has a single macronucleus and several micronuclei.	8.00
ML1037	***Paramecium,*** fission, w.m. Large number of individuals with several specimens undergoing fission. Nuclei stained.	14.75
ML1039	***Stentor,*** w.m. Trumpet-shaped organism with a distinctive beaded nucleus.	10.89
ML1040	***Vorticella,*** w.m. Bell-shaped ciliate with a contractile stalk which coils and extends like a spring.	10.60
APICOMPLEXA (SPOROZOANS)		
ML1042	***Plasmodium sp.,*** smear. Red blood cells infected by trophozoites (including ring forms) are clearly visible in this malarial preparation.	$14.75

MICROSCOPE SLIDES continued on next page.

Microscope Slides, continued

PROTISTS

Catalog No.		Description	Price/Each
EUGLENOZOA			
ML1044	***Euglena,*** w.m.	Specimens of this unique and difficult-to-classify organism clearly show all major structures.	$6.05
GREEN ALGAE			
ML1055	**Mixed green algae,** w.m.	Composite slide of five or more common species.	$10.82
ML1061	***Spirogyra,*** w.m.	Filaments of large species, cells with multiple spiral chloroplasts which are characteristic.	6.20
ML1062	***Spirogyra,*** w.m.	Small species, cells with chloroplasts.	8.25
ML1050	***Volvox,*** sec.	Sections of colonies with zygotes present.	8.95
ML1049	***Volvox,*** w.m.	Large spherical colonies that may have 1,000 or more cells. Both vegetative and reproductive colonies are shown.	7.80
GOLDEN-BROWN ALGAE			
ML1066	**Diatoms—marine,** w.m.	Mixed marine species with protoplasts stained.	$8.23
ML1067	**Diatoms—freshwater,** w.m.	Mixed freshwater species with protoplasts stained.	7.95
RED ALGAE			
ML1072	***Polysiphonia,*** w.m.	Marine species, widely distributed. Preparation of branched thallus with tetraspores.	$10.75

FUNGI

Catalog No.		Description	Price/Each
ML1074	**Mold types,** w.m.	Sporangial forms of three mold types mounted on one slide.	$11.60
ZYGOMYCETES			
ML1075	***Rhizopus,*** w.m.	Bread mold. Mycelium with sporangia.	$7.80
ASCOMYCETES			
ML1078	***Penicillium,*** w.m.	Blue mold, mycelium with conidiophores.	$6.94
ML1079	***Saccharomyces,*** w.m.	Yeast, both vegetative and budding cells present.	6.75
BASIDIOMYCETES			
ML1084	***Coprinus,*** c.s.	Mushroom, section through entire pileus showing stipe, basidia, and spores.	$9.95
LICHENS			
ML1087	**Lichen,** w.m.	Teased to show algal cells and fungal hyphae in association.	$9.10

PLANTAE

Catalog No.		Description	Price/Each
ANGIOSPERMS (MONOCOT VS. DICOT)			
The slides listed here are designed to illustrate fundamental anatomical differences between the two major divisions of the flowering plants: the Monocotyledoneae and the Dicotyledoneae.			
ML1118	**Stems,** c.s.	Typical monocot and dicot stems show variation in arrangement of conductive tissue.	$10.25
ML1119	***Roots,*** c.s.	Sections through typical monocot and dicot roots.	10.80
ML1120	**Leaves,** c.s.	Demonstrate leaf anatomy variation with sections from monocot and dicot leaves.	12.25
ML1121	**Leaf epidermis,** w.m.	Epidermal layers from representative monocot and dicot leaves.	9.75
ANGIOSPERMS (DICOT: STEMS)			
ML1125	**Herbaceous and woody stems,** c.s.	Sections of both on one slide.	$10.40
ML1141	***Tilia,*** c.s.	Composite of one-, two-, and three-year stems and older on one slide.	11.95

Protists—Compariset™

Examine the similarities and differences among the major groups of protists. The five slides selected include *Euglena*, a mastigophoran (flagellate); *Amoeba proteus*, a sarcodine; Stentor, a ciliate; *Plasmodium*, a parasitic sporozoan; and mixed freshwater diatoms, photosynthetic chrysophytes. Relevant comparisons can be made with respect to motility, photosynthetic capability, life history, and subcellular structures. The diatoms are included as an intermediate form between protists and higher algae.

Catalog No.	ML1420
Description	Protists—Compariset™
Price/Each	$35.00

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Prokaryotes vs. Eukaryotes—Compariset™

At the cellular level, living things can be divided into two basic groups: the prokaryotes—without a distinct nucleus and membrane-bound organelles, and the eukaryotes—cells which do possess a distinct nucleus and membrane bound organelles. In this set the prokaryotes are represented by the cyanobacterium *Gloeocapsa* and by bacteria—three forms mixed. The eukaryotes are represented by the evolutionarily intermediate *Euglena* and by the large and easily studied liver cells of the Congo eel *Amphiuma;* four slides total.

Catalog No.	ML1393
Description	Prokaryotes vs. Eukaryotes—Compariset™
Price/Each	$30.85

MICROSCOPE SLIDES continued on next page.

Microscope Slides, continued

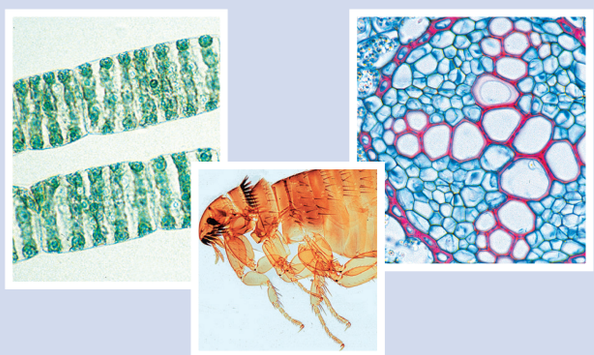
Sexual vs. Asexual—Compariset™

The myriad solutions to the reproduction puzzle fall neatly into two divisions—sexual and asexual. Both have their advantages and disadvantages. This five-slide set will help to illuminate the basic differences and provide visual examples for each. Asexual reproduction is shown by fission of *Paramecium* and by budding in *Hydra*. The complex structures often associated with sexual reproduction are illustrated by a cross section of a *Ranunculus* flower, and by separate cross sections of a mammalian testis and an ovary.

Catalog No.	ML1400
Description	Sexual vs. Asexual—Compariset™
Price/Each	$50.65

PLANTAE, *continued*

Catalog No.	Description	Price/Each
ANGIOSPERMS (DICOT: LEAVES)		
ML1148	**Hydro-, meso-, and xerophytic leaves,** c.s.	Composite slide to demonstrate leaf adaptation to environments characterized by varying degrees of moisture. $13.10
ML1151	***Sedum* leaf,** w.m.	Stonecrop, preparation of leaf epidermis with stomata. 7.00
ML1152	***Syringa vulgaris,*** c.s.	Lilac, section of leaf and midrid. 9.20
ANGIOSPERMS (MONOCOT: STEMS)		
ML1157	***Elodea canadensis,*** c.s.	Section through hydrophytic stem. $9.72
ML1158	***Elodea,*** l.s.	Non-median section of stem tip to show leaf development. 10.65
ML1159	***Zea mays,*** c.s.	Section through mature stem. 11.00
ANGIOSPERMS (MONOCOT: ROOTS)		
ML1162	***Allium cepa,*** l.s.	Section through root-tip for mitosis, iron–alum hematoxylin and orange stain. $11.35
ML1163	***Allium,*** l.s.	Section through root-tip for mitosis, quadruple stain. 12.75
ANGIOSPERMS (MONOCOT: LEAVES)		
ML1167	***Allium cepa,*** w.m.	Onion, bulb scale (leaf) epidermis to show simple cell structure. $7.95
ML1168	***Allium,*** w.m.	Leaf epidermis with stomata. 9.75
ML1170	***Elodea canadensis,*** w.m.	Whole mount representative hydrophytic leaf. Compare to *Aloe*, above. 9.35
ML1171	***Zea mays,*** c.s.	Section through leaf blade with motor cells. 8.20
ANGIOSPERMS (MONOCOT: FLOWERS AND DEVELOPMENT)		
ML1175	***Lilium,*** c.s.	Anthers with first meiotic divisions. $13.25



Flinn Comparisets™

Build fundamental microscopy skills and explore the similarities and differences among important biological topics. Classification, taxonomy, biological diversity, cells, plants and animals are only some of the areas covered with these versatile slide sets. See full details on flinnsci.com.

Catalog No.	Description	Price/Each
ML1426	Beginning Microscopy Compariset™	$25.80
ML1420	Protists Compariset™	35.00
ML1393	Prokaryotes vs. Eukaryotes Compariset™	30.85
ML1400	Sexual vs. Asexual Compariset™	50.65
ML1419	Roots and Stems Compariset™	33.00
ML1394	Monocot vs. Dicot Compariset™	33.95
ML1402	Parasites Compariset™	41.20
ML1392	Plant vs. Animal Compariset™	40.00
ML1396	Mitosis vs. Meiosis Compariset™	60.35
ML1418	Muscle, Bone and Cartilage Compariset™	50.35
ML1403	Tissue Types Compariset™	40.00

Tissue Types—Compariset™

Students from general biology to advanced anatomy and physiology should be familiar with the major types of mammalian tissue. This four-slide set is an excellent way to illustrate that form follows function all the way down to the cellular level. The tissue types included are: columnar epithelium—cross section of small intestine (epithelial); ground bone (connective); striated muscle—thin section to show striations (muscular); motor nerve cells—smear from ox spinal cord (nervous).

Catalog No.	Description	Price/Each
ML1403	Tissue Types—Compariset™	$40.00

Muscle, Bone, and Cartilage—Compariset™

Enhance your students' understanding of the structure and function of the skeletal and muscular systems. Discuss the numerous vital functions performed by these systems—in addition to their providing the framework for movement and posture. Included are five separate slides of striated, smooth, and cardiac muscle, ground bone, and hyaline cartilage. The cellular structure of the three muscle types can also be compared and contrasted.

Catalog No.	Description	Price/Each
ML1418	Muscle, Bone,and Cartilage—Compariset™	$50.35

Microlife—Bacteria, Fungi & Protists—NewPath Visual Learning Guide, Set of 10

NEW!



Microlife—Bacteria, Fungi & Protist Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11740	Microlife—Bacteria, Fungi & Protists—NewPath Visual Learning Guide, Set of 10	$43.32

MICROSCOPE SLIDES continued on next page.

Microscope Slides, continued

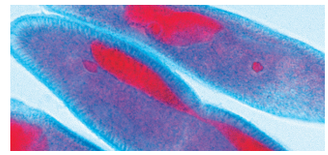
INVERTEBRATE ZOOLOGY

Catalog No.	Description	Price/Each
PORIFERA (SPONGES)		
ML1184	***Scypha (grantia),*** c.s. Section to show arrangement of canal system and location of choanocytes (collar cells).	$9.31
ML1188	**Spicules,** w.m. Several types of both calcareous and siliceous spicules.	8.25
CNIDARIA (HYDRA AND JELLY FISH)		
ML1189	***Hydra,*** w.m. Specimen to show foot, stalk, and tentacles with nematocysts.	$9.00
ML1191	***Hydra*—budding,** w.m. To illustrate asexual reproduction.	7.70
ML1195	***Obelia,*** w.m. Portion of hydroid colony to show vegetative and reproductive polyps.	10.25
ML1436	***Aurelia*, ephyra stage,** w.m. Free-swimming stage.	10.40
PLATYHELMINTHES (FLATWORMS)		
ML1197	**Planaria,** w.m. Carbon "injected" to enhance visibility of digestive tract.	$ 8.90
ML1200	**Planaria,** c.s. Composite of sections through three regions including pharynx and intestinal regions—on one slide.	16.75
NEMATODA (ROUNDWORMS)		
ML1216	***Trichinella,*** sec. Section through mammalian muscle to show encysted larvae.	$10.70
ANNELIDA (SEGMENTED WORMS)		
ML1221	***Lumbricus,*** c.s. Composite, sections through two regions: one through intestinal region, the other showing seminal vesicles and esophagus.	$10.55
ARTHROPODA (ARACHNIDS)		
ML1433	**Spider,** w.m. Young specimen.	$11.35
ARTHROPODA (CRUSTACEANS)		
ML1231	***Daphnia,*** w.m. The common water-flea.	$ 6.90
ML1233	**Copepod,** w.m. Specimen of a common species, usually *Cyclops*. Copepods are present in virtually all zooplankton assemblages and as primary consumers are a vital constituent of aquatic ecosystems.	9.20
ML1235	**Zooplankton,** w.m. Mixed species.	11.22
ARTHROPODA (INSECTS)		
ML1236	**Insect wings,** w.m. Composite, four types of wings on one slide.	$11.26
ML1237	**Insect legs,** w.m. Composite, multiple types of legs on one slide.	13.75
ML1240	**Human louse,** w.m. *Pediculus humanis,* for morphology.	10.25
ML1241	***Drosophila, w.m.*** Male and female, excellent preparation for comparing the secondary sexual characteristics of the ubiquitous fruit fly.	10.75
ML1243	**Mosquito (*Culex* sp.),** w.m. Female specimen of the all too common pest. Female possesses proboscis used to extract blood-meal.	10.55
ML1244	**Flea,** w.m. Dog or cat flea.	10.35
ECHINODERMATA		
ML1246	**Sea Star development,** w.m. All stages from unfertilized egg to bipinnaria, inclusive.	$15.13
LANCELETS		
ML1252	***Amphioxus,*** w.m. Preparation of a small specimen.	$9.50
FISHES (OSTEICHTHYES)		
ML1260	**Fish scales:** Four types, w.m. Set of four slides, one of each type of scale described: Placoid, isolated scales, dog fish (*squalus*); ganoid, eleaned scale, gar pike; cycloid, cleaned scale, northern pike; ctenoid, scale with characteristic comb-like teeth.	$34.05
ML1261	**Whitefish mitosis,** sec. Blastodisc, mitotic figures are clearly depicted and numerous, hematoxylin stain.	23.50
AMPHIBIANS		
ML1263	**Frog—blood,** smear. All cell types shown.	$7.50
ML1267	**Frog—skin,** sec. Skin, mucous, and poison glands shown.	9.37
ML1007	***Amphiuma*—liver,** sec.	7.70

Roots and Stems—Compariset™

Compare the root and stem structures of a representative monocot (*Zea mays*, corn) and a representative dicot (*Ranunculus acris*, the buttercup). Root and stem cross sections of each plant comprise the four slides included. Students can closely examine and compare the arrangements of the vascular bundles (conductive tissues) in the two major groups of flowering plants.

Catalog No.	ML1419
Description	Roots and Stems—Compariset™
Price/Each	$33.00



Monocot vs. Dicot—Compariset™

Four composite slides selected to vividly illustrate the fundamental differences between those two sub-groups of the flowering plants. Cross sections of stems, roots, leaves, and flower buds contrast vascular tissue—arranged in a ring in dicots and scattered bundles in monocots; leaf veins—branched in dicots and parallel in monocots; and flower parts—dicots with four or five or multiples thereof and monocots with three or multiples thereof.

Catalog No.	ML1394
Description	Monocot vs. Dicot—Compariset™
Price/Each	$33.95

Amphiuma—(The Congo Eel)

Slides prepared from the tissues of this animal are popular at all skill levels due to the unusually large size of its cells. Preparations that would usually require medium to high power can be viewed under low to medium power. Recommended for beginning microscopists.

MICROSCOPE SLIDES continued on next page.

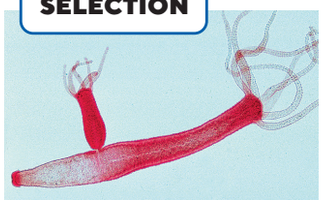
Microscope Slides, continued

Great Reference Material!

Biological Waste Disposal

Page 658.

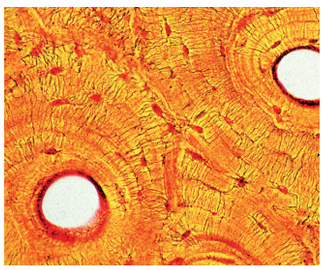
GREAT SELECTION



Parasites—Compariset™

A morbidly fascinating springboard to some very basic ideas about evolution, parasitism can be a marvelous teaching tool. A few of the mechanisms by which some organisms have evolved to make their living at others' expense are presented here. *Plasmodium*, the causative agent of malaria, is shown infecting red blood cells. The fungus *Puccinia*, the cause of wheat rust, is seen on a cross section of its host plant. *Trichinella*, the agent of trichinosis, is examined encysted in mammalian muscle tissue. And the human louse, *Pediculus humanis*, is viewed in its entirety—grasping appendages poised.

Catalog No.	ML1402
Description	Parasites—Compariset™
Price/Each	$41.20



VERTEBRATE ZOOLOGY

Catalog No.	Description		Price/Each
REPTILES AND BIRDS (REPTILIA AND AVES)			
ML1280	**Bird feathers,** w.m.	Composite of three types: contour, filoplume and down.	$12.60
MAMMALIAN HISTOLOGY (SUB-CELLULAR PREPARATIONS)			
ML1432	**Human chromosome, male,** smear.	From culture of blood.	$32.05
ML1431	**Human chromosome, female,** smear.	From culture of blood.	33.00
MAMMALIAN HISTOLOGY (EPITHELIAL TISSUE)			
ML1283	**Squamous epithelium,** smear.	From human mouth; flat, irregular cells lining the cheek.	$ 8.25
ML1284	**Cuboidal epithelium,** sec.	Section from kidney.	9.00
ML1285	**Columnar epithelium,** sec.	Section from intestine.	9.55
ML1286	**Ciliated columnar epithelium,** sec.		9.90
ML1287	**Pseudostratified ciliated columnar epithelium,** sec.	Section through trachea.	10.80
ML1288	**Stratified squamous epithelium,** sec.	Section of esophagus.	10.00
ML1289	**Stratified squamous epithelium,** sec.	Human, section of esophagus.	11.50
ML1290	**Stratified squamous epithelium,** sec.	Cornified, section of squirrel foot pad.	10.95
MAMMALIAN HISTOLOGY (CONNECTIVE TISSUE)			
ML1291	**Areolar tissue,**	subcutaneous tissue spread.	$ 9.55
ML1292	**Adipose tissue,** sec.	Human adipose (fat storage) cells.	9.20
ML1293	**Fibrous tissue,** sec.	White; cross and longitudinal sections of human tendon.	13.10
ML1294	**Cartilage—hyaline,** sec.		10.70
ML1295	**Cartilage—elastic,** sec.	Section from ear, Verhoeff's elastic tissue stain.	11.15
ML1296	**Bone—ground,** c.s.	Human, Haversian canals, lamellae lacunae, and canaliculi are all visible.	16.30
MAMMALIAN HISTOLOGY (BLOOD SMEARS)			
ML1298	**Human—normal**	Wright stain. Classic blood stain preparation. Leukocytes and platlets prominent.	$ 7.95
ML1297	**Human—normal**	Giemsa stain, erythrocytes leukocytes and platelets well differentiated.	7.95
ML1301	**Cat blood**		8.25
ML1302	**Vertebrate blood types**	Five separate slides—one each of fish, frog, turtle, bird, and human. To show variation between the major classes of vertebrates.	25.10
MAMMALIAN HISTOLOGY (MUSCLE TISSUE)			
ML1303	**Smooth muscle**	Macerated preparation to show individual cells.	$ 10.40
ML1304	**Smooth muscle,** sec.	Composite, cross and longitudinal sections from intestine.	9.10
ML1305	**Striated muscle,** l.s.	Thin sections specifically stained to show the details of the striations.	10.30
ML1306	**Striated muscle,** sec.	Composite cross and longitudinal sections to show general structure.	8.95
ML1307	**Cardiac muscle,** sec.	Section prepared to show intercalated discs.	15.00
ML1308	**Cardiac muscle,** sec.	Human heart muscle.	11.20
ML1309	**Mammalian muscle — three types,** sec.	Composite; sections of smooth (involuntary), striated (skeletal, voluntary) and cardiac muscle on one slide.	14.00

MICROSCOPE SLIDES—VERTEBRATE ZOOLOGY continued on next page.

Microscope Slides, continued

VERTEBRATE ZOOLOGY, *continued*

Catalog No.	Description		Price/Each
MAMMALIAN HISTOLOGY (NERVOUS TISSUE)			
ML1310	**Spinal cord,** c.s.	Section of mammalian spinal cord.	$10.75
ML1311	**Spinal cord,** c.s.	Stained to differentiate myelinated and unmyelinated fibers.	12.70
ML1313	**Spinal cord,** c.s.	Section of human spinal cord.	10.40
ML1314	**Peripheral nerve,** sec.	Composite, cross and longitudinal sections on one slide.	11.20
ML1315	**Motor nerve cells,** smear.	Prepared from ventral horn of ox spinal cord.	10.50
MAMMALIAN HISTOLOGY (VASCULAR SYSTEM)			
ML1316	**Artery,** sec.	Verhoeff's elastic tissue stain, compare to vein preparation below for thickness of muscle layer and proportion of elastic tissue in that layer.	$10.70
ML1318	**Vein,** sec.	Elastic tissue stain, for general structure and comparison to artery preparation above.	10.35
ML1320	**Artery and vein with attached nerve,** c.s.	All three shown in a selected tissue section.	9.30
MAMMALIAN HISTOLOGY (INTEGUMENT)			
ML1322	**Skin—human,** sec.	Section from palm of hand.	$ 7.95
ML1323	**Skin—pigmented and nonpigmented,** sec.	Sections of pigmented and nonpigmented skin.	16.75
MAMMALIAN HISTOLOGY (INTEGUMENT), continued			
ML1324	**Scalp—human**	Section showing portions of hair follicles, sebaceous glands, and sweat glands.	$15.95
ML1325	**Skin,** sec.	Section of non-human skin showing several hair follicles cut longitudinally.	10.55
MAMMALIAN HISTOLOGY (RESPIRATORY SYSTEM)			
ML1327	**Lung—human,** sec.	Section of normal, healthy human lung.	$10.40
ML1329	**Trachea,** c.s.	For general structure.	8.80
MAMMALIAN HISTOLOGY (DIGESTIVE SYSTEM)			
ML1331	**Stomach,** sec.	Section through fundic region.	$ 8.95
ML1332	**Small intestine,** c.s.	Section through jejunum (middle region).	10.55
ML1333	**Small intestine,** c.s.	Composite, sections through all three regions—duodenum, jejunum, and ileum.	13.10
ML1334	**Pancreas,** sec.	Normal, mammalian.	8.60
ML1336	**Liver—human,** sec.	Normal, human liver.	10.75
MAMMALIAN HISTOLOGY (UROGENITAL SYSTEM)			
ML1338	**Kidney,** c.s.	Section through normal mammalian kidney.	$ 8.60
ML1339	**Kidney—human,** sec.	Normal human kidney section.	10.60
ML1341	**Testis,** sec.	Iron hematoxylin stain to show spermatogenesis and spermiogenesis.	8.94
ML1342	**Sperm—human,** smear.		10.75
ML1344	**Ovary,** sec.	Section from a young mammal, shows a large number of primary follicles.	9.00
ML1346	**Ovary,** sec.	Section selected to show corpus luteum.	11.66

VERTEBRATE EMBRYOLOGY

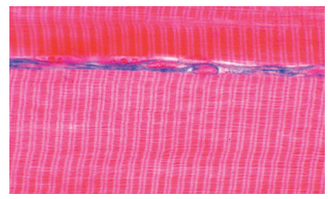
Catalog No.	Description		Price/Each
AMPHIBIA—FROG			
ML1351	**Frog blastula,** sec.	Representative section of blastula stage.	$19.95

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Plant vs. Animal—Compariset™

What comparison in biology is more fundamental than that between plants and animals? The slides in this set can be used to take this comparison to a different level—microscopic. Epidermal cells from onion leaf are compared and contrasted with those from a human—cells whose similarities in structure are due to similarities in function. Cross sections of pine stems are compared and contrasted with cross sections from an earthworm—both of which have structures specialized for conducting materials through the organism. These and many other points can be made with this set of four slides.

Catalog No.	ML1392
Description	Plant vs. Animal—Compariset™
Price/Each	$40.00



Mitosis vs. Meiosis—Compariset™

This set of four slides is selected to introduce and compare and contrast processes which are integral to any study of biology—to say the least! Mitosis—cellular division that results in two identical daughter cells; and meiosis—reduction division, the products of which are haploid sex cells or gametes; are examined in both plant and animal tissues. Slides for mitosis are sections of onion root-tip and whitefish blastula. Slides for meiosis are sections of lily anthers and ovaries of *Ascaris*.

Catalog No.	ML1396
Description	Mitosis vs. Meiosis—Compariset™
Price/Each	$60.35

MICROSCOPE SLIDES continued on next page.

Microscope Slides—Topical Slide Sets, continued

Microscope Slide Sets

Slides set include a full-color brochure with corresponding pictures. See flinnsci.com for the full listing of slides in each set.

Catalog No.	Description	Number of Slides in Set	Price/Set
ML1440	Invertebrate Zoology General Slide Set	25	$299.00
ML1441	Invertebrate Zoology Supplementary Slide Set	50	405.80
ML1442	Histology of Vertebrata (Excluding Mammalia) Slide Set	25	172.59
ML1443	Histology of Mammalia General Slide Set	25	225.00
ML1449	Liverworts and Mosses Slide Set	15	78.59
ML1450	Fungi and Lichen Slide Set	20	152.00
ML1451	Algae Slide Set	30	220.00
ML1454	Bacteria Slide Set, Basic	25	219.00
ML1455	Bacteria Slide Set, Large	50	436.00
ML1456	Pathogenic Bacteria Slide Set	25	223.00
ML1457	Human Pathology Slide Set I	40	375.00
ML1458	Human Pathology Slide Set II	40	329.55
ML1459	Human Pathology Slide Set, Short	50	451.90
ML1460	Normal Human Histology Slide Set	40	431.50
ML1461	Normal Human Histology Complete Slide Set	100	1034.50
ML1462	Insecta General Slide Set	25	182.90
ML1464	Mitosis and Meiosis Slide Set I	6	74.42
ML1465	Mitosis and Meiosis Slide Set II	5	92.00
ML1466	Pig Embryology Slide Set	10	135.53
ML1467	Chicken Embryology Slide Set	10	123.28
ML1468	Frog Embryology Slide Set	10	150.00
ML1469	Sea Urchin Embryology Slide Set	12	135.00
ML1473	Cells and Tissues of Angiosperme Slide Set	20	147.93
ML1479	Gymnospermae Slide Set	15	101.25
ML1480	Agriculture and Forestry Slide Set I	20	145.20
ML1481	Agriculture and Forestry Slide Set II	22	220.00
ML1486	Parasite, Pathogenic Bacteria and Insect Pests for Veterinary Medicine Slide Set	31	290.00
ML1487	Rocks and Minerals, Ground Thin, Slide Set I	10	325.00

Multimedia Microscope Slide Packages

Multimedia microscope slide student packages come in sturdy cardboard storage boxes and contain slides, plastic slide storage boxes and instructional packets. Instructor packages also include high-quality color transparencies and sketch sheets and worksheets for each slide. See flinnsci.com for the full listing of slides in each package.

Catalog No.	Description	Instructor or Student	Number of Slides in Pkg.	Price/Pkg.
ML1503	Invertebrates Multimedia Microscope Slide Package	Student		$ 55.00
ML1504	Insects Multimedia Microscope Slide Package	Instructor	12	142.03
ML1505		Student		107.80
ML1506	Parasites Multimedia Microscope Slide Package	Instructor	12	275.00
ML1507		Student		180.25
ML1508	Embryology Multimedia Microscope Slide Package	Instructor	6	88.25
ML1510	Genetics Multimedia Microscope Slide Package	Instructor	6	115.00
ML1511		Student		105.00
ML1520	Water Droplets Multimedia Microscope Slide Package	Instructor	12	145.00
ML1521		Student		115.00
ML1522	Air Pollution and Allergens Multimedia Microscope Slide Package	Instructor	6	94.00
ML1523		Student		70.00
ML1524	Environmental Damages Multimedia Microscope Slide Package	Instructor	8	102.35
ML1525		Student		75.55

Slide Boxes

Catalog No.	Description	Price/Each
ML1495	Slide Box for 12 Microscope Slides	$16.00
ML1498	Slide Box for 100 Microscope Slides	42.30
ML1499	Plastic Slide Box for 25 Microscope Slides	5.90

INTRODUCTORY SLIDE SET

A concise and affordable survey set for introductory biology and life science courses. All of the included slides can be resolved at low to medium (400X) power and are well suited to beginning microscopists.

Paramecium caudatum, w.m.
Mixed green algae, w.m.
Stems, c.s. Monocot and dicot.
Allium cepa (onion), l.s. Root tip for mitosis.
***Hydra,* budding,** w.m. Asexual reproduction.
Lumbricus (earthworm), c.s. Two regions.
Human blood, smear. Wright stain.
Euglena, w.m.
Pinus leaf, c.s. Two-needle leaf.
Syringa (lilac) leaf, c.s.
Planaria, w.m. Injected.
Striated muscle, l.s.

Catalog No.	Description	Price/Each
ML1408	Introductory Slide Set	$93.00

SILK THREAD SLIDE SET

Fantastic tool for teaching focusing procedures of the microscope. This clever set of six slides has different combinations of vertically stacked colored silk threads. Have students report the correct vertical order of the various slides. The slides have the six combinations possible with red, blue, and yellow silk threads.

Catalog No.	Description	Price/Each
ML1424	Silk Thread Slide Set	$70.75

INTRODUCTORY PROTOZOOLOGY SET

This 12-slide set includes many of the most commonly studied representatives from the four major classes of protozoa. Students can compare and contrast parasitic and free-living forms, unicellular and colonial forms, and the remarkable variety of adaptations for food-gathering, movement, and survival among the protists.

Amoeba proteus, w.m.
Paramecium caudatum, w.m. Single micronucleus.
Paramecium multimicronucleatum, w.m. Several micronuclei.
Stentor, w.m. Beaded nucleus.
Didinium nasutum, w.m. Ingesting paramecia.
Plasmodium, smear. Infected red blood cells.
Chlamydomonas, w.m. Single-celled biflagellate.
Gonium, w.m. Flat 4–16 cell colonies.
Volvox, w.m. Vegetative and reproductive colonies.
Vorticella, w.m. ***Euglena,*** w.m.
Trypanosoma lewisi, smear. Infected rat blood.

Catalog No.	Description	Price/Each
ML1417	Introductory Protozoology Set	$87.00

INVERTEBRATE SLIDE SET

Covers all of the more commonly studied invertebrate phyla with representative specimens illustrating key taxonomic characteristics. Provides the student with an excellent introduction and basic insight into a remarkably diverse group.

Amoeba proteus, w.m.
Scypha, (*Grantia*), c.s.
Hydra, c.s. and l.s.
Planaria, "injected," w.m.
Bugula, w.m.
Earthworm, l.s. of anterior
Snail, radula, w.m.
Sea star young, w.m.
Insect, legs (four types), w.m.
Insect, spiracle and trachea, w.m.
Paramecium caudatum, w.m.
Hydra, w.m.
Aurelia, ephyra, w.m.
Planaria, three regions, c.s.
Earthworm, c.s.
Neanthes, *(Nereis)*, parapodium, w.m.
Sea star, ray, w.m.
Insect, wings (four types), w.m.
Insect, cornea, w.m.
Honey bee, mouth parts, w.m.
Obelia, vegetative and reproductive polyps, w.m.
Fasciola hepatica, (liver fluke), w.m.
Taenia (tapeworm), mature and gravid, w.m.
Ascaris, male and female, c.s.
Trichinella spiralis, section of infected muscle

Catalog No.	Description	Price/Each
ML1376	Invertebrate Slide Set	$233.35

MICROSCOPE SLIDES—TOPICAL SLIDE SETS continued on next page.

Microscope Slides—Topical Slide Sets, continued

BEGINNER'S SLIDE SET

For newcomers to the microscopic world a five-slide set designed to teach the fundamentals of microscopy and to introduce some basic comparisons. The letter "e" is used to demonstrate reversal of direction and image. Colored threads allow students to practice focusing on different planes of the slide. *Chaos carolinensis* (giant amoeba) introduces the basic structure of a unicellular organism. *Allium* (onion) epidermis shows representative plant cells and a section of *Amphiuma* (Congo eel) liver serves as representative animal cells.

Catalog No.	Description	Price/Each
ML1399	Beginner's Slide Set	$30.85

MARINE LIFE SURVEY

Landlocked or coastal, these eleven carefully prepared and selected slides bring the diversity of marine life to your classroom. Slides cover gross and fine structures of representatives from several significant and widely distributed groups.

Radiolaria, strew.
Diatoms—Marine, w.m.
Metridium, c.s. Sea anemone.
Neanthes *(Nereis),* w.m. Parapodium.
Sea star ray, c.s.
Ulva, w.m. Sea-lettuce, green algae.
Polysiphonia, w.m. Red algae.
Obelia, w.m. Colonial hydroid.
Crab zoea, w.m. Larval form.
Amphioxus, w.m.
Fish scale, placoid, w.m. Dogfish *(Squalus).*

Catalog No.	Description	Price/Each
ML1414	Marine Life Survey	$86.35

POND LIFE SURVEY

A microscopic tour of pond life—excellent as a reference for field collections. Organisms selected are common, widely distributed, and relatively easy to identify.

Water bloom, w.m. Mixed blue-green algae.
Euglena, w.m.
Leech, w.m.
Volvox, sec.
Hydra, w.m.
Mixed green algae, w.m.
***Elodea* leaf,** w.m.
Daphnia, w.m.

Catalog No.	Description	Price/Each
ML1411	Pond Life Survey	$55.40

FUNGI SURVEY SET

A diverse, and too often ignored group that collectively performs the vital ecological role of decomposers. This set of eight slides includes unicellular and multicellular species, and free-living, parasitic, and mutualistic species. Economically beneficial forms (*Penicillium* and *Saccharomyces*) are included, as is the agricultural pest *Puccinia* (wheat rust, infecting *Triticum*).

Rhizopus, w.m. Bread mold.
Penicillium, w.m. Blue mold.
Coprinus, c.s. Mushroom.
Lichen, w.m. Teased.
Aspergillus, w.m. Brown mold.
Saccharomyces, w.m. Yeast, vegetative and budding.
Puccinia graminis, sec. *Triticum* leaf or stem.
Lycoperdon, l.s. Puffball.

Catalog No.	Description	Price/Each
ML1415	Fungi Survey Set	$52.60

MITOSIS, MEIOSIS AND CELL DIVISION

Eight slides introduce and illustrate concepts of cell division, sexual reproduction and asexual reproduction. Slides cover topics from "simple" fission to mitosis (cell division) to meiosis (reduction division and the production of gametes). Mitosis and meiosis in both plants and animals are represented.

***Paramecium* fission,** w.m.
***Saccharomyces* (yeast),** w.m. Vegetative and budding.
***Allium* (onion),** l.s. Root tip for mitosis.
Lilium, c.s. Anthers for first meiotic division.
Hydra, budding, w.m.
Ascaris, sec. Through uterus for meiotic stages.
Grasshopper testis, sec. Spermatogenesis.
Whitefish mitosis, sec. Blastodisc.

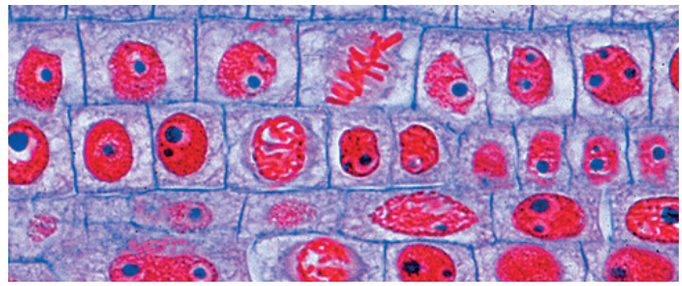
Catalog No.	Description	Price/Each
ML1409	Mitosis, Meiosis and Cell Division	$112.00

GENERAL BIOLOGY SLIDE SET A

Selected to include a number of popular slides with key representatives from all bacteria and eukarya. An excellent overview for the beginning biologist and microscopist. Designed to complement General Biology Set B but comprehensive on its own.

Bacteria, three types, (bacilli, cocci, spirilli), separate smears.
Moss, protonema, w.m.
Fern, prothallium, antheridia and archegonia, w.m.
Fern, *(Pteridium)* rhizome, c.s.
Leaf epidermis, *(Sedum)* w.m.
Lily, *(Lilium)* anthers with pollen, c.s.
Amoeba proteus, w.m.
Scypha, *(Grantia),* c.s. and l.s.
Planaria, "injected," w.m.
Earthworm, c.s.
Insect, wings, 4 types, w.m.
Drosophila, (fruit fly), w.m.
Frog, blood, smear.
Frog, intestine, c.s.
Onion, *(Allium)* root tip l.s., mitosis
Buttercup, *(Ranunculus)* root, c.s.
Lilac, *(Syringa)* leaf, c.s.
Paramecium caudatum, w.m.
Hydra, w.m.
Ancylostoma caninum, (hook-worm), w.m.
Trichinella spiralis, encysted larvae, section.
Insect, cornea, w.m.
Amphioxus, w.m.
Mitosis, section of whitefish blastodisc.
Oedogonium, homothallic species, w.m

Catalog No.	Description	Price/Each
ML1372	General Biology Slide Set A	$252.50



GENERAL BIOLOGY SLIDE SET B

A good choice by itself or as a companion to set A. This set includes several slides selected to reinforce fundamental comparisons. A well-chosen array that spans the breadth and diversity of living things.

Slime mold, *(Stemonitis),* fruiting body, w.m.
Spirogyra, vegetative and conjugating, w.m.
Wheat rust, *(Puccinia),* uredinia, telia, aecia, and spermogonia (pycnia), l.s.
Mold types, (sporangia of *Rhizopus*, *Aspergillus*, and *Penicillium*), w.m.
Marchantia, thallus with cupule, antheridia, archegonia, and sporophyte, l.s.
Herbaceous and **woody dicot stems,** c.s.
Corn, stem, c.s.
Lily, ovary, c.s.
Planaria, three regions, c.s.
Ascaris, male and female, c.s.
Earthworm, l.s. of anterior.
Insect, legs, four types, w.m.
Frog, liver, section.
Bull, sperm, smear.
Corn, root, c.s.
Euglena, w.m.
Frog, testis, section.
Ovary, developing follicles, section.
Corn, leaf, c.s.
Aurelia, ephyra
Fasciola hepatica, w.m.
Bugula, (marine bryozoan), w.m.
Sea star, ray, c.s.
Insect, spiracle and trachea, w.m.
Bird, feathers, three types, w.m.

Catalog No.	Description	Price/Each
ML1373	General Biology Slide Set B	$265.00

The Forensic Slide Set

Give students the opportunity to see what types of evidence scientists examine in a forensics lab! This intriguing set of slides allows students to view seven different samples containing different evidence specimens that would typically be found at a crime scene. Capture student curiosity as they learn to identify different types of natural fibers, hair, skin, fibrous tissue and blood.

Catalog No.	Description	Price/Each
ML1439	The Forensic Slide Set	$57.43

MICROSCOPE SLIDES—TOPICAL SLIDE SETS continued on next page.

Microscope Slides—Topical Slide Sets, continued

BACTERIA, FUNGI AND SLIME MOLDS

From basic structure to fascinating details of natural history and life cycles, this set introduces the world of microscopic life. Careful examination of these slides will instill an excellent framework for further study and identification.

Coccus, Gram-negative.
Bacillus, Gram-positive.
Coprinus, c.s. Mushroom.
Stemonitis, w.m. Sporangia.
Mouth smear, mixed bacteria. Gram stain.
Spirillum, Gram-negative.
Physarum, w.m. Sporangia.
Saccharomyces, w.m. Yeast, vegetative and budding.
Mold Types, w.m. *Rhizopus, Aspergillus,* and *Penicillium.*
Puccinia graminis, sec. Wheat rust on *Triticum* leaf.

Catalog No.	Description	Price/Each
ML1416	Bacteria, Fungi, and Slime Molds	$75.65

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GENERAL BOTANY SLIDE SET

Includes representatives from the protists, Fungi, and plants. Slides are selected to cover all major divisions. Slides are designed to illustrate detailed anatomy and life histories of commonly studied plants, plus several popular comparison slides.

Stemonitis, (slime mold), fruiting body, w.m.
Nostoc, (colonial blue-green algae), portion of colony, w.m.
Hydrodictyon, (water net), w.m.
Laminaria, (kelp), brown algae with sporangia, section.
Polysiphonia, red algae, antheridia, cystocarps and tetraspores, w.m.
Puccinia, (wheat rust), uredinia, telia, aecia and spermagonia (pycnia), l.s.
Mold types, sporangia of *Rhizopus*, *Aspergillus* and *Penicillium*, w.m.
Marchantia, thallus with cupule, antheridia, archegonia and sporophyte, l.s., on one slide.
Mnium, (moss), antheridia, archegonia and sporophyte, l.s., on one slide.
Polypodium, (fern), leaflet with sporangia, l.s.
Equisetum, strobilus with spores, c.s. and l.s.
Pinus, stem, cross, radial and tangential sections.
Pinus, young stem, leaf, male strobilus and female strobilus, c.s., on one slide.
Tilia, (basswood,) one-, two- and three-year stems, c.s.
Cuscuta, (dodder), haustorium of this parasitic plant penetrating host plant, section.
Primary and secondary roots of willow, c.s.
Hydrophytic, mesophytic and xerophytic leaves, c.s.
Dionaea, (Venus flytrap), leaf, c.s., showing digestive glands.
Elodea, leaf, w.m. (two cells in thickness).
Tradescantia, leaf epidermis with stomates, w.m.
Ovary types, four flowers, c.s., showing free central, axile and parietal placentation.
Monocot and dicot stems, c.s.
Monocot and dicot leaves, c.s.
Monocot and dicot roots, c.s.
Mixed pollen, (various types), w.m.

Catalog No.	Description	Price/Each
ML1375	General Botany Slide Set	$267.65

FLATWORMS AND ROUNDWORMS

The five slides chosen for this set will allow students to compare and contrast the body plans of flatworms (acoelomate) and roundworms (pseudocoelomate). They can also examine relative adaptations to parasitic vs. free-living existance within groups.

Planaria, w.m. Injected.
Taenia (pork tapeworm), w.m. Mature and gravid proglottids.
Trichinella, sec. Larvae encysted in muscle.
Ascaris lumbricoides, sec. Composite male and female.
Planaria, c.s. Three regions.

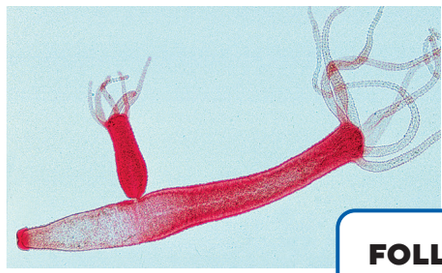
Catalog No.	Description	Price/Each
ML1410	Flatworms and Roundworms	$63.80

GENERAL ZOOLOGY SLIDE SET

The set contains many of the most frequently designated animal study slides from popular textbooks and laboratory manuals. Representative protists and invertebrates as well as a number of vertebrate histology slides are included. An excellent set.

Amoeba proteus, w.m.
Scypha, *(Grantia),* c.s.
Hydra, near median, l.s.
Planaria, "injected," w.m.
Earthworm, c.s.
Amphioxus, w.m.
Hyaline cartilage, section.
Frog blood, smear.
Liver, section.
Thyroid, section.
Paramecium caudatum, w.m.
Hydra, w.m.
Obelia, vegetative and reproductive polyps, w.m.
Planaria, three regions, c.s.
Mitosis, section of whitefish blastodisc
Ascaris, male and female, c.s.
Bone, ground, c.s.
Human blood, smear.
Artery, vein, and nerve tissue c.s.
Ovary, developing follicles, section.
Trichinella spiralis, section of infected muscle.
Stratified squamous epithelium, section of frog skin.
Ciliated columnar epithelium, section of oviduct.
Muscle, three types, (smooth, striated, cardiac), section.
Testis, spermatogenesis and spermiogenesis, section.

Catalog No.	Description	Price/Each
ML1374	General Zoology Slide Set	$230.00



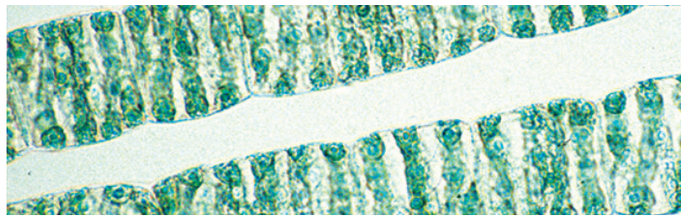
FOLLOW FLINN ON SOCIAL MEDIA

INTRODUCTORY ZOOLOGY SET

Sixteen slides selected to survey the animal world. Emphasis is placed on the invertebrate groups with representative tissue preparations from several vertebrates. All are popular, commonly studied slides that can be resolved at medium power (400X).

Scypha *(Grantia),* c.s.
Obelia, w.m.
Planaria, w.m.
Daphnia, w.m.
Frog blastula, sec.
Amphiuma **intestine,** c.s.
Hydra, budding, w.m.
Planaria, c.s. Three regions.
Ascaris, c.s.
Lumbricus (earthworm), c.s. Two regions.
Zooplankton, w.m. Mixed species.
Human blood, smear. Wright stain.
Starfish development, w.m. Egg through gastrula.
Whitefish mitosis, sec. Blastodisc.
Mammalian muscle—three types, sec.
Artery, vein, and nerve tissue sec.

Catalog No.	Description	Price/Each
ML1412	Introductory Zoology Set	$138.00



MICROSCOPE SLIDES—TOPICAL SLIDE SETS continued on next page.

Microscope Slides—Topical Slide Sets, continued

ANATOMY AND PHYSIOLOGY SLIDE SET

Illustrating the fascinating diversity and specialization of tissues which comprise the various organ systems of the mammalian body. Preparations have been selected which represent normal human and other mammalian tissues. Special staining techniques are used in several instances to enhance structures which would be difficult to observe in routine preparations.

Squamous epithelium, c.s. of kidney, also shows cuboidal epithelium.
Ciliated columnar epithelium, c.s. of oviduct.
Developing cartilage bone, section. Shows osteoblasts, osteoclasts, boney spicules, primary marrow and resorbing cartilage.
Bone, ground, human, c.s. Haversian canals, lamellae, lacunae, and canaliculi clearly shown.
Mammalian muscle, sections of smooth, striated, and cardiac muscles.
Tongue with **taste buds,** section. Also demonstrates foliate papilla and stratified squamous epithelium.
Lingual glands, section. Shows both serous and mucous glands.
Duodenum, jejunum, and **ileum,** c.s., includes columnar epithelium.
Testis, section. Illustrates spermatogenesis and spermiogenesis.
Ovary, section. Shows maturing follicle with ovum and cumulus oophorus.
Suprarenal (adrenal) gland, section.
Hyaline cartilage, section.
Human blood, smear.
Spinal cord, c.s.
Spleen, c.s.
Skin, with hair follicles, section.
Pancreas, section.
Liver, section.
Transitional epithelium, section of bladder.
Striated muscle, l.s.
Motor nerve cells, smear.
Artery, vein, and nerve tissue c.s.
Lung, section.
Fundic stomach, section.
Parathyroid and thyroid glands, section.

Catalog No.	Description	Price/Each
ML1390	Anatomy and Physiology Slide Set	$203.00

Microscopy—Supplies

Slide Prep Sets



FB0445

Convenience and economy. Place a set at each lab table to save time and traffic. Available in glass or high quality plastic. The glass slide prep set includes 72 economy choice glass microscope slides, one hundred 22 x 22 mm No. 1 glass cover slips and two 50-sheet books of lens paper. The plastic slide prep set includes 144 unbreakable vinyl-plastic microscope slides, one hundred 22 x 22 mm plastic cover slips and two 50-sheet books of lens paper.

Catalog No.	Description	Price/Each
FB0445	Slide Prep Set—Glass	$17.50
FB0120	Slide Prep Set—Plastic	26.40

Cover Slips, Glass



Cover Slips, Glass, No. 1
ML1382 and ML1383

High-quality glass, square. Perfect for routine microscopy work and for preparing permanent mounts. The No. 1 thickness ranges from 0.13–0.17 mm*. The No. 2 thickness ranges from 0.19–0.20 mm. Cover slips packages are sold by the ounce.

Catalog No.	Description	Size	Dimensions (mm)	Approx. Qty	Price/Pkg.
ML1382	Cover Slips, Glass 1 oz. pkg.*	No. 1	18 x 18	200	$ 10.22
ML1383		No. 1	22 x 22	200	11.60
ML1384		No. 2	18 x 18	160	10.85
ML1385		No. 2	22 x 22	100	12.30

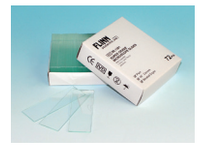
*Note: No. 1 thickness is recommended for oil immersion applications.

Cover Slips, Plastic

Break-resistant and clear as glass. For temporary and wet mounts. Size is 22 mm square. Package of 100.

Catalog No.	Description	Price/Pkg.
ML1377	Cover Slips, Plastic	$5.45

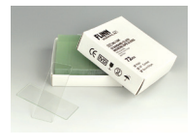
Microscope Slides, Glass, Best Quality



Optically clear glass microscope slides. Carefully precleaned and dust-free with precision beveled edges. Made of non-corrosive glass with 45-degree corners. 25 x 75 mm with a 1.0 mm thickness. Package of 72.

Catalog No.	Description	Price/Each
ML1381	Microscope Slides, Glass, Best Quality	$12.20

Microscope Slides, Glass, Economy Choice



Pre-cleaned glass slides for routine, temporary preparations. Edges are beveled and polished with 45-degree corners for safe handling. Slides measure 75 x 25 mm (3" x 1") with a thickness of 1.0 mm. Package of 72.

Catalog No.	Description	Price/Each	Price/Each 5 or More
ML1398	Microscope Slides, Glass, Economy Choice	$10.80	$9.94

Microscope Slides, Plastic



Clear as glass—these vinyl plastic slides will not break or cut your fingers. 1" x 3" in size. Package of 144.

Catalog No.	Description	Price/Pkg.
ML1380	Microscope Slides, Plastic	$21.00

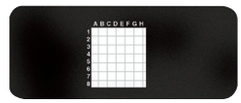
Microscope Slide Labels



Provided in a dispensing carton. White in color. Adhesive backed, 24 mm (15⁄16") square. Roll of 1,000 labels.

Catalog No.	Description	Price/Pkg.
AP1735	Microscope Slide Labels	$45.78

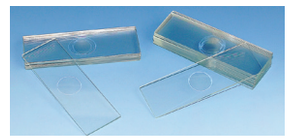
Ruled Microscope Slides



These specially lined microscope slides each feature 64 2-mm squares. The printed grid allows students to perform a variety of activities including the counting of cells in a known area, measuring the movement of microlife and more! 15 slides are included in one set.

Catalog No.	Description	Price/Each
FB1485	Ruled Microscope Slides	$74.45

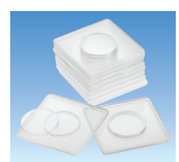
Depression Slides



Used to examine living microorganisms in a hanging drop. Depression is approximately 15 mm in diameter and 0.8 mm deep. Slide is 25 x 75 mm and 1.0 mm thick. ML1438 slides have ground edges and 45-degree corners.

Catalog No.	Description	Depression	Price/Pkg.
ML1378	Depression Slides	Single	$13.75/12
ML1438		Single	77.32/72
ML1379		Double	24.24/12

Well Chamber



These well chambers are large enough to fit into a slide projector but are thin enough to view using a compound microscope. Adding a few drops of pond water to the slide gives students the ability to view a variety of life in a natural environment, rather than squeezed under a cover slip. Made of plastic with tight-fitting lids, the well chambers are durable and reusable with no sharp edges. Chamber itself is 23 mm in diameter and holds a milliliter of water. Entire unit measures 5 cm square. Package of 10.

Catalog No.	Description	Price/Each
FB2323	Well Chamber, Package of 10	$31.55

MICROSCOPY continued on next page.

Microscopy—Supplies, continued

Lens Paper



A soft, dust-free paper for cleaning microscope slides and lenses without scratching the glass. Two sizes available.

Catalog No.	Description	Sheet Size	Sheets/Book	Price/Book
AB1175	Lens Paper	4" x 6"	50	$2.15
FB1650		6" x 8"	100	5.95

Pop-Up Lens Paper



Lint-free paper to delicately clean slides and lenses, in convenient pop-up dispenser. 280 sheets per box.

Catalog No.	Description	Price/Each
FB1949	Pop-Up Lens Paper	$14.95

Hand Microtome



The side set screw and internal clamp are used to lock the specimen securely into place in the center of the microtome. Specimens are exposed for cutting by turning the precision calibrated screw base. As the base is turned the specimen is raised above the cutting surface in very small increments. The cutting blade is then used to carefully cut a razor-thin section appropriate for microscope mounting and viewing. Cutting blade and microtome sold separately.

Catalog No.	Description	Price/Each
FB1262	Hand Microtome	$119.00
FB1263	Knife for Microtome	10.16

Staining Jar, Coplin, Polyethylene, with Lid



An unbreakable plastic slide staining jar with internal grooves. Will hold up to 10 standard 25 x 75 mm slides back to back. Screw top cap is provided. Jar size is 45 mm in diameter and 114 mm high. Autoclavable.

Catalog No.	Description	Price/Each
AB1176	Staining Jar, Coplin, Polyethylene, with Lid	$10.48

Microscopy—Immersion Oils

Immersion Oils



High quality immersion oils for microscopy that meet or exceed DIN standards. These oils, both high (1250 cs) and low (150 cs) viscosity, are formulated to be nondrying and nonhardening to prevent damage to and time consuming cleaning of microscope objectives and slides. For optimal resolution, these low fluorescence oils have a refractive index (RI) of 1.515 under standard conditions and are PCB free. Packaged in convenient, squeezable dropper-type bottles.

Catalog No.	Description	Size (ounces)	Price/Each
I0051	Immersion Oil—Low Viscosity (Objective/Slide)	0.5	$13.50
I0052		1.0	21.00
I0054	Immersion Oil—High Viscosity (Condenser/Slide)	1.0	78.00

Mounting Media

Low viscosity mounting media is an acrylic resin and will not crack or discolor with age. It is quick-drying and soluble in toluene and xylenes. This low viscosity media spreads and is suggested for use with a cover slip.

Catalog No.	Description	Price/Pkg.
M0194	Mounting Media, Low Viscosity, 4 oz.	$34.00

Microscopy—Stains

Stain Set, Basic

FLINN EXCLUSIVE



Six commonly used staining solutions selected for a wide variety of applications; each supplied in a volume of 100 mL. Includes information on recommended uses. Stains included: methylene blue, Loeffler's; Lugol's iodine; eosin yellow, 1% alcoholic; methyl green, 1% aqueous acidified; sudan III, 0.5% alcoholic; and Wright's stain, 0.3% alcoholic.

Catalog No.	Description	Price/Each
FB0122	Stain Set, Basic	$65.00

Stains

For a comprehensive listing of biological stains—most available in powdered form and as ready-to-use solutions in dropping bottles—see individual listings in the Chemical Section of this Catalog/Reference Manual.

Stain Set, Gram

FLINN EXCLUSIVE



Stains are formulated to meet the most widely accepted standards and are ready to use. Includes crystal violet (Hucker), 100 mL; iodine, 100 mL; safranin, 100 mL; 95% ethanol (decolorizer), 500 mL; and one package of 20 thin-stem polyethylene dropper pipets.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
FB0124	Stain Set, Gram	$35.35

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Microscopy—Slide Storage

Slide Storage Case—Five Slide



Durable, translucent plastic case for short-term storage and distribution of slides. Case has a snug fitting snap lid and internal dividers.

Catalog No.	Description	Price/Each	Price/Each 5 or More
FB0451	Slide Storage Case—Five Slide	$1.24	$1.17

Commonly Used Microscopy Stains

Catalog No.	Description	Use	Page No.	Price/Each
C0120	Congo Red	Cytoplasmic staining; Amyloid stains red	50	$14.70
G0036	Gram Iodine Solution	Mordant for Gram stain procedure	63	7.65
I0036	Lugol's Iodine Solution	Vital stain; Starch stains blue-black	63	8.24
J0001	Janus Green B	Mitochondria stain green	65	44.80
R0013	Resazurin Solution	Mitochondria	84	10.30
S0159	Sudan III Solution	Lipids stain red	93	9.39
S0160	Sudan IV Solution	Lipids stain red	93	11.15

MICROSCOPY continued on next page.

Microscopy—Slide Storage, continued

Plastic Slide Storage Boxes



Durable molded plastic slide storage box. The internal dividers keep the slides safely separated and the overlapping cover holds them in place.

Catalog No.	Description	Price/Each
FB1353	Plastic Slide Storage Box—25 Slides	$ 4.30
FB1354	Plastic Slide Storage Box—100 Slides	15.80

Cabinet, Slide Storage, Economy



This tough, polypropylene cabinet will hold up to 240 standard (27 x 75 mm) slides horizontally—so slides last longer and are easier to find. The cabinet accommodates twelve 20-slide trays and includes a clear slide-out door. Cabinet dimensions are 14" L x 8" W x 8" H. Polystyrene trays are sold separately, in packages of six.

Catalog No.	Description	Price/Each
FB0588	Cabinet, Slide Storage, Economy	$360.50
FB0769	Microscope Slide Trays, Pkg. of 6	85.17

Cabinet, Microscope Slide Storage



The ideal storage unit for your collection of prepared microscope slides. Slides are held flat in removable, compartmented aluminum trays. Flat storage is essential to keeping specimens and cover slips in place—ensuring a long, useful life for expensive slides. Each of the 25 trays has 20 separate compartments—giving a nominal capacity of 500 slides. Compartments are deep enough that slides (with the exception of thicker whole mounts) can be stacked two high—doubling the total capacity. Trays are also numbered so the cabinet contents can be indexed for quick, accurate retrieval of slides.

Cabinet measures 8½" W x 13" D x 11" H. Designed with flat sides and a disappearing door so additional units can be placed side-by-side or stacked. Constructed of durable, seasoned hardwood with a light oak finish.

Catalog No.	Description	Price/Each
FB0444	Microscope Slide Storage Cabinet	$867.00

Microscopy—Study Kits

Exploring the Compound Microscope—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In this four-part activity, students perform a basic focusing procedure using prepared cork slides, create a wetmount slide using newsprint, estimate and compare crystal size using ruled microscope slides and a slightly more challenging protozoa identification activity using depression slides. Reproducible worksheets, Teacher Notes and extension activities are provided.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB1819	Exploring the Compound Microscope—Student Laboratory Kit	$115.00

Introductory Slide-Making—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



Students will marvel at the sight of an insect's eye, leg, mouth parts, antennae or other body parts. Includes the basic materials needed to fix, clear, mount and stain small organisms are provided as well as detailed instructions for these procedures.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB1630	Introductory Slide-Making—Student Laboratory Kit	$132.90

Advanced Slide-Making—Student Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



- Glass microscope slides
- Lens paper
- Depression slides
- Disposable pipets
- Cover slips
- Acetone
- Microscope labels
- Fast green stain
- Razor blades
- Xylene
- Balsam
- Specimen jars
- Methylene blue solution
- Forceps
- Magnifying glasses
- Isopropyl alcohol
- Rulers
- Activity manual *Adventures With a Microscope*

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB1762	Advanced Slide-Making—Student Laboratory Kit	$150.90

Plant and Animal Cell Mystery—Super Value Laboratory Kit

FLINN EXCLUSIVE

By: The Flinn Staff



In this activity, written in the form of a mystery, students must apply their knowledge of cell structure and organelles to identify four unknown prepared slides. To successfully solve the mystery, students need to determine if each sample originated from a plant or animal, and they must provide sketches and the supporting evidence such as identifiable organelles to explain their choices. Includes eight prepared slides—(two of each type), Teacher Notes and reproducible student handouts.

Super Value Kit is complete for 32 students working in groups of four. All materials are reusable!

Catalog No.	Description	Price/Each
FB1910	Plant and Animal Cell Mystery—Super Value Laboratory Kit	$59.11

CONTACT US VIA E-MAIL AT
CUSTOMERCARE@FLINNSCI.COM

Microscope "Mystery"—A Drawing, Identifying, and Size-Estimating Challenge—Super Value Kit

FLINN EXCLUSIVE

By: Steve Parker, Cornell High School, Cornell, WI



Take your students on a journey into the "mysterious" microscopic world as new and perhaps strange-looking life forms are examined. Students will view specimens at different magnifications and then draw what they see. Applying their math skills, students will calculate the approximate size of microscopic objects. Then using the information they have compiled, correctly identify eight "mystery" slides. This simple, but effective, activity uses no live cultures, messy biological stains, is easy to set up and can be reused many times.

Super Value Kit includes set of 8 prepared slides and masters of all student worksheets. All materials are reusable. Compound microscopes are required.

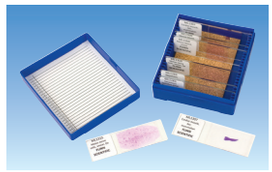
Catalog No.	Description	Price/Each
FB1751	Microscope "Mystery"—A Drawing, Identifying, and Size-Estimating Challenge—Super Value Kit	$62.00

MITOSIS AND MEIOSIS—STUDY KITS continued on next page.

Microscopy—Study Kits, continued

Investigating Tissue Microscopy—Forensic Super Value Laboratory Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Students examine four different slides to determine what type of tissue is present in each sample. Then they classify epithelial tissue according to its layers. Before reporting their findings to the investigators, students sketch tissue images and explain the features that led to their conclusions for each specific tissue type. Kit includes eight prepared slides (two of each type), valuable Teacher Notes and reproducible student handouts.

Super Value Kit is complete for 32 students working in groups of four. All materials are reusable.

Catalog No.	Description	Price/Each
FB1995	Investigating Tissue Microscopy—Forensic Super Value Laboratory Kit	$73.90

Forensics of Fibers—Student Laboratory Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Luckily for student investigators the burglar left something behind—fibers from his or her clothing that got caught in broken glass. Students eagerly take the samples back to the crime lab to be analyzed. Six different types of fibers are examined using a burn test and dye analysis to discover their unique physical and chemical properties and determine the identity of each. Includes an optional microscopy extension activity.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
FB2022	Forensics of Fibers—Student Laboratory Kit	$40.55

Mitosis and Meiosis—Models

Animal Cell Meiosis Model

FLINN EXCLUSIVE

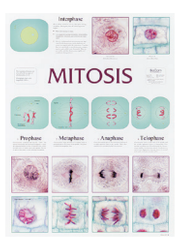


Mounted on a sturdy plastic base, this animal meiosis display contains twelve individual cell models. Each cell contains detailed graphics depicting the major events that occur in each meiotic phase leading up to the formation of gametes. In addition, every cellular structure important to the process is shown—centrioles, asters and spindle fibers, chromosomes, chromatids, nuclei, and nucleoli. The display measures 20" L x 17¾" H x 2" W.

Catalog No.	Description	Price/Each
FB1771	Animal Cell Meiosis Model	$121.15

Mitosis and Meiosis—Posters

Mitosis Chart



Students will refer to this chart again and again as they acquire an understanding of the concepts and sequence of cell division. Clear, colorful diagrams reinforce exceptional photomicrographs of mitotic stages in a plant (onion root tip) and an animal (whitefish blastodisc). The stages, including interphase, are also outlined in brief, descriptive text. Printed in full color, these laminated charts measure 18" x 24".

Catalog No.	Description	Price/Each
FB0363	Mitosis Chart	$32.10

Meiosis Chart



Diagrams, photomicrographs and explanatory text combine to illustrate the sequential stages of sex cell division. The labelled diagrams complement the stunning photomicrographic images of meiosis in lily anthers. Skillfully stained for contrast, the photomicrographs reinforce student microscopic observations. The full-color, durably laminated chart measures 18" x 24".

Catalog No.	Description	Price/Each
FB0364	Meiosis Chart	$31.05

Mitosis & Meiosis—NewPath Visual Learning Guide, Set of 10

NEW!



Mitosis & Meiosis Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11729	Mitosis & Meiosis—NewPath Visual Learning Guide, Set of 10	$43.32

Mitosis and Meiosis—Study Kits

FLINN360science®: Planaria Regeneration



This kit presents the essential concepts of growth and development, regeneration, and cell division through hands-on science activities designed to engage all your students, regardless of level. Students will observe that planaria will respond to stimuli. Their experiment will result in varying degrees of regeneration success—from no regeneration occurring to the full regeneration into two complete specimens. The concept of stem cells and regenerative properties in other species will peak students' interest. Teachers can extend learning through guided inquiry into associated phenomena such as, "Curing Disease."

Catalog No.	Description	Digital Access	Price/Each
AP10658	360Science: Planaria Regeneration	1-Year	$62.85
AP10758		3-Year	78.50

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FLINN EXCLUSIVE

Catalog No.	Description		Price/Each
FB1606	Mitosis Study— Student Laboratory Kit		$ 42.40
FB1993	Magnetic Mitosis Demonstration Kit		49.50
FB0481	DNA Staining—Student Laboratory Kit		51.20
FB0479	Normal Mitosis Kit		235.00
FB1763	"Constructing" Mitosis the 5E Way—Student Laboratory Kit		49.10
ML1434	Mitosis and Meiosis Study Set		105.45
FB2204	Flinn Modeling, Inquiry and Analysis: Meiosis—Student Laboratory Kit	Full-Size Kit	121.15
AP10309		Small-Size, Refill Kit	69.23
FB1443	The Cell Cycle—Simulations of Chromosome Behaviors—Super Value Kit	Full-Size	168.44
AP10107		Full-Size, Refill Kit	155.56
AP10185		Small-Size	88.30
AP10263		Small-Size, Refill Kit	79.51
FB1792	Allele's Crossing Over to the Other Side—Super Value Kit		56.50
FB1992	Magnetic Meiosis Models Demonstration Kit		50.35

MITOSIS AND MEIOSIS—STUDY KITS continued on next page.

Mitosis and Meiosis—Study Kits, continued

FLINN360science®: Environmental Effects on Mitosis



This kit presents the essential concepts of biotic and abiotic factors, cell cycle, plant hormones, and chi-square analysis through hands-on science activities designed to engage all your students, regardless of level. By completing this investigation, the students will conclude that environmental factors can impact cell growth. They will discover that the onion roots grown with additional IAA will spend more time in mitosis when compared to the onion roots grown without additional IAA. Teachers can extend learning through guided inquiry into associated phenomena such as, "Farm to Table."

Catalog No.	Description	Digital Access	Price/Each
AP10662	360Science: Environmental Effects on Mitosis	1-Year	$74.30
AP10762		3-Year	89.66

Plants—Living, Terrestrial

Introduction to Plants—NewPath Visual Learning Guide, Set of 10

NEW!



Introduction to Plants Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11722	Introduction to Plants—NewPath Visual Learning Guide, Set of 10	$43.32

Plant Life Cycle 3-D Model Kit

NEW!



Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11692	Plant Life Cycle 3-D Model Kit	$34.95

Dicot Seeds



Quality, viable seeds for all types of germination and growth experiments. Seeds are untreated. Package sizes and approximate number of seeds per package are shown.

Catalog No.	Description	Pkg. Size/Ounces	Seeds/Pkg.	Price/Pkg.
AB1429	Alfalfa*	1	13,000	$4.95
AB1431	Bean—Mung	4	1,500	8.25
AB1439	Radish—Red*	1	2,500	5.40

*Denotes types that are rapid germinators.

Monocot Seeds

Catalog No.	Description	Pkg. Size/Ounces	Seeds/Pkg.	Price/Pkg.
FB0577	Grass Mixture	4	Varies	$5.65

Wisconsin Fast Plants®



Grow complete plants in 28–30 days! Fast Plants (*Brassica rapa*) are rapid-cycling plants closely related to cabbage, turnips, broccoli and other cruciferous vegetables. Over the course of 30 years, Dr. Paul H. Williams (University of Wisconsin–Madison) successfully bred a type of wild *Brassica* by artificially selecting and breeding plants with certain traits. Growing Fast Plants is easy—all you need is continuous fluorescent light, water and fertilizer. Because these plants have been artificially selected, there are many controls built in to the plants that make them perfect for research in genetics, host-parasite relations, molecular biology, cell biology, plant biochemistry, population biology and plant breeding. Package of 200 seeds. Variable for expression of purple pigment in stems.

Catalog No.	Description	Price/Pkg.
FB2044	Wisconsin Fast Plants	$53.64

Lichen Set—3 Types



© Ken Wagner/Visuals Unlimited



© David Sieren/Visuals Unlimited

Most often mistaken for plants, lichens actually represent complex symbiotic associations between algal and fungal species. Notable as pioneer species in the process of ecological succession and as residents of environments that few other organisms can tolerate. Although they seem to thrive under inhospitable conditions, lichens are highly susceptible to pollution and are often seen as natural indicators of air quality. Set includes examples of the three most common morphological types of lichens: foliose, crustose and fruticose. Species vary.

Catalog No.	Description	Price/Set
LM1028	Lichen Set—3 Types	$23.50

Onion Sets



Ideal for growing root tips in the laboratory for mitosis studies. Simplifies the study of root growth development by eliminating the need for soil removal.

Comes in package of 100 bulblets. Perishable material; only available and shipped from September through May.

Catalog No.	Description	Price/Set
FB1468	Onion Sets	$15.50

Plant Study Kits See page 497.

Plants—Living, Aquatic

Aquatic Plants



© Bernd Wittich/Visuals Unlimited

Healthy, viable plants ready for transplant into your freshwater aquarium or for laboratory study. With the exception of *Lemna*, aquarium plants are shipped moist-pack in plastic bags. Package sizes indicate number of stems supplied. *Lemna* is shipped in a two-ounce polystyrene jar.

★**MAINTENANCE:** Do not release aquatic plants into local environments. Upon receipt, rinse plants under gently flowing tap water to remove the majority of bacteria and other contaminants. Remove any dead or discolored leaves. Rooted plants require approximately two inches of coarse sand or aquarium gravel. Plants will do best if the aquarium has been operating at least 4–6 weeks. During this time chemical cycles equilibrate and necessary nutrients accumulate in the water and in the gravel. When ready to transplant, scoop a shallow depression in the substrate and arrange the plant's roots loosely in the depression. Refill the depression with surrounding gravel such that the plant's root crown is level with the gravel surface. Arrange plants eight to ten centimeters apart with taller plants toward the rear of the tank. Remember to allow the plants—and their roots—room to grow.

Catalog No.	Description	Price/Each
LM1131	*Cabomba* (Fanwort) Rooted. Thin stems with long, fine leaves. Adapted to high light and relatively high temperature conditions. A state permit is required to ship to AK, AZ, CA, CT, HI, IL, MA, ME, NH, UT, VT, and WA.	$15.70
LM1211	Hornwort. Rooted. Long, fine stems with forked, fine leaves arranged in whorls.	20.20
LM1132	*Elodea (Anacharis).* Rooted/Floating. A good oxygen generator for the aquarium. Growing tips are popular for observation of cytoplasmic streaming. A state permit is required to ship to AL, AK, CA, CT, FL, GA, HI, ID, IL, LA, MA, ME, MI, MS, NY, NC, NE, NH, OR, SC, TN, TX, VT, WA, and WI. We will substitue *Elodea canadensis* if possible.	12.25
LM1133	*Lemna* (Duckweed). Floating. Small, rapidly growing plant which develops extensive green mats on surfaces of ponds and still waters.	20.20
FB1675	Hydroponic Nutrient Solution	33.85

PLANTS continued on next page.

Plants—Living, Algae

★**MAINTENANCE:** Algal cultures are shipped in clear, two- to eight-ounce polystyrene jars. Immediately upon receipt, loosen caps and aerate cultures with clean pipet (included). Leave caps loosely in place to prevent contamination, yet permit air exchange. Cultures should receive diffuse light and be held in a temperature range of 18 to 22 °C. Maintain long-term cultures in clean culture dishes, flasks, or battery jars using an appropriate medium. For lighting, use two 48-inch, 40-watt fluorescent bulbs (plant grow-light or wide-spectrum) at a height of 12 to 18 inches. Begin with a light cycle of 16 hours on 8 hours off and reduce to 12 hours on, 12 hours off after 7 to 10 days. Subculture to fresh media every 6 to 8 weeks.

Green Algae

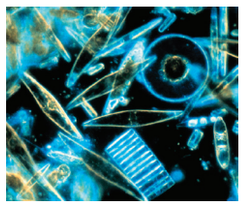
This division includes both microscopic and macroscopic forms found in a remarkable diversity of habitats. The green algae are very common in aquatic and terrestrial environments and as endosymbionts among lichens, protozoans, and cnidaria. Food is stored as starch and pigments in the division are chlorophylls *a* and *b*, carotenes, and xanthophylls.

★**MAINTENANCE:** Maintain green algae in moderate to high light. Recommended culture media are referenced for each species listed. Algae culture media (FB1820) is a Bristol's Modified Medium.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1041	*Chlamydomonas*. Also classified with the protozoa. Unicellular, biflagellate organism. First in the Volvicine line of evolution to colonial organization and multicellularity.*†	30	**$14.90**
LM1042		100	**47.00**
LM1043	*Chlorella.* Small, spherical, single-celled algae. Common endosymbiont with *Hydra* and *Paramecium* species. Popular food organism for aquatic invertebrates.*†	30	**14.90**
LM1044		100	**47.00**
LM1051	*Spirogyra.* Filaments composed of cylindrical cells with large central vacuoles and distinctive ribbon-like spiral chloroplasts. Reproduce sexually by conjugation.†	30	**14.95**
LM1055	*Volvox.* Large, phototactic colonies of *Chlamydomonas*-like cells surrounded by a common gelatinous matrix. Reproduce asexually via the development of daughter colonies within the hollow sphere of the parent colony. Culture in timothy hay infusion.	30	**14.90**
LM1056		100	**47.85**

*Bristol's Modified Medium †Pringsheim's Soil Water

Diatoms



© Neo Sci

Diatoms possess chlorophylls *a* and *c* and accessory carotenoids that are responsible for the characteristic coloration. Food is stored as the polysaccharide chrysolaminarin. Diatoms can be either unicellular or chain-forming with siliceous cell walls composed of two overlapping plates.

★**MAINTENANCE:** Culture diatoms under moderate to high light in Pringsheim's Soil Water or Knop's solution (K0003).

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1037	Diatoms. Mixed freshwater species.	30	**$14.90**
LM1038		100	**53.00**

Euglena



© T.E. Adams/Visuals Unlimited

Euglenoids have a proteinaceous secondary cell covering called a pellicle, and most species possess pronounced eyespots (stigma). Products of photosynthesis are stored as the glucose polymer paramylon. Euglenoids have chlorophylls *a* and *b*.

★**MAINTENANCE:** Maintain *Euglena* under moderate light in Pringsheim's Soil Water supplemented with ¼ of a pea cotyledon or Algae Culture Medium (FB1820).

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1039	*Euglena.* Extremely active organism moves by means of single flagellum. Popular for behavioral studies involving responses to light, temperature and pH.	30	**$14.90**
LM1040		100	**47.85**

Algae Sets



These sets include those species most widely studied. Two choices are available. Species listed are those typically included. Occasional substitutions may be necessary depending on availability of individual species. Note that sets include cultures from several of the major eukaryotic divisions of algae.

Catalog No.	Description	Pkg. Size	Price/Pkg.
LM1059	Algae Set—Mixed. Includes six types in one container. Typically *Gloeocapsa,* diatoms, desmids, *Spirogyra, Volvox* and *Chlamydomonas.*	30	**$29.75**
LM1060	Algae Set—Individual. Includes five types in individual containers. Typically *Gloeocapsa,* diatoms, desmids, *Spirogyra* and *Volvox.*	30	**63.80**

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Plants—Plant Stands

Economy Plant Stand



This plant stand includes eight 22" x 11" rugged plastic trays on four shelves—all in just four square feet of floor space. Stand is built to last with 1"-square polished aluminum tubing. At 70" H x 25" L x 23" D, the stand will accommodate up to four accessory light fixtures.

Optional twin-bulb fixtures are reflective white aluminum with four chains for suspension from the frame. Chains are adjustable in ½" increments to accommodate growing plants and allow variation in light exposure. Fixtures are furnished with two 18" 15-Watt wide spectrum bulbs. Replacement bulbs are available.

Catalog No.	Description	Price/Each
FB0629	Economy Plant Stand	**$265.85**
FB0633	Fluorescent Light Fixture	**132.95**
FB0636	Cool White Standard Bulb, 18", 15W	**13.45**
FB0672	Gro-Lux Bulb, 18", 15W	**22.80**

LED Light Fixture, Magnetic

NEW!



With a modern, minimalist look and a compact footprint, this simple and stylish grow light garden is the perfect small-space solution for starting seeds and keeping houseplants happy and healthy. Made from durable, rust-proof galvanized steel with attractive and protective green powder coating, the frame is lightweight—but it packs heavyweight growing power, illuminated by energy-efficient, full-spectrum LED grow lights.

Specifications:

- High-output LED, aluminum, polycarbonate with 2 magnetic clips (light fixture)
- 22½" L x 2¼" W x 1⅜" H; 2 lbs
- 24W LED specs: Color temperature: 6,400K, Lumens: 3960 lm, PPFD: 110.8 µmol/(m^2-s), Lifespan: 50,000 hrs

Catalog No.	Description	Price/Each
AP11905	LED Light Fixture, Magnetic	**$89.99**

PLANTS—CARE SUPPLIES continued on next page.

Plants—Care Supplies

Greenhouse Kit, Student



Maximize success with this all-in-one student greenhouse kit. The plastic tray and clear plastic cover retain the warmth and humidity that seeds need to germinate and thrive. Twenty-five expanding peat pellets fit into the tray and provide an optimum germination medium for all types of seeds. This economical unit is ideal for individual student use, for independent projects, and for science fairs.

Catalog No.	Description	Price/Each
FB0542	Greenhouse Kit, Student	$14.65

Pots, Plastic



Bottoms are perforated with drainage holes and small legs keep pots slightly elevated. Colors of pots may vary.

Catalog No.	Description	Diameter	Price/Each
FB0652	Pots, Plastic	3½"	$ 0.78
FB0653		4"	0.85
FB0654		5½"	1.04



Planting Trays and Accessories

With these reusable plastic trays and accessories you can easily customize your own seed-starting setup. The trays are durable, watertight plastic and measure 11" x 22". Inserts for 72 individual cells are available to fit the planting tray. A clear plastic greenhouse cover which efficiently maintains warmth and humidity for healthier seedlings. Greenhouse cover securely fits the 11" x 22" tray.

Catalog No.	Description	Price/Each 1–9	Price/Each 10 or More
AB1456	Planting Tray, Plastic, 11" x 22"	$5.05	$4.85
AB1457	Planting Tray Inserts, 72 cells total	5.15	4.95
AB1459	Greenhouse Cover, 11" x 22"	6.05	5.93

Peat Pots, Jiffy®



These pots are pre-formed from peat and natural fibers making them 100 percent biodegradable. Ideal for starting seeds and rooting cuttings.

Catalog No.	Description	Pot Diameter	Pots per Package	Price/Pkg. 1–9	Price/Pkg. 10 or More
AB1453	Peat Pots, Jiffy®	2¼"	12	$3.10	$2.94
AB1454		3"	10	3.15	2.99
AB1455		4"	6	4.25	4.04

Pot Marker Labels



Writing stays clear and legible on these stiff, vinyl-plastic markers. Easy to mark with a soft pencil or felt tip pen, they measure 4" x ⅝". In packages of 100.

Catalog No.	Description	Price/Each
FB0655	Pot Marker Labels, Pkg. of 100	$9.60

Potting Soil



Organically rich, all-purpose potting soil blended to ensure excellent drainage and to promote deep root growth. A compost-based medium that will promote growth of beneficial microorganisms, and provide excellent nutrient and water holding capacity. This is an ideal medium for all types of house plants, cuttings, or bulbs. Eight-pound (3.6 kg) bag.

Catalog No.	Description	Price/Each
FB0673	Potting Soil	$6.95

Planting Mix



Jiffy-Mix® soilless planting medium is unsurpassed for seed starting and for rooting cuttings. A natural peat/vermiculite mixture with added nutrients, it is lightweight, sterile, and ideal for all types of flowers and vegetables. Supplied in an ten-quart bag.

Catalog No.	Description	Price/Each
AB1460	Planting Mix, Jiffy, Ten-quart Bag	$11.05

Peat Moss



The most widely used soil acidifier and modifier. Peat moss adds moisture retention capacity, buffering capacity, and organic matter to soilless mixes for starting seeds and rooting cuttings. It is also an essential ingredient in acid-bog soils for carnivorous plants, and other acid- and moisture-loving plants. Eight quart (4.4 L) bag.

Catalog No.	Description	Price/Each
FB0585	Peat Moss	$13.20

Peat Pellets, Jiffy-7®



Disc-shaped pellets are made from compressed sphagnum peat moss surrounded by a plastic netting material. When water is added, pellets expand up to seven times their original size—forming pot and medium in one tidy package. Developing roots easily penetrate pot exterior so that young plants can be transferred directly into garden or larger container with minimal disturbance.

Catalog No.	Description	Price/Pkg. 1–9 Pkgs.	Price/Pkg. 10 or More Pkgs.
AB1452	Peat Pellets, Jiffy-7, Pkg. of 25	$7.05	$6.77

Sphagnum Moss



An excellent multi-purpose planting medium and soil supplement. Available as long fibers or milled. Long fiber sphagnum is used as a mulch, bulb starter, moisture retainer, and soil conditioner. Milled sphagnum is an ideal germination medium—actually helping to eliminate seedling "damp-off". Either type will serve as a cultivation medium for carnivorous plants in terraria. Supplied in bags of approximately two gallons.

Note: Product type may vary—will either receive long fiber or sheet moss.

Catalog No.	Description	Type	Price/Each
FB0102	Sphagnum Moss, Approx. 2-Gallon Bag	Long Fiber	$12.45
FB0103		Milled	11.82

Planting Medium—Gro-Brick™



Natural coconut fibers ultra-compressed into the size of a brick. Combined with one gallon of water it will expand to yield a full nine quarts of ready-to-use organic potting medium or soil improver. Compact for storage and handling; and unlike peat it is a completely renewable resource—actually a byproduct of coconut processing. Medium has excellent moisture retention capacity, remains highly porous, is near neutral pH (approx. 6.0) and is free from weeds and disease organisms.

Catalog No.	Description	Price/Each
FB0385	Planting Medium—Gro-Brick	$4.80

PLANTS—CARE SUPPLIES continued on next page.

Plants—Care Supplies, continued

Vermiculite



As a germination medium, vermiculite virtually eliminates the problem of damping-off and maintains optimum moisture and aeration levels. As a soil additive, its numerous pores and large internal surface area improve soil texture and help to absorb and then to slowly release water as needed. The chemical nature of vermiculite also contributes buffering capacity and pH stability to soils. This is horticultural grade vermiculite—sterile, nearly neutral in pH, and free of substances toxic to plants. Asbestos-free.

Catalog No.	Description	Price/Each
FB0674	Vermiculite, 8-qt bag	$10.40

Fertilizer, All-Purpose



Carefully formulated plant fertilizers for use indoors and out. Essential nutrients are present in proper proportions and in forms readily taken up by plants. Liquid concentrate and granular types available. Detailed instructions for mixing and application are supplied on package.

Catalog No.	Description	Type	Price/Each
FB0675	Fertilizer, All-Purpose	Crystal, 1.5-lbs	$14.40
FB0676		Liquid, 32-oz	27.23

Fertilizer, Time-Release



Applied only once a year this slow release fertilizer provides gentle continuous feeding with no risk of root burn. 24-4-8 formulation provides sulfur coated urea (N), polymer-coated potassium (K), and plant-available phosphorus (P). Will support initial and continued growth of indoor or outdoor plants. Sixteen-ounce package will feed 80 average "house" plants for a full year. Includes measuring spoon and application instructions.

Catalog No.	Description	Price/Each
FB0386	Fertilizer, Time-Release	$11.44

Hydroponics Nutrient Solution



No more guesswork and no more complicated mixing of chemicals to produce a complete hydroponics nutrient solution. This all-purpose nutrient solution has everything your plants need for larger, healthier growth in any hydroponics apparatus. Get faster growth and longer-lasting blooms with this ready-to-use nutrient formula. The liquid solution comes in quart bottles. The concentrate is diluted for use with 1 tsp./gallon of water for initial full feedings and ⅛ tsp./gallon for constant or intermittent hydroponics feedings.

Catalog No.	Description	Price/Each
FB1675	Hydroponics Nutrient Solution	$33.85

Algae Culture Media

FLINN EXCLUSIVE



By: The Flinn Staff

Nutrient-rich algae media for long-term algae culturing. Appropriate for most algae types. Preparation instructions printed on bottle label. Need assistance culturing algae just call.

Catalog No.	Description	Price/Each
FB1820	Bristol's Algae Media Concentrate, 100 mL	$10.20

Blotting Paper



Best quality medium weight blotting paper. Popular for experiments with seed germination and for plant and flower preservation. Supplied in a package of ten 12" x 19" (30 x 48 cm) sheets.

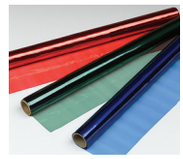
Catalog No.	Description	Price/Pkg.
FB0678	Blotting Paper, 10 sheets	$18.05



Hormones and Growth Regulators

Catalog No.	Description	Approx. Working Concentration mg/liter	Pkg. Size	Price/Each
A0298	Abscisic Acid (Dormin)	0.1–10.0	50 mg	$92.23
D0056	2,4-Dichlorophenoxy Acetic Acid (2,4-D)	0.01–5.0	100 g	81.14
G0003	Gibberellic Acid (A_3)	0.01–5.0	1 g	39.15
I0002	Indole-3-Acetic Acid (IAA)	1.0–3.0	5 g	48.80
L0114	Lectin	50	10 mg	42.85

Cellophane, Roll



Used in plant physiology and photosynthesis studies to determine a plants reaction to, and dependence on, various wavelengths of light. Also used to demonstrate and experiment with the phototropic responses of invertebrates to white light versus colored light. Packaged in rolls of 30" x 25'.

Catalog No.	Description	Color	Price/Each
FB0596	Cellophane, Roll	Red	$21.75
FB0597		Green	21.02
FB0598		Blue	20.51

Light and Water Meter



The key to ensuring that your plants' basic needs are being met. This simple meter instantly tells you when your plants need water and whether or not they're getting enough light. The wide-range, dual-scale meter covers the diverse needs of all types of plants. Light and moisture requirements for over 150 plants are referenced in the included booklet. The 4" stainless steel probe penetrates to plant roots for accurate and relevant readings. Meter requires no batteries or outside power source.

Catalog No.	Description	Price/Each
FB0550	Light and Water Meter	$28.10

Trowel, Garden



Catalog No.	Description	Price/Each
FB0599	Trowel, Garden	$12.75

Flinn Plant Press

FLINN EXCLUSIVE



This durable, quality press will help preserve your display specimens as lifelike as possible. Special drier sheets provide extra absorbency for faster drying and color retention. Corrugated ventilator sheets provide an even air flow throughout the multiple layers of the press. The large 12" x 16" frame (and matching ventilators) enables you to process many specimens at each level. The multi-tiered rails assure even pressure across the entire flat surface of the press. The tough cinch straps allow for firm pressure during the drying process. Comes with 12 drying sheets and 12 ventilators. Ready for immediate use.

Catalog No.	Description	Price/Each
FB1115	Flinn Plant Press	$55.00

PLANTS continued on next page.

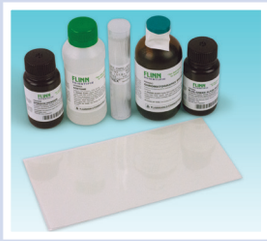
Plants—Introductory Study Kits

FLINN360science™: Photosynthesis in Leaf Disks



This kit presents the essential concepts of photosynthesis and cellular genetics through hands-on science activities designed to engage your students. Through this investigation, students gain a better understanding of how biotic and abiotic factors influence the rate of photosynthesis. Teachers can extend learning through guided inquiry into associated phenomena such as, "How do we design materials for specific functions?"

Catalog No.	Description	Digital Access	Price/Each
AP10671	360Science: Photosynthesis in Leaf Disks	1-Year	$ 95.50
AP10771		3-Year	114.30



Plant Pigment Chromatography—Student Laboratory Kit
FB0586

FLINN EXCLUSIVE



Sun Print Paper
FB1554

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Plants in the Spotlight—A Photosynthesis Investigation—Student Laboratory Kit
FB1780

Catalog No.	Description	Price/Each
FB0586	Plant Pigment Chromatography—Student Laboratory Kit	$ 85.20
FB1807	Growing Gloves—Super Value Laboratory Kit	46.25
FB1634	Seed Germination and Moisture—Guided-Inquiry Kit	44.40
FB0584	Seed Germination Set	18.05
FB1563	Plant Wars—Student Laboratory Kit	40.10
FB1653	The Grass Won't Grow—Student Laboratory Kit	49.95
FB1554	Sun Print Paper	14.80
FB2205	Flinn Modeling, Inquiry and Analysis: Photosynthesis—Student Laboratory Kit	140.60
FB1780	Plants in the Spotlight—A Photosynthesis Investigation—Student Laboratory Kit	29.65
FB2125	Sodium Alginate Photosynthesis—Student Laboratory Kit	86.20
FB1861	Stomata and Transpiration Rates—Student Laboratory Kit	86.00
FB0478	Gibberellic Acid and Plants—Student Laboratory Kit	132.60
FB0477	Hydroponics Experiment	148.85
FB1231	Nutrient Deficiency in Plants—Hydroponics Laboratory Kit	82.30
FB1560	Plant Tropisms—Student Laboratory Kit	76.75

Plants—Models

Plant Kingdom Survey Set See page 467.

Plant Cell Model Kit



Excellent contrasting model to be used with the animal cell model (FB1370) for teaching the differences between plant and animal cells. Model is made of resilient, non-toxic, damage-proof EVA foam. A detailed teacher's guide includes five inquiry-based lab activities, reproducible worksheets, complete background information, cross-curriculum activities and assessment ideas. Topics covered include cell structure and function, osmosis, photosynthesis and plant pigments.

Catalog No.	Description	Price/Each
FB1372	Plant Cell Model Kit	$101.00

Flower Model Kit



Colorful teaching model made of resilient non-toxic, damage-proof EVA foam. This rugged foam material allows for hands-on manipulation of the model without concern for breakage or damage. An excellent 3-D visual reference for teaching the entire life cycle of a flowering plant. Detailed teacher's guide includes complete background information, reproducible worksheets, cross-curriculum activities and assessment ideas. Topics include pollination, fertilization and structure and function of all flower parts.

Catalog No.	Description	Price/Each
FB1371	Flower Model Kit	$102.15

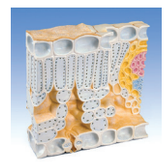
Flower Model, Dicot



Representing a greatly enlarged, complete flower, this 17" x 14" x 10" non-breakable vinyl plastic model teaches the reproductive function of flowers, angiosperm pollination and fertilization. Three petals, four sepals and four stamens are detachable. Two anthers are sectioned open to expose pollen grains. The ovary is dissected to reveal the seven-celled female gametophyte. Pollination is demonstrated by six pollen grains that have adhered to the stigma. One of them has generated a pollen tube that has penetrated the micropyle. Depicting the condition just prior to double fertilization, the tube nucleus, closely followed by the two sperm cells, can be observed near the apex of the pollen tube. Twenty-seven hand-coded structures are identified in the accompanying key.

Catalog No.	Description	Price/Each
FB0165	Flower Model, Dicot	$771.60

Leaf Structure Model



The model shows the 3-D histological structure of a Beech leaf magnified 1,500 times. Clearly shown is the upper epidermis, palisade layer, parenchyma cells and lower epidermis with stomates. Elements of the vascular tissue are likewise shown in cross section. Model measures 35 x 37 x 11 cm.

Catalog No.	Description	Price/Each
FB1275	Leaf Structure Model	$375.30

Photosynthesis & Cellular Respiration—NewPath Learning Guide and Flip Chart Set



The NewPath Learning Guides and Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP9925	Photosynthesis & Cellular Respiration—NewPath Science Flip Chart Set	$ 39.50
AP11487	Photosynthesis & Respiration Student Learning Guide with Online Lesson	14.95
AP11535	Photosynthesis & Respiration Student Learning Guide with Online Lesson, Set of 10	103.21

PLANTS continued on next page.

Plants—Posters

Pond Posters

Beautiful full-color images represent each class within a phylum on these durable posters. Brief descriptions help students keep them straight during discussions and assessments. Just remember to take them down before the test! Posters measure 18" x 24" and are laminated.



Catalog No.	Description	Price/Each
FB1188	Pond I—Smaller Microlife	$32.67
FB1189	Pond II—Larger Microlife	32.67
FB1190	Pond III—Photosynthetic Microlife	32.67

Plants—NewPath Visual Learning Guides

NewPath Visual Learning Guides about plants provide comprehensive coverage of plants. Each 11" x 17" guide includes four panels of helpful information, including an overview, practice exercises, a graphic organizer and assessment and review questions. Each laminated Write-On/Wipe-Off guide provides an engaging way to study an in-depth aspect of plants. Each comes as a set of 10.



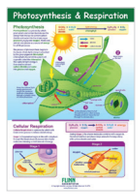
AP10937

Catalog No.	Description	Price/Each
AP10747	All About Plants	$43.32
AP10937	Flowers & Seeds	44.19
AP10945	Roots, Stems & Leaves	44.19
AP11522	Growth & Development of Plants & Animals	39.95
AP11515	Growth & Development of Plants & Animals Student Learning Guide with Online Lesson	14.95
AP11565	Growth & Development of Plants & Animals Student Learning Guide with Online Lesson, Set of 10	99.00

Photosynthesis & Respiration—NewPath Visual Learning Guide, Set of 10

NEW!

Photosynthesis & Respiration Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.



Catalog No.	Description	Price/Each
AP11738	Photosynthesis & Respiration—NewPath Visual Learning Guide, Set of 10	$43.32

Population and Selection—Study Kits

FLINN360science®: Artificial Selection

Students observe, measure and characterize the natural variation of traits in a population of Fast Plants® and identify the characteristics for artificial selection in a second generation. Editable, differentiated instructions range from a time-sensitive prescriptive lab to full open inquiry, and robust online videos and content—including a virtual reality (VR) simulation—help students prepare for and better understand the labs they're conducting.



Catalog No.	Description	Digital Access	Price/Each
AP10669	360Science: Artificial Selection	1-Year	$118.00
AP10769		3-Year	137.15



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Lynx Eats the Hare—Super Value Kit FB1880, etc.



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Coacervate—Student Laboratory Kit FB1430

Catalog No.	Description	Price/Each
FB2203	Flinn Modeling, Inquiry and Analysis: Natural Selection—Student Laboratory Kit	$53.65
FB1433	Duckweed Population Study—Student Laboratory Kit	18.35
FB1577	Survival Island—Super Value Kit	51.05
FB1607	Stick Bug Survival—Super Value Kit	93.70
FB1880	Lynx Eats the Hare—Super Value Kit	40.70
FB2129	STEM INTEGRATED Fish Fitness—Flinn STEM Design Challenge™	34.40
FB1746	Prey vs. Predator—Win, Lose or Draw?—Super Value Kit	69.65
FB2130	STEM INTEGRATED Beaks—Flinn STEM Design Challenge™	98.15
AP7257	Frog Pond Population—Super Value Game	67.05
FB1439	Estimating Populations—Super Value Kit	70.40
FB1989	Natural Selection—Super Value Kit	28.40
FB1568	Gene Pool and Natural Selection—Super Value Kit	49.95
FB2011	Studying Seed Evolution Using Histograms—Student Laboratory Kit	62.50
FB2197	Adaptations—Activity-Stations Kit	71.30
FB1437	Spontaneous Generation Demonstration Kit	44.00
FB2132	STEM INTEGRATED Biomimicry—Flinn STEM Design Challenge™	99.00
FB1430	Coacervate—Student Laboratory Kit	34.25

Evolution by Natural Selection 3-D Model Kit

NEW!

Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.



Catalog No.	Description	Price/Each
AP11693	Evolution by Natural Selection 3-D Model Kit	$34.95

Antibodies—NewPath Science 3-D Model Kit

NEW!

The antibody is a remarkable weapon of the immune system. Now your students can make their very own model of an antibody complete with antigen!



Catalog No.	Description	Price/Each
AP11831	Antibodies—NewPath Science 3-D Model Kit	$40.00

POPULATION AND SELECTION—STUDY KITS continued on next page.

Population and Selection—Study Kits, continued

Life Cycle, Habitat and Taxonomy—NewPath Visual Learning Guides

NewPath Visual Learning Guides about Life Cycle, Habitat and Taxonomy cover a wide range of species population topics. Each 11" x 17" guide includes four panels of helpful information, including an overview, practice exercises, a graphic organizer and assessment and review questions. Each laminated Write-On/Wipe-Off guide provides an engaging way to study life cycles, habitats and the taconomy of life. Each comes as a set of 10.



AP10938

Catalog No.	Description	Price/Each
AP10749	Food Chains	$45.68
AP10938	Food Chains & Food Webs	44.19
AP10750	How Living Things Grow & Change	45.68
AP10753	Life Cycles	44.19
AP10936	Cycles of Life & Biomes	44.19
AP10933	Where Animals Live	32.49
AP10932	Water Habitats	44.19
AP10754	Living & Nonliving Things	32.49

Viruses and Epidemiology—Study Kits



FLINN EXCLUSIVE

Outbreak: A Study in Epidemiology—Super Value Laboratory Kit
FB1794



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ELISA—Demonstration Kit
FB1790

Catalog No.	Description	Price/Each
FB2025	Constructing Model Viruses—Student Activity Kit	$90.65
FB2107	West Nile Virus Transmission—Super Value Game	49.40
AB1210	AIDS—Transfer of Body Fluids—Student Laboratory Kit	65.20
FB1572	AIDS Testing Simulation—Student Laboratory Kit	73.60
FB1790	ELISA Demonstration Kit	67.65
FB1967	Antibody Function—Student Laboratory Kit	21.90
FB2097	Infection! Epidemic Simulation—Super Value Laboratory Kit	61.10
FB1796	The Epidemic—Super Value Laboratory Kit	75.95
FB1794	Outbreak: A Study in Epidemiology—Super Value Laboratory Kit	70.90
FB2102	Diagnosis: You are the Doctor—Super Value Laboratory Kit	34.05
FB2292	Diagnosis: You are the Doctor, Part II—Super Value Laboratory Kit	34.00

Viruses and Epidemiology—Games

Virulence: An Infectious Card Game

Virulence is a blind bidding game in which players take on the roles of viruses competing to infect a host cell. Players use their bidding hands to win (replicate) viral component cards in order to either score points or build the strength of their virus (their bidding hand) increasing their odds of winning critical bids later in the game. Compliant with NGSS standards and STEM principles, the game takes approximately 20 minutes and accommodates 2–5 players.



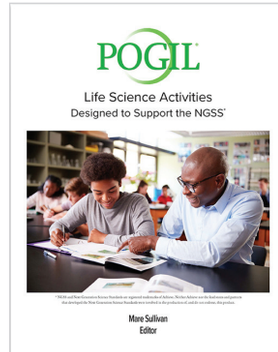
Catalog No.	Description	Price/Each
AP10539	Virulence: An Infectious Card Game	$23.50

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General Biology

POGIL® Activities for Life Science

This digital download offers 12 interactive, guided-inquiry activities:



- How Do Living Things Interact?
- How Body Cells Reproduce (Mitosis)
- Why Aren't We All Clones? (Meiosis)
- Animal Arms Races
- Cookies and Proteins: When Instructions Go Wrong
- Looking Closer at Making Proteins
- Comparing Early Development of Organisms
- Seeing the Past: Imagining How Species Change Over Time
- The Fossil Record: How Have Animals Changed Over Earth's Long History?
- Factors That Influence the Process of Evolution
- Interactions Between Pests and Crops: Will There Be Damage?
- How Does the Amount of Food Affect an Organism's Growth?

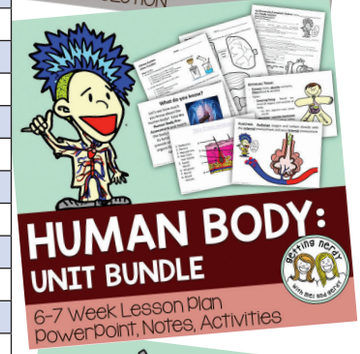
Catalog No.	Description	Price/Each
FB2324	POGIL Activities for Life Science	$29.95

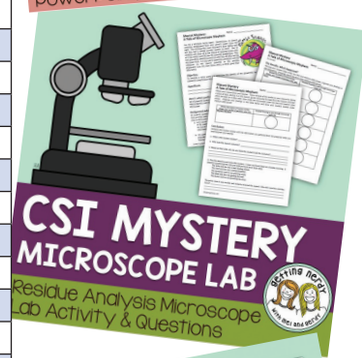
Getting Nerdy® Science

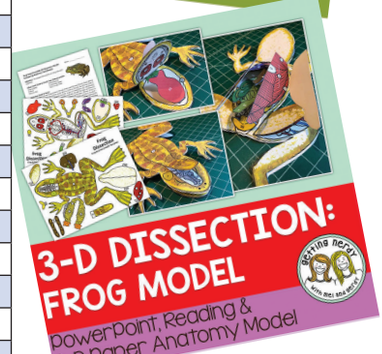
Inspire a love of science in every student! Getting Nerdy offers unique, engaging and differentiated science lessons that will get students excited about life science and the natural world. Offering Interactive Notebooks, curriculum units, dissection alternatives, stand-alone activities, supplementary resources and more, the products are simple to implement, easy on the budget and save precious time when it comes to lesson planning. Full product details at flinnsci.com.

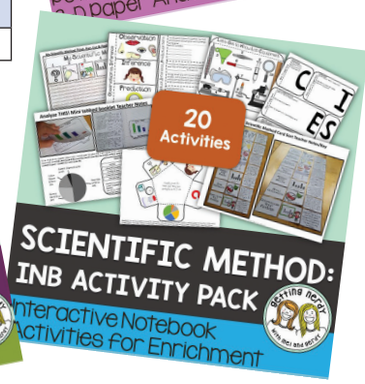
Catalog No.	Description	Price/Each
GN1000	Getting Nerdy Science—Interactive Notebook Bundle for Life Science	$109.70
GN1001	Getting Nerdy Science—Life Science: Supplemental Bundle	191.00
GN1002	Getting Nerdy Science—Interactive Notebook Set-Up Guide	13.65
GN1003	Getting Nerdy Science—Organelles Bundle	33.10
GN1004	Getting Nerdy Science—Cell Processes Bundle	29.65
GN1005	Getting Nerdy Science—Cells: Complete Bundle	90.25
GN1006	Getting Nerdy Science—Cells: Unit Bundle	61.65
GN1007	Getting Nerdy Science—STEAM Circuits Cells Bundle	34.25
GN1008	Getting Nerdy Science—Classification: Complete Bundle	83.40
GN1009	Getting Nerdy Science—Classification: Unit Bundle	57.10
GN1010	Getting Nerdy Science—Invertebrate Dissection Bundle	109.70
GN1011	Getting Nerdy Science—Vertebrate Dissection Bundle	200.00
GN1012	Getting Nerdy Science—Ecology: Unit Bundle	91.40
GN1013	Getting Nerdy Science—Ecology: Complete Bundle	125.70
GN1014	Getting Nerdy Science—Evolution: Complete Bundle	66.25
GN1015	Getting Nerdy Science—Evolution: Unit Bundle	45.70
GN1016	Getting Nerdy Science—Genetics: Unit Bundle	63.95
GN1017	Getting Nerdy Science—Genetics: Complete Bundle	90.25
GN1018	Getting Nerdy Science—Human Body: Unit Bundle	68.55
GN1019	Getting Nerdy Science—Human Body: Complete Bundle	90.25
GN1020	Getting Nerdy Science—Life Science: Curriculum Bundle	414.65
GN1021	Getting Nerdy Science—Life Science: Lab Stations Bundle	240.05
GN1022	Getting Nerdy Science—Life Science: Task Card Bundle	22.80
GN1023	Getting Nerdy Science—Life Science: Vocabulary Bundle	29.65
GN1024	Getting Nerdy Science—Life Science: Word Wall Bundle	68.55
GN1025	Getting Nerdy Science—Scientific Method: Unit Bundle	63.95
GN1026	Getting Nerdy Science—Scientific Method: Complete Bundle	81.10
GN1027	Getting Nerdy Science—Cells: Interactive Notebook Activity Pack	13.65
GN1028	Getting Nerdy Science—CSI Mystery Microscope Lab	4.95
GN1029	Getting Nerdy Science—Classification: Interactive Notebook Activity Pack	13.65
GN1030	Getting Nerdy Science—Scienstructable 3-D Dissection: Worm Model	15.95
GN1031	Getting Nerdy Science—Scienstructable 3-D Dissection: Eye Model	15.95
GN1032	Getting Nerdy Science—Scienstructable 3-D Dissection: Fetal Pig Model	28.50
GN1033	Getting Nerdy Science—Scienstructable 3-D Dissection: Frog Model	26.25
GN1035	Getting Nerdy Science—Ecology: Interactive Notebook Activity Pack	13.65
GN1037	Getting Nerdy Science—Evolution: Interactive Notebook Activity Pack	13.65
GN1038	Getting Nerdy Science—Winter Punnett Square Practice	4.95
GN1039	Getting Nerdy Science—Genetics: Interactive Notebook Activity Pack	13.65
GN1042	Getting Nerdy Science—Human Body: Interactive Notebook Activity Pack	13.65
GN1044	Getting Nerdy Science—Scientific Method: Interactive Notebook Activity Pack	13.75

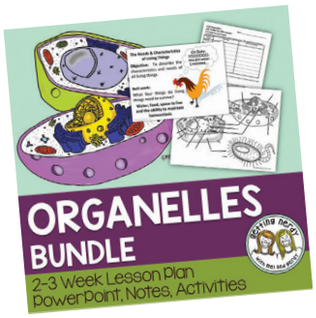




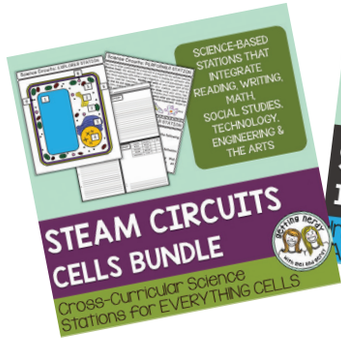












Environmental Science

Explore our assortment of kits, activities and equipment focused on climate change and the quality of our air, soil and water. **Discover how you can inspire the next generation of environmentally aware scientists.**

509 Acid Rain
506 Advanced Placement® Environmental Science
509 Air Kits
513 Ecology
515 Global Climate Change
514 Pollution
516 Recycling
510 Soil
510 Water



FLINNprep™ has you covered for AP® Enviromental Science Prepare Your Students for Success

As scientists and educators, we know that properly aligning lessons and labs to test requirements is essential to raising students' AP test scores. Carefully following the College Board guidelines for AP, we have developed a variety of solutions in accordance with the guidelines as well as the new Unit Breakouts.

FLINNprep

FLINNprep is a complete learning solution that helps prepare and support students as they interact with the fast pace and rigor of Advanced Academic science courses. Using a combination of online courses and inquiry labs, FLINNprep is built to cover the full AP Curriculum, from the hands-on to the conceptual, all the way to the exam.

FLINNprep is found within PAVO. PAVO is our award-winning gateway to comprehensive digital content. Educators can customize content, assign students work and monitor progress.

FLINNprep Courses: Textbook Alternatives:

These online digital courses walk students through BIG IDEAS and UNITS, one by one. Complete with content, supporting videos, assessments and practice exams, these courses can be used individually or together to fully teach your AP program.

FLINNprep Lab Solutions:

Comprehensive Courses Plus Inquiry Labs: These unique blended labs enable a flipped classroom model by offering a combination of lab videos and simulations in addition to the physical, inquiry-based labs themselves.

Inquiry Lab Kits

These engaging inquiry lab activities are aligned to the latest AP curriculum standards. They include comprehensive background information, step-by-step procedures, student worksheets, teacher notes and the basic materials needed for each experiment.

POGIL®

The College Board specifically calls out using POGIL activities as one of the learning strategies for teaching AP Courses. Flinn is proud to be the sole supplier of POGIL Activities for Environmental. This year we've launched our new Flinn POGIL Platform converting all our POGIL books into digital PDFs. Use the platform to access all your POGIL materials, upload additional content and store your lessons all in one easy-to-access location.

Review Demonstration Kits

Help students prepare for the AP Environmental Exam. Select these integrated, interactive activities to help students review principles and concepts for major areas on the AP Environmental Exam. Choose from the following five products, containing three separate demonstrations per kit. Students observe and record data, perform calculations and analyze the results to answer AP-style essay questions. Kits include all consumable chemicals and equipment needed to perform all three demonstrations for two complete class sections.



Flinn Classic Laboratory Kits

The standards may have changed, but some things never go out of style! Flinn's tried-and-true Classic Labs provide necessary and valid lessons for AP Environmental Students. Only six labs in your curriculum must be inquiry-based to meet College Board requirements. If you have clear favorites among your existing labs, please continue to do them.

Flinn Inquiry Transition Guides are available! These guides are 2–3 pages each and include an Opportunities for Inquiry section. This section describes several approaches that may be used to adapt the classic lab procedure to guided inquiry. The guides also show how each lab aligns with the Enduring Understandings, Essential Knowledge, Learning Objectives and Science Practices in the revised AP Environmental Curriculum Framework.



Advanced Placement®—FLINNprep™

FLINNprep™ for AP® Environmental Science

FLINNprep courses and inquiry labs use a blended approach that saves time, increases student engagement and comprehension and leads to better exam scores.



FLINN EXCLUSIVE

FLINNprep is the only AP Solution that offers inquiry labs that connect the labs back to course content and the AP Exam.

Whether you want to use FLINNprep for a single discipline with your class or you want to adopt it for multiple disciplines across your school or district, we can create a custom solution for you. You can purchase the online course or inquiry labs or both for each discipline. Accompanying physical lab kits are available.

Lab Solution	Blended Bundle Lab Kits & 2 Year Access to Digital Content
Digital student and teacher lab instructions	✓
Introductory videos	✓
Technique videos	✓
Apply what you learned on the exam videos	✓
Sample inquiry procedures and data	✓
AP® style practice exam questions	✓
Reteach videos	✓
Virtual reality simulations	✓
Downloadable lab instructions	✓
Physical lab materials for hands-on practice	✓
Inquiry Labs for AP® Enviromental Science: 6 Labs	✓

6 Investigations

- Landfill Decomposition
- Wind Energy
- Build a Solar Cell
- Environmental Pollution
- Environmental Pollution and Lichens
- Greenhouse Effect and Global Warming

Visit flinnpavo.com—Online Course for AP Environmental Science

AP® Environmental Science

FLINNprep Course for AP Environmental Science is a complete review of foundational Environmental Science with additional units of advanced Environmental Science topics. Units include:

- Planet Earth
- Earth's Surface
- Fundamentals of Ecology
- Interdependence in Ecosystems and How Energy Maintains the Living World
- Land Use
- Population Dynamics
- Conservation and Sustainability
- Energy Concepts and Consumption
- Types of Pollution
- Impacts of Pollution
- Climate Change
- Biodiversity Loss
- Nonrenewable and Renewable Energy

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Advanced Placement®
Environmental Science Kits

FLINN EXCLUSIVE

Each kit includes comprehensive background information, easy-to-follow step-by-step procedures, student worksheets, detailed teacher notes and the basic materials needed to perform each laboratory experiment.

Catalog No.	Advanced Placement® Kit		Price/Each
AP6881	Mapping Earthquakes and Volcanoes—Student Activity Kit		$ 44.85
AP7357	Exploring Groundwater—Activity-Stations Kit		101.00
AP7184	Physical and Chemical Properties of Soil—Student Laboratory Kit		90.52
AP7401	Stream Macroinvertebrate Sampling Simulation—Super Value Kit		47.20
FB1991	Discover Life in the Soil—Student Laboratory Kit		37.50
FB1433	Duckweed Population Study—Student Laboratory Kit		18.35
FB0425	Landfill Decomposition—Student Laboratory Kit		86.05
AP7052	Common Uses of Rocks and Minerals—Student Laboratory Kit		105.90
AP7512	Wind Energy—Stem Integrated—Student Laboratory Kit		52.30
AP6916	Build a Solar Cell—Stem Integrated—Student Laboratory Kit		73.87
AB1133	Environmental Pollution		94.00
AP6461	Environmental Pollution and Lichens—Standard Laboratory Kit	Full-Size Kit	86.25
AP10112		Full-Size Kit, Refill Kit	76.65
AP10190		Small-Size Kit	47.10
AP10268		Small-Size Kit, Refill Kit	37.54
AP7324	Greenhouse Effect and Global Warming—Student Laboratory Kit		78.19



Wind Energy—Student Laboratory Kit
AP7512

The Flinn Labs for AP Environmental Science 14-Kit Bundle!

Cost-saving, comprehensive bundle includes all 14 Flinn Labs for AP Environmental Science—enough to fulfill the requirements for the AP Environmental Science curriculum. Save money by purchasing the kits as a bundle rather than individually—and save time with Flinn Laboratory Kits!

Catalog No.	Description	Price/Each
AP7689	Flinn Labs for AP Environmental Science 14-Kit Bundle	$925.00

Advanced Study Kits
for Environmental Science

FLINN EXCLUSIVE

Make your AP® classroom lab experience more memorable and engaging with hands-on Advance study kits for Environmental Science. Reading about concepts pales next to actually doing and engaging in the science at hand, so Flinn has provided step-by-step student procedures and all consumable materials in ready-to-use hands-on kits. Flinn's assortment of science kits, multimedia resources and editable lab procedures create a hands-on science curriculum to help you connect with every student.

Catalog No.	Inquiry Lab	Price/Each
FB1881	Bioassay Experiment	$ 89.10
AP7035	Chemical and Mechanical Weathering of Rock	101.97
FB1913	Copper Mining	34.70
FB1924	Get the Lead Out	48.85
FB1797	How a Food Web is Formed	72.39
FB1882	Permeability, Porosity and Soil Moisture	90.50
FB1746	Prey vs. Predator—Win, Lose or Draw?	69.65
FB1878	Salinity of Water	91.35
AP7181	Soil Is A Natural Filter	33.85
AP7027	Water Quality Index (WQI)—Field Trip Kit	344.02



Soil Is A Natural Filter—Demonstration Kit
AP7181

Acid Rain

Acid Rain and Plants—Student Laboratory Kit

FLINN EXCLUSIVE



What is acid rain and how does it affect nature? In this experiment, rain solutions of varying pH are placed on plant seedlings. That results in dramatic harmful effects of acid rain! Students gain in-depth knowledge of what acid rain is, how it forms and its devastating effects. Includes Teacher Notes, reproducible student handouts and all necessary chemicals and specialized equipment.

Complete for 30 students working in pairs.

Catalog No.	Description	Price/Each
AP6300	Acid Rain and Plants—Student Laboratory Kit	$100.75

Acid Rain in a Bag—Demonstration Kit

FLINN EXCLUSIVE



By: Sue Anne Berger, Colorado School of Mines, Evergreen, CO

Perform a safe, microscale simulation of acid rain formation in a plastic bag. Chemicals react to form a visible brown cloud of nitrogen dioxide which, in turn, acidifies water present in the system. An acid–base indicator shows the speed and degree to which the pH is altered. The results are direct and unmistakable—and it all takes place within a bag on an overhead projector! The procedure is also easily adaptable as a classroom activity.

Note: Perform this demonstration in a fume hood or well-ventilated lab.

Catalog No.	Description	Price/Each
AP9157	Acid Rain in a Bag—Demonstration Kit	$30.40

Acid Rain Study Outfit



Students collect rain samples and test the pH either out in the field or in the lab. Water samples from local streams, lakes or ponds can also be tested for acidity. Analyze and compare results from different areas and discuss this environmental concern. Kit contains rain gauge with ground stakeholder for collecting rain samples, octet comparator device, pH indicator testing reagent, tubes and a study guide with reproducible student activity masters. Enough reagents provided for 100 tests.

Catalog No.	Description	Price/Each
AP5039	Acid Rain Study Outfit	$83.40

Compound Interest Carbon Dioxide and Ocean Acidification



By: Andy Brunning & Compound Interest, Cambridge, UK

Bring real-world issues into the classroom with this colorful poster! Students will see the effects of excess carbon dioxide in our atmosphere and how it affects our oceans. Use the poster to initiate discussion about important issues like climate change and its effects on our planet! Laminated, 24" x 36".

Catalog No.	Description	Price/Each
AP9895	Compound Interest Carbon Dioxide and Ocean Acidification	$26.15

Acid Rain Survey Kit

FLINN EXCLUSIVE



This kit contains everything you need to collect and monitor the pH of rainwater or potentially acid fresh water sources. Each kit includes enough materials for an entire class—15 sample tubes with caps, 5 color comparison charts and enough test paper (pH 3.0–6.0) for over 75 determinations. Also included is a vial of Hydrion 0–12 pH test paper for testing and comparing the pH values of other liquids. All components are completely portable for use in the field.

Catalog No.	Description	Price/Each
AP7054	Acid Rain Survey Kit	$31.90

Acid Rain Test Strips



Kit contains 15 strips of pH test paper and a color comparison chart—designed for measuring the pH of rain in the range of 3.0 to 6.0. A student taking an acid rain survey can take readings on 15 samples.

Catalog No.	Description	Price/Each
AP1834	Acid Rain Test Strips	$1.70

Air Kits

FLINN360science℠: Electricity and Wind Energy



This kit presents the essential concepts of solar energy, wind energy and power through hands-on science activities designed to engage all your students, regardless of level. Through this activity, students will discover that no single variable makes the difference in how much power the wind turbine can produce. All the different pieces must work together for the most efficient design. Blade material, angle, size, shape and placement are all important.

Catalog No.	Description	Digital Access	Price/Each
AP10339	360Science: Electricity with Wind Energy	1-Year	$58.85
AP10439		3-Year	76.55

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FLINN EXCLUSIVE

Make Your Own Ozone Test Paper—Student Laboratory Kit FB1619



Catalog No.	Description	Price/Each
AP6460	Airborne Particulates—Student Laboratory Kit	$42.65
FB1611	Greenhouse Effect—Demonstration Model	17.20
FB1619	Make Your Own Ozone Test Paper—Student Laboratory Kit	36.75
AP7558	Air in a Bottle—Demonstration Model	105.00

Earth's Atmosphere—NewPath Visual Learning Guide, Set of 10

NEW!



Earth's Atmosphere Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11718	Earth's Atmosphere—NewPath Visual Learning Guide, Set of 10	$43.32

Soil Kits

FLINN360science™: Manipulating Equilibria



This kit presents the essential concepts of equilibrium, reaction rates, solubility, acid–base reactions, and Le Chatelier's principle through hands-on science. During this lab, students will successfully manipulate the various equilibria within the grape juice sample and determine the amount of sulfites it contains.

Catalog No.	Description	Digital Access	Price/Each
AP10705	360Science: The Formation of Soil	1-Year	$39.25
AP10805		3-Year	56.05



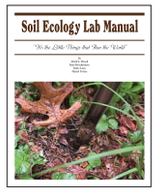
FLINN EXCLUSIVE

Lead in Soil—Student Laboratory Kit FB1923

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Catalog No.	Description	Price/Each
FB1095	Biology and Chemistry of Soil—Student Laboratory Kit	$144.05
AB1142	Garden Soil Analysis Kit	85.90
FB1923	Lead in Soil—Student Laboratory Kit	26.65
FB2208	MudWatt™ Classic Kit	47.75
AP6165	pH of Soil—Super Value Laboratory Kit	31.05
AP5313	Porosity and Drainage Rate of Soil—Student Laboratory Kit	98.75
AB1143	Soil Analysis Kit	595.00
FB0646	Soil Analysis Kit—Reagent Refill	322.35
AP6864	Soil Contamination—Forensics Laboratory Kit	92.39
FB0426	Soil Test Kit—Rapitest®	28.84
FB0427	Soil Test Kit—Rapitest—Refill Kit	12.93
FB0609	Topsoil Tour—Reagent Refill	89.35

Soil Ecology Lab Manual



By: David Brock, Roland Park Country School, Baltimore, MD

Soil is the foundation of every ecosystem and biome on Earth, and yet we know more about the moon than we do about the ground beneath our feet! Let students dig deeper into the composition of soil using the most comprehensive manual about soil ecology available! Eighteen different labs allow students to learn how different environmental factors affect the soil, including the nitrogen cycle, pH, plants, precipitation, and UV radiation. 88 pages, 8½" x 11", soft cover.

Catalog No.	Description	Price/Each
FB1787	Soil Ecology Lab Manual	$31.65

Soil Sampling

Soil pH Meter



A simple, easy-to-use meter for measuring the pH of soil. You can quickly determine whether or not soil is suitable for particular plants, and if your soil pH needs to be adjusted. Soil pH preferences of over 400 plants are listed in an included fold-out along with detailed instructions for accurate measurements. Techniques and materials for adjusting soil pH, up or down, are also described. Includes meter, 4" probe and probe cable. Requires no batteries or external power.

Catalog No.	Description	Price/Each
FB0549	Soil pH Meter	$31.10

Soil Sampling Bags



Reclosable plastic bags imprinted with instructions for proper techniques of collecting and preparing soil samples. Bag size is 6" x 4".

Catalog No.	Description	Price/Pkg. of 100
AB1147	Soil Sampling Bags, Pkg. of 100	$64.05

Soil Sampling Tube



This 12"-long galvanized steel sampling tube has a 1" core diameter. A cutaway side in the tube allows for examination of soil core sample prior to its removal. Comes with detailed instructions and 20 soil sampling bags.

Catalog No.	Description	Price/Each
AB1148	Soil Sampling Tube	$47.85

Soil Sieve Set



Used to separate and grade soil samples. Six interlocking plastic sieves each have a different size brass wire mesh screen. Wire mesh sizes are 5, 10, 40, 60, 120 and 250 holes per cm. Mesh openings measure 3.35 mm, 0.86 mm, 0.38 mm and 0.14 mm respectively. Each sieve is 6" in diameter and 2" tall. Complete with a solid bottom container and cover. Set of six.

Catalog No.	Description	Price/Set of 6
AB1140	Soil Sieves, Set of 6	$99.50

Soil Thermometer



Stainless steel thermometer has a 5" stem. The 1½" diameter dial reads in both °C and °F. Thermometer ranges are 0 °C–80 °C and 20 °F–180 °F.

Catalog No.	Description	Price/Each
AB1146	Soil Thermometer	$30.75

Water Models

Water Cycle Model with Study Cards



A two-piece plastic terrain model is used with ice*, water* and a desk lamp*. Students can create and study first-hand—clouds, fog, rain formation, rivers and melting snow processes. Observe how water evaporates from a lake, collects and condenses on the cloud form, and precipitates onto the land areas. Ten 8½" x 11" color study cards are provided to show students how the water cycle influences our day-to-day life. Also includes an activity notebook with lesson plans and a color transparency for classroom presentation. Model size: 16" L x 12" W x 2½" D.

Catalog No.	Description	Price/Each
AB1159	Water Cycle Model with Study Cards	$202.01

*Not provided.

Middle School Earth Science Curriculum Mastery® Game—Class-Pack Edition



Includes 25 individually packaged sets of 30 colorful, review cards per topic—a total of 750 curriculum-based questions! Also includes 12 double-sided, laminated game boards; comprehensive Teacher Planning & Resource Guide; and FREE 1-Year Premium Subscription to NewPath's Online Learning Program providing access to Science games, interactive activities, quizzes and more.

Complete curriculum coverage of the following standards-based topics: Introduction to Earth Science, Maps as Models of the Earth/Contour Models, Minerals, Rocks, Fossils, Earth's Energy Resources, Geologic Time, Plate Tectonics, Earthquakes, Volcanoes, Weathering of Rocks & Soil Formation, Earth's Fresh Water, Groundwater Resources, Erosion & Deposition, Oceans/Oceanography, The Movement of Ocean Water, Earth's Atmosphere, Understanding Weather, Weather Patterns, Climate, Studying & Exploring Space, Stars, Galaxies & the Universe, The Sun-Earth-Moon System, and Our Solar System, Our Impact on Earth.

Catalog No.	Description	Price/Each
AP11661	Middle School Earth Science Curriculum Mastery Game—Class-Pack Edition	$112.15

WATER MODELS continued on next page.

Water Models, continued

FLINNeverydayscience™

NEW!

Water Cycle in a Bottle



With this FlinnEverydayScience™ lab, students observe the water cycle in action by creating a water cycle in a bottle. They add water to a bottle and let it sit in the sun overnight, then label the processes of evaporation, precipitation, and condensation occurring in the bottle. Students are able to directly observe the three major processes that make up the water cycle here on Earth. They then propose ideas for how they could make their model more accurately represent the water cycle on Earth.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes permanent markers, 6 1-L plastic bottles and caps, and food coloring dyes.

Complete for 24 students working in groups of 4.

Catalog No.	Description	Price/Each
AP11811	Water Cycle in a Bottle	$67.25

Water Testing Kits

FLINN360science™:

Water Purification



This kit presents the essential concepts of contaminants, purification techniques, and heavy metals through hands-on science activities designed to engage students. Students will purify water samples with a cost limit and provided purification materials. Students test their water samples with a 0.02% sodium rhodizonate solution. Teachers can extend learning through guided inquiry into associated subjects such as, "How do fuel cells work?"

Catalog No.	Description	Digital Access	Price/Each
AP10428	360Science: Water Purification	1-Year	$ 88.30
AP10528		3-Year	104.00

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FLINN EXCLUSIVE

Catalog No.	Description	Price/Each
AP5953	Freshwater Pollution Testing—Full-Size Kit	$ 79.06
AP10134	Freshwater Pollution Testing—Full-Size, Refill Kit	68.59
AP10212	Freshwater Pollution Testing—Small-Size Kit	41.61
AP10290	Freshwater Pollution Testing—Small-Size, Refill Kit	31.78
AP5954	Freshwater Pollution Testing—Super Value Kit	234.56
AP5955	Testing Pollution in Tap Water—Single-Class Kit	96.87
AP5956	Testing Pollution in Tap Water—Five-Class, Super Value Kit	226.22
AP6126	Replacement Testing Pollution in Tap Water Color Comparison Charts	9.57
AP6137	Chlorine in Water Test Kit	10.79
AP6144	Copper in Water Test Kit	14.63
AP6141	pH of Water Test Kit	15.99
AP5274	TesTab® Water Investigation Kit, Complete Set of 12 Modules	328.39

Water Test Kits, Individual



Ammonia Nitrogen Test Kit
AP5010

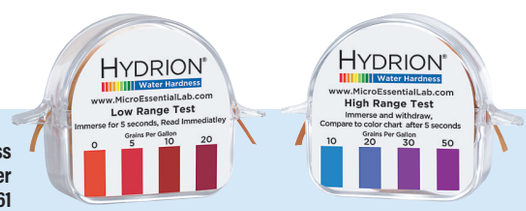
Analyze your local waters for pH, dissolved oxygen, nitrate, turbidity and much more with this wide selection of easy-to-use water testing kits. Each LaMotte kit comes conveniently supplied with pre-calibrated test tubes, labware and all necessary reagents to give fast, accurate results whether you're out in the field or back in the lab. Easy-to-follow, step-by-step testing instructions are included with each kit, allowing your class to obtain reliable and repeatable values. Individual water kits utilize one of the following high-precision testing methods—titrimetric methods using direct reading titrators or drop count tests or colorimetric methods using octet comparators, axial readers or colorulers.

Use of hazardous testing materials has been reduced or eliminated to ensure safety. Materials are sufficient for at least 50 tests and are furnished in a compact and durable black storage/carrying case. Economical reagent refill packages are available for all kits.

Catalog No.	Description	Range (ppm)	Refill Kit Catalog No.†	Price/Each
AP5008	Alkalinity Test Kit	0–200	AP5009	$ 48.77
AP5010	Ammonia Nitrogen Test Kit	0–2.0	AP5011	105.79
AP5012	Calcium Hardness Test Kit	0–200	AP5013	97.88
AP5014	Carbon Dioxide Test Kit	0–50	AP5015	57.60
AP5016	Copper Test Kit	0–0.50	—	128.12
AP5018	Detergent Test Kit	1.0 ppm/drop	AP5019	84.72
AP7533	Dissolved Oxygen Test Kit	0–10	AP7534	70.49
AP5020	Hardness Test Kit—Total/Ca/Mg	0–200	—	83.57
AP5022	Iron Test Kit	0.5–10.0	—	84.73
AP5024	Nitrate-Nitrogen Test Kit	0–15	AP5025	84.06
AP5028	pH Test Kit, Wide-range	pH 3.0–10.5	AP5029	58.25
FB0774	Phosphate Test Kit	0–2.0	FB0775	126.98
FB0569	Salinity Test Kit	0–40 ppt	AP5033	90.96
AP5036	Turbidity Test Kit	5–200 JTU*	—	97.36

*JTUs are Jackson Turbidity Units.

†For refill kit pricing, see page 512.



Water Hardness Testing Paper
AB1161

Catalog No.	Description	Price/Each
AP5290	GREEN™ Low Cost Water Monitoring Kit	$53.56
FB0606	Pondwater Tour	106.30
FB0607	Pondwater Tour—Refill Kit	82.95
FB2126	The Tapwater Tour	94.15
FB0025	Dissolved Oxygen Test Kit, Color Comparison	70.55
FB0026	Dissolved Oxygen Test Kit, Color Comparison—Refill Kit	42.00
FB1113	Flinn Winkler Dissolved Oxygen	67.55
FB0411	How Hard Is Your Water?—Student Laboratory Kit	25.60
AB1161	Water Hardness Testing Paper	14.35
FB0027	Phosphates, Color Comparison	83.95
FB0028	Phosphates—Refill Kit	37.10

WATER TESTING KITS continued on next page.

Water Testing Kits, continued

Water Test Kit Refills, Individual

Economical and convenient reagent refill packages for individual LaMotte water test kits. Each refill contains reagents sufficient for 50 additional tests. FB0644 Dissolved Oxygen Refill Kit is for AB1154.

Catalog No.	Description	Price/Each
AP5009	Alkalinity Refill Kit	$22.75
AP5011	Ammonia Nitrogen Refill Kit	47.80
AP5015	Carbon Dioxide Refill Kit	19.06
AP5019	Detergent Refill Kit	52.15
AP7534	Dissolved Oxygen Refill Kit	44.50
FB0644	Dissolved Oxygen Refill Kit	39.70
AP5025	Nitrate-Nitrogen Refill Kit	33.70
AP5029	pH Refill Kit	10.50
FB0775	Phosphate Refill Kit	37.75
AP5033	Salinity Refill Kit	57.00

Water Cycle 3-D Model Kit

NEW!

Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.



Catalog No.	Description	Price/Each
AP11708	Water Cycle 3-D Model Kit	$34.95

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Water Testing Kits, Advanced

FLINN EXCLUSIVE

Water Quality Educator and Monitoring Outfit
AP5287



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Catalog No.	Description	Price/Each
AB1155	Limnological Analysis Kit	$602.70
FB0554	Limnological Analysis Kit—Reagent Refill	215.00
FB0555	Marine Science Test Outfit	611.55
AP5287	Water Quality Educator and Monitoring Outfit	520.21

Test Factor	Range	Number of Tests	Refill Kit No.	Price/Each
Alkalinity, total	0–200 ppm	50	AP5009	$22.75
Dissolved Oxygen	0–10.0 ppm	50	FB0644	39.70
Nitrate-Nitrogen	0–15 ppm	50	AP5025	33.70
pH	3.0–10.5	100	AP5029	10.50
Phosphate	0–2.0 ppm	50	FB0775	37.75
Temperature	–5 to 45 °C	N/A	N/A	N/A

Water Sampling

All-Weather Field Notebook



Bound notebook contains unique Rite in the Rain® all-weather writing paper, which has an exclusive waterproof coating. Paper can withstand long periods of immersion without losing its strength or writeability. Has an all-weather durable yellow cover, 48 numbered pages, and can be used with any standard pencil or ball-point pen.

Catalog No.	Description	Price/Each
AP5150	All-Weather Field Notebook	$8.50

Aquatic Dip Net



Insect collecting net with a 30" aluminum handle with rubber grip at end. Made of strong muslin netting cloth with 180 micron mesh, which is attached to a 12" diameter iron wire ring. Net is 30" deep—plenty of room for insects.

- 30" deep net designed for collecting insects and other small flying organisms
- Made of strong muslin netting cloth with 180 micron mesh
- 12" diameter metal ring provides a wide opening for viewing collections
- Equipped with durable 30" anodized aluminum handle with rubber grip end for ease of use
- Great for gifting to kids who wish to explore the various creatures that live in the air

Catalog No.	Description	Price/Each
FB0020	Aquatic Dip Net	$69.95

BOD Bottle



Thick glass bottle has a ground stopper to prevent oxygen from entering or leaving the collected water sample. 300 mL capacity; 2¾" W x 6¼" H.

Catalog No.	Description	Price/Each
AP6209	BOD Bottle, 300 mL	$17.35

Aquatic Collecting Starter Kit

FLINN EXCLUSIVE



Ready to head to your local river, pond or stream for environmental studies? Each set includes: a 10" stainless steel collecting forceps, a 10" collecting syringe, two dip nets of different sizes, a pair of stainless steel utility scissors, six specimen jars, a folding field magnifier and 100 reclosable specimen bags. Every student collecting team will want these useful items—order one set per team.

Catalog No.	Description	Price/Each
FB1580	Aquatic Collecting Starter Kit	$76.50

Meters, pH See pages 171–173.

Dissolved Oxygen Meter



One-hand simple operation with automatic temperature compensation and calibration to air makes this pen meter excellent for environmental field work. Allows students to determine water quality for a variety of real-life applications, such as general environmental testing, labs, industrial and municipal testing, aquariums, fish hatcheries and much more.

Features include a range of 0–20.0 mg/L; 0–100%, a resolution of 0.1 mg/L; 0.1%, an accuracy of ±0.4 mg/L; ±0.7%, a temperature range of 32–122 °F; 0–50 °C, simultaneous display of dissolved oxygen and temperature readings, ability to hold readings and recall min/max, and completely waterproof.

Polarographic probe has a built-in temperature sensor and easy-to-replace pop-off probe heads. Meter is IP-65 waterproof and comes ready to use in a soft carrying case with a belt loop, two spare probe heads, electrolyte and 4 AAA batteries. Meter must be submerged 10 cm to obtain reading. 8" x 2" x 1½".

Catalog No.	Description	Price/Each
FB2008	Dissolved Oxygen Meter	$362.10

WATER SAMPLING continued on next page.

Water Sampling, continued

Secchi Disk



A relative estimate of the phosphate concentration of a lake can be made using a Secchi disk to determine water clarity. The disk is lowered into the water and the depth at which it is no longer visible is recorded. Light extinction depth is determined and helps to estimate the microscopic plant and animal life supported by the water. This standard 20 cm diameter limnological disk is black and white on one side, white on the other, and constructed of durable ABS plastic. Supplied with integral weight and 48' (15 m) of ⅛" nylon cord.

Catalog No.	Description	Price/Each
AP7175	Secchi Disk	$76.80

Seine Net



This durable, easy-to-handle seine is ideal for the capture and census of macroinvertebrates, minnows and other small fish. Netting is woven polyester with an ⅛" mesh. The seine is 15' L x 4' D and comes fully assembled with lead weights on the bottom line, and high-density foam floats on the top line. Fifteen-foot length can be easily handled by two students. To facilitate use of the seine, a pair of net poles is available separately. Poles are one-inch diameter, texture-grip aluminum, 51" long, with protective end caps and holes at either end for tying off seine ropes.

Catalog No.	Description	Price/Each
FB0679	Seine Net	$55.00
FB0587	Seine Net Poles, Pkg. of 2	33.50

Thermometer, Armored



Spirit-filled thermometer encased in tough plastic armor with window opening for easy reading. Tie-loop is provided at the top of the armor allowing the instrument to be easily lowered into the water for total immersion. Scale is permanently fused into the glass and cannot be destroyed. Range is 10–110 °C/50–230 °F. Length is 6".

Catalog No.	Description	Price/Each
AB1145	Thermometer, Armored	$29.05

Stream Flowmeter, Handheld



Take accurate measurements of stream velocity with this basic, easy-to-use hand-held flowmeter. Just lower the impeller stick into the flow of moving water, attach "riser rods," start the counter, and read the digital display on the flowmeter. Includes durable plastic 3-foot impeller stick that easily disassembles into four sections for convenient storage, protective pouch to store the flowmeter, three "riser rods" to elevate the impeller off the stream bed, and a 30-page operation manual with laminated calibration charts and reproducible data collection sheets. Operates on two AAA batteries for over 100 hours of use. Supplied in a handy waterproof storage/carrying box. Batteries included.

Catalog No.	Description	Price/Each
AP5284	Stream Flowmeter, Handheld	$390.00

Long-Handled Water Dippers



Collect water samples with ease with this light and economical long-handled water dipper. Made of high-density polyethylene, the strong honeycomb tube is ribbed for a sure grip. The polypropylene cup's threaded fittings securely screw onto the handle. The handle end has a hook for storage. Available in two lengths, each with a 16-oz dipper cup with two pouring spouts, useful for right- and left-handed people.

Catalog No.	Description	Price/Each
AP5054	Water Dipper, 3-Foot Handle	$54.75
AP5055	Water Dipper, 6-Foot Handle	72.85

Water Sampler



Includes a unique trigger mechanism that requires only one line to raise and lower the sample chamber and seal it. Efficient flow-through design retrieves an ample 1.5-liter volume of water. Invaluable for monitoring water quality of lakes and determining how oxygen content and temperature vary with depth. Water sampler is 9 cm diameter, 46 cm L and supplied with 48 feet (15 m) of ⅛" nylon cord.

Catalog No.	Description	Price/Each
AB1149	Water Sampler	$110.80

Lead Testing—Super Value Kit

FLINN EXCLUSIVE



In this activity, students test materials from their environment for lead content. Teacher Notes, reproducible student handouts and all necessary chemicals and specialized equipment are provided. Test procedure is only appropriate for solid items and not reliable for testing lead in solutions.

Super Value Kit is complete for conducting 100 lead tests on solid items.

Catalog No.	Description	Price/Each
AP6257	Lead Testing—Super Value Kit	$29.25

Earth Force Elementary Education Watershed Field Trip



Helps to explain the Watershed and provides guidelines on taking a field trip, conducting water quality tests, and data sheets for collection and interpretation of data.Elementary Education Watershed Field Trip helps to explain the Watershed and provides guidelines on taking a field trip, conducting water quality tests, and data sheets for collection and interpretation of data.

Teacher's manual with guidelines on taking a field trip and conducting water quality tests, Perform an actual field study Data sheets to reproduce Tests for pH, nitrate, phosphate, and dissolved oxygen using TesTabs® plus temperature and turbidity. Includes all reagents and accessories and one activity from Project WET.

Catalog No.	Description	Price/Each
AP11656	Earth Force Elementary Education Watershed Field Trip	$101.25

Funky Faucet Sink Science



Explore what's coming out of your funky faucet! Test tap water for pH, chlorine, hardness, copper, and iron. Learn while you laugh with Just for Fun activities including Make Your Own Lava Lamp and edible experiments like the Pollution Parfait. Non-hazardous TesTab reagents, test tubes, word search game, internet connections and instructions for simple water quality tests also included.

Catalog No.	Description	Price/Each
AP11657	Funky Faucet Sink Science	$45.55

Ecology

Aquatic Macroinvertebrate Life Cycle and Habitat Flashcards



The 22 full-color cards feature photos of both immature and adult insect stages and detailed life cycle and habitat information. A detailed manual containing student activities and facts on insect characteristics, life cycles, taxonomy, classification, food webs and how macroinvertebrates can be indicators of water quality is also provided. Cards are 6½" x 4" in size.

Catalog No.	Description	Price/Each
AP6574	Aquatic Macroinvertebrate Life Cycle and Habitat Flashcards	$72.95

ECOLOGY continued on next page.

Ecology, continued

Stream Ecology Kit



Kit features a detailed, 18-card set of macroinvertebrate flashcards that provide an easy way to identify exactly what insect you collect. Kit includes all apparatus (such as mesh collecting bags, sorting trays, brushes and spoons) for collecting, sorting and identification, and a comprehensive instructor's manual.

Catalog No.	Description	Price/Each
AP6509	Stream Ecology Kit	$324.30

Sampling Square

FLINN EXCLUSIVE



This lightweight, portable sampling square is quick to set up and use. A durable bungee cord runs through the pipes of the sampling square to allow the square to literally pop together. Simply place the 0.25 m^2 square on the location to be studied and count the number of organisms within that square. Available as an individual square or a classroom set of eight.

Catalog No.	Description	Price/Each
AP6833	Sampling Square	$ 33.25
AP6834	Sampling Square, Classroom Set of 8	229.75

Stream Macroinvertebrate Sampling Simulation—Super Value Kit

FLINN EXCLUSIVE



By: The Flinn Staff

What is the water quality of this stream? Is it polluted? Students use a sample of illustrated macroinvertebrates to determine the Biotic Index and the water quality of a simulated natural water source. Students also use the illustrated macroinvertebrates to learn how some populations are estimated in the wild using a common technique known as mark-and-recapture. Complete with valuable Teacher Notes, reproducible student handouts and illustrated macroinvertebrates.

Super Value Kit is complete for 10 student groups. All materials are reusable.

Catalog No.	Description	Price/Each
AP7401	Stream Macroinvertebrate Sampling Simulation—Super Value Kit	$47.20

NewPath Learning Guides and Flip Chart Sets for Ecosystems

The NewPath Learning Guides and Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11523	What Are Ecosystems FlipChart	$41.65
AP11516	What Are Ecosystems Student Learning Guide with Online Lesson	14.95
AP11566	What Are Ecosystems Student Learning Guide with Online Lesson, Set of 10	99.00

Pollution

FLINN360science™: Ocean Currents



This kit presents the essential concepts of climate change, ocean currents, density and salinity through hands-on science activities designed to engage all your students, regardless of level. Students will determine that cold fresh water flowing into the ocean can result in/affect ocean currents. Teachers can extend learning through guided inquiry into associated phenomena including, "How does ocean acidification affect coral reefs?"

Catalog No.	Description	Digital Access	Price/Each
AP10416	360Science: Ocean Currents	1-Year	$47.10
AP10516		3-Year	64.75

FLINN360science™: The pH of Seawater



This kit presents the essential concepts of ocean water pH, carbon dioxide uptake, and seawater chemistry through hands-on science activities designed to engage all your students, regardless of level. Students will observe that the dissolution of carbon dioxide gas into a saline solution that resembles seawater causes a decrease in the pH of the solution. This change in pH will be measured directly with a pH meter. Also, the change in pH will cause the change in color of the solution due to the presence of an acid–base indicator. Teachers can extend learning through guided inquiry into associated phenomena including, "How does ocean acidification affect coral reefs?"

Catalog No.	Description	Digital Access	Price/Each
AP10414	360Science: The pH of Seawater	1-Year	$46.20
AP10514		3-Year	63.50

FLINN360science™: Calcium Carbonate and Shell Production



Students explore the essential concepts of acid and bases, neutralization and environmental chemistry through hands-on science activities. Designed to engage all your students, regardless of level. Ocean acidification and its impact on the human population can be difficult for students to understand since it happens on such a large scale and over an extended period of time. Students will see that higher concentrations of acid have a stronger effect on shell material and will be able to understand the effects this has on the ocean's buffering system and the organisms living within.

Catalog No.	Description	Digital Access	Price/Each
AP10413	360Science: Calcium Carbonate and Shell Production	1-Year	$129.15
AP10513		3-Year	147.45

FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

FLINN EXCLUSIVE



Understanding Your Carbon Footprint—Student Activity Kit AP7322

Catalog No.	Description	Price/Each
AP8319	Landfills—Flinn STEM Design Challenge™ STEM INTEGRATED	$ 94.50
AB1152	Bacterial Pollution (Coliform)—Student Laboratory Kit, Full-Size Kit	75.75
AP10136	Bacterial Pollution (Coliform)—Student Laboratory Kit, Full-Size, Refill Kit	67.00
AP10214	Bacterial Pollution (Coliform)—Student Laboratory Kit, Small-Size Kit	41.20
AB1133	Environmental Pollution—Student Laboratory Kit	94.00
FB1911	Buffering Lakes and Streams—Demonstration Kit	50.70
AP6461	Environmental Pollution and Lichens—Student Laboratory Kit, Full-Size Kit	86.25
AP10112	Environmental Pollution and Lichens—Student Laboratory Kit, Full-Size, Refill Kit	76.65
AP10190	Environmental Pollution and Lichens—Student Laboratory Kit, Small-Size	47.10
AP10268	Environmental Pollution and Lichens—Student Laboratory Kit, Small-Size, Refill Kit	37.54
AP5905	Chemical Pollution in Water—A Qualitative Ion Test—Super Value Kit	103.30
AP7322	Understanding Your Carbon Footprint—Student Activity Kit	12.30
AP7357	Exploring Groundwater—Activity-Stations Kit	101.00

POLLUTION continued on next page.

Pollution, continued

FLINN360science™: Design a Model of Ocean Acidification: Engineering Design Challenge



This kit presents the essential concepts of ocean acidification, carbon dioxide levels and pH through hands-on science activities designed to engage all your students, regardless of level. Students determine and demonstrate that there is an inverse relationship between the amount of dissolved CO^2 in seawater and pH. Teachers can extend learning through guided inquiry into associated phenomena including, "How does acid rain impact the environment?"

Catalog No.	Description	Digital Access	Price/Each
AP10390	360Science: Design a Model of Ocean Acidification	1-Year	$ 88.30
AP10490		3-Year	103.90



FLINN EXCLUSIVE

Environmental Pollution—Student Laboratory Kit AB1133

FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Catalog No.	Description	Price/Each
FB0012	Forensic Groundwater Contamination—Student Laboratory Kit	$79.74
AP7368	Groundwater Simulation Model—Guided-Inquiry Kit	97.45
AP4559	Becker Bottles "One in a Million"	83.00
AP4854	Becker Bottle "One in a Million Too"	59.25
FB1615	Plants and Pollution—Student Laboratory Kit	64.48
FB1922	Lead in Water—Student Laboratory Kit	57.30
FB2066	Lead in Water—Student Laboratory Kit—Super Value Laboratory Kit	78.70
FB1200	Oil-Eating Bacteria—Student Laboratory Kit	72.90
AP8329	Oil Spill Containment—Flinn STEM Design Challenge™ STEM INTEGRATED	57.00
FB1025	Enviro-Bond™ 403—An Oil Spill Cleanup Demonstration Kit—Flinn STEM Design Challenge™ STEM INTEGRATED	49.85
AP6863	Stream Contamination—Forensic Laboratory Kit, Full-Size Kit	73.45
AP10115	Stream Contamination—Forensic Laboratory Kit, Full-Size, Refill Kit	66.80
AP10193	Stream Contamination—Forensic Laboratory Kit, Small-Size Kit	45.55
AP10271	Stream Contamination—Forensic Laboratory Kit, Small-Size, Refill Kit	38.30
AP7377	Effects of Chemical and Thermal Pollution—Student Laboratory Kit	77.85
AP7559	Water Pollution Testing Kit	515.00
AP7560	Water Pollution, Reagent Refill	173.75
FB1795	Why is the Water Green?—Student Laboratory Kit	76.80
AB1201	Water Purification—Student Laboratory Kit	40.10

SPER Meters for Environmental Science

See details at flinnsci.com.

Catalog No.	Description	Price/Each
AP10068	SPER Combined Conductivity, Salinity, TDS and Temperature Meter	$356.25
AP10075	SPER Environmental Quality Meter with Sound	330.00
AP10074	SPER Indoor Air Quality Meter	325.00
AP10073	SPER Portable Conductivity Pen	77.65
AP10071	SPER Portable pH Pen	99.00
AP10070	SPER Portable Salinity Pen	77.33
AP10069	SPER Test Tube pH Pen	69.90



AP10071

Global Climate Change

FLINNeverydayscience™

NEW!

The Greenhouse Effect



With this FlinnEverydayScience™ lab, students model the greenhouse effect by adding carbon dioxide to a water bottle, placing it in front of a light source, and measuring the change in temperature over time. Students will also have a control bottle with ambient air to compare their results. Students learn what the greenhouse effect is and how the addition of extra greenhouse gases into the atmosphere may affect global temperatures.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 30 Alka-Seltzer tablets, 12 1 L clear plastic bottles, and 2¼ lb package modeling clay.

Complete for 24 students working in groups of 4.

Catalog No.	Description	Price/Each
AP11814	The Greenhouse Effect	$55.25

FLINN360science™: Model Climate Change with Melting Ice



This kit presents the essential concepts of phase changes, solid and liquid states, and melting/freezing point through hands-on science activities designed to engage all your students, regardless of level. Teachers can extend learning through guided inquiry into associated phenomena including, "What are the causes of and possible solutions to climate change?"

Catalog No.	Description	Digital Access	Price/Each
AP10400	360Science: Model Climate Change with Melting Ice	1-Year	$83.00
AP10500		3-Year	98.00

FLINN360science™: Natural Resource Management



In this lab experience, students design simulations to explore the relationships between human sustainability, the use of finite, natural resources, and biodiversity. This lab does not include VR.

Catalog No.	Description	Digital Access	Price/Each
AP11350	360Science: Natural Resource Management	1-Year	$995.00
AP11450		3-Year	24.95

GLOBAL CLIMATE CHANGE continued on next page.

Global Climate Change, continued

FLINN360science™: Climate Change and Keeping Cool



This kit presents the essential concepts of climate change and evaporative cooling. Students will come to understand that climate change is more than simply changes in temperature, and that other potential changes could have dramatic effects on our lives.

Catalog No.	Description	Digital Access	Price/Each
AP10401	360Science: Climate Change and Keeping Cool	1-Year	$ 80.80
AP10501		3-Year	100.10

FLINN360science™: Carbon Dioxide Capture



This kit presents the essential concepts of greenhouse gases, climate change, and carbon dioxide capture through hands-on science activities designed to engage all your students, regardless of level. Carbon dioxide gas emitted by a burning candle. Light diffuses into an aqueous solution of sodium hydroxide. Phenolphthalein indicator is added to the solution from the beginning so the solution changes color (from pink to colorless) as it gets acidified by the carbon dioxide that diffuses and reacts with the base in solution.

Catalog No.	Description	Digital Access	Price/Each
AP10396	360Science: Carbon Dioxide Capture	1-Year	$126.65
AP10496		3-Year	147.45

FLINN360science™: Carbon Dioxide and its Role in Climate



This kit presents the essential concepts of Greenhouse effect, atmospheric gases, and climate change through ands-on science activities designed to engage all your students, regardless of level. Students will draw correlations between excess CO_2 and climate change as they observe the temperature in the experimental bottle (with effervescent [carbon] tablets added) will increase at a faster rate than the control bottle with ambient air.

Catalog No.	Description	Digital Access	Price/Each
AP10397	360Science: Carbon Dioxide and Its Role in Climate Change	1-Year	$70.65
AP10497		3-Year	87.00

FLINN360science™: How Nature Records Changes in Climate



Through hands-on science activities, this standards-aligned kit presents the concepts of climate change, dendrochronology and annual rings. By comparing tree ring growth and climate data, students gain a better understanding of how variation in climate influences organisms. They also replicate the methods used by climate scientists to gather climate data from hundreds of years ago.

Catalog No.	Description	Digital Access	Price/Each
AP10398	360Science: How Nature Records Changes in Climate	1-Year	$134.90
AP10498		3-Year	153.15

FLINN360science™: Climate Change and the Carbon Cycle



This kit presents the concepts of greenhouse gases, combustion, climate change and carbon dioxide capture through hands-on science. Through this investigation students will explore climate change and the carbon dioxide cycle. The mulitple version allow students of all levels the opportunities to explore this and related concepts.

Catalog No.	Description	Digital Access	Price/Each
AP10338	360Science: Climate Change and the Carbon Cycle	1-Year	$41.20
AP10438		3-Year	58.85

VISIT OUR WEBSITE
WWW.FLINNSCI.COM

Recycling

Paper-Making—Student Laboratory Kit



By: The Flinn Staff

Every student will make his or her own recycled pulp and press it into a 3" x 5" piece of paper. Once the paper is made, students will test it for writeability and strength. Student experimental recipes will yield a wide variety of papers with different properties. The process utilized in this activity simulates the major steps involved in the real manufacturing of recycled paper. Includes deckle frames, screen filters, couching felts and linters. *Complete for eight student groups.*

Catalog No.	Description	Price/Each
FB1486	Paper-Making—Student Laboratory Kit	$185.00

SPOTLIGHT ON SAFETY

PRACTICE GOOD HAND HYGIENE



Encourage students and staff to practice hand hygiene etiquette and properly sanitize hands as they enter and exit the classroom/lab area and any time the share equipment.

Keep hand sanitizer accessible to students at all times. Unless hands are visibly soiled, an alcohol-based hand rub is preferred over soap and water in most clinical situations due to evidence of better compliance compared to soap and water.

Constant reminders about proper hand hygiene, respiratory etiquette, and physical distancing guidelines will be useful to enhance the awareness of the new routines.

Earth & Space Science

For astronomy, Earth forces, geology and weather, dig into our laboratory kits, activities, equipment and teaching aids and **create instruction that is out of this world.**

518 **Astronomy,** Charts, Lab Activities, Models & Planetariums

521 **Earth Forces,** Charts, Stereograms, Lab Activity Kits and Models

525 **Field Equipment**

527 **Geology,** Charts, Collection Boxes and Trays, Fossils, Minerals & Kits

529 **Maps and Globes,** Globes, Lab Activities, Satellite Images

525 **Stream Tables**

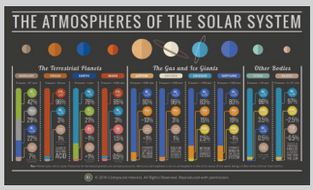
521 **Telescopes**

532 **Tools,** Psychrometers, Rain Gauges, Thermometers

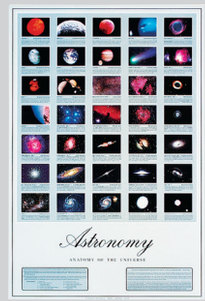
530 **Weather,** Barometers, Charts, Lab Activities

533 **Weather Stations,** Wind Speed Indicators

Astronomy—Charts



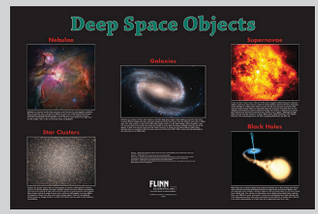
AP9025



AP5295



AP5294



AP7295

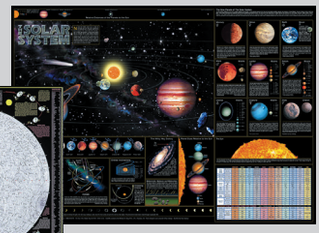


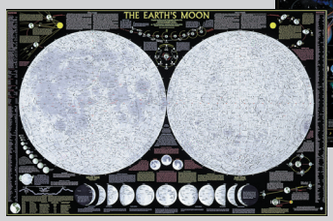
AP5240



AP9941


AP5233


AP5236



AP7685



AP7591 AP5298

Atmospheres of the Solar System Poster

By: Andy Brunning and Compound Interest™, Cambridge, UK

Laminated and 24" x 36".

Catalog No.	Description	Price/Each
AP9025	Atmospheres of the Solar System Poster	$26.35

Anatomy of the Universe Chart

35 deep space photos. 24" x 36"; glossy paper.

Catalog No.	Description	Price/Each
AP5295	Anatomy of the Universe Chart	$23.71

Comets Chart

Includes illustrations, examination of various theories about the nature of comets, and background histories of comet experts around the world from Aristotle to Kepler to Halley. Size: 22½" x 29"; glossy paper.

Catalog No.	Description	Price/Each
AP5294	Comets Chart	$14.50

Deep Space Objects Poster

FLINN EXCLUSIVE

By: The Flinn Staff

Features beautiful color photos and brief descriptions of galaxies, nebulae, supernovae, star clusters and black holes. 24" x 36"; heavy-duty laminated stock.

Catalog No.	Description	Price/Each
AP7295	Deep Space Objects Poster	$13.77

The Full Earth Poster

Image has been enhanced to show the vertical relief of mountains and valleys, heavy or sparse vegetation areas and the presence of the moon. Size: 22" x 28"; glossy paper.

Catalog No.	Description	Price/Each
AP5240	The Full Earth Poster	$14.50

Map of the Universe Chart

Students learn to locate stars and constellations as viewed from our position on the Earth's Northern Hemisphere. All constellations that can be seen during the year are outlined on the map. Size: 35" x 35"; glossy, textured paper with a phosphorescent "glow-in-the-dark" ink.

Catalog No.	Description	Price/Each
AP5233	Map of the Universe Chart	$34.85

Solar System Chart

All images and technical data are courtesy of NASA. 39" x 25"; glossy, high-quality paper.

Catalog No.	Description	Price/Each
AP5236	Solar System Chart	$15.70

EarthBall® Inflatable Globe

See page 529.

NewPath Learning Guides and Flip Chart Sets for Astronomy

The NewPath Learning Guides and Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP9941	Our Solar System FlipChart	$ 39.50
AP11503	Our Solar System Student Learning Guide with Online Lesson	15.59
AP11552	Our Solar System Student Learning Guide with Online Lesson, Set of 10	99.00
AP9942	Sun-Earth-Moon FlipChart	39.50
AP11504	Sun-Earth-Moon Student Learning Guide with Online Lesson	15.59
AP11553	Sun-Earth-Moon Student Learning Guide with Online Lesson, Set of 10	103.21

Moon Poster

Moon poster lists hundreds of craters, rays, highlands, seas, mountain ranges and rilles (with a convenient index) on large images of two different views of the Moon's surface. The poster diagrams the Moon's revolutions around the Earth, and both orbital paths are displayed for easy comparison. Defines total solar, annular solar and lunar eclipses. Discusses the physical properties of the Moon, including temperature, atmosphere and surface rock. Illustrates the phases of the Moon and discusses different calendars and lore. As well as the Apollo Missions and moon landings. 42½" x 28½".

Catalog No.	Description	Price/Each
AP7685	Moon Poster	$27.95

Solar Eclipse Poster

Each photo or image is explained in detail with facts and figures all centered around the image of an eclipse in totality. 24" x 36" on glossy, high-quality paper.

Catalog No.	Description	Price/Each
AP7591	Solar Eclipse Poster	$13.95

Sun Chart

Educational reference with illustrations of the core, radiative and convective zones, the photosphere, chromosphere, and sun spots. Size: 22½" x 29"; glossy paper.

Catalog No.	Description	Price/Each
AP5298	Sun Chart	$19.84

ASTRONOMY continued on next page.

Astronomy Lab Activities

FLINN EXCLUSIVE

The mystery of outer space (astronomy); the sun, moon and stars fascinate many students. Make your classroom lab experience more memorable and engaging with these Astronomy Lab Activities.

Eclipses—Demonstration Kit AP8339



FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Catalog No.	Description	Price/Each
AP7676	Investigating Impact Craters—Super Value Kit	$ 73.95
AP6266	Build a Telescope—Student Laboratory Kit—Individual Kit	33.02
AP6297	Build a Telescope—Student Laboratory Kit—Classroom Set	137.00
AP8339	Eclipses Demonstration Kit	18.75
AP6464	Elliptical Orbit Overhead Demonstration Kit	30.00
AP6739	Lunar Phases—Student Activity Kit	13.10
AP7319	Orbital Speed Demonstration Kit	19.90
AP7326	Planetary Orbits—Student Laboratory Kit	55.90
AP7251	Sun Scale—Student Activity Kit	25.60

Astronomy—Globes

See details at flinnsci.com.



Catalog No.	Description	Price/Each
AP5141	Celestial Star Globes, Basic	$180.50
AP5138	The Constellation Globe	106.30
AP5139	The Moon Globe	93.00

Astronomy—Models

FLINNeverydayscience™

NEW!

The Solar System



With this FlinnEverydayScience™ lab, students investigate a scale model of the Sun and the first four planets in our solar system. Then, in the challenge activity, students continue using scale models by creating their own drawing of a classroom or room in their house at home.

Includes access to pre-lab videos, editable lab instructions, downloadable student handouts, detailed background information, safety information, teacher notes with answers to all questions and sample data, and teaching and lab tips.

This kit includes 10 measuring tape, string, and a PDF of sun and planet handout.

Complete for 30 students working in groups of two.

Catalog No.	Description	Price/Each
AP11820	The Solar System	$52.35

Moon Phaser, Lunar Cycle Model



Recreate the lunar cycle right in your classroom! Hands-on manipulation of this unique astronomy model demonstrates lunar phases in a memorable way. Turn down the lights and use the lighted sphere for an even more dramatic effect. Use the Moon Phaser to its full potential with the included demonstration DVD and teacher manual. Materials are completely reusable. 4" diameter globe.

Catalog No.	Description	Price/Each
AP7463	Moon Phaser, Lunar Cycle Model	$135.00

Copernican Solar System Model



The bright yellow 6"-diameter Sun is the center of this Copernican model, which shows the motions of the planets, their relative sizes and colors and relative distances from one another. Ten steel arms on a sturdy base show the planetary orbits and the Asteroid Belt. Included is an illustrated, 46-page *Worlds in Motion* study guide, which combines astronomy facts with activities using the model for demonstration and explanation. 14" H x 21" L.

Catalog No.	Description	Price/Each
AP5131	Copernican Solar System Model	$156.60

NEW!

NewPath Visual Learning Guide, Set of 10



Visual Learning Guide provide comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11726	Sun, Earth & Moon Systems—NewPath Visual Learning Guide, Set of 10	$43.32
AP11734	Our Solar System—NewPath Visual Learning Guide, Set of 10	43.32

ASTRONOMY—PLANETARIUMS continued on next page.

High School Earth Science Curriculum Mastery Game

NEW!



Features 25 individually packaged sets of 30 full-color, review cards per topic—a total of 750 curriculum-based questions! Also includes 12 laminated, double-sided game boards; comprehensive Teacher Planning & Resource Guide; and a 1 Year Premium Subscription to NewPath's Online Learning Platform featuring animated, narrated tutorials, virtual lab exercises, inactive activities, quizzes, games and more!

Complete curriculum coverage of the following standards-based topics:

- The Science of Earth Science
- The History of the Earth
- The Rock Cycle
- Minerals I
- Fossils II
- Volcanoes
- Weather I
- Weathering & Erosion
- The Sun-Earth-Moon System
- Stars, Galaxies & the Universe
- Maps as Models of the Earth
- Earth's Crust
- Rocks I
- Minerals II
- Plate Tectonics
- Oceans
- Weather II
- Groundwater Resources
- Our Solar System
- Lab Investigations/Scientific Method
- Rocks II
- Fossils I
- Earthquakes
- The Atmosphere
- Climate

Catalog No.	Description	Price/Each
AP11714	High School Earth Science Curriculum Mastery Game	$119.95

Astronomy—Models, continued

Phases of the Moon 3-D Model Kit

NEW!



Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11709	Phases of the Moon 3-D Model Kit	$34.95

Astronomy—Planetariums

FLINN360science™: Model the Orbital Motion of Planets



This kit presents the concepts of orbital speed, centripetal force, centripetal acceleration, gravitational force, and Kepler's Law through hands-on activities that promise to engage all. During this lab, students determine that, all else being equal, orbital period (T) decreases as the orbital radius (r) decreases; and orbital speed (v) increases as the orbital radius (r) decreases.Teachers can extend learning through guided inquiry into associated phenomena such as, "Why don't satellites fall to the ground?"

Catalog No.	Description	Digital Access	Price/Each
AP11312	360Science: Model the Orbital Motion of Planets	1-Year	$74.45

FLINN360science™: Kepler's Laws of Planetary Motion



This kit presents the essential concepts of orbital period, elliptical orbits, eccentricity, and Kepler's Law through hands-on activities designed to engage your students of all levels. Students will draw two ellipses with different eccentricities to model the shape of planetary orbits and then determine the eccentricity of each ellipse by dividing the distance between the foci by the length of the major axis. They will also explore the geometry of ellipses, and the implications of this geometry on the trajectory of the planets around the sun.

Catalog No.	Description	Digital Access	Price/Each
AP11313	360Science: Kepler's Laws of Planetary Motion	1-Year	$47.00

FLINN360science™: The Expansion of the Universe



Thise kit presents the essential concepts of nuclear fusion, solar flares and solar energy through hands-on science activities designed to engage all your students, regardless of level. Teachers can extend learning through guided inquiry into associated phenomena including, "How will the sun change over time?"

Catalog No.	Description	Digital Access	Price/Each
AP11380	360Science: The Expansion of the Universe	1-Year	$28.00
AP11480		3-Year	41.70

FLINN360science™: Elemental Composition of Stars



This kit presents the concepts of nuclear fusion, spectroscopy and Big Bang through hands-on science. Students observe the emission spectra of several different elements. They then build on this experience by considering how stellar spectroscopy can provide information about a star's composition and age. Teachers can extend learning through guided inquiry into associated phenomena including, "How will the sun change over time?"

Catalog No.	Description	Digital Access	Price/Each
AP11378	360Science: Elemental Composition of Stars	1-Year	$42.55
AP11478		3-Year	58.50

FLINN360science™: Half-Life Simulation



This kit presents the essential concepts of radioactive decay, half-life, and radiometric dating through hands-on science activities designed to engage all your students, regardless of level. In this lab experience, students should come to understand that radioactive decay is more of a probability model than a predictive process. Extend the learning through investigation into associated phenomena such as, "How can you predict the results of multiple events, but not a single event?"

Catalog No.	Description	Digital Access	Price/Each
AP11373	360Science: Half-Life Simulation	1-Year	$156.00

Solar House Kit



Perfect companion project for solar based learning. It requires no tools to assemble, is easy to wire up using our special conductive tape, and can be used again and again. Light up LEDs, power the motor, create switches, and assemble your house.

The Solar House features a robust 6V solar panel that can light up the included LEDs or can power the motor + fan. Just stick the Solar House in moderate sunlight and watch the fun! In some situations it'll even work with artificial light, provided you have a strong enough light source. For extra fun, the motor + fan can be turned into a power source and used to light LEDs!

Catalog No.	Description	Price/Each
AP11628	Solar House Kit	$30.00

The Orbiter Planetarium, Manual



The Orbiter is a hand-operated working model designed to show basic Earth and Moon motions and explain the causes of the seasons and phases of the Moon. A special transparent hemisphere, or shadow, can be snapped around half of the Earth to show day and night. Teacher's guide with background, student experiments and projects is included. Overall planetarium size: 12" H x 20" L.

Catalog No.	Description	Price/Each
AP5134	The Orbiter Planetarium, Manual	$239.25

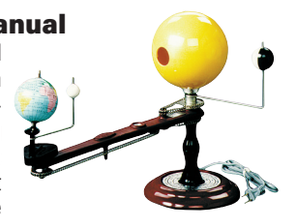
The Orbiter Planetarium, Illuminated



Illuminate the Sun to demonstrate daylight, night, seasons, and phase of the Moon. The Sun, Earth, and Moon manually revolve around one another in this gear-driven model. Earth and Moon are to scale. Arm is 15", Sun is 6", and the Earth is 4". Includes an 8-page packet with student activities. 6' power cord plugs into a standard wall outlet. 25½" x 16" x 10½".

Catalog No.	Description	Price/Each
AP7860	The Orbiter Planetarium, Illuminated	$356.50

Planetarium, Illuminated, Manual



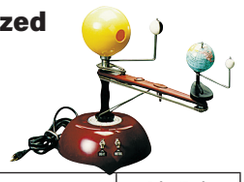
Create the motions of the Earth, Sun, Moon, and Venus simultaneously with this gear-and-chain driven planetarium. The light from the illuminated 6"-diameter Sun follows the revolving Earth to show solar, lunar, and annular eclipses; phases of the Moon; seasonal changes; night and day; and twilight. Included is a 12-page instruction manual for using the planetarium. Durable, well-engineered planetarium promises years of classroom use. 14" H x 16½" L; 110V AC.

Catalog No.	Description	Price/Each
AP5135	Planetarium, Illuminated, Manual	$589.01

ASTRONOMY continued on next page.

Astronomy—Planetariums, continued

Planetarium, Illuminated, Motorized



Just plug it in, turn it on, and watch the synchronized orbital movements of the Sun, Earth, the Moon and Venus. This motorized version of the planetarium has all of the dependable features of AP5135 yet is fully automated. 16½" H x 16½" L; 110 V AC.

Catalog No.	Description	Price/Each
AP5136	Planetarium, Illuminated, Motorized	$1275.00

Astronomy—Telescopes

See details at flinnsci.com.

Catalog No.	Description	Price/Each
AP7123	Spacestation™ 60 mm Refractor Telescope, Tasco®	$189.00
AP8698	Astro Fi 90 mm Refractor Telescope, Celestron®	619.75



AP7123

Build Your Own Telescope Kit

See page 387.

Eyepieces—Low vs. High Power

Use low power eyepieces to view the full Moon, planets, star clusters, nebulae and even constellations. High power eyepieces, under the right conditions, allow you to see mountains, ridges, craters and even the light/dark separation line on the Moon.

Earth Forces—Charts

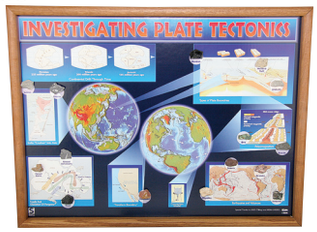
NewPath Visual Learning Guide, Set of 10



Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11725	Volcanoes—NewPath Visual Learning Guide, Set of 10	$43.32
AP11730	Earthquakes—NewPath Visual Learning Guide, Set of 10	43.32
AP11731	Understanding Weather—NewPath Visual Learning Guide, Set of 10	43.32

Investigating Plate Tectonics



Volcanic activity, earthquakes, flooding—relate dynamic forces such as these to the origin of continents, ocean basins, mountain ranges, and the processes of plate tectonics and sea floor spreading! This detailed chart features actual specimens of rocks and minerals securely mounted on the chart, allowing students to see and trace the action of the rock cycle. Contains illustrations and explanation of phenomena; chart is mounted in a wooden frame for easy wall hanging and extended life. Size: 23½" x 15½".

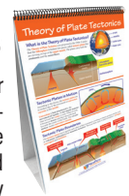
Catalog No.	Description	Price/Each
AP5199	Investigating Plate Tectonics	$79.00

Mercator Projection

A Mercator projection is a type of map projection used in navigation where both latitude and longitude lines are parallel. Continents have the correct shapes, but distorted areas. Land and sea areas near the poles appear much larger than they actually are because the longitude lines are spread apart to make them parallel.

NewPath Learning Guides and Flip Chart Sets for Earth Forces

AP9935

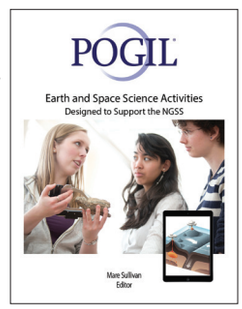


The NewPath Learning Guides and Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP9935	Plate Tectonics FlipChart	$39.50
AP11497	Plate Tectonics Student Learning Guide with Online Lesson	15.59
AP11546	Plate Tectonics Student Learning Guide with Online Lesson, Set of 10	99.00
AP9936	Earthquakes FlipChart	39.50
AP11498	Earthquakes Student Learning Guide with Online Lesson	15.59
AP11547	Earthquakes Student Learning Guide with Online Lesson, Set of 10	99.00
AP9937	Volcanos FlipChart	38.05
AP11499	Volcanoes Student Learning Guide with Online Lesson	15.59
AP11548	Volcanoes Student Learning Guide with Online Lesson, Set of 10	99.00
AP11524	How Does Earth's Surface Change FlipChart	39.95
AP11517	How Does Earth's Surface Change Student Learning Guide with Online Lesson	14.95
AP11567	How Does Earth's Surface Change Student Learning Guide with Online Lesson, Set of 10	99.00
AP9938	Earth's Surface FlipChart	39.50
AP11500	Earth's Surface Student Learning Guide with Online Lesson	14.95
AP11549	Earth's Surface Student Learning Guide with Online Lesson, Set of 10	99.00
AP9939	Earth's Atmosphere FlipChart	39.50
AP11501	Earth's Atmosphere & Weather Student Learning Guide with Online Lesson	14.95
AP11550	Earth's Atmosphere & Weather Student Learning Guide with Online Lesson, Set of 10	99.00
AP9940	Earth's Climate FlipChart	39.50
AP11502	Earth's Climate Student Learning Guide with Online Lesson	15.59
AP11551	Earth's Climate Student Learning Guide with Online Lesson, Set of 10	99.00
AP11525	What is Weather FlipChart	41.65
AP11518	What is Weather Student Learning Guide with Online Lesson	14.95
AP11568	What is Weather Student Learning Guide with Online Lesson, Set of 10	99.00

Earth Forces—Stereograms

POGIL® Activities for Earth and Space Science



This digital download offers 10 interactive, guided-inquiry activities:

- You Rock! How Are Different Kinds of Rocks Made?
- Earth's Layered Structure
- Movement Inside the Earth (Plate Tectonics)
- To Shake or Not to Shake? Exploring How Earthquakes Behave
- Where are Tectonic Plate Boundaries Located?
- Shuffling the Continents (Pangaea to Present Day Location of Continents)
- Forecasting National Catastrophes
- Human Impacts on Drinking Water Quality
- Comparing Objects in the Solar System
- Life Cycles of Stars

Catalog No.	Description	Price/Each
AP10094	POGIL Activities for Earth and Space Science	$29.95

EARTH FORCES continued on next page.

Earth Forces—Lab Activity Kits

FLINN360science™: Investigate the Rock Cycle



This kit presents the essential concepts of rock cycle and geological processes through hands-on science activities designed to engage all your students, regardless of level. Students gain a better understanding of the different kinds of rocks, their formation, and the process that transitions them to other forms through this role-playing activity. Teachers can extend learning through guided inquiry into associated phenomena such as, "What causes volcanoes to form?"

Catalog No.	Description	Digital Access	Price/Each
AP10343	360Science: Investigate the Rock Cycle	1-Year	$29.45
AP10443		3-Year	47.10

FLINN360science™: Observe Convection Currents



This kit presents the essential concepts of convection, plate tectonics and the first law of thermodynamics through hands-on science activities designed to engage all your students, regardless of level. Through this investigation, students gain a better understanding of how the process of convection works by adjusting the experimental conditions and the properties of the two liquids. Teachers can extend learning through guided inquiry into associated phenomena such as, "What causes volcanoes to form?"

Catalog No.	Description	Digital Access	Price/Each
AP10344	360Science: Observe Convection Currents	1-Year	$104.00
AP10444		3-Year	121.05

FLINN360science™: The Rise and Fall of Pangaea



This kit presents the essential concepts of convection, continental drift and plate tectonic evidence through hands-on science activities that engage your students, regardless of their level. During this lab, students will arrange both continental and oceanic plates based off historical positions will illustrate how the surface of Earth has changed throughout history. Teachers can extend learning through guided inquiry into associated phenomena such as, "What causes volcanoes to form?

Catalog No.	Description	Digital Access	Price/Each
AP10345	360Science: The Rise and Fall of Pangaea	1-Year	$ 88.30
AP10445		3-Year	103.90

FLINN360science™: Construct Fault Models



This kit presents the essential concepts of faults, shearing and earthquakes through hands-on science activities designed to engage all your students, regardless of level. By constructing models of faults and simulating the movement that occurs at them, students gain a better understanding of the landforms and geological events that occur on the earth's surface. Teachers can extend learning through guided inquiry into associated phenomena such as, "What causes volcanoes to form?"

Catalog No.	Description	Digital Access	Price/Each
AP10346	360Science: Construct Fault Models	1-Year	$41.00
AP10446		3-Year	58.00

FLINN360science™: Plate Tectonics and Seafloor Spreading



This kit presents the essential concepts of Pangaea, continental drift, continental and oceanic crust. Students will model plate tectonics and observe how the continental and oceanic plates shifted over time and how the rocks located in these areas can help to date the movement.

Catalog No.	Description	Digital Access	Price/Each
AP11375	360Science: Plate Tectonics and Seafloor Spreading	1-Year	$157.40

FLINN360science™: Cohesive Forces and Surface Tension



Through hands-on science, students will explore the formation of soap bubbles of various sizes, seeking to develop an understanding of the relationship between intermolecular cohesive forces and the surface tension of a liquid. This kit presents the concepts of Cohesion, surface tension, and intermolecular forces to engage all your students, regardless of level.

Catalog No.	Description	Digital Access	Price/Each
AP11327	360Science: Cohesive Forces and Surface Tension	1-Year	$58.50
AP11427		3-Year	70.00

FLINN360science™: Collisions at a Fault Line



This kit presents the concepts of collision, and fault earthquake through hands-on activities that engage all your students, regardless of level. Students discover that there is different geological evidence for the different types of collisions that can occur in Earth's crust. Teachers can extend learning through guided inquiry into associated subjects such as, "What happens when tectonic plates collide?"

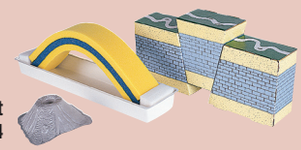
Catalog No.	Description	Digital Access	Price/Each
AP11339	360Science: Collisions at a Fault Line	1-Year	$47.85
AP11439		3-Year	63.80

FLINN EXCLUSIVE



Modeling and Mapping Topography—Student Activity Kit
AP7315

FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM



Landform Demonstration Kit
AP5124

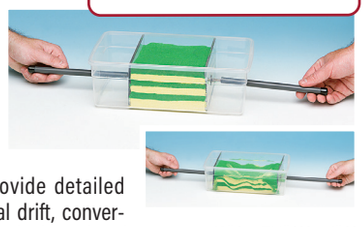
Catalog No.	Description	Price/Each
AP7346	Coriolis Effect—Student Laboratory Kit	$ 91.55
AP7406	Exploring Earthquakes—Activity-Stations Kit	65.45
AP7266	Find the Epicenter of an Earthquake—Student Activity Kit	57.95
AP6881	Mapping Earthquakes and Volcanoes—Student Activity Kit	44.85
AP7675	Water Cycle Adventure—Super Value Kit	17.70
AP7170	Pangaea—Student Activity Kit	75.00
AP7374	Strike-Slip Fault—Student Activity Kit	97.85
AP7315	Modeling and Mapping Topography—Student Activity Kit	46.95
AP6185	Topography Map Reading—Model and Lab Activity	186.50
AP7422	Plate Tectonics and Earthquakes—Demonstration Model	38.05
AP5124	Landform—Demonstration Model	84.50
AP7313	Ocean Current—Demonstration Model	39.10

EARTH FORCES continued on next page.

Earth Forces—Demonstration Kits

Tectonics Model—Demonstration Kit

FLINN EXCLUSIVE



By: The Flinn Staff

Demonstrate the powerful forces of tectonic processes with this easy-to-use, hands-on model. Brightly colored sand simulates the formation of folds, faults, erosion and rift valleys. Student worksheets and teacher's guide provide detailed discussion and analysis of continental drift, convergence, divergence, the Earth's surface and other related concepts. 13" L x 7½" W x 4" H.

Note: Replacement tectonic sand is available separately.

Catalog No.	Description	Price/Each
AP7178	Tectonics Model—Demonstration Kit	$104.80
AP7218	Tectonic Model Sand Refill	26.75

Earth Forces—Models

Plate Tectonics—NewPath Visual Learning Guide, Set of 10

NEW!



Plate Tectonics Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11743	Plate Tectonics—NewPath Visual Learning Guide, Set of 10	$43.32

Earthquakes—Newpath Science 3-D Model Kit

NEW!

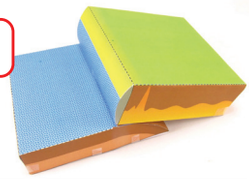


Your students will enjoy learning about earthquakes with this dynamic model. First, they make their subsurface model and model of a city using the colorful parts.Then they use their subsurface model to look at the features of an earthquake, epicenter, focus (hypocenter) and the P and S seismic waves.

Catalog No.	Description	Price/Each
AP11832	Earthquakes—Newpath Science 3-D Model Kit	$50.00

Tectonics Plates 3-D Model Kit

NEW!



Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11706	Tectonics Plates 3-D Model Kit	$44.95

Volcano 3-D Model Kit

NEW!



Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11707	Volcano 3-D Model Kit	$34.95

Coriolis Effect Apparatus



How does the Earth's rotation affect objects moving over its surface? This kit allows students to observe the Coriolis effect simply and clearly with a ¾"-diameter steel ball and a revolving turntable that shows a visible yet erasable mark from the ball's path. See how the ball's path is unaffected when the platform is static, but curved when the platform is revolved to simulate the Earth's rotation. Activity sheets guide students as they investigate the Coriolis effect in the Northern and Southern hemispheres and observe its influence on atmospheric circulation. 14"-diameter platform. This kit will serve one lab group of 3–4 students.

Catalog No.	Description	Price/Each
AP5113	Coriolis Effect Apparatus	$54.75

Contour Model Kit



Students draw contour lines on the 3-D plastic model by progressively adding water to the box, centimeter by centimeter. Trace the irregular concentric circles on the plastic lid and—*voila!*—watch the contour model appear! Students proudly compare their map to the provided aerial photograph of Mt. Capulin. Kit includes transparent molded plastic box containing volcano, transparent plastic lid, metric ruler, marking pencil and student investigation sheets detailing the activities. This kit will serve one lab group of 3–4 students.

Catalog No.	Description	Price/Each
AP5111	Contour Model Kit	$35.63

Density Flow Model Junior



Unique demonstration tank is used to demonstrate hard-to-visualize concepts related to Geology, Meteorology and Fresh and Saltwater systems. Students will be introduced to topics such as plate tectonics, thermoclines, air masses, fronts, and wind and ocean currents, to name a few. Comes complete with detailed 55-page manual with thought-provoking student activities, teacher setup instructions and answer key.

Catalog No.	Description	Price/Each
AP6539	Density Flow Model Junior	$330.00

Seismograph Model



The model consists of a pen mounted on a weight that is suspended from a frame. A roll of paper below the pen simulates the recording device. Have a student pull the paper and—if no vibrations occur—the pen traces a smooth even line. Have a student cause a simulated earthquake (i.e., vibrate the table), and watch as the support moves with the tremors and the stationary pen records the "earthquake." Explain the similarities of the model to an actual recording apparatus of a seismograph, which is anchored to bedrock to measure seismic waves, locate the epicenter and determine magnitude. Included is a teacher manual with easy setup instructions and lessons.

Catalog No.	Description	Price/Each
AP5122	Seismograph Model	$66.00

Tectonics Model Set



This 3-D model demonstrates plate tectonic principles, plate boundary interactions and the geometry and relative motions of faulting of geologic layers. Includes an access code to download interactive Teacher and Student Guides, videos, geoinformation data sets, and other resource information.

Catalog No.	Description	Price/Each
AP10225	Tectonics Model Set	$196.75

EARTH FORCES—MODELS continued on next page.

Don't Leave **Safety** to **Chance**

Contact us with your safety questions



800-452-1261

customercare@flinnsci.com

Earth Forces—Models, continued

Middle School Earth Science Curriculum Mastery® Game



Includes 25 individually packaged sets of 30 colorful, review cards per topic—a total of 750 curriculum-based questions! Also includes 12 double-sided, laminated game boards; comprehensive Teacher Planning & Resource Guide;and FREE 1-Year Premium Subscription to NewPath's Online Learning Program providing access to Science games, interactive activities, quizzes and more.

Catalog No.	Description	Price/Each
AP11661	Middle School Earth Science Curriculum Mastery® Game—Class-Pack Edition	$112.15

Density Flow OriginalModel

NEW!



Demonstrate important density concepts to an entire classroom. Challenge students to use scientific inquiry techniques to explore geology, meteorology, freshwater and saltwater systems. Using the illuminated flow of colored fluids, students can visualize abstract concepts related to plate tectonics, isostasy, seafloor spreading, air masses, fronts, air pressure, winds, ocean currents, thermoclines, haloclines, upwelling, El Niño and more.

Catalog No.	Description	Price/Each
AP11827	Density Flow Original Model	$475.00

Earth Forces—Stream Tables

Stream Table



An affordable and well-made stream table with impressive features! Five different water jets provide a wide range of flexibility, allowing you to demonstrate erosion, drainage, delta formation, stream processes and more. Students can clearly see sediment layers through clear acrylic sides. Create variable slopes by raising or lowering the table with the adjustable height bar. Smoothly turn the jets on and off using easy-to-turn valves. Simple to set up—all you need is water and sediment! Provided pump generates a consistent water flow. Includes a built-in sediment trap to prevent clogging and a removable dam to create lakes and deltas. Sand is available separately. Folds for storage. 48" x 20".

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
AP7684	Stream Table	$632.00
AP6462	Stream Table Sand, 50 lbs	73.15

* Must be shipped by motor truck freight.

Augmented Reality Sandbox



Use the Augmented Reality Sandbox to create topography models to teach geographic, geologic and hydrologic concepts. Shape real sand augmented in real time by an elevation color map, topographic contour lines and simulated water and lava. The 3-D visualization applications and hands-on station includes a closed-loop Microsoft Kinect 3-D camera, Linux laptop computer and data projector. Features wire management, heavy-duty locking casters and a hinged laptop shelf that folds away when not in use. Detailed instructions included. Solid oak and oak veneer. 48" W x 30" D x 85" H; top of sandbox at 36" D. Sand is required and available separately.

Catalog No.	Description	Price/Each
AP9564	Augmented Reality Sandbox	$9500.00
AP9565	Sandtastik® Coarse Therapy Sand, 25 lbs	23.95
AP9567	Sandtastik® Sparkling White Play Sand, 25 lbs	22.80

Stream Table Recirculating Pump



Provide the constant flow of water that your stream table needs with this 1/70 hp pump. Its 3.3"-diameter motor is capable of circulating up to 250 gallons of water per hour. Operates on 115V AC and has a three-prong grounded plug for safety. Included with the pump is a 13" L x 10½" W x 4" H sturdy plastic reservoir tub.

Catalog No.	Description	Price/Each
AP5127	Stream Table Recirculating Pump	$201.20

Field Equipment—Binoculars

Binoculars



AP6508

High quality and durability at an extremely affordable price. The 10 x 25 compact binoculars contain state-of-the-art prisms for clear crisp images. Non-slip rubber armor provides a firm grip and is shock-resistant if dropped. The 10 x 42 full-sized binoculars feature a wide-angle prism design with one-touch Insta-focus for fast and easy focus on moving targets. Bright clear images are always guaranteed. Each binocular is complete with neck strap and durable carrying case.

Catalog No.	Description	Viewing Field at 1000 Yards	Price/Each
AP6507	Binoculars, Compact, 10 x 25	300'	$ 44.05
AP6508	Binoculars, Full-Size, 10 x 42	368'	135.00

Foldable Binoculars



Slip these binoculars into your backpack or pocket, attach them to your clipboard or put them into your field study folder. Their lightweight feature makes them easy to transport while the affordable price makes observing nature accessible to everyone. Binoculars fold nearly flat to 3" x 4" and magnify 3X through acrylic lenses. Flex them when they're unfolded to slightly adjust the focus.

Catalog No.	Description	Price/Each
AP9908	Foldable Binoculars	$3.95

Field Equipment—Compasses



FB0601



AB1125

See details at flinnsci.com.

Catalog No.	Description	Price/Each
FB0601	Compass, Magnetic, Field	$15.70
AB1127	Compass, Magnetic, Liquid-Filled	13.25
AB1125	Compass, Magnetic, Simple, 44 mm (1¾") Diameter	6.05
AP5285	Compass, Magnetic, Small	1.33
AP6387	Student Compass Set, Package of 30	32.05
AB1126	Compass, Magnetic, with Cover	10.50

FIELD EQUIPMENT continued on next page.

NewPath Learning Guides for Earth Science



The NewPath Learning Guides Earth Science Student Learning Guides are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, freestanding easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP11543	Earth Science Student Learning Guides with Online Lessons, Set of 10	$105.25

Field Equipment—Global Positioning System

Global Positioning System, eTrex® 10

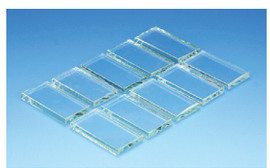


Compact, easy-to-use GPS device is designed to be used by anyone regardless of skill level. Enhanced 2.2" monochrome display is easy to read in any light. Water-resistant and durable to withstand the outdoor elements. Supports paperless geocaching GPX files to store up to 1,000 waypoints and display location, terrain, difficulty and more. High-sensitivity receiver locates your position quickly and precisely whether in a field or deep canyon. Tracks both GPS and GLONASS satellites simultaneously. The 4" x 2" receiver will run for 25 hours on just two AA batteries (available separately). USB interface. Includes a detailed user's reference guide and USB cable.

Catalog No.	Description	Price/Each
AP7562	Global Positioning System, eTrex® 10	$236.62

Field Equipment—Hardness Plates

Glass Hardness Plates



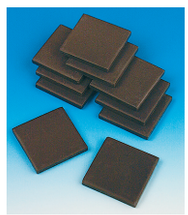
The perfect sized plate for mineral testing! Determine the hardness of minerals using these durable glass plates. If the mineral scratches the plate, it has a hardness factor greater than 5.5 on Moh's hardness scale. Ideal 1" x 2" x ¼" size for field or lab testing. Sold in packages of 10 plates.

Catalog No.	Description	Price/Pkg. of 10
AP7379	Glass Hardness Plates	$29.58

Streak Plates, White and Black



AP5081



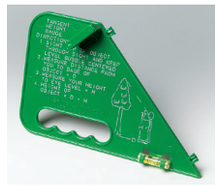
AP5082

Identify minerals using these unglazed white or black porcelain plates. Simply rub the sample across the plate and observe the streak color. Use white plates for dark minerals; black plates for light minerals. Ideal 2" x 2" size for field or lab testing. Sold in packages of 10 plates.

Catalog No.	Description	Price/Pkg. of 10
AP5081	Streak Plates, White	$11.15
AP5082	Streak Plates, Black	12.00

Field Equipment—Height Gauge

Height Gauge, Tangent



An elegantly simple device for measuring the height of nearly any object. The user sights the top of the object being measured through the two circular sighting rings and alters her position until the level bubble is centered (as viewed through the mirror). The distance from the user to the base of the object plus the distance from the ground to the user's eye level is the height of the object. Constructed of durable ABS plastic, the gauge is virtually unbreakable under normal use. Instructions for use are printed directly on the gauge.

Catalog No.	Description	Price/Each
FB0433	Height Gauge, Tangent	$38.30

Field Equipment—Tools and Accessories

Estwing Striking Tools



AP5084

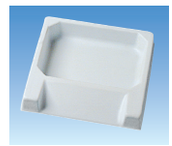
Estwing has been making the world's finest striking tools since 1923. Strong, one-beam, solid steel construction eliminates the risk of the handle breaking or the head loosening. Molded nylon-vinyl cushion grip absorbs shock and provides for a firm grip.

A lightweight hammer with polished pick head and 2 x 2 cm striking surface, useful for chipping and cracking small rocks. 28 cm length; 14 oz.

Catalog No.	Description	Price/Each
AP5084	Rock Pick, Pointed-Tip	$53.91

Geology—Collection Boxes and Trays

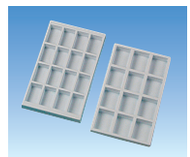
Label-edge Trays, Plastic



Perfect for the storage and display of large mineral, rock or fossil specimens. Each sturdy polystyrene tray has a slanted front edge for a label. Package of 100.

Catalog No.	Description	Compartment Size L x With x H (cm)	Price/Pkg. of 100
AP4871	Label-edge Tray, Large	9.5 x 7 x 2	$64.55

Collection Trays, Plastic



Vacuum-formed plastic collection trays for the convenient storage of minerals, rocks and fossils. Can be used by itself or with a cardboard collection box. Available in four different compartment configurations. Each compartment is 2.5 cm deep—other dimensions vary.

Catalog No.	Description	Compartment Size (cm)	Number of Compartments	Price/Each
AP4989	Collection Trays, Plastic	4 x 6	12	$3.88
AP4991		3 x 5.5	16	3.88

Collection Boxes with Trays



Conveniently display and safely store mineral, rock and fossil specimens. Sturdy cardboard boxes have plastic compartment trays with lids. Available in various sizes.

Catalog No.	Description	Compartment Size (cm)	Number of Compartments	Price/Each
AP4988	Collection Boxes with Trays	4 x 6	12	$ 8.79
AP4990		3 x 5.5	16	8.52
AP4992		3 x 3.5	24	8.15
AP4994		4.5 x 5	40	17.54

GEOLOGY continued on next page.

Geology

FLINN EXCLUSIVE

Lab Activities

Geology, not only the study of rocks and minerals but also of fossils. Dig into our different lab activities, examine our rock and mineral specimens, analyze the charts and tools that will explode your students' minds and rock their world.



Colorful Stalactites and Stalagmites—Demonstration Kit AP6538

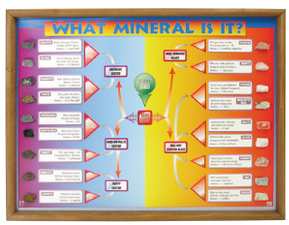
FULL KIT DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Catalog No.	Description	Price/Each
AP6195	Earth Science Density— Student Laboratory Kit	$155.00
AP6738	Density of the Earth— Student Laboratory Kit	85.30
AP6740	Bits and Pieces Sediment Activity Kit	47.95
AP6515	Reading River Sediments	208.40
AP5121	Sedimentator	25.15
AP7030	Rock Formation and Identification—Super Value Kit	141.21
AP8045	Egg Geodes—Student Laboratory Kit	60.05
AP5291	Flinn Rock and Mineral Test Kit	12.60
AP6350	Flinn Rock and Mineral Test Kit—Set of 10	97.90
AP7035	Chemical and Mechanical Weathering of Rock—Student Laboratory Kit	101.97
AP5949	Be a Mineral Detective— Student Laboratory Kit	100.53
AP7168	Formation and Identification of Minerals—Student Laboratory Kit	128.00
AP6896	Minerals, Metals, and Mining—Super Value Guided-Inquiry Kit	47.85
AP7520	What's My Mineral?—Super Value Guided-Inquiry Kit	44.75
AP5092	Mineral Hunt Kit	43.84
AP6124	Mineral Crystal Shapes	65.55
AP6505	Geometry of Crystal Structure Kit	154.18
AP6538	Colorful Stalactites and Stalagmites—Demonstration Kit	48.85

Geology—Charts



AP7666



AP5203

See details at flinnsci.com.

Catalog No.	Description	Price/Each
AP7666	Minerals Poster	$ 24.65
AP5203	What Mineral Is It? Chart	78.95
AP5209	Investigating the Rock Cycle Chart	80.55
AP5204	What Rock Is It? Chart	80.55
AP5208	Sedimentary Rock Chart	70.31
AP5211	Rock Charts Set	216.05

Geology—Fossils

Fossil Collection, Introductory



A great collection to start your study of fossils. Fifteen fossils from the Cenozoic, Mesozoic and Paleozoic eras are provided. The specimens' geologic ages range from 1 million to 500 million years. Each specimen is numbered and keyed to the provided teacher's guide. Packaged in a sturdy collection box.

Catalog No.	Description	Price/Each
AP5002	Fossil Collection, Introductory	$48.05

Fossil Collection, Plastic



Students are fascinated with the study of fossils. 21 plastic replica fossils are provided in each package. Students will measure, identify and classify by geologic time periods. Fact sheet provided.

Catalog No.	Description	Price/Each	Price/Each 10 Pkgs. or more
AP5114	Fossil Collection, Plastic	$18.00	$16.35

Stratigraphic Fossil Collection, Advanced



An excellent advanced collection of 45 plant and animal specimens from the Paleozoic, Mesozoic and Cenozoic eras. All-inclusive collection is organized by periods from the Cambarian to Tertiary—all of the major phyla are represented. Each specimen is numbered and comes complete with a teacher's key. Packaged in a durable collection box.

Catalog No.	Description	Price/Each
AP6405	Stratigraphic Fossil Collection, Advanced	$124.60

Geology—Mineral Collections

Mineral Collections

Catalog No.	Description	Price/Each
AP4880	Introductory Mineral Collection	$37.55
AP4883	Classroom Mineral Collection	84.57
AP4887	Cleavage Mineral Collection	14.75
AP4997	Crystal Mineral Collection	37.00
AP4888	Fracture Mineral Collection	16.18
AP4885	Moh's Hardness Scale Mineral Collection	17.72
AP4886	Luster Mineral Collection	23.78
AP4892	Fluorescent Mineral Collection, Short and Long Wave	39.61
AP4889	Color and Streak Mineral Collection	25.78
AP5003	Gem Mineral Collection	50.41

Geology—Mineral and Rock Collections

Mineral and Rock Collections



Classroom Rock Collection AP4996

Catalog No.	Description	Price/Each
AP4874	Introductory Mineral and Rock Collection	$ 23.44
AP4873	Rock and Rock-Forming Mineral Collection	47.55
AP4884	Classroom Collection of Rocks and Minerals	71.00
AP4879	Washington School Collection	91.80
AP4872	Test Chips for Washington School Collection	10.69
AP5292	Earth Science Collection, Introductory	149.76
AP5005	Earth Science Collection, Advanced	258.34

GEOLOGY continued on next page.

Geology—Minerals



Mineral Specimens
AP4896, etc.

Mineral Specimens

Specimens are 2–3 cm in size and include 10 minerals per package. Perfect for student use and identification.

Catalog No.	Description	Price/Pkg. of 10
AP4896	Apatite, Green to Blue-Green, Massive, Crystalline	$17.43
AP4898	Azurite, Green to Blue	26.60
AP4902	Biotite, Black, Cleavage Plates	14.46
AP4903	Calcite, White to Brown, Cleavage	14.18
AP4904	Calcite, Iceland Spar, Clear	23.66
AP4905	Chalcopyrite, Massive	26.84
AP4907	Copper, Native Nuggets	32.92
AP4908	Corundum, Massive	24.35
AP4909	Dolomite, White/Tan	8.43
AP4910	Fluorite, Cleavable, Various Colors	21.21
AP4912	Graphite, Black, High Grade, Foliated	22.29
AP4913	Gypsum, Alabaster, White/Pink, Massive	11.34
AP4914	Gypsum, Selenite, Transparent, Cleavage	11.48
AP4915	Gypsum, Satin Spar, White Fibrous	20.86
AP4916	Halite, Clear, Cleavable	18.24
AP4917	Hematite, Black, Specular, Glittery Metallic	14.23
AP4918	Hematite, Dark Red-Brown, Massive	12.23
AP4919	Hornblende, Cleavable	18.06
AP4922	Magnetite, Black, Crystalline	11.37
AP4923	Magnetite, Loadstone, Magnetic	21.21
AP4924	Malachite, Bright Green, Massive, Good Grade	22.92
AP4925	Microcline, Feldspar, Pink, Cleavages	11.12
AP4927	Muscovite, Cleavage Sheets	13.60
AP4928	Olivine, Green, Crystalline	12.01
AP4929	Pyrite, Massive	17.49
AP4931	Quartz, Amethyst	21.15
AP4935	Quartz, Milky White, Massive	10.90
AP4936	Quartz, Clear, Rock Crystal	35.88
AP4937	Quartz, Rose, Light Pink, Massive	12.40
AP4938	Quartz, Smokey	15.43
AP4941	Sulfur, Bright Yellow, Massive	12.85
AP4942	Talc, Soapstone, Gray, Massive	11.83

HAVE A QUESTION?
1-800-452-1261
PLEASE CALL US

Geology—Rock Collections

Rock Collections

Catalog No.	Description	Price/Each
AP5001	Introductory Rock Collection	$27.77
AP4998	Igneous Rock Collection	29.58
AP4999	Metamorphic Rock Collection	27.77
AP5000	Sedimentary Rock Collection	29.58
AP4996	Classroom Rock Collection	90.65

NewPath Visual Learning Guide, Set of 10

NEW!



Visual Learning Guide provides comprehensive coverage. Each 11" x 17" laminated Write-On/Wipe-Off guide includes four panels of helpful information to engage students in the study of this topic.

Catalog No.	Description	Price/Each
AP11717	Weathering of Rocks & Soil Formation—NewPath Visual Learning Guide, Set of 10	$43.32
AP11741	Rocks—NewPath Visual Learning Guide, Set of 10	43.32
AP11742	Minerals—NewPath Visual Learning Guide, Set of 10	43.32

Minerals 3-D Model Kit

NEW!



Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11704	Minerals 3-D Model Kit	$44.95

Rock Cycle 3-D Model Kit

NEW!



Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11705	Rock Cycle 3-D Model Kit	$44.95

Geology—Rock Tumbler

Rock Tumbler, Tumble-Vibe®



The teacher's choice when finishing rocks. This vibrating tumbler is useful for smoothing and polishing a wide variety of rocks. Following the provided Tumble-Vibe four-step finishing process, students are guaranteed success in getting good finishing results. Up to four pounds of rocks can be processed at one time. A second bowl is recommended for quality polishing, as residual grit from the grinding and smoothing process will become embedded in the first bowl, preventing a good final polish. Grain and finishing polish are not included.

Catalog No.	Description	Price/Each
AP5263	Rock Tumbler, Tumble-Vibe	$204.60

GEOLOGY continued on next page.

Geology—Rocks



Rocks, Igneous
AP4945, etc.

Rocks, Metamorphic
AP4944, etc.

Rocks, Sedimentary
AP4946, etc.

FULL COLLECTION DESCRIPTIONS AT FLINNSCI.COM

Rocks, Igneous

Catalog No.	Description	Price/Pkg. of 10
AP4945	Andesite, Hornblende Phenocrysts	$11.00
AP4948	Basalt, Flood, Dark	10.71
AP4947	Basalt, Gray to Black, Fine-Grained	10.46
AP4953	Diorite, Medium Grain with Hornblende	10.33
AP4954	Gabbro, Brown to Black, Coarse-Grained	18.36
AP4956	Granite, Gray-White, Medium-Grained	10.95
AP4965	Obsidian, Black, Glassy	10.21
AP4967	Peridotite	12.34
AP4969	Pumice, Light Gray	10.33
AP4973	Rhyolite, Gray Porphyry	10.27
AP4972	Rhyolite, Pink	10.85
AP4977	Scoria, Reddish-Brown to Dark Gray	11.19

Rocks, Metamorphic

Catalog No.	Description	Price/Pkg. of 10
AP4950	Coal, Anthracite	$11.37
AP4955	Gneiss, Coarse-Grained, Banded	12.06
AP4962	Marble, Pink	11.34
AP4963	Marble, White, Coarse	10.62
AP4964	Marble, White, Fine	11.72
AP4968	Phyllite, Gray-Green, Fine Texture	11.49
AP4970	Quartzite, Gray to White	11.13
AP4971	Quartzite, Pink	10.90
AP4978	Schist, Mica, Muscovite, Fine-Grained	10.52
AP4984	Slate, Black to Gray	10.84
AP4985	Slate, Red	10.81

Rocks, Sedimentary

Catalog No.	Description	Price/Pkg. of 10
AP4946	Arkose, Brown to Gray	$14.28
AP4949	Breccia, Gray Chert in Matrix	10.52
AP4951	Coal, Bituminous	9.86
AP4952	Conglomerate, Quartz Pebbles	10.39
AP4958	Limestone, Chalk	10.57
AP4960	Limestone, Gray, Fine-Grained	10.84
AP4959	Limestone, Shell	13.26
AP4975	Sandstone, Red, Fine-Grained	11.05
AP4974	Sandstone, Siliceous	10.17
AP4979	Shale, Bituminous, Black	10.84
AP4981	Shale, Carbonaceous, Black	11.61
AP4982	Shale, Oil, Brown	10.33
AP4983	Siltstone, Red, Gray or Buff	10.33

NewPath Learning Guides and Flip Chart Sets for Geology



AP9933

The NewPath Learning Guides and Flip Chart Sets are perfect for the classroom as well as group and independent learning. Spiral-bound in stable, free-standing easels, the 12" x 18" charts are double sided and feature a graphical overview of skills on one side and a Write-On/Wipe-Off activity chart on the other. Includes Activity Guide with copy masters of charts and review questions. Each set has 10 charts.

Catalog No.	Description	Price/Each
AP9933	Minerals FlipChart	$38.05
AP11495	All About Minerals Student Learning Guide with Online Lesson	14.95
AP11544	All About Minerals Student Learning Guide with Online Lesson, Set of 10	99.00
AP9934	Rocks FlipChart	39.50
AP11496	All About Rocks Student Learning Guide with Online Lesson	14.95
AP11545	All About Rocks Student Learning Guide with Online Lesson, Set of 10	99.00

FLINN360science™: Mechanical Weathering of Rock



This kit presents the essential concepts of earth processes and forces, mechanical weathering, water erosion, glacial activity, and geological changes through hands-on science activities designed to engage all your students, regardless of level. During this lab, students build models to simulate breaking and dissolution of rock, geological changes due to frictional forces, and glacial changes that shape the surface of Earth.

Catalog No.	Description	Digital Access	Price/Each
AP11308	360Science: Mechanical Weathering of Rock	1-Year	$79.70

FLINN360science™: Radiometric Dating of Rocks



This kit presents the concepts of half-life, radioactive decay and radiometric dating through hands-on activities designed to engage all your students. In this lab, students will count the colored chips to determine the half-life of their rock samples. Then use that half-life and the information about the parent isotope to calculate the age of their rock samples. Teachers can extend learning through associated topics such as, "How do objects and materials change over time?"

Catalog No.	Description	Digital Access	Price/Each
AP11374	360Science: Radiometric Dating of Rocks	1-Year	$34.05

Maps and Globes—Globes



The Pioneer Globe
AP5143



EarthBall® Inflatable Globe
AP7683

Catalog No.	Description	Price/Each
AP7268	The Traveler Globe	$50.88
AP5143	The Pioneer Globe	96.05
AP5156	The Atlantis Globe	99.85
AP7683	EarthBall® Inflatable Globe	19.30
AP7214	Write-On Globe	69.99

MAPS AND GLOBES continued on next page.

Maps and Globes—Lab Activities

Earth's Orbit and Seasons—Demonstration Kit

FLINN EXCLUSIVE

By: The Flinn Staff



What causes our seasons on Earth? How does Earth's revolution around the Sun influence the changing of the seasons? Demonstrate and explain the answers to these questions and more using this low-cost, highly visual kit! Use the Earth model to allow students to observe the changing of the seasons in both the Northern and Southern Hemisphere over a year's time. Students also see the variation in day length in different areas of the world at various times of the year.

Catalog No.	Description	Price/Each
AP6150	Earth's Orbit and Seasons—Demonstration Kit	$16.05

Sun-Earth Motion—Student Activity Kit

FLINN EXCLUSIVE



Does the Earth rotate around the Sun? Students will create their own primitive sundials to find out! The sundial will be used to track a shadow and further understand how the Earth rotates and the Sun appears to move through the sky. The motion of the Sun and Earth is clearly observed using this simple activity. Includes assembly instructions, detailed background information and a reproducible student worksheet.

Complete for five sundial setups.

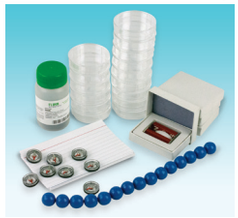
Catalog No.	Description	Price/Each
AP6625	Sun-Earth Motion—Student Activity Kit	$42.70

Maps and Globes—Lab Activities, continued

Earth's Magnetic Field—Super Value Kit

FLINN EXCLUSIVE

By: The Flinn Staff



The Earth's magnetic field is all around us! Explore the properties of the Earth's amazing magnetic field lines using iron filings, a magnetic sphere and a compass to determine the locations of North and South poles on a simulated magnetic Earth. Includes background information, detailed step-by-step instructions, student worksheets and valuable Teacher Notes.

Full-size kits are complete for 30 students in pairs. Small-size kits are complete for 10 students in pairs. Refill kits contain materials only.

Catalog No.	Description	Type	Price/Each
AP7157	Earth's Magnetic Field—Super Value Kit	Full-Size Kit	$61.40
AP10154		Full-Size, Refill Kit	55.00
AP10310		Small-Size, Refill Kit	31.78

Maps and Globes—Maps

United States Shaded-Relief Map



A spectacular map of the continental United States displaying the great diversity of the country's landforms. From across the room, detailed shading highlights the mountains, plains, rivers and valleys, giving the map a raised three-dimensional appearance. Step closer and you'll find state capitals, county seats and highways. This map brings a breathtaking view of the country right into your classroom. Colored in earth tones of greens and browns and laminated for extended life. Size: 58" x 37".

Catalog No.	Description	Price/Each
AP5160	United States Shaded-Relief Map	$107.25

Maps and Globes—Satellite Photos

The Living Earth from Space Poster



Earth comes alive in this panoramic map! See terrain features, prominent landmarks, and the natural beauty of our world with this topographical satellite image. The image was taken from a remote sensing satellite, processed, and computer-enhanced from digital data to create the layout shown. Each of the four hemispheres are shown in the lower region of the map. Size: 36" x 24"; glossy paper.

Catalog No.	Description	Price/Each
AP5296	The Living Earth from Space Poster	$21.20

Weather—Barometers

Barometer, Metric



Non-mercurial, dial-type barometer with a dual range scale. Range is 940 to 1070 millibars or 710 to 800 mm of mercury with an accuracy of ±3 to 4 millibars. Instrument can be wall mounted. 4" dial is easy to read from a distance.

Catalog No.	Description	Price/Each
AP5070	Barometer, Metric	$45.45

Barometer, Aneroid

A perfect barometer for teachers on a tight budget. Non-mercurial instrument. The 7.5"-diameter, glass-covered dial is calibrated in inches, centimeters and millibars of mercury. The pressure range is from 720–790 mm Hg. Aneroid means that the indicator hand changes position as a result of atmospheric pressure changes on an airtight metal diaphragm. Reference hand is set by a thumbscrew. The aneroid barometer consists of a cylindrical metal container, closed at the back and sides and with a dial, pointers, and a glass cover on the front. There is a circular wooden base for mounting the barometer on a wall. Includes an instruction sheet.

Catalog No.	Description	Price/Each
AP1884	Barometer, Aneroid	$148.60

Barometer, Digital



Finally—a safer alternative to the traditional mercury barometer—the new 4-in-1 digital barometer! Simultaneously display barometric pressure, humidity, temperature and time/day with this accurate, easy-to-read electronic barometer. Displays a 24-hour pressure history graph. Ideal for recording ambient changes in the lab, monitoring plant conditions and assisting in the prediction of weather changes. Features include: Barometric Pressure—Range 800 to 1100 mb/hPa; resolution of 1 mb/hPa, Humidity—Range 20 to 99% RH; resolution of 1%, Temperature—Range –4 to 140 °F/–20 to 60 °C, Time/Day—Clock displaying time to the minute in either a.m./p.m. and calendar showing month and date.

Measures 6⅝" H x 6 ⅞" With x 1¼" D. Switches permit setting in °F/°C and in Hg/mb/hPa mbars. Requires 2 AA batteries (sensor) and 3 AA batteries (base), available separately.

Catalog No.	Description	Price/Each
AP7527	Barometer, Digital	$117.00

Weather—Charts

Weather Events Poster

FLINN EXCLUSIVE

By: The Flinn Staff



A magnificent poster that is sure to grab your students' attention! Eight major weather events—clouds, lightning, rain, snow, auroras, tornadoes, rainbows, and hurricanes—are captured in stunning and detailed photographs on this visually striking poster. The perfect companion for your weather unit! Poster size 24" x 36", printed on heavy-duty laminated stock.

Catalog No.	Description	Price/Each
AP7250	Weather Events Poster	$19.08

WEATHER—CHARTS continued on next page.

Weather—Charts, continued



AP5218

AP5223

AP5221

FULL COLLECTION DESCRIPTIONS AT FLINNSCI.COM

See details at flinnsci.com.

Catalog No.	Description	Price/Each
AP5218	Cloud Chart	$13.00
AP5221	Four Seasons Chart	96.25
AP5223	Weather Map Chart	83.10

Climate Change 3-D Model Kit

NEW!



Models are powerful tools for teaching science as they provide useful simplifications of structures and processes, helping to make the unseen seen and the complex simple.

Catalog No.	Description	Price/Each
AP11703	Climate Change 3-D Model Kit	$44.95

Weather—Lab Activities

FLINN360science™: Feedback and Climate Change



This kit presents the essential concepts of carbon cycle, feedback mechanisms, and climate change through hands-on science activities designed to engage all your students, regardless of level. By completing this investigation students gain a better understanding of the composition of Earth's atmosphere, and how gases like carbon dioxide and water vapor trap some of the radiation emitted by Earth. Teachers can extend learning through guided inquiry into associated phenomena including, "How do we design materials for specific functions?"

Catalog No.	Description	Digital Access	Price/Each
AP10347	360Science: Feedback and Climate Change	1-Year	$70.65
AP10447		3-Year	88.30

FLINN360science™: Albedo and Composition of Earth's Surface



Students gain essential concepts of albedo, solar radiation, and specific heat through hands-on science activities designed to engage and will find that there is a tradeoff between removal rate and the quality of the surface finish. Teachers can extend learning through guided inquiry into associated phenomena including, "What causes droughts?" and "How are they impacted by climate change?"

Catalog No.	Description	Digital Access	Price/Each
AP10392	360Science: Albedo and Composition of Earth's Surface	1-Year	$47.10
AP10492		3-Year	64.00

FLINN360science™: How Melting Ice Affects Sea Level



This kit presents the concepts of climate change and rising sea levels through hands-on science. After completing this investigation students will have a much better understanding of how the melting of ice located in the sea and melting of the ice located on land influence sea level differently. Teachers can extend learning through guided inquiry into associated phenomena including, "What causes flooding? How is it impacted by climate change?"

Catalog No.	Description	Digital Access	Price/Each
AP10394	360Science: How Melting Ice Affects Sea Level	1-Year	$76.55
AP10494		3-Year	92.50

FLINN360science™: Observe Air Pollution



This kit presents the essential concepts of air pollution and climate change through hands-on science activities designed to engage all your students, regardless of level. After completing this investigation students will gain a better understanding of how human activity has added other substances into the atmosphere, creating an imbalance and causing the quality of air to degrade. Teachers can extend learning through guided inquiry into associated phenomena including, "How does climate change impact our health?"

Catalog No.	Description	Digital Access	Price/Each
AP10395	360Science: Observe Air Pollution	1-Year	$70.65
AP10495		3-Year	87.00

FLINN360science™: Catching Rainwater



This kit presents the essential concepts of climate change, rainwater and flooding through hands-on science activities designed to engage all your students, regardless of level. Students gain a better understanding of one of the challenges associated with an increase in urbanization. Teachers can extend learning through guided inquiry into associated subjects such as, "What causes flooding? How is it impacted by climate change?"

Catalog No.	Description	Digital Access	Price/Each
AP10421	360Science: Catching Rainwater	1-Year	$150.15
AP10521		3-Year	160.17

FLINN360science™: Design a Green Roof



Through hands-on science, this kit presents concepts of climate change, rainwater collection and flooding. Students determine through testing that a green roof reduces internal temperature change in a building compared to a control. Teachers can extend learning through guided inquiry into associated subjects such as, "What are the causes of and possible solutions to climate change?"

Catalog No.	Description	Digital Access	Price/Each
AP10431	360Science: Design a Green Roof	1-Year	$145.00
AP10531		3-Year	164.60

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FLINN EXCLUSIVE

Catalog No.	Description	Price/Each
AP5074	Flinn Weather—Activity Kit	$ 66.35
AP7267	Weather Events—Activity-Stations Kit	78.60
AP7349	Weather Map Symbol Bingo—Super Value Game	34.80
AP6449	Measuring Relative Humidity and Dew Point—Student Laboratory Kit	164.60

WEATHER continued on next page.

Weather—Models

Ultimate Cloud-Forming Apparatus

FLINN EXCLUSIVE

By: The Flinn Staff



Create atmospheric conditions that produce rain, fog and clouds. By introducing smoke from a burning match and a little water vapor to the cloud-forming apparatus, you can create a dense cloud over and over again simply by squeezing and releasing the large rubber bulb. Under high pressure, air can hold a greater amount of water vapor than it can under less pressure. When the pressure is lowered suddenly, the excess vapor condenses and forms tiny droplets around each smoke particle.

Catalog No.	Description	Price/Each
AP5302	Ultimate Cloud-Forming Apparatus	$34.80

Weather—Psychrometers

Sling Psychrometer, Stainless Steel



Two non-mercuric-filled thermometers, one with a cotton wick attached to its bulb, are securely attached to a stainless steel metal frame. The attached wooden swivel handle allows the user to freely swing the psychrometer. Thermometers are 24 cm long and have a range of –20 to 120 °F.

Catalog No.	Description	Price/Each
AP5069	Sling Psychrometer, Stainless Steel	$139.45

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PLEASE CALL US

Sling Psychrometer—Student Activity Kit

FLINN EXCLUSIVE



An easy-to-use and inexpensive sling psychrometer. Quickly determine dew point and relative humidity with the wet-bulb/dry-bulb technique. Includes two thermometers mounted on stiff vinyl backing, wet-bulb sleeve, sling handle and mounting screw. A reproducible instruction sheet provides concept explanation s, psychrometer chart and sample calculations.

Individual kit is complete for one psychrometer. Small-size kits include materials to make 5 psychrometers. Full-size kits include materails to make 15 psychrometers. Refill kits contain materials only.

Catalog No.	Description	Type	Price/Each
FB1582	Sling Psychrometer—Student Activity Kit	Full-Size	$118.77
FB0543		Individual Kit	11.34
AP10180		Full-Size, Refill Kit	77.28
AP10258		Small-Size	66.40
AP10102		Small-Size, Refill Kit	115.43

Weather—Rain Gauges

Rain Gauge



Durable, transparent plastic construction with clear, permanent graduations. Dual scale markings measure up to 5.0" or 127 mm. Gauge can be pole mounted or installed in the ground using the 4½" tapered base.

Catalog No.	Description	Price/Each
FB0559	Rain Gauge	$11.25

Rain Gauge, Clear-Vu™



Everything you need to accurately collect and record rainfall. The Clear-Vu rain gauge is a precision instrument designed to give accurate precipitation measurement. The heavy-duty plastic cylinder has a 2"-diameter opening and can collect up to 5" of precipitation. Readability is accurate to a hundredth of an inch. The rain gauge is easy to install and comes with a one-piece rustproof mounting bracket. Record sheets are provided to track precipitation on a daily basis for five years. Instructions provided.

Catalog No.	Description	Price/Each
AP5071	Rain Gauge, Clear-Vu	$21.00

Weather—Thermometers

Thermometer, Whiteback/Wall



An all-purpose, utility thermometer for classrooms, storage areas, greenhouses, and outdoors. Thermometer is securely affixed to an aluminum and plastic frame which enables attachment to any vertical surface or post (mounting screws included). Bright white background, red column, and large black graduations provide readability at 15 to 20'. Graduated in Fahrenheit (–74 to 130) and Celsius (–60 to 55).

Catalog No.	Description	Price/Each
FB0558	Thermometer, Whiteback/Wall	$11.10

Thermometer, Indoor/Outdoor with Hygrometer



Measure indoor and outdoor temperature as well as indoor humidity in this self-contained combination unit. Both instruments have large, easy-to-read graduations. Installation can be completed in minutes. Wall mounted. Size: 24 x 6 cm.

Catalog No.	Description	Price/Each
AP5064	Thermometer, Indoor/Outdoor with Hygrometer	$24.95

Thermometer, Classroom, Indoor/Outdoor



Large, 12" diameter, easy-to-read instrument that can be mounted either indoors or out. These thermometers have 1¼" outside figures which can be read from across the laboratory. The instrument is accurate to within ±2°. Thermometer is calibrated in both Celsius and Fahrenheit.

Catalog No.	Description	Price/Each
AP1627	Thermometer, Classroom, Indoor/Outdoor	$35.60

Digital Hygro-Thermometer Clock



This digital "mini-monitor" makes collecting basic temperature and humidity data easy. Features include: three large LCDs display temperature, humidity, and time; provides maximum/minimum readings for temperature and humidity; easy reset function for maximum/minimum readings; ranges: temperature –4 to 122 °F –20 to 50 °C humidity 25–95%; and Complete with built-in tilt stand and 1.5 V AAA battery. Ideal for desktop or wall mounting. Dimensions: 4⅝" x 2 13/16" x 13/16".

Catalog No.	Description	Price/Each
FB1166	Digital Hygro-Thermometer Clock	$48.98

WEATHER continued on next page.

Weather—Weather Stations

Weather Center



Create a weather station right in your classroom with these durable meteorological instruments! Measure barometric pressure, relative humidity and air temperature, and record the trends, averages, and highs and lows. Sturdy carrying case holds a 3" barometer, hygrometer, and Celsius and Fahrenheit thermometer, as well as three stands for using the instruments individually. Included Activity Guide explains in detail how to use each instrument.

Catalog No.	Description	Price/Each
AP9339	Weather Center	$52.00

Weather Station, Wireless



Easy to read, easy to program, and affordable. Data updates every 4 seconds giving you an accurate weather picture. Displays both outside and inside temperatures as well as a min/max temperature that can be reset at the touch of a button. Weather forecasting icons and weather tendency indicator is determined by a barometric pressure reading that causes the icon to change when a significant change in pressure occurs. Wireless sensor transmits weather data 330 feet. Wall hanging or free standing. Requires 3 AA batteries for the receiver and 2 AA batteries for the sensor.

Catalog No.	Description	Price/Each
AP7462	Weather Station, Wireless	$59.25

Vantage Pro2™ Wireless Weather Station



Vantage Pro2 Wireless Weather Station is a research-grade weather station that provides professional-grade data for weather enthusiasts, researchers, growers, and weather professionals. It reports real-time wind speeds up to 200 mph, temperature and humidity, barometric pressure, rainfall and other information such as heat index, dew point, highs and lows, and much more.Vantage Pro2 sensors are NIST-traceable and are suitable for professional weather data reporting. Now includes WeatherLink Console & Standard Radiation Shield.

The Vantage Pro2 weather station provides the technology and real-time data you need to respond to changing conditions and make timely decisions. Engineered to handle rugged environments and deliver data with scientific precision year after year, the economical Vantage Pro2 offers the professional weather observer, or serious weather enthusiast, a robust performance with a wide range of options and sensors. The WeatherLink Console revolutionizes the way you access, analyze, and understand your hyperlocal weather data. One intuitive device lets you receive and display data from your local network and connect to Wi-Fi to push your data to the WeatherLink Cloud.

Catalog No.	Description	Price/Each
AP7538	Vantage Pro2™ Wireless Weather Station	$1270.00

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Solar-Powered Weather Station



AP10542

Say goodbye to electricity and power cords—this weather station and its sensors are powered by solar energy! All the weather-monitoring features you need are provided in this lightweight, professional quality weather station. Measure wind speed and direction, temperature, barometric pressure, rainfall and relative humidity. The station computes wind chill and dewpoint, shows wind direction variations and stores maximum and minimum data readings. A sealed battery is powered by solar panels, which are adjustable for latitude optimization depending on geographic location. The station's transmitter is 28" H x 15" With x 10" D and can be located anywhere up to 1 mile of the long range digital display panel (available separately). Two-year manufacturer warranty.

The Long Range Digital Display panel allows you to see an array of weather monitoring data. Set the display to auto to continuously scan each weather category in sequence every 2 seconds. With a bright, clear LED readout visible from 25 feet away even in the dark, the panel can be wall mounted or placed on a countertop. 5¾" H x 7¾" With x 1¾" D.

Access your data anytime, anywhere with the Network Interface Module. Every 3–5 seconds, this interface sends data received by the weather station to a cloud-based dashboard portal, making it available and accessible in real time on nearly any Internet-capable device with up to two years of on-demand data archiving and the ability to export your data for analysis.

Weather Station Specifications:

Temperature: –40 to 140 ºF (–40 to 60 ºC); accuracy ±0.4 ºF (±0.2 ºC).
Barometric Pressure: 300 to 1100 mbar; accuracy ±0.5 mbar; resolution 1 mbar.
Relative Humidity: 0–100%; accuracy ±2% for 10 ≤ %RH ≤ 90 at 25 ºC; resolution 1%.
Wind Speed: 0–67 m/s.
Wind Direction: 0–360º.
Rainfall: 28.6" per hour; resolution to 0.01"; accuracy ±2% at 1" per hour.

Catalog No.	Description	Price/Each
AP10542	Solar-Powered Weather Station	$1171.70
AP10543	Network Interface Module for Weather Station	523.55
AP10544	Long Range Display for Weather Station	583.00

Weather—Wind Speed Indicators

Digital Anemometer



This portable digital anemometer measures wind speed conveniently and accurately whether the wind is fast or slow. Additional temperature and RH readings make this an excellent tool for environmental field studies. Automatic shut-off feature conserves battery life. Includes clear, concise instructions, button cell battery, and a sturdy carrying case with a wrist strap.

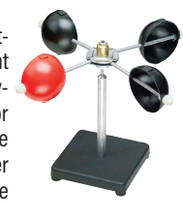
Catalog No.	Description	Price/Each
FB2081	Digital Anemometer	$154.00

Anemometer, Pocket

A dual-scale, portable instrument for gauging wind speed. Simple, yet highly accurate. The low-range scale (2 to 10 mph) has an accuracy of ±0.5 mph; the high-range scale (4 to 66 mph) has an accuracy of ±3 mph. The durable plastic instrument comes complete with instructions and a protective case.

Catalog No.	Description	Price/Each
FB0507	Anemometer, Pocket	$75.00

Anemometer, Working Model



An extremely sensitive, model anemometer for demonstrating the principles of wind velocity measurement. Instrument consists of four cups (5 cm diameter) mounted on a low-friction axle—securely affixed to a molded plastic base for stability. The super-smooth, cone-bearing hub allows the anemometer to rotate in breezes as gentle as two miles per hour. One cup is painted a high-contrast color to facilitate counting of rotations. Complete with instructions for classroom demonstration.

Catalog No.	Description	Price/Each
FB0508	Anemometer, Working Model	$26.05



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At Flinn, we want to help you make the most of every dollar and every lab. Count on us when you're looking for the highest quality, most dependable products and the most effective lab solutions. And if you ever have a question, Flinn can help-whether it's a one-on-one call with one of our scientists or a follow-up call with your account representative, we're here for you.

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Technology

Technology makes your classroom life easier, but often it can be complicated. Flinn Scientific has chosen **the best tech tools to deliver the most benefit to your classroom**

540 **Calculators**

540 **Lab Manuals**

539 **Pasco Sensors**

536 **Tools,** 3D Printers, VR Headsets, Document Camera

536 **Vernier Interface Systems,** Software and Sensors

3D Printers

3Doodler® DoodlePad

With the 3Doodler® DoodlePad, you can doodle over stencils or other items. The DoodlePad also helps you keep your doodles in place and peel them off with ease.

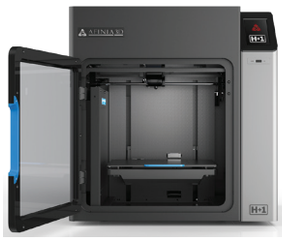
Catalog No.	Description	Price/Each
AP9425	3Doodler® DoodlePad	$11.45

3Doodler® Foot Pedal

3Doodler® Foot Pedal gives you the freedom to doodle from various angles and for longer periods of time without holding down the pen's extrusion buttons. The pedal connects to the control port on the 3Doodler pen and allows you to use your foot to control extrusion.

Catalog No.	Description	Price/Each
AP9424	3Doodler® Foot Pedal	$12.40

Afinia 3D Printers



Start 3D printing in no time! Afinia 3D printers are shipped fully assembled, ready to use and with all the materials you'll need, so you can start printing in minutes. A HEPA air filtration system reduces 3D printing air emissions for a safer 3D printing environment. Includes a one-year limited warranty.

Catalog No.	Description	Type	Price/Each
WAP-P4	3D Printer	Afinia H+1	$2850.00
WAPABSBLA	ABS Premium Filament	Black	67.76
WAPABSBLU		Blue	67.76
WAPABSGRN		Green	67.76
WAPABSNAT		White	67.76
WAPABSRED		Red	67.76
WAPABSYLW		Yellow	67.76
WAPPLAAL	PLA Specialty Filament	Aluminum	29.98
WAPPLACPR		Copper	29.98

VR Headsets



Welcome to the future! This virtual reality headset connects to a smart phone and projects 3D images right before your eyes. Simply position the headset on your head and over eyes. With 360 degree capabilities, it will seem as though you are part of the 3D image. Follow the image as you turn your head from side to side. Use the amazing standalone technology as a teaching tool in the classroom and you will be sure to capture and sustain student's attention!

Catalog No.	Description	Price/Each
AP9887	VR Headset, Cardboard	$9.51

Document Camera



This high resolution document camera is an easy way to integrate technology into your classroom! See full specification details at flinnsci.com.

Catalog No.	Description	Price/Each
AP7641	Document Camera	$1459.50

Vernier Interface Systems and Software

LabQuest™ Mini

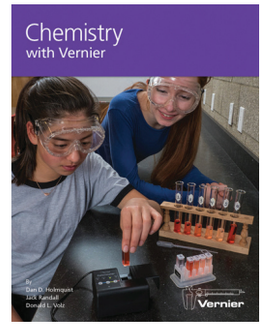


An affordable and powerful solution for data collection in the classroom. Students of all ages and experience levels will be able to collect and analyze data like professionals with this easy-to-use Vernier device. The LabQuest Mini connects easily to a Windows or Macintosh computer in a "plug-and-go" fashion—simply plug it in, open the software and you are ready to work! A maximum sampling rate of 100,000 samples per second allows you to take full advantage of the LabQuest interface. Five sensor ports—three analog inputs and two digital inputs—are available and can be used with more than 50 compatible sensors. Students can start collecting, graphing and analyzing data right away after the simple installation of the Logger Lite™ software that can be downloaded from the Vernier website. Also works with Logger *Pro*® 3 software, which is sold separately (Catalog No. TC1421). Compatible with Windows, iOS or Chromebook operating systems.

Catalog No.	Description	Price/Each
TC1559	LabQuest™ Mini	$214.29

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Chemistry with LabQuest 3™ Starter Kit



Chemistry with Vernier LabQuest 3™ Technology Starter Kit for data collection contains LabQuest 3™ Interface System, Chemistry with Vernier lab manual, two stainless steel temperature probes, pH sensor, and gas pressure sensor.

Catalog No.	Description	Price/Each
TC1647	Chemistry with LabQuest 3™ Starter Kit	$807.92

Logger *Pro*® *3* Software for Windows® and Macintosh



This award-winning software is the ultimate in data-collection software! Collect, graph, analyze, and print your data all with the same easy-to-learn and easy-to-operate program! You'll be amazed with the fabulous features available, including graphic, image, and video analysis capabilities. Easily share data wirelessly with iPads, Android devices, most smartphones, and even other computers. Logger *Pro 3* also includes experiment files for each and every probe and sensor we have available, so it's the only software you need! Logger *Pro 3* includes a free site license, so you only need one copy for your entire school! You and your students are sure to love this exciting, easy-to-use software. Requires a Windows or OS operating system.

Catalog No.	Description	Price/Each
TC1421	Logger *Pro*® *3*	$345.72

Vernier Go Direct® Sensors

Go Direct sensors connect directly to your mobile device, Chromebook or computer using the free Graphical Analysis™ 4 app—no additional equipment or software purchases are necessary. Go Direct sensors can be used wired via USB or wirelessly via Bluetooth. Most Go Direct sensors feature a robust rechargeable battery that offers long battery life and provides always-ready operation.

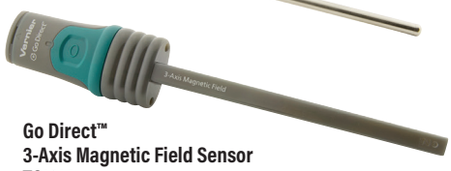
Detailed specification information for each sensor listed is available at flinnsci.com.



Go Direct pH Sensor
TC1610



Go Direct™ Temperature Sensor
TC1607



Go Direct™
3-Axis Magnetic Field Sensor
TC1614



Go Direct™ SpectroVis® Plus Spectrophotometer
TC1606



Go Direct Gas Pressure Sensor
TC1616



Go Direct Constant Current System
TC1622



Go Direct™
Colorimeter
TC1615



Go Direct™ Force and Acceleration Sensor
TC1609

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Catalog No.	Description	Price/Each
TC1614	Go Direct 3-Axis Magnetic Field Sensor	$ 105.00
TC1637	Go Direct Acceleration Sensor	130.00
TC1628	Go Direct Ammonium Selective Electrode	305.00
TC1689	Go Direct Blood Pressure Sensor	125.00
TC1642	Go Direct Carbon Dioxide Gas Sensor	285.00
TC1690	Go Direct Centripetal Force System	325.00
TC1633	Go Direct Charge Station	105.00
TC1691	Go Direct Chemical Polarimeter	545.00
TC1615	Go Direct Colorimeter	164.89
TC1617	Go Direct Conductivity Sensor	143.61
TC1622	Go Direct Constant Current System	93.83
TC1630	Go Direct Current Probe	109.00
TC1692	Go Direct Cylic Voltammetry System	999.00
TC1623	Go Direct Drop Counter	125.00
TC1641	Go Direct EKG	208.50
TC1693	Go Direct Emissions Spectrometer	950.00
TC1629	Go Direct Energy Sensor	109.00
TC1694	Go Direct Ethanol Vapor	169.00
TC1695	Go Direct Flat pH Electrode BNC	83.00
TC1696	Go Direct Flat pH Sensor	134.00
TC1697	Go Direct Fluorescence/UV-Vis Spectrophotometer	2999.00
TC1609	Go Direct Force and Acceleration Sensor	135.10
TC1698	Go Direct Force Plate	399.00
TC1616	Go Direct Gas Pressure Sensor	117.35
TC1699	Go Direct Hand Dynamometer	129.00
TC1613	Go Direct Light and Color Sensor	107.10
TC1620	Go Direct Melt Station	693.88
TC1700	Go Direct Mini GC™	3599.00
TC1612	Go Direct Motion Detector	132.65
TC1627	Go Direct Nitrate Ion-Selective Electrode	305.00
TC1635	Go Direct Optical Dissolved Oxygen Probe	465.00
TC1621	Go Direct Oxidation-Reduction Potential	125.00
TC1636	Go Direct Oxygen Gas Sensor	260.62

Catalog No.	Description	Price/Each
TC1701	Go Direct PAR	$ 299.00
TC1610	Go Direct pH Sensor	127.55
TC1611	Go Direct pH Sensor, Teacher Pack, Pack of 8 with Charging Station	984.69
TC1702	Go Direct Photogate	95.00
TC1703	Go Direct Projectile Launcher	499.00
TC1704	Go Direct Pyranometer	299.00
TC1618	Go Direct Radiation Monitor	239.35
TC1632	Go Direct Respiration Belt	135.00
TC1631	Go Direct Rotary Motion Sensor	235.00
TC1705	Go Direct Salinity Sensor	180.00
TC1643	Go Direct Sensor Cart	228.71
TC1706	Go Direct Sensor Cart Accessory Kit	62.00
TC1707	Go Direct Sensor Cart Charge Station	149.00
TC1708	Go Direct Soil Moisture Sensor	149.00
TC1606	Go Direct SpectroVis® Plus Spectrophotometer	525.00
TC1709	Go Direct Spirometer	219.00
TC1710	Go Direct Static Charge	109.00
TC1711	Go Direct Structures & Materials Tester	1199.00
TC1634	Go Direct Surface Temperature Sensor	109.00
TC1712	Go Direct Temperature Probe	78.00
TC1607	Go Direct Temperature Sensor	99.00
TC1608	Go Direct Temperature Sensor, Teacher Pack, Pack of 8 with Charging Station	795.00
TC1713	Go Direct UV-Vis Spectrophotometer	2499.00
TC1714	Go Direct Visible Spectrophotometer	1899.00
TC1619	Go Direct Voltage Sensor	101.02
TC1715	Go Direct Weather	129.00
TC1716	Go Direct Weather System	158.00
TC1717	Go Direct Weather Vane	29.00
TC1718	Go Direct Wide-Range Temperature Probe	139.00
TC1719	Go Direct Wide-Range Pressure Sensor	219.00
TC1720	Go Direct Wide-Range Pressure Liquid	249.00
TC1688	Fan Cart	119.00

Vernier Sensors

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Constant Current System
TC1592



Radiation Monitor
TC1564



Go Wireless® Heart Rate
TC1573



pH Sensor
TC1503



Colorimeter
TC1504



Polarimeter
TC1593



Ethanol Sensor
TC1579



Spirometer
TC1580



Drop Counter
TC1544



Thermocouple
TC1523

Catalog No.	Description	Price/Each
TC1502	Temperature Probe	$ 44.67
TC1523	Thermocouple	85.00
TC1544	Drop Counter	119.45
TC1590	UV-Vis Spectrophotometer	3283.88
TC1503	pH Sensor	105.10
TC1505	Gas Pressure Sensor	109.65
TC1506	Voltage Probe	17.79
TC1504	Colorimeter	141.84
TC1592	Constant Current System	90.00
TC1507	Conductivity Sensor	138.30
TC1508	Light Sensor	76.85
TC1564	Radiation Monitor	234.56
TC1513	Barometer	92.81
TC1531	EKG Sensor	208.92
TC1511	Relative Humidity Sensor	86.07
TC1573	Go Wireless® Heart Rate	109.56
TC1166	Respiration Monitor Belt	81.14
TC1580	Spirometer	281.90

Catalog No.	Description	Price/Each
TC1593	Polarimeter	$595.00
TC1175	Nitrate Ion-Selective Electrode	297.11
TC1579	Ethanol Sensor	146.00
TC1514	CO_2 Gas Sensor	372.45
TC1515	Oxygen Gas Sensor	229.69
TC1562	O_2 Gas Sensor to Spirometer Adapter	7.56
TC1583	Optical Dissolved Oxygen Sensor	425.00
TC1528	Turbidity Sensor	142.72
TC1516	Dual-Range Force Sensor	147.93
TC1517	Vernier Photogate	60.04
TC1518	Accelerometer	123.50
TC1519	Low-*g* Accelerometer	124.65
TC1541	Current Probe	52.00
TC1542	Differential Voltage Probe	52.00
TC2322	Microphone	63.80
TC2321	Motion Detector 2	122.40
TC1524	Magnetic Field Sensor	77.00

PASCO Sensors

NEW!

PASCO provides educators with the most complete and innovative classroom solutions on the market.

PASCO's line of Wireless Sensors improve the efficiency of experimental setups by allowing chemistry students to monitor key measurements on their personal devices. Featuring long-lasting batteries, remote data logging, and real-time data reporting, these durable sensors effectively eliminate the need for continuous monitoring, freeing students from their lab notebooks to focus on the phenomenon at hand.

After the experiment is complete, data can be easily altered and analyzed within the software, exported to Excel, shared with lab members, or printed for physical lab reports. Reduce bench clutter with PASCO space-saving lab essentials or analyze samples directly at the field site with compact analytical solutions.

Detailed specification information for each sensor listed is available at flinnsci.com.

Catalog No.	Description	Price/Each
TC1648	PASCO Wireless Spectrometer (VIS)	$ 575.00
TC1649	PASCO Wireless Temperature Sensor	79.00
TC1650	PASCO Wireless Pressure Sensor	123.00
TC1651	PASCO Wireless pH Sensor	123.00
TC1652	PASCO Wireless CO_2 Sensor	265.00
TC1653	PASCO Wireless Conductivity Sensor	155.00
TC1654	PASCO Wireless Voltage Sensor	97.00
TC1655	PASCO Wireless Current Sensor	115.00
TC1656	PASCO Wireless Drop Counter	143.00
TC1657	PASCO Wireless Colorimeter & Turbidity Sensor	165.00
TC1658	PASCO Wireless Oxygen Gas Sensor	255.00
TC1659	PASCO Wireless Temperature Sensor Link	102.00
TC1660	PASCO Wireless Polarimeter	799.00
TC1661	PASCO Wireless Melting Point Apparatus	799.00
TC1662	PASCO UV/VIS Spectrometer	2900.00
TC1663	PASCO Wireless Geiger Counter	329.00
TC1664	PASCO Wireless Force Acceleration Sensor	136.00
TC1665	PASCO Wireless Motion Sensor	150.00
TC1666	PASCO Wireless Rotary Motion Sensor	205.00
TC1667	PASCO Wireless Magnetic Field Sensor	115.00
TC1668	PASCO Wireless Acceleration/Altimeter	140.00
TC1669	PASCO Wireless Smart Gate	165.00
TC1670	PASCO Wireless Sound Sensor	115.00
TC1671	PASCO Wireless Force Platform	899.00
TC1672	PASCO Wireless 2-Axis Force Platform	1099.00
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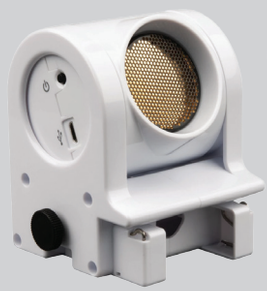
PASCO Wireless Temperature Sensor TC1649



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TC1331	Physics with Vernier	61.51
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Calculators

CBL-2

CBL-2 system comes with the following features:

- Flash memory: Approximately 500 KB allows users to save experiment setups, store multiple trials and archive calculator programs.
- Built-in user program: DataMate software program quickly transfers data to the calculator with one button.
- Quick setup mode: Collect data without the calculator and reconnect to a calculator to retrieve and analyze data.
- Performance: Collect around 12,000 data points at up to 5,000 points per second channels (50,000 points per second on a single channel).
- Compatibility: Compatible with TI-73 Explorer, TI-82, TI-83, TI-83 Plus, TI-84 Plus, TI-84 Plus C Silver Edition, TI-86, TI-89, TI-89 Titanium, TI-92, TI-92 Plus and TI Voyage calculators. Also compatible with Flinn/Vernier sensors and manuals. Not compatible with TI-84 Plus CE or TI-Nspire handhelds.
- Four data-collection channels: three analog, one sonic/bi-directional digital.

Includes 3 sensors—an improved stainless steel temperature sensor, voltage sensor and light sensor. Includes innovative cradle system and a 6" link cable. When ordering additional sensors, look for the sensors with a BT connector for maximum performance and ease of use.

Catalog No.	Description	Price/Each
TC1525	CBL-2	$286.23

Calculator-Based Ranger™ 2

The Ranger collects distance, velocity, and acceleration data and contains built-in programs to download to the TI graphing calculator.

Catalog No.	Description	Price/Each
TC2325	Calculator-Based Ranger 2	$165.00

TI-84 Plus CE Graphing Calculator

Enhanced screen readability with high-resolution and backlit display allow users to visualize concepts clearly and achieve faster and stronger connections and make it easier to distingbetween multiple equations, data and graphs in full color. Approved for PSAT, SAT, ACT, AP Exams and Praxis tests. Classroom Package includes 10 calculators, 5 USB computer cables, 5 unit-to-unit cables, a Getting Started Guide and a classroom poster. Specifications: rechargeable battery (included) and USB port; screen size: 320 × 240 pixels; horizontal and vertical split-screen options; 154 KB of available RAM memory; 15 colors for function graphing and 8 different graph styles; one-year limited warranty.

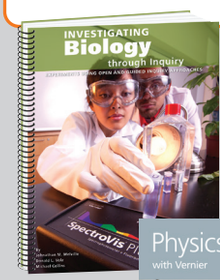
Catalog No.	Description	Price/Each
TC1599	TI-84 Plus CE Graphing Calculator	$ 254.39
TC1600	TI-84 Plus CE Graphing Calculator, Classroom Package	2396.08

TI-83 Plus Graphing Calculator

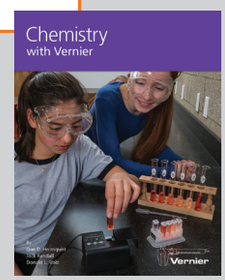
The TI-83 Plus contains Flash ROM technology. The Flash ROM can be used to store and execute calculator software applications, and it enables the calculator to be electronically upgraded.

Catalog No.	Description	Price/Each
TC2306	TI-83 Plus Graphing Calculator	$191.40

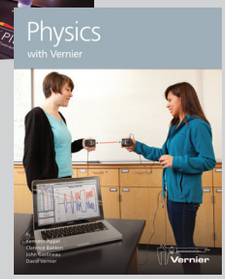
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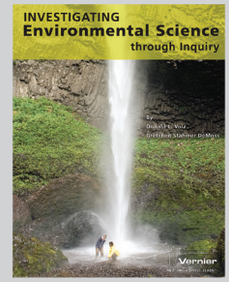
TC1563



TC1303



TC1331



TC1574



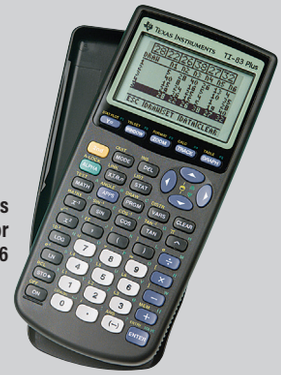
CBL-2
TC1525



Calculator-Based Ranger 2
TC2325



TI-84 Plus CE Graphing Calculator
TC1599

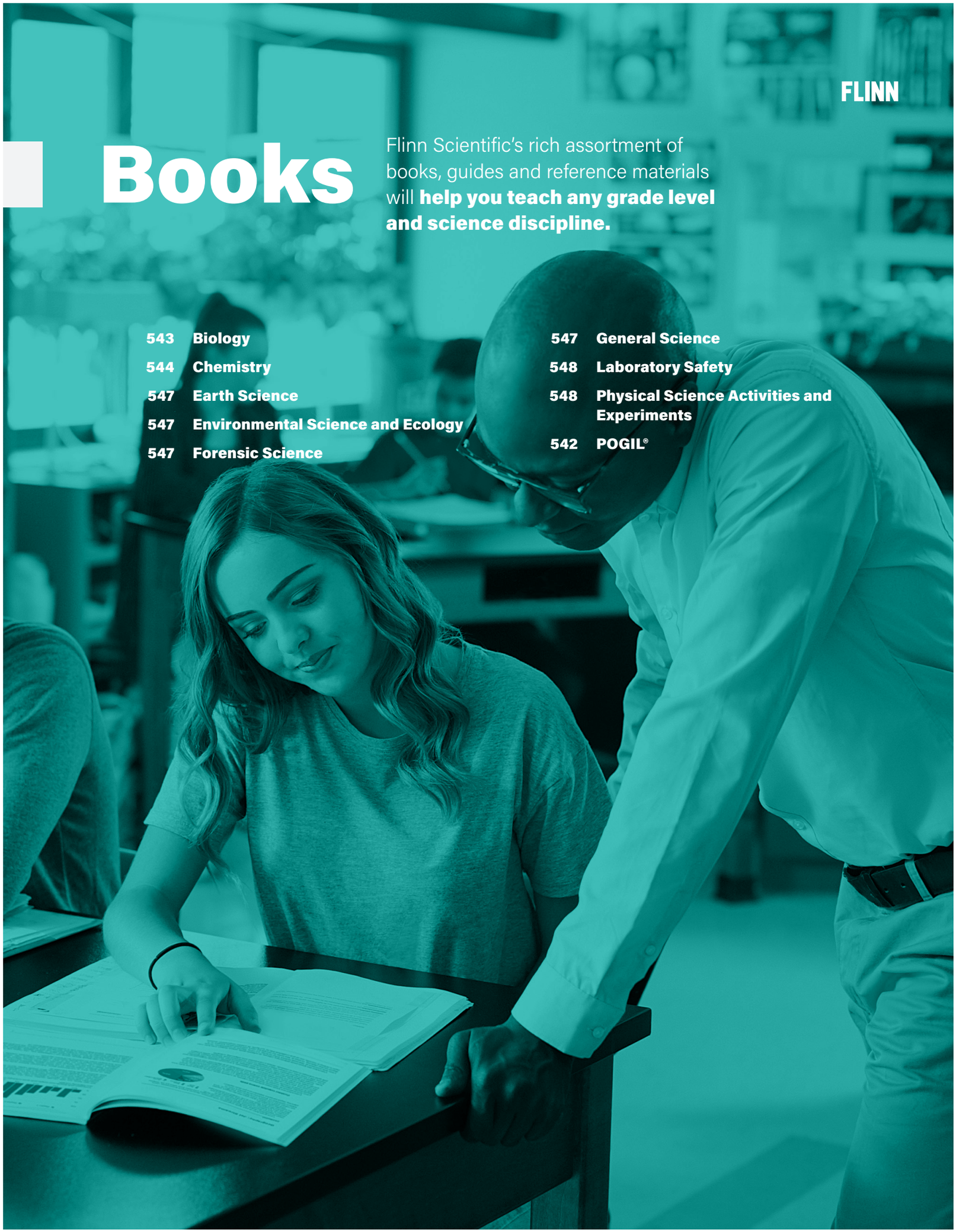


TI-83 Plus Graphing Calculator
TC2306

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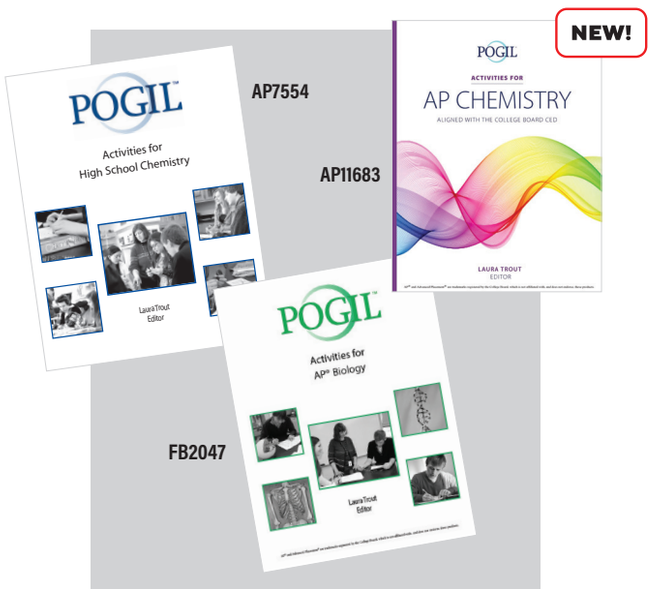
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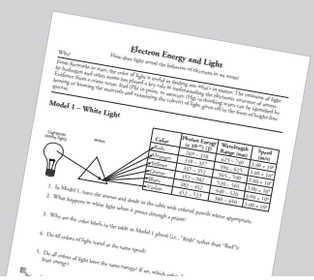
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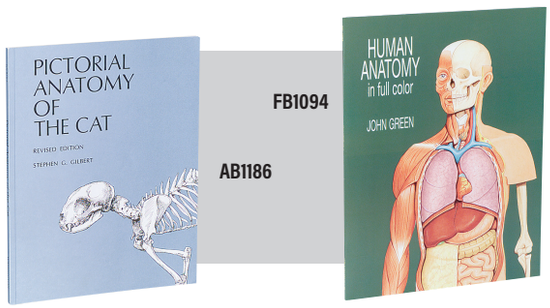
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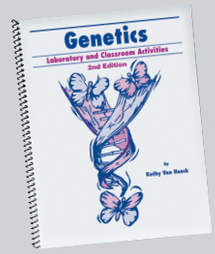
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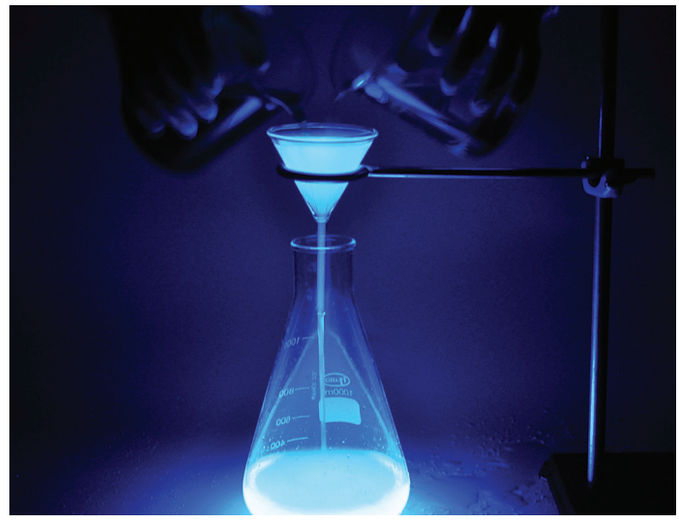
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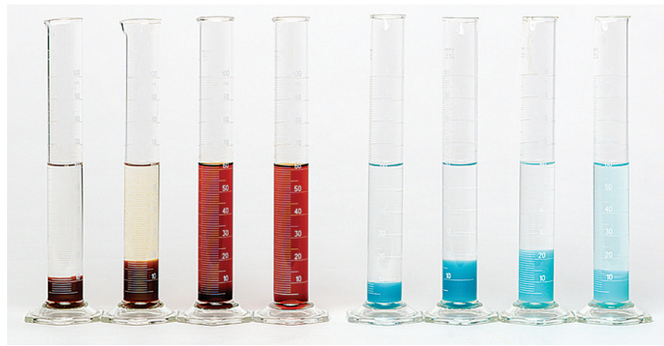
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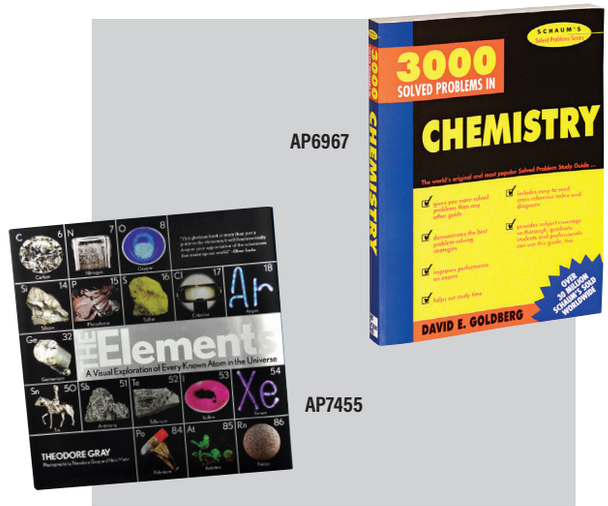
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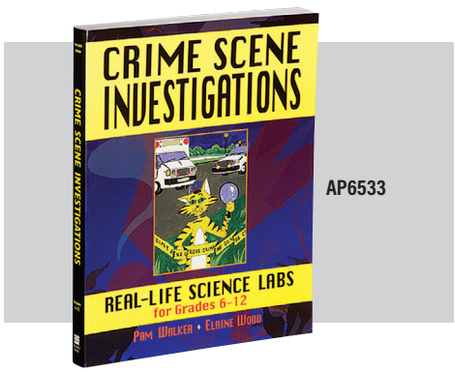
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AP6533

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AP8333

AP10948

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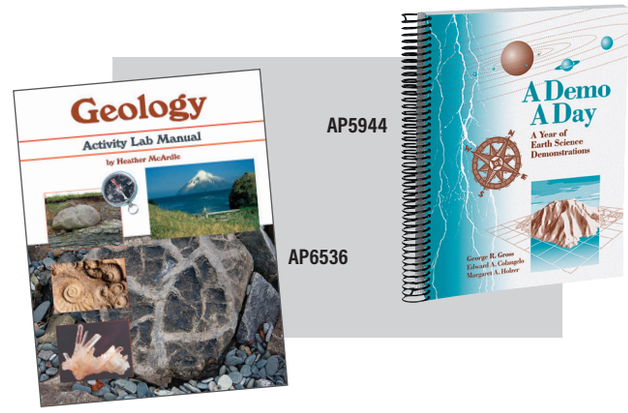
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AP5944

AP6536

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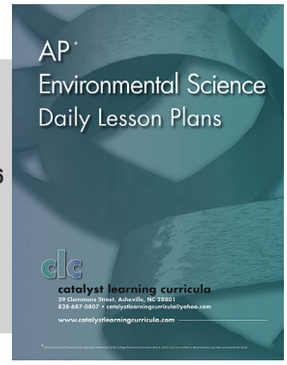
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AP5970	Easy Science Demos & Labs—Earth Science	$30.88
AP6344	Hands-On Science Series—Earth Science—Our Solar System	32.10
AP5321	Daily Warm-Ups: Earth Science	36.70
AP5963	Hands-On Earth Science Activities	43.30
AP10951	Earth Science NewPath Learning Vocabulary Flash Cards	28.52
FB1020	Environmental Science Activities Kit	49.25
AP5907	Peterson Guides—Stars and Planets	29.30
AP5257	Golden Guides—Fossils	11.00
AB1111	Golden Guides—Rocks and Minerals	10.35

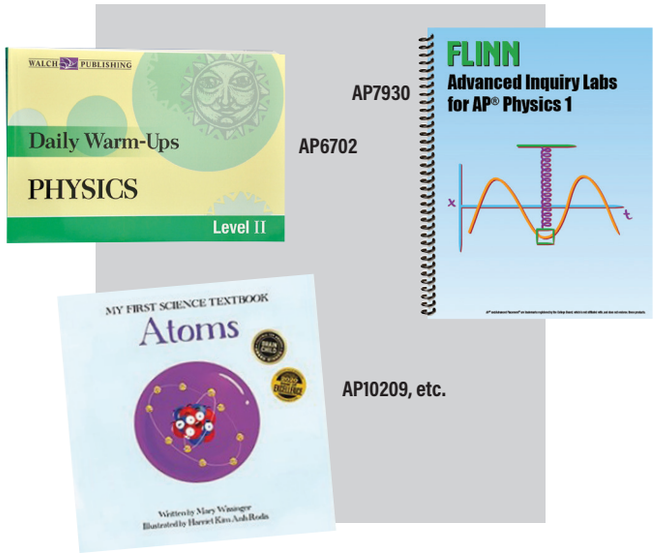
Environmental Science and Ecology



AP7866

Catalog No.	Description	Price/Each
AP7866	AP® Environmental Science Daily Lesson Plans CD	$731.60

Physical Science



Activities and Experiments

FLINN EXCLUSIVE

Catalog No.	Description	Price/Each
AP7930	Flinn Advanced Inquiry Labs for AP® Physics 1 Lab Manual	$160.35
AP8072	Flinn Advanced Inquiry Labs for AP® Physics 2 Lab Manual	156.60
AP7305	A Demo A Day™—A Year of Physics Demonstrations	49.95
AP9305	A Demo A Day™—A Year of Physical Science Demonstrations	38.70

Activities and Experiments

Catalog No.	Description	Price/Each
AP6702	Daily Warm-Ups: Physics	$35.98
AP8827	Hands-On Physics Activities with Real-Life Applications	50.60
AP9175	Hands-On Physical Science Activities	48.95
AP6705	Physics Challenge: A Classroom Quiz Game	29.44
AP10952	Physical Science NewPath Learning Vocabulary Flash Cards	28.52

My First Science Textbook

My First Science Textbooks are a lighthearted and fun way to introduce subatomic particles to young readers. Available in both hardback and board book formats. These books are scientifically accurate, so not only will they capture children's attention, they will also introduce real concepts from the fields of physics and chemistry helping to foster a lifelong love of learning. Hardcover, 32 pages. Board book, 25 pages.

Catalog No.	Description	Price/Each
AP10209	My First Science Textbook: Atoms (Hardcover)	$16.94
AP10213	My First Science Textbook: Atoms (Board Book)	11.21
AP10207	My First Science Textbook: Electrons (Hardcover)	16.94
AP10243	My First Science Textbook: Electrons (Board Book)	11.21
AP10208	My First Science Textbook: Protons & Neutrons (Hardcover)	16.94
AP10211	My First Science Textbook: Protons & Neutrons (Board Book)	11.21

Flinn's 30-Day Book Guarantee

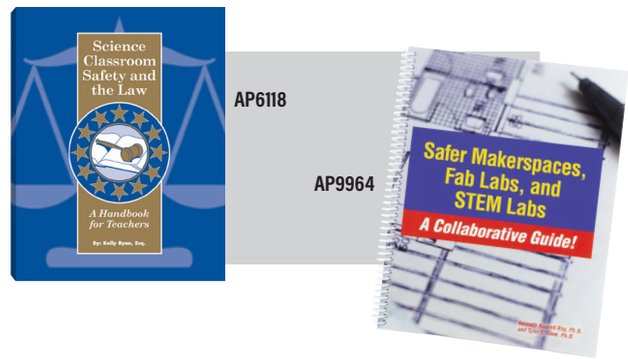
If you find a book you would like to order, but are unsure about its content, go ahead and send us your order. We've carefully chosen each book listed in our catalog/reference manual and are confident you'll be pleased with your purchase. If you are not entirely satisfied with the book, return it to us within 30 days for an exchange or full refund. Call us at **1-800-452-1261**. We'll advise you on how to properly return the book.

Laboratory Safety

Activities and Experiments

FLINN EXCLUSIVE

Catalog No.	Description	Price/Each
AP6118	Science Classroom Safety and the Law—A Handbook for Teachers	$31.00



Activities and Experiments

Catalog No.	Description	Price/Each
AP7292	Science Laboratory Safety Manual	$107.00
AP9964	Safer Makerspaces, Fab Labs, and STEM Labs: A Collaborative Guide!	81.00

FREE!

Science Classroom Safety and the Law
Online Videos



Kelly Ryan, author of the best-selling book on *Science Classroom Safety and the Law*, discusses and explains the legal principle of negligence and liability. Three video series are available:

- Science Safety and the Law
- Science Safety and the Law—the Court Cases
- Laboratory Safety FAQs

You will walk away with real world stories of what can go wrong in a lab if the proper precautions are not taken. These free online videos will give you the motivation you need to correct safety problems at your school! The videos above are also a great way to communicate safety issues to your school administration.

Author Kelly Ryan understands firsthand the safety problems science teachers face. Kelly was a chemistry teacher for 17 years at a large California high school before becoming an attorney. Kelly teaches the fundamental legal principles for each chapter in his book and discusses the topics in depth in each video.

Laboratory Furniture & Safety Storage Cabinets

Flinn Scientific's team of safety specialists can help you design a safe and efficient lab with all the proper lab furniture, chemical cabinets and more. **Get advice on proper ventilation, placement of furniture and selecting the safety storage you need.**

550 **SciMatCo® Cabinets**

554 **Fume Hoods**

555 **Furniture,** Chemical Shelving Systems, Storage Cabinets, Stools, Lab Bench Finishing Materials and Lab Stations

Flinn/SciMatCo® **Cabinets**

Acid attacks ALL metal cabinets. Wooden acid cabinets are safer and more durable than metal cabinets. All-wood construction eliminates corrosion and guarantees years of safe acid storage.

5 YEAR FLINN WARRANTY

- **Acids oxidize and corrode metal.**
- **Even if metal is coated or painted, a single scratch will break the protected surface and the oxidation begins and spreads rapidly.**

FLINN/SciMatCo WOODEN ACID CABINETS are manufactured without metal components. Our all-wood construction eliminates cabinet corrosion and guarantees years of safe acid storage.



Extensive Cabinet Interior Damage
Flinn/SciMatCo Acid Cabinets are constructed of 9-ply exterior grade, high density plywood (not particleboard) and are covered with Super Chem-Tuff™ paint. Exterior grade plywood is extremely durable and cannot be attacked or affected by acids. You will never have a rusting problem with a Flinn/SciMatCo Acid Cabinet.



Oxidation and Destruction of Door
Look at the remarkable metal door destruction! We could not get a good picture of the metal hinges but the owner had to force the door open. Flinn/SciMatCo Acid Cabinets have wooden hinges—not metal! Insist on wooden hinges for durability and long life.



Damage to Metal Shelf Support Clip is Particularly Dangerous Since Shelf Collapse Could Result
It won't be long until this cabinet's shelf supports corrode through and collapse. Can you imagine that dangerous mess? Get your money's worth. For long acid cabinet life buy Flinn/SciMatCo Acid Cabinets—they are metal-free!

Did You Know?

Did you know that particleboard is made from wood shavings which are glued together and compressed? Did you also know that acids eventually attack the glue that holds the particleboard together?

Cabinets are made to order. Lead times may vary. Call for more information.

FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT SCIMATCO.COM

All cabinets constructed to meet and exceed applicable NFPA and OSHA standards.

*The pictures (taken in a Texas high school) depict a metal, epoxy-coated acid cabinet. The cabinet is less than 3 years old.

SciMatCo Cabinets are Built for the Safe Storage of Hazardous Chemicals and Substances

SCIENTIFIC MATERIALS COMPANY, INC.

Safety

- Our wood and plastic cabinets do not react with acid or corrosives as metal cabinets do.
- Wood cabinets are the safest choices for flammables since wood is a thermal insulator.

Long life

- Wood or plastic cabinets last many years since they never rust or corrode.
- Rugged 1" exterior plywood construction withstands the most abusive environments.
- All cabinets come with a 5 year warranty.

Code and standards compliant

- Meet and exceed OSHA, NFPA, IFC and UFC standards.
- UL listed (flammables).



Flinn/SciMatCo Wooden Acid Cabinet SE8041

Catalog No.	Description	Price/Each
SE8063*	Bench Top Wooden Acid Cabinet	$ 994.50
SE8041*	Wooden Acid Cabinet, interior PARTIALLY lined with polypropylene (floor, shelf and top tray)	1275.00
SE8051*	Wooden Acid Cabinet, interior COMPLETELY lined with polypropylene (floor, interior walls, interior top and top tray)	1479.00
SE7023*†	Wooden Safety Floor Flammables Cabinet with Self-Closing Door	841.96
SE7133*†	Wooden Floor Flammables Cabinet with Self-Closing Door	2500.00

* Must be shipped by motor truck freight. 60-gallon flammables cabinets may not fit through your doorways. Check dimensions carefully.
† Available with flame arrestors upon request.

Why Use Wood for a Safety Cabinet?

	WOOD	METAL
HEAT INSULATION	Thermal Insulator In a fire, wood cabinets merely char on the outside keeping the heat from penetrating to inside.	Heat Conductor In a fire, metal cabinets become ovens, quickly conducting heat to the cabinet's interior. X
STRUCTURAL INTEGRITY	High In a fire, wood cabinets keep their shape and do not distort or bend.	Low In a fire, metal cabinets bend or distort, opening their contents to the flames. X
MATERIAL COMPATIBILITY AND REACTIVITY	Compatible /Non-Reactive Per IFC code, wood or plastic construction is "nonreactive with hazardous material stored"—never rust or corrode.	Incompatible /Reactive Metal cabinet construction (even stainless steel) is reactive with corrosives stored within—metal will quickly oxidize, rust and corrode. X

Flinn/SciMatCo® **Cabinets**



Under-the-Counter, Corrosive Cabinet, Partially Lined, 35"
SE1436



Under-the-Counter, Flammables Cabinet, 35", Self-Closing Doors
SE1837



Under-the-Counter, Combination Acid/Flammables Cabinet, Fully Lined, 35", Self-Closing Door
SE2237



Bench Oxidizer Cabinet
SE8030



Floor Base Cabinet, Fully Lined
SE8053



Bench Polypropylene Acid Cabinet
SE5000

Floor Cabinets

Top recessed to include a liquid-tight polypropylene tray. Use this top tray as a dispensing area. 31" W x 36⅝" H x 20" D.

Catalog No.	Description	Price/Each
SE8042*	Floor Corrosive Cabinet, Partially Lined, Top Tray, Blue	**$1275.00**
SE8052*	Floor Corrosive Cabinet, Fully-Lined, Top Tray, Blue	**1479.00**
SE8043*	Floor Base Cabinet, Partially Lined, Blue	**1275.00**
SE8053*	Floor Base Cabinet, Fully Lined, Blue	**1479.00**

Under-the-Counter Cabinets

Under-the-counter cabinets fit under laboratory casework or as stand-alone units. Cabinet floor constructed as a 2" liquid-tight trough. Interior floor and shelf are lined with polypropylene plastic. 35½" H x 22" D.

Catalog No.	Description	Price/Each
SE1530*	Base Cabinet, 29" W, Blue	**$1250.00**
SE1536*	Base Cabinet, 35" W, Blue	**1450.00**
SE1548*	Base Cabinet, 47" W, Blue	**1650.00**
SE1430*	Corrosive Cabinet, Partially Lined, 29" W, Blue	**1250.00**
SE1436*	Corrosive Cabinet, Partially Lined, 35" W, Blue	**1450.00**
SE1448*	Corrosive Cabinet, Partially Lined, 47" W, Blue	**1650.00**
SE1630*	Corrosive Cabinet, Fully Lined, 29" W, Blue	**1450.00**
SE1636*	Corrosive Cabinet, Fully Lined, 35" W, Blue	**1650.00**
SE1648*	Corrosive Cabinet, Fully Lined, 47" W, Blue	**1850.00**
SE1829*	Flammables Cabinet, 29" W, Self-Closing Doors, Yellow	**1250.00**
SE1837*	Flammables Cabinet, 35" W, Self-Closing Doors, Yellow	**1550.00**
SE1847*	Flammables Cabinet, 47" W, Self-Closing Doors, Yellow	**1750.00**

Under-the-Counter, Combination Acid/ Flammables Cabinets

"Combo" Cabinet utilizes the safety features of both the Acid and Flammables Cabinets. 35" W x 35½ "H x 22" D.

Catalog No.	Description	Price/Each
SE2037*	Combination Acid/Flammables Cabinet, Partially Lined, Self-Closing Door, Gray	**$2250.00**
SE2237*	Combination Acid/Flammables Cabinet, Fully Lined, Self-Closing Door, Gray	**2250.00**

Benchtop Flammables Cabinet

Ideal for small schools or science departments, such as biology, where small quantities of flammables are stored. 16¾" W x 15¾" D x 21¼" H.

Catalog No.	Description	Price/Each
SE8023*†	Flinn/SciMatCo® Benchtop Flammables Cabinet with Self-Closing Door, Yellow	**$648.54**

† Available with flame arrestors upon request.

Bench Plast-a-Cab® Cabinets

Cabinet constructed of ¾" high-density polyethylene plastic. Acid Cabinet (SC5010) marked "ACID" for the storage of acidic corrosive materials. Base Cabinet (SE5012F) marked "BASE" for the storage of basic corrosive materials. Cabinet floor constructed as a 2" liquid-tight trough to contain spillage. 16¾" W x 15¾" D x 21" H.

Catalog No.	Description	Price/Each
SC5010*	Bench Plast-a-Cab, HDPE, Acid, White	**$850.00**
SE5012F*	Bench Plast-a-Cab, HDPE, Base, White	**850.00**

Bench Oxidizer Cabinet

Constructed of 1" multi-ply, exterior-grade plywood. Cabinet floor constructed as a 2" liquid-tight trough. 21¼" H x 15¾" D x 16¾" W.

Catalog No.	Description	Price/Each
SE8030*	Bench Oxidizer Cabinet, Gray	**$550.00**

Bench Polypropylene Acid Cabinet

Cabinet marked "ACID" and constructed of ¼" polypropylene plastic. Cabinet has a 2" liquid tight welded bottom to contain accidental spills. Meets OSHA standard for secondary containment. 16" W x 16" H x 16½" D.

Catalog No.	Description	Price/Each
SC5000*	Bench Polypropylene Acid Cabinet, White	**$489.00**

* Must be shipped by motor truck freight.

Stak-a-Cab™ Cabinets

Individual cabinet is designed for stacking or as a stand-alone unit for the laboratory bench. 47" W x 18" H x 18" D.

Catalog No.	Description	Price/Each
SE1360	Stak-a-Cab Acid Cabinet, Blue	$1014.90
SE1460*	Stak-a-Cab Acid Cabinet, Blue	1014.90
SE1560*	Stak-a-Cab Base Cabinet, Blue	1014.90
SE1863*§	Stak-a-Cab Flammables Cabinet with Self-Closing Doors, Yellow	1275.00
SE1960*	Stak-a-Cab Oxidizer Cabinet, Gray	1014.90
SE2260*	Stak-a-Cab Combination Acid/Base Cabinet, Gray	1014.90
SE2460*	Stak-a-Cab Poison Cabinet, Gray	1014.90
SE2560*	Stak-a-Cab Hazardous Waste Cabinet, Gray	1014.90
SE2063*§	Stak-a-Cab Combination Acid/Flammables Cabinet with Self-Closing Door on Flammables Side, Gray	1275.00

Mini Stak-a-Cab Cabinets

Individual cabinet is designed for stacking or as a stand-alone unit for the laboratory bench. Can be shipped UPS. 31" W x 17" H x 14½" D.

Catalog No.	Description	Price/Each
SE9042*	Mini Stak-a-Cab Acid Cabinet, Blue	$682.67
SE9039*§	Mini Stak-a-Cab Flammables Cabinet with Self-Closing Doors, Yellow	756.63
SE9043*§	Mini Stak-a-Cab Combination Acid/Flammables Cabinet with Self-Closing Door on Flammables Side, Gray	853.34

* Must be shipped by motor truck freight. § Flammables cabinets are UL Listed.





Stak-a-Cab Acid Cabinet SE1460, etc.



Flinn Jumbo Stacking Cabinets SE8081, etc.



Flinn/SciMatCo General Purpose Storage Cabinet SE6075

Flinn Jumbo Stacking Cabinets

Cabinets for safer chemical storage are constructed of 1" exterior-grade plywood and finished with easily identified, chemically resistant paint. Includes one shelf. Designed as stand-alone cabinets, but they may be stacked up to two units high. 30" W x 32½" H x 18½" D.

Catalog No.	Description	Price/Each
SE8081*	Flinn Jumbo Stacking Cabinet Acids, Blue	$ 969.00
SE8082*	Flinn Jumbo Stacking Cabinet Corrosives, Blue	1010.19
SE8083*	Flinn Jumbo Stacking Cabinet Corrosives, Base, Blue	853.34
SE8079*	Flinn Jumbo Stacking Cabinet Flammables, Self-Closing Door, Yellow	995.00

General Purpose Storage Cabinet

General Purpose Storage Cabinet for safer chemical storage is a general purpose, locked cabinet that serves as an ideal solution for locking up your chemicals. 36½" H x 31" W x 20" D.

Catalog No.	Description	Price/Each
SE6075*	Flinn/SciMatCo General Purpose Storage Cabinet	$984.19

Biological Safety Cabinet

Cabinet provides protection from hazardous particulates and can also be used when working with genetic material, asbestos and other substances that generate hazardous airborne particulates. 54½" W x 31¼" D x 89–96" H.

Catalog No.	Description	Price/Each
FB2118*	Biological Safety Cabinet	$14089.40

Polypropylene Acid Cabinet

Cabinet constructed of ⅜" polypropylene plastic. Cabinet marked "ACID". Excellent cabinet for very corrosive environments inside and out. Meets OSHA standard for secondary containment. 48" W x 60" H x 18½" D.

Catalog No.	Description	Price/Each
SE5060*	Polypropylene Acid Cabinet, White	$2500.00

Nitric Acid Compartment for Flinn Acid Cabinets, Polypropylene

Nitric acid compartment for Flinn Acid Cabinets accommodates nitric acid to isolate it within the cabinet and holds five 2.5-liter bottles. Fits into top half of either the partially or fully lined acid cabinets.

Catalog No.	Description	Price/Each
SE8071*	Flinn/SciMatCo Nitric Acid Compartment for Flinn Acid Cabinets, Polypropylene	$147.91

* Must be shipped by motor truck freight.

Demonstration Hood

Flinn Portable Demonstration Hood

- Removes corrosive, noxious or other dangerous fumes.
- Easily moved, no permanent installation required.
- Hood is painted light gray with chemical-resistant Super Chem-Tuff™ paint.
- Durable ¾" plywood construction.
- Chemical-resistant front and rear sash, 3⁄16" thick polycarbonate.
- 500 ft^3/min of free air moved at a fixed fan speed of 1570 rpm.
- 60 linear feed face velocity when attached to ductwork provided.
- Shaded pole, 110 VAC, 1/10 H.P., 3.5 amp direct drive, continuous duty motor.

Catalog No.	Description	Price/Each
SE4050*	Flinn Portable Demonstration Hood	$1200.83
SE4051*	Flinn Portable Demonstration Hood Table	636.43

* Must be shipped by motor truck freight.

**The Flinn Portable Demonstration Hood is *NOT* a fume hood. Please see online catalog listing for full description.



Flinn Portable Demonstration Hood SE4050

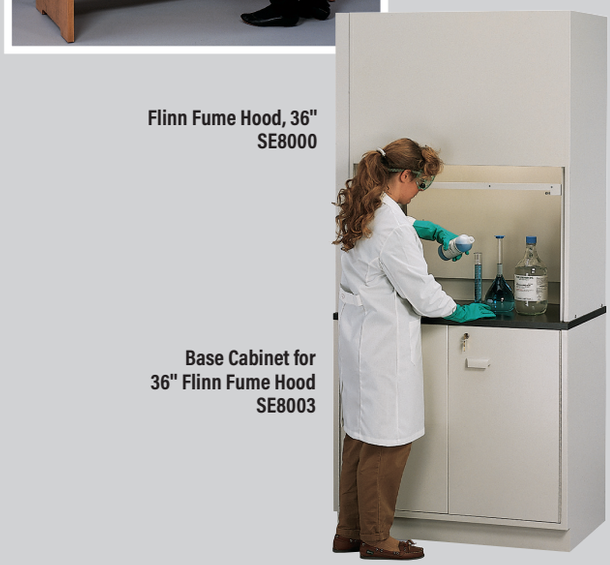
Demonstration Hood Table SE4051

Fume Hoods

Catalog No.	Description	Price/Each
SE8000*	Flinn Fume Hood, 36"	$2550.00
SE9000*	Flinn Fume Hood, 48"	2856.00
SE8003*	Base Cabinet for 36" Flinn Fume Hood	1069.52
SE8004*	Base Cabinet for 36" Flinn Fume Hood With Cupsink	1211.74
SE9003*	Base Cabinet for 48" Flinn Fume Hood	1302.76
SE9004*	Base Cabinet for 48" Flinn Fume Hood With Cupsink	1388.10
SE9072	Water Outlet with Gooseneck Faucet	258.75
SE9073	Gas Outlet for Flinn Fume Hood	210.10
SE9074	Laboratory Oval Cupsink for Flinn Fume Hood	149.62
SE1900*	Labconco Basic™ 4 Foot Fume Hood	6480.00
SE1901*	Labconco Basic 6 Foot Fume Hood	9385.00
SE1906*	Labconco Basic Base Cabinet for 4 Foot Fume Hood	1632.00
SE1071	Labconco Basic Cold Water Service Fixture Kit	345.10
SE1072	Labconco Basic Hot Water Service Fixture Kit	385.00
SE1903	Labconco Basic Gas Service Fixture Kit	382.80
SE1904	Labconco Basic Polypropylene Cupsink and Turret Kit	680.15
SE1905	Labconco Basic Duplex Electrical Receptacle Kit	144.05

* Must be shipped by motor truck freight.

Air and vacuum service fixture kits are available upon request.



Flinn Fume Hood, 36" SE8000

Base Cabinet for 36" Flinn Fume Hood SE8003

HOW TO **Find the Right Fume Hood**

Flinn Scientific is a full-line dealer for Labconco. Labconco designs and manufactures the finest laboratory fume hoods in the world. Please call our technical services department toll-free at **1-800-452-1261** for assistance selecting the right fune hood for your laboratory.

FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Chemical Shelving Storage Systems

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
SE6010	Flinn Shelving Assembly, Wood	$950.00
SE6025	Polypropylene Shelf Liner for use with above shelving assemblies. Liners easily fit the shelves, add to the useful life and appearance of your shelf assembly.	27.33

* Must be shipped by motor truck freight. Unit ships in two pieces.



5 YEAR FLINN WARRANTY

Flinn Shelving Assembly with Combination Acid/ Flammables Cabinet SE6010

Flinn Laboratory Furniture and **Safety Storage Cabinets**

Safe, Efficient, Affordable

Safety must be your top priority when designing a science lab. Imagine a lab where kids don't bump into one another, all students are easily supervised, the lab table is large enough to successfully perform any experiment and the proper type of safety equipment is quickly accessible.

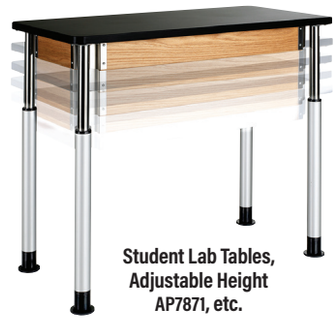
Flinn Scientific can help you design such a lab. We have provided assistance to thousands of Flinn customers who have either renovated or constructed a new science lab. Our ideas will not only improve safety, but also save you time and money. When designing a lab, you must take into account hundreds of small but important details. Don't reinvent the wheel—the Flinn lab design staff can help you identify and address all of these important issues.

On the following pages, sample floor layouts have been developed to show how Flinn laboratory furniture can be successfully used at your school. If you are working on a lab design project or are planning a remodel or new build in the future, give the Flinn lab design staff a call at **1-800-452-1261**. They will gladly help and their services are free!



Instructor's Demonstration Table, 5' AP6547

Economy Size Mobile Demonstration Table AP8733, etc.



Student Lab Tables, Adjustable Height AP7871, etc.



Standard Size Mobile Demonstration Table AP8732

Demonstration Tables

Catalog No.	Description	Price/Each
AP6547	Instructor's Demonstration Table, 5' Long	$3700.00
AP6548	Instructor's Demonstration Table, 8' Long	5476.25
AP7889	Instructor's Demonstration Table, ADA-Compliant, 6' Long	4600.00
AP7143	Clamp, ¾" x ¾" for Instructor's Demonstration Table	28.40
AP7128	Clamp, ¾" x ½" for Instructor's Demonstration Table	26.80
AP7129	Upright, 36" x ¾" for Instructor's Demonstration Table	42.45
AP7144	Crossbar, 48" x ¾" for Instructor's Demonstration Table	49.00
AP7146*	Rod Socket with Washer and Nut for Instructor's Demonstration Table	30.45
AP8733	Mobile Demonstration Table, Economy Size	1621.60
AP5350	Mobile Demonstration Table, Economy Size with Extended Top	2233.05
AP8732	Mobile Demonstration Table, Standard Size	2205.45
AP9289	Mobile Demonstration Table, Extra Large Size	3172.10
AP8734	Mirror for Mobile Demonstration Table	268.65
AP5351	Mobile Demonstration Table/Storage Cabinet	915.50

* Must be shipped by motor truck freight.

*Fits ¾" diameter upright.

Student Laboratory Tables

Catalog No.	Description	Price/Each
AP9132	Plastic Laminate, 24" x 48" x 30"	$ 491.55
AP9133	Plastic Laminate, 24" x 54" x 30"	505.10
AP9134	Plastic Laminate, 24" x 60" x 30"	492.65
AP9135	Plastic Laminate, 24" x 72" x 30"	623.00
AP9136	Plastic Laminate, 42" x 72" x 30"	845.35
AP9137	Chemical-Resistant Laminate, 24" x 48" x 30"	495.00
AP9138	Chemical-Resistant Laminate, 24" x 54" x 30"	540.50
AP9139	Chemical-Resistant Laminate, 24" x 60" x 30"	575.00
AP9140	Chemical-Resistant Laminate, 24" x 72" x 30"	692.60
AP9141	Chemical-Resistant Laminate, 42" x 72" x 30"	1003.02
AP9142	Epoxy Resin, 24" x 48" x 30"	805.80
AP9143	Epoxy Resin, 24" x 54" x 30"	785.00
AP9144	Epoxy Resin, 24" x 60" x 30"	850.00
AP9145	Epoxy Resin, 24" x 72" x 30"	1132.45
AP9146	Epoxy Resin, 42" x 72" x 30"	1807.70

Must be shipped by motor truck freight.

Student Laboratory Tables, Adjustable

Catalog No.	Description	Price/Each
AP7871	Plastic Laminate, 24" x 48" x 30"	$1386.75
AP7872	Plastic Laminate, 24" x 54" x 30"	1050.00
AP7873	Plastic Laminate, 24" x 60" x 30"	1553.00
AP7874	Chemical-Resistant Laminate, 24" x 48" x 30"	1100.00
AP7875	Chemical-Resistant Laminate, 24" x 54" x 30"	1642.00
AP7876	Chemical-Resistant Laminate, 24" x 60" x 30"	1200.00
AP7877	Solid Phenolic, 24" x 48" x 30"	1870.50
AP7878	Solid Phenolic, 24" x 54" x 30"	1913.00
AP7879	Solid Phenolic, 24" x 60" x 30"	1999.50

Must be shipped by motor truck freight.

ADA Laboratory Table Legs

Catalog No.	Description	Price/Pkg. of 4
AP6549	ADA Lab Table Legs	$196.13

HOW TO

Clean and Care for Epoxy Resin Tabletops

To clean off dirt and chemical residues from your laboratory tabletop, you will need a sponge, water and a sudsing cleanser like Comet® or Ajax®. Do not rub hard. Just clean the table as you would your sink at home. Making a practice of applying a light film of Scott's Liquid Gold® or Old English Lemon Oil after washing the tabletop is a good idea. This will make the top become shiny. It also tends to hide any scratches in the tabletop surface. If you elect to do this, be sure to wipe off all residual oil. The surface doesn't need to be wet. Just apply a thin film, wipe down the tabletop thoroughly and in a few minutes the top will be glossy, but dry.

Storage Cabinets

Storage Cabinets

Catalog No.	Description	Price/Each
AP6553	Floor Storage Cabinet, 36"	$1366.40
AP6554	Floor Storage Cabinet, 48"	1632.24
AP6562	Floor Storage Cabinet with Sink and Fixtures, 36"	2126.70
AP7141	Clean-Up Sink	3995.00
AP6557	"Dead Corner" Floor Storage Cabinet, Left	1379.00
AP6561	"Dead Corner" Floor Storage Cabinet, Right	1375.00
AP6555	Wall Mounted Storage Cabinet, 36"	623.00
AP6556	Wall Mounted Storage Cabinet, 48"	725.90
AP7134	Wall Mounted Storage Cabinet with Glass Doors, 36"	875.00
AP7135	Wall Mounted Storage Cabinet with Glass Doors, 48"	975.00
FB1031	Mobile Microscope Cabinet	1466.76
AP6559	Full Height Storage Cabinet, 36"	1590.75
AP6560	Full Height Storage Cabinet, 48"	1810.00
AP7136	Full Height Storage Cabinet with Glass Doors, 36"	2360.50
AP7137	Full Height Storage Cabinet with Glass Doors, 48"	2720.60
AP7142	Full Height Microscope Storage Cabinet, 36"	1967.00
AP7133	Full Height Microscope Storage Cabinet, 48"	2340.00

Must be shipped by motor truck freight.

Stools, Laboratory

Kik Step® Step Stool See page 579.

Laboratory Stools

Catalog No.	Description	Price/Each
AP1092	Laboratory Stool, 18"	$ 76.50
AP1093	Laboratory Stool, 24"	89.75
AP6207	Adjustable Laboratory Stool, 25"–33"	93.50
AP6208	Wooden Laboratory Stool, 24"	140.35

Tabletop, Lab Bench Finishing Materials

Catalog No.	Description	Price/Each
AP8724	Black, Semi-Gloss Lacquer Paint (Primer), Quart	$30.95
AP7426	Aqua Epoxy Finish, Two-Part Package, 1-L Total	44.95
AP6611	Smooth-On Epoxy Adhesive	78.55
AP1648	Lab Bench Repair Resin	80.20

FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM

Lab Stations

Catalog No.	Description	Price/Each	Price/7 or more
AP6550	4-Student Perimeter Lab Station, Door/Drawer	$7600.00	$7296.00
AP7880	4-Student Perimeter Lab Station, without Water and Gas Assemblies, Door/Drawer	7900.00	—
AP6552	Upright Rod Set with Crossbar	164.60	—
AP6205	Flinn Combination Classroom Lab Station	5103.04	5001.94
AP6206	Flinn Combination Classroom Lab Station, without Water and Gas Assemblies	4056.85	3977.10
AP7881	Flinn Combination Classroom Lab Station, End Sink	8739.75	—
AP7882	Flinn Combination Classroom Lab Station, ADA-Compliant	5200.00	5094.57

Must be shipped by motor truck freight.



Floor Storage Cabinet with Sink and Fixtures AP6562



Wall Mounted Storage Cabinet AP6555, etc.



Full Height Storage Cabinet with Glass Doors AP7136, etc.



Mobile Microscope Cabinet FB1031



Wooden Laboratory Stool AP6208



Laboratory Stool AP1092, etc.



Aqua Epoxy Finish, Two-Part Package, 1-L Total AP7426



Flinn Combination Classroom Lab Station AP6205



FLINN

Safety Supplies & Equipment

For more than 40 years, Flinn Scientific has been the leader in providing you with everything you need to **create the safest laboratory and classroom environment.**

558 **Acid Pump**
558 **Aprons, Laboratory**
559 **Biohazard Disposal Bags,** Bottle Carriers, and Cans
560 **Circuit Testers**
561 **Containers,** Chemical Storage
561 **Eyewashes**
564 **Fire Blanket**
565 **Fire Extinguishers,** First Aid Kits
576 **Flinn Chemventory™**
566 **Fume Hood Accessories**
567 **Gas Safety**
567 **Glass Safety**
568 **Gloves, Hand Protection**
570 **Goggles, Eye and Face Protection**
574 **Hair Safety**
575 **Heat Protection**
575 **Inspection Safety**
560 **Lab Coats**
578 **Labels, Chemicals**
579 **Ladders, Safety**
579 **Liability Reduction**
584 **Matting**
580 **Mercury Safety Aids**
580 **Posters, Safety**
568 **Personal Protective Equipment**
580 **Respirators**
581 **Safety Data Sheets**
581 **Safety Shield**
581 **Sharps Container**
581 **Shelf Lips**
582 **Shower/Drench, Body, Safety**
583 **Signs, Safety**
583 **Spill Control and Cleanup Materials**
584 **Videos and Books, Safety**

Acid Pump

Suitable for dispensing caustic solutions and most acids except perchloric acid. The plastic pump attaches onto the screw neck of a standard 2.5-L acid bottle. All parts directly in contact with acid are chemical-resistant. A 100-mL bottle fits into a threaded socket on the side of the valve housing and serves as a pressure bulb to force liquid through the delivery spout. Flow can be stopped by pressing the relief valve on top of the pump. The entire pump can be disassembled for cleaning. Do not use plastic bottles with concentrated nitric acid.

Catalog No.	Description	Price/Each
SE221	Acid Pump	$68.59



Acid Pump
SE221

Aprons, Laboratory

Apron, Rubberized, Medium-Duty

The fabric is flexible—not stiff! The edges of the garment are folded over and stitched. The neck loop is a cotton tape, and the ends have been sewn into the folded-over garment edge. A cross-stitch has been sewn into each of the four locations where cotton tapes (neck and waist) join the rubber sheeting. The weight specification for the rubberized fabric in these garments is 7.5 ounces per square yard.

Catalog No.	Description	Apron Size	Price/Each	Price/Pkg. of 12
AP7125	Apron, Rubberized, Medium-Duty	27" x 36"	$19.38	$214.20
AP7126		27" x 42"	19.38	222.24
AP7127		36" x 46"	25.50	287.88

Apron, Rubberized, Heavy-Duty

These heavy-duty aprons are made exactly like the medium-duty aprons listed above except that the rubberized sheeting is at least 30 percent heavier. The weight specification for the heavy-duty aprons is 10 ounces per square yard. This specification is a reliable indicator of the apron's durability and quality.

Catalog No.	Description	Apron Size	Price/Each	Price/Pkg. of 12
AP7130	Apron, Rubberized, Heavy-Duty	27" x 36"	$19.38	$220.92
AP7131		27" x 42"	19.38	221.28
AP7132		36" x 42"	25.50	290.52

Apron, Plastic, Medium-Duty

Provide excellent chemical resistance for your students with this vinyl plastic apron. Cotton tapes are sewn into the garment to form the neck loop and waist ties. Every edge of the vinyl plastic has been folded over and sewn. Apron size is 30" wide and 36" long.

Catalog No.	Description	Price/Each	Price/Pkg. of 12
AP7120	Apron, Plastic, Medium-Duty	$10.25	$116.88

Apron, Polyethylene, Disposable

An inexpensive polyethylene apron that provides protection against most solvents, acids and detergents. One-piece construction includes neck loop and waist ties. Apron is very lightweight (2 mil) and may be reused several times. Apron size is 24" wide x 42" long.

Catalog No.	Description	Price/Pkg. of 100
AP4346	Apron, Polyethylene, Disposable	$39.00

Free Apron Sample

Would you like to examine our laboratory aprons before you purchase aprons for yourself and your students? We will be glad to send you a free sample of any of our aprons. E-mail us at flinn@flinnsci.com or call 1-800-452-1261, and we will get a sample apron on its way to you!



Apron, Rubberized
AP7125, etc.

Rubberized laboratory aprons are manufactured using synthetic rubber and do not contain latex. These aprons will not cause an allergic reaction in students who are sensitive to latex.



Apron, Plastic, Medium-Duty
AP7120

Apron, Polyethylene, Disposable
AP4346

SAFETY TIP

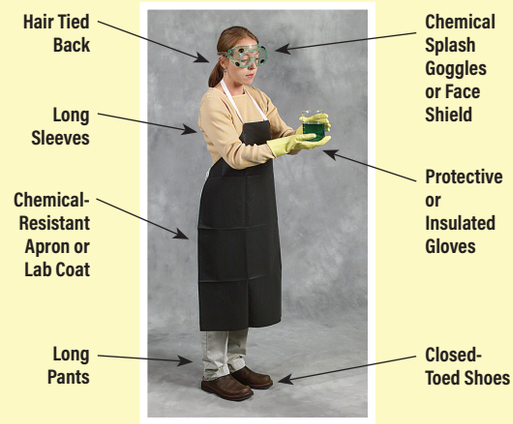
Laboratory Dress

Improper Laboratory Dress

- Long, loose hair
- Open-toed shoes/sandals
- Shorts
- Loose/balloon sleeves
- Long, hanging jewelry
- Absorbent watch strap
- Long or loose necktie

Proper Laboratory Dress

- Hair tied back
- Closed-toed shoes/sandals
- Long pants
- Long sleeves
- Chemical resistant apron or lab coat
- Chemical splash goggles or face shield



Biohazard Disposal Bags

Bag and contents are sterilized at 121 °C (250 °F) prior to disposal. An indicator patch changes color to note the autoclaving. Printed in high-visibility red with the standard biohazard symbol and disposal directions. Bags measure 12" x 24".

Catalog No.	Description	Price/Each
FB0060	Biohazard Disposal Bags, Package of 25	$28.80

Bottle Carrier, Safety

Bottle Carrier, Safety, Polyethylene

Polyethylene carrier designed to hold a 2.5-L acid bottle and to cushion it during transport.

Catalog No.	Description	Price/Each
SE201	Bottle Carrier, Safety, Polyethylene	$105.10

Bottle Carrier, Safety, Rubber

A safe way to transport 2.5-L and 4-L bottles. Durable rubberized construction resists most solutions, acids, and bases and will last for years. Centering ring in bottle carrier base holds bottle 1" away from carrier inside wall, reducing the chances of accidental breakage. Color is black.

Catalog No.	Description	Price/Each
AP4379	Bottle Carrier, Safety, Rubber	$109.05

Cans, Safety

Fire-Containment Waste Can

This all-metal can will contain and smother fire. The interior of the can is rustproof. A plastic bag liner can be used. The lid can be opened by hand but also has a foot-activated lid opener. Color: Federal Safety Red.

Catalog No.	Capacity	Height x Diameter	Weight	Price/Each
SE3051	6 gal.	18¼" x 11⅞"	11 lbs.	$115.00

Can, Saf-Stor®

See page 561.

Flammable Liquid Storage Can

The cap-opening handle is spring-loaded and closes shut upon release. Cans are made of steel. Also feature automatic relief valves and flame arrestors in both pour and fill outlets. Meets OSHA requirements. UL listed. 3.8 L capacity.

Catalog No.	Description	Price/Each
SE206	Flammable Liquid Storage Can	$98.79

Charts

See Posters, page 580.

Chemventory™

See pages 576–577.



Biohazard Disposal Bags FB0060



Bottle Carrier, Safety, Polyethylene SE201



Bottle Carrier, Safety, Rubber AP4379



Fire-Containment Waste Can SE3051



Flammable Liquid Storage Can SE206

SAFETY TIP

Transporting Chemicals Between Classes

Secondary containment should always be used for carrying bottled chemicals between the storeroom and your classroom or between classrooms. A rubber safety carrier or plastic safety carrier designed to cushion the bottle is the best option. A 5-gallon plastic bucket will also provide secondary containment, but it is not as safe. Secondary containment is important even if you use a cart to transport chemicals.

Another solution for providing secondary containment is to purchase chemicals in PVC-coated glass or plastic bottles. The bottle may break, but the PVC outer envelope retains the chemical and glass shards. Spend a few extra dollars and purchase your concentrated acids in PVC-coated glass bottles. All other chemicals from Flinn come in either plastic or PVC-coated glass bottles. Rely on Flinn to make your classroom safer.

Circuit Testers

Circuit Tester, Electrical Safety

Schools will commonly find five unsafe electrical conditions—open ground, open neutral, open hot, hot/ground reverse, hot/neutral reverse. Each of the five conditions is measured using this simple device.

Catalog No.	Description	Price/Each
SE9095	Circuit Tester, Electrical Safety	$20.65



Circuit Tester, Electrical Safety SE9095

Lab Coats

Laboratory Coat, Women's

Knee-length (39") lab coat. The durable combination of Dacron® and cotton provides a routinely washable garment. Coat has a button-down design with a fold-over collar and lapels, double fabric cuffs and an adjustable back belt. There are two roomy lower pockets and a utilitarian breast pocket. Sizes are based on women's dress sizes 8 to 18. Coats have a tendency to run small, and sleeves are made to be slightly shorter for working with chemicals.

Catalog No.	Description	Lab Coat Size	Equivalent Dress Size	Price/Each
AP3290	Laboratory Coat, Women's	28	8	$51.00
AP3291		30	10	51.00
AP3292		32	12	51.00
AP3293		34	14	51.00
AP3294		36	16	51.00
AP3295		38	18	51.00

Laboratory Coat, Men's

Knee-length lab coat. Fabric will tolerate frequent laundering. Button-down coat includes lapel collar, double thickness cuffs, and an adjustable back belt. Three roomy pockets—one upper left breast pocket and two deep lower pockets. Coats have a tendency to run small and sleeves are made to be slightly shorter for working with chemicals.

Catalog No.	Description	Chest	Sleeve	Coat Length	Price/Each
AP3280	Laboratory Coat, Men's	36	31¼"	42½"	$55.25
AP3281		38	31½"	43¼"	55.25
AP3282		40	32"	43¾"	55.25
AP3283		42	32¼"	44"	55.25
AP3284		44	32½"	44½"	55.25
AP8868		46	32¾"	45"	50.30
AP8869		48	32¼"	45½"	52.30

HOW TO

Measure Sleeve Length

Using a tape measure, measure from the neck base down to the wrist.

Laboratory Coat, Economy

White, full cut, disposable, knee-length Tyvek™ coats. Tyvek is a tough, opaque material of spun-bonded polyolefin fibers with a cloth-like appearance and feel. Tyvek is durable enough to tolerate two or three washings. Will resist a wide array of both organic and inorganic chemicals, including acids.

Catalog No.	Description	Size	Price/Each
AP3270	Laboratory Coat, Economy	Medium	$10.21
AP3271		Large	10.21
AP3272		Extra Large	10.21

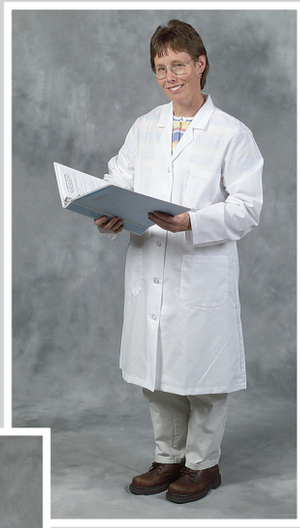
Rainbow Tie-Dyed Lab Coats

Show students your stylish side in your new rainbow tie-dyed lab coat. Available in four sizes, see page 299.

SAFETY TIP

Electrical Hazards

Typical high school laboratories have a substantial number of electrical outlets and a variety of electrical apparatus from hot plates to pH meters. Older schools may not have grounded plugs and receptacles—these should be replaced and updated. Science teachers should audit the condition of all electrical outlets and apparatus and arrange for immediate repairs as necessary. This is a very important and often overlooked safety precaution.



Laboratory Coat, Women's AP3290, etc.



Laboratory Coat, Men's AP3280, etc.

Containers, Chemical Storage

Chem-Saf™ Bags

FLINN EXCLUSIVE



Heavy-duty polyethylene bags designed to contain and protect laboratory chemicals. Bag twist ties are provided. Bag dimensions (width x height) are listed.

Catalog No.	Description	Accepts Bottle Size	Price (with ties)
SE041	Chem-Saf Bags, 5" x 9"	100 g or 4 oz	$18.70 per 100
SE042	Chem-Saf Bags, 7" x 12"	500 g or 1 lb	20.25 per 100
SE043	Chem-Saf Bags, 6" x 12"	500 mL or 1 pt	21.05 per 100
SE044	Chem-Saf Bags, 12" x 22"	5 pt, 2.5 kg or 1 gal	38.05 per 50

Saf-Stor™ Can

FLINN EXCLUSIVE



Heavy-duty metal can filled with SuperSorb®. Cans are an ideal way to store your chemical hazards. Place your chemical bottle in the can and cover it with the SuperSorb provided. Place the friction lid on the can. You now have a durable, fire-and break-resistant safety storage container for severe hazards.

▶ See free video at flinnsci.com.

Catalog No.	Description	Dimensions (Height x Diameter)	Price/Each
SE262	Saf-Stor Can, Small	4⅞" H x 4¼" D	$11.95
SE060	Saf-Stor Can, Medium	7⅛" H x 6⅛" D	14.65
SE263	Saf-Stor Can, Large	9½" H x 6¾" D	24.00

Americans with Disabilities Act

ADA-compliant eyewashes and showers are available. Please call Flinn at 1-800-452-1261 for ordering information.

Poly Lab-Pack™

This huge unique and versatile container has many possible uses in your laboratory. Temporarily store containers of mystery substances, hazards or waste chemicals; store organics or infrequently used substances; transport materials; or use it as an inexpensive alternative to an acid cabinet. Holds eight 2.5-liter acid bottles. Specifications: Polyethylene, molded handles, screw lid; 21½" high x 21½" overall width; 18" wide opening.

Catalog No.	Description	Price/Each
AP1803	Poly Lab-Pack	$113.00

Cream, Hand, Protective

Designed for use by lab personnel. Non-greasy. Special combination of silicone and lanolin acts as a secondary barrier when wearing gloves to handle hazardous chemicals. Especially helpful against strong corrosives and defatting organic solvents. Packaged in tubes.

Catalog No.	Description	Tube Size	Price/Each
AP2041	Hand Cream	8 oz.	$29.49

Eyewashes

Eyewash, One-Step Activation



Simply push the pin to activate the eyewash—an eliminator valve keeps the eyewash constantly pressurized. Hands remain free to hold eyes open as eyes are rinsed simultaneously. Push the pin the other way to allow water to flow through the faucet. Eliminator valve also allows for the water temperature to be pre-set to provide tempered water. Delivers over 0.4 gallons of water per minute. Includes two adapters. ANSI Z358.1–2009.

Catalog No.	Description	Price/Each
SE1079	Eyewash, One-Step Activation	$157.00

SAFETY TIP

Eyewash Activation

According to the ANSI Z358.1 standard, eyewashes should be activated weekly to ensure correct operation and enough clean fluid is available for flushing.

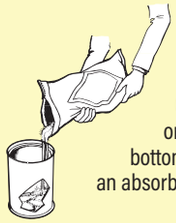
FLINNSCI.COM
VISIT US ONLINE

HOW TO

Use Flinn *Chem-Saf* Bags and *Saf-Stor* Cans



STEP 1
Place your chemical substance inside the bag. Twist tie the bag closed. Zipper-type bags are not as useful. If the substance is dropped, you now have a sack full of chemical instead of a floor full of trouble.



STEP 2
Create a shallow layer of kitty litter or SuperSorb® absorbent on the bottom of the can. This material acts as an absorbent, a cushion and an insulator.

STEP 3
Lower your bagged bottle of chemical into the can.



STEP 4
Fill the remaining void of the can with kitty litter or SuperSorb so that the can is now full and the bottle of chemical is entirely surrounded.



- Use bags, cans and kitty litter to dramatically improve hazardous chemical safety.
- Buy Flinn bags, cans and kitty litter or buy them locally. No matter where you buy the components of this package, the result will be improved safety in your school.

STEP 5
Place the friction lid on the can.



STEP 6
Label the outside of the can with the full chemical name, amount and hazard information.



Eyewash, Economy Wall-Mount



Durably constructed with stainless steel bowl and push paddle; chrome-plated brass valve, inlet pipe and outlets; and a one-piece cast aluminum base/mounting bracket. Dual outlets are fitted with flow-softening heads (aerators). Includes an emergency eyewash sign for quick recognition. Shipped completely assembled. Delivers 3 gallons of water per minute at the minimum rated water pressure of 30 pounds per square inch (psi). Eyewash provides compliance under ANSI Z358.1–2009 standards.

Catalog No.	Description	Price/Each
SE2514	Eyewash, Economy Wall-Mount	$330.00

NOTE: Unlike more expensive eyewashes listed in this catalog, this unit is not self-regulating. It does not incorporate a flow regulator in its design. Attention should be given to the water supply feeding the proposed eyewash location. Incoming pressure should be between the minimum required pressure of 30 psi and the maximum recommended pressure of 100 psi. The pressure in your system may already be known or can be measured by maintenance personnel.

HOW TO

Convert Your Sink Faucet to an Eyewash

The eyewash (SE1040) is simply threaded onto your sink fixture. The eyewash contains a centrally located diverter valve. Pulling the spring-activated diverter causes water to flow to the eyewash. When you turn off the water, the diverter springs back and water flows to the faucet again. A series of adapters are available should the eyewash threads not match your faucet. If we can't match your fixture's threads, a universal adapter is available. Please call us if you have any questions.

Eye/Face Wash, with Bowl and Wall Mounting Bracket



The eye/face wash has two very large nozzles to irrigate and wash both sides of the face and both eyes. Pressing down on the yellow pushplate valve activates the flow of water, which will remain on until manually closed. Both hands thus remain free to hold eyelids open. Self-adjusting 8.0-gpm regulator assures a constant, even flow of water. Unit comes with a mounting bracket. Eyewash is ANSI Z358.1–2009, SEI certified.

Catalog No.	Description	Price/Each
SE1010	Eye/Face Wash, with Bowl and Wall Mounting Bracket	$435.55

Eyewash, Swivel



Ideally deck-mounted next to a sink. When needed, simply swing the safety aid over the sink. When not in use, it swivels out of the way. Complete with two bright yellow heads, ½" IPS (Iron Pipe Size) male inlet, stay-open ball valve. No drain necessary since the device is mounted next to a sink. Left or right mounting. Self-adjusting regulator assures an even water flow rate of 2.4 gallons per minute. Counter top eyewash sign included. ANSI Z358.1–2009, SEI certified.

Catalog No.	Description	Price/Each
AP1905	Eyewash, Swivel	$459.00

SAFETY TIP

Squeeze Bottle Eyewashes

These devices are not safe and should not be used! Why? Squeeze bottle eyewashes only treat one eye at a time. They simply cannot provide the volume of water necessary to properly treat the eyes, and they are easily contaminated by vandalism. *Get rid of them!* They are unsafe and give you a false sense of protection.

Eyewash/Drench Hose, Counter Mount



Save valuable counter space while providing the safety protection you and your students need in the laboratory. Install this hand-held dual-stream hose next to the sink on the counter—the 8-foot reinforced PVC hose is attached to your water supply and conveniently stored below the counter. In an emergency, simply squeeze the "stay-open locking-handle," and flood both eyes with fresh water. It can also be used as a body drench, rinsing off the face, neck, arms, legs, or wherever needed. Each spray head has a flip-top dust cover, internal flow control, and a filter to remove impurities from the water flow. Complete with two bright orange heads, chrome-plated brass squeeze valve, and standard ⅜" pipe threads (NPT), ready to attach to your water supply. Eyewash wall placard included. Eyewash is ANSI Z358.1–2009, SEI certified.

Catalog No.	Description	Price/Each
SE1027	Eyewash/Drench Hose, Counter Mount	$506.32

Emergency Body Shower/Drench/Eye/Face Wash Combination



This versatile eyewash can be converted into a drench shower for the entire body by simply lifting the spray head. Provides a continuous dual stream of drenching water wherever aimed. Bayonet mounted for stationary flushing, or removable for spot body drenching. Both units are ANSI Z358.1–2009, SEI certified.

Wall Mounted Type: Fixed position wall mount allows for easy installation on a wall or the side of a laboratory bench. Mounting bracket includes spring clips to ensure that the spray heads face forward at all times. Unit may be left in the mounting bracket for use as a fixed eyewash, leaving the user's hands free or removed for use as a drench hose. Each spray head has a flip-top dust cover, internal flow control and filter to remove impurities from the water flow. Features a chrome-plated brass stay-open ball valve with PTFE seals and a retractable 12' reinforced-nylon hose. Requires a ⅜" NPT connection to water supply.

Swivel Benchtop Type: Mounted onto the top of the lab bench next to a sink. When needed, the eyewash swivels over the sink so the water will go down the drain. Features include ½" chrome-plated bronze stay-open ball valve with chrome-plated ball and stainless steel pushplate; plastic, dual stream heads with chrome-plated brass yoke; plastic float-off covers with stainless steel bead chains; 6' coiled hose stores neatly when not in use; self-adjusting regulator assures a constant, even flow of 8 gallons per minute under varying conditions. Requires a ½" NPT connection to water supply.

Catalog No.	Description	Price/Each
AP2264	Emergency Body Shower/Drench/Eye/Face Wash Combination, Wall Mounted Type	$542.41
AP8731	Emergency Body Shower/Drench/Eyewash Combination, Swivel Benchtop Type	505.24

Safety Showers See page 562.

SAFETY TIP

Is Your Eyewash Effective?

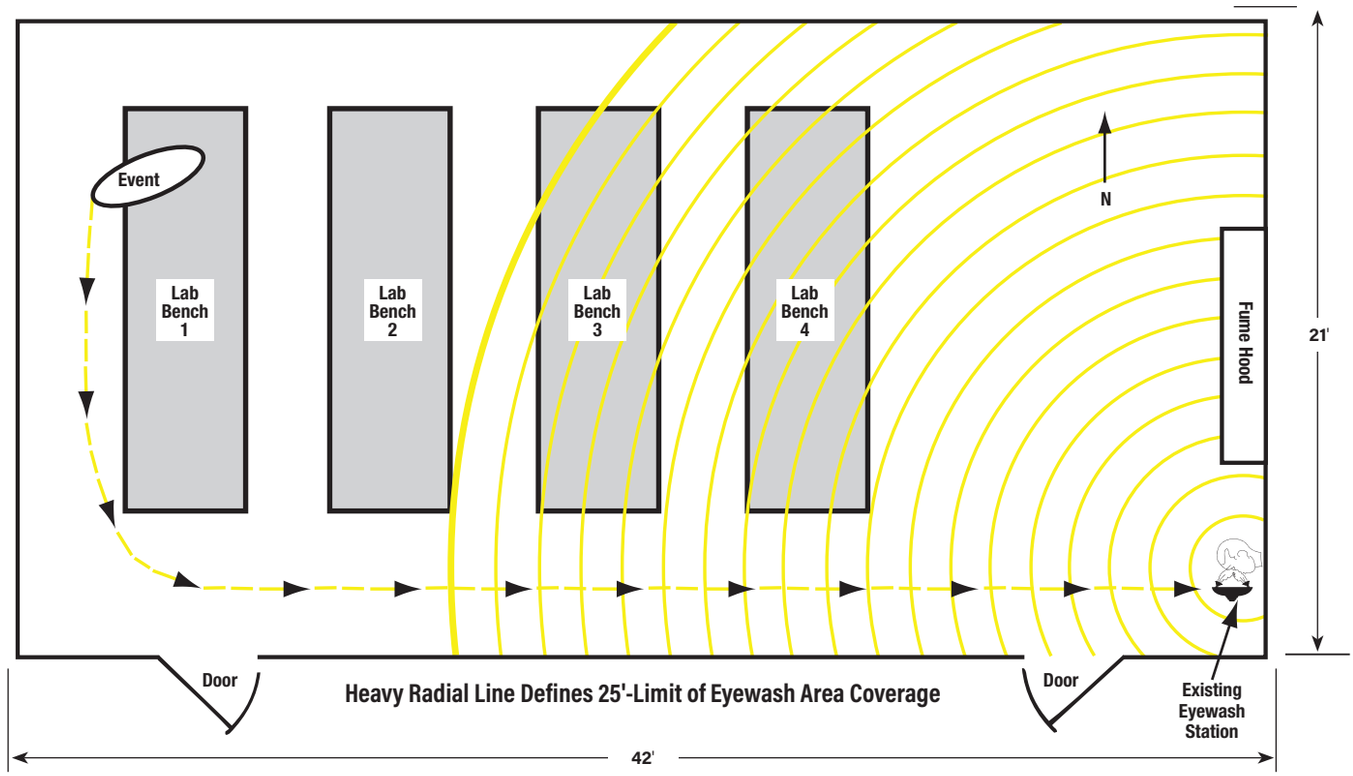
The eyes are the most vulnerable portion of the body where laboratory injury is involved. Eyes also represent the most important link between the individual and the outside world. Every effort should be made to protect the eyes. The first line of protection, of course, is chemical splash goggles.

If, however, a laboratory chemical is splashed into the eyes, the eyeballs and eyelids must be washed thoroughly and immediately. According to all experts, rinsing of the eyeballs and interiors of the eyelids should continue for at least 20 minutes. This procedure should be carried out with a gentle but copious flow of water. The water should be of drinking quality. The eyewash should treat both eyes.

The eyewash must be located within 25 feet of any area where chemicals are used or stored.

Lastly, the victim's hands must be free so the eyelids may be held open to allow water to reach the entire eye cavity.

Eyewash Area Coverage Plan



When chemicals are used in the laboratory, chemical splash goggles must be worn and an eyewash should be readily available.

The above drawing is intended to represent a school laboratory. The single eyewash station is located along the southeastern wall. Will the single eyewash provide adequate laboratory coverage? No, it will not! Our drawing includes an event that occurs at the far, north end of Bench 1. Our victim will have to travel almost 40 feet to the eyewash station. An average, sighted, non-traumatized person will walk a distance of 40 feet in about 9–10 seconds. A strongly caustic chemical splash will do its damage in 30 seconds or less. If the victim takes immediate action (which is unlikely), the travel time to use the eyewash is too long. The travel time could be reduced significantly if an additional eyewash station were installed on the other side of the room.

What can you do? Make a crude sketch of each laboratory area. Draw lines on your sketches that represent travel distance limits from the eyewash station. The heavy radial line in our sketch defines that limit—25 feet from the eyewash station. Using the same graph sketches, prepare similar coverage plans for other key safety aids, such as fire blankets, fire extinguishers and a safety shower.

SAFETY TIP

Safety Regulations

OSHA regulations require you to placard the location of all safety and emergency equipment with signs. See page 583 for safety signs.

In General Terms...

...the maximum travel distance to reach each safety aid should be as follows:

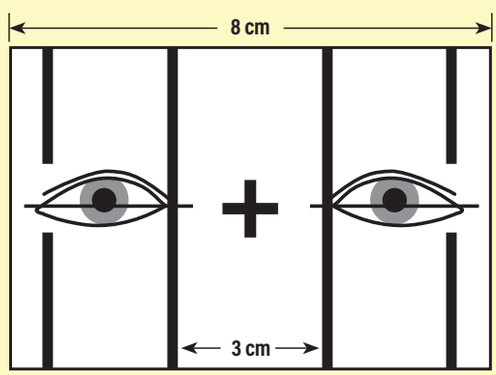
Safety Aid	Max. Suggested Travel Distance
Body Shower	50 Feet
Fire Extinguisher	25 Feet
Fire Blanket	30 Feet
Eyewash	25 Feet

HOW TO

Test Your Eyewashes

Your eye/face washes should be tested on a routine basis to make sure they are in good working condition, to clear mineral deposits out of the system and to make sure the water stream will hit both eyes. How often you check your eyewash depends on the water quality and age of the eyewash. Once a week is a good starting point. Remember to document when you test your safety equipment to remind yourself when you last did it and to demonstrate you are a responsible science teacher.

A simple, inexpensive device can be made to check the efficiency of your eyewash. Draw a pair of eyes onto a clear plastic (overhead transparency) sheet, using the pattern shown to the right. Turn the eyewash on and place the sheet over the eyewash as if it were your face. You'll be able to see instantly if you're getting the proper eyewash coverage.



Fire Blanket

A woolen blanket for smothering fires and for containing and controlling chemical spills. Blanket dimensions are 62" x 80". You may buy the blanket with the metal container for wall mounting or, if you have the wall container, you can purchase the blanket alone. Mount fire blankets and other safety aids in fixed locations. This will allow you and your students to know exactly where to find these important safety tools in case of emergency. Fire blanket case dimensions are 18" W x 16" H x 5¼" D.

FLINN EXCLUSIVE

See free video at flinnsci.com.

Catalog No.	Description	Price/Each
SE3006	Fire Blanket with Case	$163.00
SE3007	Fire Blanket Only	88.25
SE3008	Case Only	85.16



Fire Blanket
SE3006, etc.

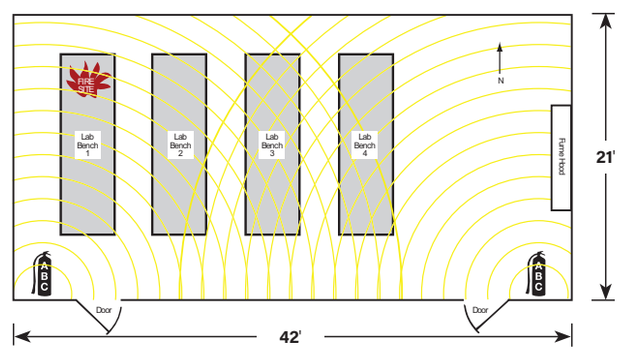
Fire Risk Reduction Rules

Is your science department prepared and ready to manage fire risks?

1. **Is there a plan in existence to immediately notify the fire department in the event of fire?** Is a telephone or alarm nearby?
2. **Are ABC-type fire extinguishers present and located in fire risk areas, such as laboratories, chemical storage areas and classrooms?** Make a list, room by room, where extinguishers are needed.
3. **Are extinguishers fully charged and operational?** A discharged or broken extinguisher offers false security but no protection.
4. **Are extinguisher location(s) unobscured and conspicuous?** Large, overhead locator signs should be placed near your extinguishers. Teachers and students should know where all fire extinguishers are located.
5. **Can each teacher use a fire extinguisher?** Don't wait for the event to happen. Plan regular practice sessions.
6. **Is the travel distance from source of fire risk to the extinguisher(s) a maximum of 25 feet?** Create a floor plan of the entire science area, and plot the best location(s) for all extinguishers. Imagine a fire in various locations within the lab, and estimate how far you have to go to reach a fire extinguisher. See diagram.
7. **Has a fire evacuation plan been established and practiced?** Create a plan if none exists, and practice it regularly.
8. **Has a fire extinguisher maintenance schedule been established and monitored?** Inspection tags should be placed on all safety equipment and every inspection noted. See page 575 for Flinn safety inspection tags.
9. **Are flammable liquids under control and stored in approved and dedicated flammables cabinets for protection?** Reduce your risk by protecting flammables in dedicated cabinets.
10. **Do student safety training plans include fire safety issues?** Do you reinforce fire training on a regular and established basis during the school year?
11. **Do your purchasing plans include sensible acquisition of flammable liquids aimed at minimizing your inventory and, therefore, your risk?** Buy and store only the minimum amounts of flammable materials necessary. Dispose of flammable waste solvent responsibly.
12. **Are your chemicals stored in chemically compatible families to reduce possible fires and chemical reaction hazards?** Consult page 628 to review Flinn compatible chemical family codes.
13. **Is your chemical store room adequately ventilated?** Consult page 598 to review ventilation in chemical storage areas.
14. **Are students using the lowest possible fire risk equipment when heating substances in the laboratory?** Use hot plates, water baths or heating mantles in place of Bunsen burners and especially alcohol burners.

Call Flinn at 1-800-452-1261 for information on fire risk reduction and fire extinguisher safety.

Fire Extinguisher Area Coverage Plan



Radial lines define suggested east/west extinguisher coverage limits for this example room.

Fire Extinguishers

Fire Extinguisher, Dry Chemical, ABC

Your best choice for the science laboratory—ABC type fire extinguishers treat most types of fires and are easy to use! This dry ammonium phosphate extinguisher is under nitrogen pressure. Effective range is 20 feet. Provided with a pressure gauge to indicate extinguisher ready condition. A quick release valve lock helps to avoid accidental discharge—an important feature where students are present. The plastic discharge horn is at the end of a flexible hose. Complete with wall mounting bracket. The UL rating is 2A:10B:C for SE1034 and 4A:60B:C for SE3001. Can be recharged by any local fire protection company.

Catalog No.	Description	Chemical Weight	Overall Weight	Overall Height	Price/Each
SE1034	Fire Extinguisher, Dry Chemical, ABC	5 lb	8 lb	15"	$ 87.10
SE3001		10 lb	15 lb	20"	148.85

Types of Fires

Class	Uses	Examples
A	Common Combustibles	Wood, paper, plastic, cloth, trash
B	Flammable Liquids	Gasoline, grease, oil, paint, organic solvents
C	Energized Electrical Equipment	Hot plate, balances, microscopes
D	Flammable Metals	Sodium, potassium, calcium

Fire Extinguisher, Powder, Class D

FLINN EXCLUSIVE

A special fire extinguishing powder specifically for use with flammable solids fires. To use, simply dump the bottle contents on the fire. Have a material like this available when demonstrating or using alkali metals. Dry sand also works well. 500 g bottle.

Catalog No.	Description	Price/Each
SE3004	Fire Extinguisher, Powder, Class D	$20.40

First Aid Kits

Provide the safety you need in your laboratory with one of our first aid kits—designed to meet OSHA and ANSI first aid requirements. Durable, steel box has a built-in handle and is wall mountable. Two options are available.

The SE1082 kit contains first aid items, such as plastic bandages, triple antibiotic ointment packs, BZK antiseptic towelettes, CPR mask with one-way valve, burn dressing, cold compress, eyewash, nitrile gloves, scissors, trauma pad, first aid guide and more. 10½" x 7⅝" x 2⅛".

The larger SE1083 kit contains a greater number of the items listed above as well as fingertip and knuckle fabric bandages, 2" x 5-yd elastic bandage, insect sting relief pads, tweezers, alcohol cleansing pads and povidone-iodine infection control wipes. 9½" x 9" x 2⅜".

Catalog No.	Description	Price/Each
SE1082	First Aid Kit for 25 People	$56.10
SE1083	First Aid Kit for 50 People	76.18



Fire Extinguisher, Dry Chemical, ABC
SE1034, etc.



Fire Extinguisher, Powder, Class D
SE3004



First Aid Kit
SE1082, etc.

SAFETY TIP

First Aid

In collaboration with school medical staff, science teachers should develop written first aid policies for their classrooms. Knowing what to do in the event of an accident can minimize injury!

Fire Extinguisher Operation

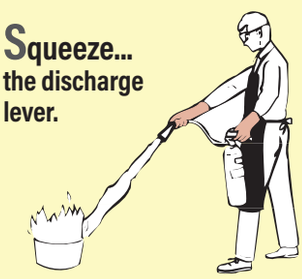
Pull Aim Squeeze Sweep



Pull... the ring or lock pin.



Aim... at the base of the fire standing back 8–10 feet.



Squeeze... the discharge lever.

Sweep... side to side.

Learn to operate a fire extinguisher *before* it's needed! Remember the simple word PASS.

Fume Hood Accessories

Velometer

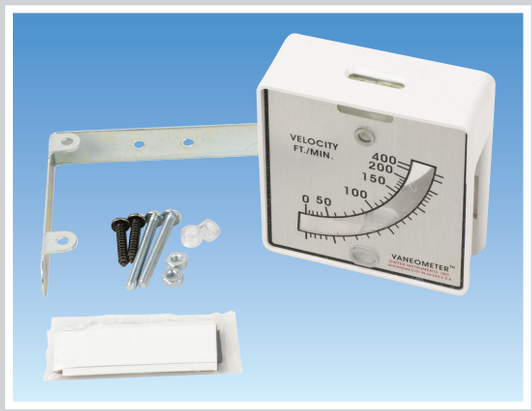
The efficient operation of your school's fume hood is essential to the well-being of you and your students. Used to check fume-hood efficiency, a velometer measures air velocity with readings expressed as linear feet of air per minute.

To check hood efficiency, measure the air velocity at the "face" of the hood opening, ideally at multiple locations across the face. A hood should provide air movement of at least 100 linear feet of air per minute.

Easy to use, the unit must be level during use, so a bubble level is built in. The unit is calibrated from 0 to 400 feet per minute. Accuracy is ±10%, full scale.

The carrying case is available to protect the instrument during storage.

Catalog No.	Description	Price/Each
SE4055	Velometer (Vaneometer®)	$114.30



Velometer (Vaneometer®)
SE4055, etc.

Hood Efficiency Label

FLINN EXCLUSIVE

Labels should be affixed to the posts of your hood so that you and your students know where the hood sash should be placed to offer the highest level of protection. Adhesive backing; 2½" x 1".

Catalog No.	Description	Price/Each
SE5017	Hood Efficiency Label	$ 0.80



Hood Efficiency Label
SE5017

Smoke Generators

A great and inexpensive way to monitor air movement in your fume hood or to test the laboratory ventilation system. Once ignited, these military-type smoke generators will allow you to safely determine if your room ventilation system operates properly or if your fume hood efficiently moves air. Smoke generators also enable you to trace air movement from the inside to the outside of a building. The white/gray smoke generated is a result of a chemical reaction, so there will be no messy residue in your lab or on your clothing. If your budget does not allow a velometer to check your fume hood, then at least consider using a smoke generator to be sure that your hood efficiently moves air. Two sizes of generators are available. The 30-second type will generate approximately 4,000 ft^3 of smoke. This size should be adequate to test air movements within the laboratory or fume hood. The 3-minute generator will provide almost 40,000 ft^3 of smoke. This generator would be your choice if you wish to trace the exhaust path from your hood or exhaust to a remote, outdoor roof stack. Sold in packages of two generators.

Catalog No.	Description	Size (Diameter x Length)	Price/Pkg. of 2
SE5010	Smoke Generator, 30-second	1½" x 1½"	$18.05
SE5011	Smoke Generator, 3-minute	1½" x 6"	37.95



Smoke Generators
SE5010, etc.

SAFETY TIP

Fume Hood Considerations

HOOD SAFETY

1. Do not assume that a fume hood is operating efficiently just because you hear the motor running. Check the hood using a velometer or a smoke generator.
2. Label your fume hood side post(s) to indicate which sash position (opening) offers the greatest protection.
3. Position the adjustable hood baffles (if furnished) to provide the most efficient air movement.
4. Do not use a fume hood as a storage area for chemicals or other materials.
5. Work as far under the hood as is practical and comfortable, but at least six inches inside the hood area as a minimum.
6. To the extent possible, use the fume hood sash as a face shield. Avoid working with the hood sash wide open.

HOOD LOCATION

1. Room drafts dramatically affect hood efficiency. Never locate a hood near or across from a window, door or air outlet/inlet.
2. Hoods should never be placed in heavy traffic areas.
3. Room air flow patterns will affect a fume hood, and these patterns should be considered before permanently locating a hood.
4. Hood exhaust should be independent of other building exhaust stacks, and the exhaust exit should be located well away from any school air inlet.
5. If multiple hoods are part of a single exhaust system, that exhaust system must be designed so each and every hood can be operated with no influence on others in the system.

Gas Safety

Gas Jet Safety Caps

The caps fit securely onto your laboratory gas jets and can be removed with the supplied key. Designed with an inner rubber seal to prevent accidental gas leaks, these caps are certified by the American Gas Association. Each bright yellow gas jet safety cap is sold separately and comes with its own key. Caps will fit most gas jets to prevent entry of foreign objects. Airtight on Delta faucets and Chicago faucets.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Pkg. of 25
SE1037	Gas Jet Safety Caps—Delta Faucets	$297.20
SE1036	Gas Jet Safety Caps—Chicago Faucets	297.20

Pocket Gas Detector

Detect potentially hazardous gas leaks in your classroom! No longer do you need to depend on your maintenance staff. You can now test for gas leaks every 3 to 6 months with this easy-to-use, highly accurate detector of combustible gases. Features:

- 40 ppm methane sensitivity and bearing defects
- Trace natural gas lines and fittings for leaks frame to failure
- Check gas equipment for leaks
- Test and check propane tanks, fittings, lines, and heaters for leaks
- Test confined spaces for gas build-up

Catalog No.	Description	Price/Each
SE1065	Pocket Gas Detector	$135.35
AP1423	Battery, AA (Alkaline)	2.75

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VISIT US ONLINE

Glass Safety

Glass Disposal Container

Protect yourself and students from broken glass cuts with this highly visible cardboard glass disposal container. The container is supplied with a 3-mil-thick polyethylene bag to contain broken glass fragments and spilled liquids. When the container is full, simply pull the safety cap into place and dispose of the entire unit. Available in a benchtop or floor model. Floor model comes with external handles. Six containers per package.

Catalog No.	Description	Size (L x W x H)	Price/Pkg. of 6
AP8829	Glass Disposal Container Benchtop Model	9" x 9" x 14"	$59.00
AP8830	Glass Disposal Container Floor Model	12" x 18" x 22"	78.75



Gas Jet Safety Caps
SE1037, etc.



Pocket Gas Detector
SE1065



Glass Disposal Container, Benchtop Model AP8829

Glass Disposal Container, Floor Model AP8830

HOW TO

Use Smoke Generators to Test Your Lab's Ventilation

Many times it is difficult for administrators to understand the need for good ventilation in a chemistry laboratory. A great idea is to invite the superintendent, principal, business manager and other decision-makers to your laboratory. Explain to them again the need for good ventilation. If they still don't seem to understand your problem, tell them you would like them to see a demonstration.

Inform them that you will be lighting a 30-second smoke generator. They are to pretend that the nontoxic smoke from the smoke generator is actually those harmful invisible vapors sometimes given off during a chemistry experiment. Light the smoke generator. Turn on your existing ventilation. The room will soon fill up with smoke. The administrators will start to leave the room because it's getting too smoky. As they attempt to leave, stop them and ask, "Where are you going? I'm stuck in this poorly ventilated lab five class periods a day, every day!" They now understand your problem.

Hopefully, this visual demonstration will give you the proof you need to get your ventilation problem resolved.

Gloves, Hand Protection

Gloves, Zetex,™ for High and Low Temperatures

Zetex is an asbestos-free, woven silica fiber that can withstand high (+593 °C) temperatures. These general purpose gloves are wool-lined, loose-fitting and double sewn for extra strength. Available in two sizes.

Catalog No.	Description	Price/Pair
AP3240	Gloves, Zetex, 11" Length	$85.00
AP3242	Gloves, Zetex, 14" Length	90.25

Gloves, Autoclave

Heat-resistant up to 232 °C, these all-cotton, terry cloth gloves are excellent for handling hot objects just out of the autoclave. Gauntlets provide wrist and forearm protection against possible steam burns. Machine washable. Glove is 12" long.

Catalog No.	Description	Price/Pair
AP8876	Gloves, Autoclave	$39.87

Gloves, Butyl Rubber

Specialty rubber gloves provide chemical resistance against esters and ketones, especially methyl ethyl ketone (MEK). Smooth finish ensures comfort and performance. Versatile size fits medium to large hands.

Catalog No.	Description	Price/Pair
AP7482	Gloves, Butyl Rubber	$70.00

Gloves, Cotton and Canvas

Extra-heavy fabric—including palm, thumb, and back of first finger—provides superior protection. Gauntlet cuff protects wrist and forearm. Glove is made of cotton flannel and finger backs are made of heavy canvas. Glove is 12" long.

Catalog No.	Description	Price/Pair
SE1031	Gloves, Cotton and Canvas	$12.00

Gloves, Terrycloth, General Purpose

Affordable, heavyweight glove provides excellent protection against heat, sharp objects, and abrasion. Durable glove is made of a cotton/polyester blend with a knit cuff that fits snugly around the wrist. Glove is machine washable, absorbent, reversible to fit either hand, and is 10" long.

Catalog No.	Description	Price/Pair
SE1030	Gloves, Terrycloth, General Purpose	$7.00

Gloves, Playtex®-Type, General Purpose

Gloves are fabricated of neoprene and natural latex rubber blend. There are embossed gripping surfaces on fingers, palm, and thumb. Glove is 12" long which enables user to turn up the cuff to prevent liquid from rolling off the glove gauntlet.

Catalog No.	Description	Size	Price/Pair
AP3230	Gloves, Playtex-Type	Small	$3.95
AP3232		Medium	4.40
AP3234		Large	4.50
AP4581		X-Large	4.30

GLOVES, HAND PROTECTION continued on next page.



Zetex Gloves
AP3240, etc.



Autoclave Gloves
AP8876



Butyl Rubber Gloves
AP7482



Cotton and Canvas Gloves
SE1031



Terrycloth Gloves
SE1030



Playtex-Type Gloves
AP3230, etc.

HOW TO Glove Selection Chart

As with any personal protective equipment, it is important to select gloves that are appropriate for the chemical hazards. One type of glove does NOT protect against all types of chemicals!

The following glove selection chart is offered to help you assess the general chemical resistance of various glove materials. We assume the gloves will be worn to protect against incidental contact of chemicals with skin. The glove selection chart does not replace the need for hazard assessment for avoiding contact with corrosive or irritating chemicals.

*Chemical resistance of gloves is measured in three ways: degradation, breakthrough time and permeation rate. For heavy-duty or long-term use, you must consider not only the glove material but also the thickness, size and fit of the gloves.

Glove Material	General Uses*
Latex (disposable)	Dilute aqueous solutions of mild irritants, inorganic salt solutions, alcohols
Nitrile (disposable)	Dilute acid and base solutions, aliphatic hydrocarbons, alcohols
Nitrile (heavy duty)	Corrosive or caustic acids and bases, aqueous halogens, aliphatic and aromatic hydrocarbons, alcohols and ethers, some chlorinated organics
Neoprene	Corrosive and oxidizing acids, caustic alkali, hydrocarbons, alcohols
Butyl	Acids and bases, alcohols, ethers, ketones, esters

Gloves, Hand Protection, continued

Gloves, Nitrile, Acid-Resistant

Nitrile gloves are unlined and have a reinforced cuff. Nitrile is superior to rubber or neoprene particularly with acids and bases. And since nitrile contains no natural rubber proteins, this glove is the ideal solution for individuals allergic to natural rubber latex. Fingers are tapered. Glove is 13" long and provides good lower arm protection.

Catalog No.	Description	Size	Price/Pair
AP3257	Gloves, Nitrile, Acid-Resistant	7	$5.05
AP3258		8	5.05
AP3259		9	5.05
AP3260		10	5.05
AP3262		11	5.05

Gloves, Polyethylene, Disposable

Transparent, wrist-length gloves with heat-sealed seams. Will provide protection against acids and detergents without hindering manual dexterity. While these gloves offer good chemical resistance and overall protection, the polyethylene film is only 1¼ mils thick and is easily ruptured. Packages of 500.

Catalog No.	Description	Size	Price/Pkg.
AP3214	Gloves, Polyethylene, Disposable	Small	$17.30
AP3215		Medium	17.90
AP3216		Large	17.90
AP9779		X-Large	18.65

Gloves, Polyethylene, Disposable

Embossed gloves are breathable to keep your hands cooler, and they slide on and off hands easily without tearing. Gauntlet cuffs for added wrist protection. Ambidextrous, transparent gloves are packaged in 500-glove boxes.

Catalog No.	Description	Price/Pkg.
SE1032	Gloves, Polyethylene, Disposable, Pkg. 500	$40.95

Gloves, Latex

Easily and quickly contours to the shape of the user's hand. Provides the ultimate in sensitivity when performing intricate tasks. Powder level kept to absolute minimum. Good tensile strength. 5-mil thick, 10" long. Packaged in 100-glove dispensers.

Catalog No.	Description	Size	Price/Pkg. of 100
AP4427	Gloves, Latex	Small	$17.00
AP4428		Medium	19.95
AP4429		Large	19.95
AP4582		X-Large	19.95

Gloves, Latex, Powder-Free

Reduce the risk of allergic reactions and skin irritation resulting from the powder. Textured latex offers exceptional gripping power in wet or dry conditions while still maintaining tactile sensitivity. These gloves meet or exceed federal and ASTM tear- and puncture-resistance standards. Packaged in 100-glove dispensers.

Catalog No.	Description	Size	Price/Pkg. of 100
AP4826	Gloves, Latex, Powder-Free	Small	$23.00
AP4827		Medium	23.00
AP4828		Large	23.00
AP4829		X-Large	21.05

Gloves, Nitrile, Disposable, Powder-Free

Provides fit flexibility while offering superior protection against accidental contact with acids and bases or halogenated organic solvents. Pinhole-free material is 4 mils thick, resists tearing, and will outlast common latex disposable gloves. Sold in boxes of 100.

Catalog No.	Description	Size	Price/Pkg. of 100
AP7078	Gloves, Nitrile, Disposable, Powder-Free	Small	$25.00
AP7079		Medium	25.00
AP7080		Large	25.00
AP7081		X-Large	25.00

GLOVES, HAND PROTECTION continued on next page.



Nitrile Gloves, Acid-Resistant AP3257, etc.



Polyethylene Disposable Gloves AP3214, etc.

HOW TO

Determine Glove Size

Wrap a measuring tape around the widest part of your palm, including the thumb. The number of inches equals your glove size.



Polyethylene, Disposable Gloves SE1032

Powder-Free Gloves

If you suffer from red, rashy or itchy skin after using powdered gloves, our powder-free gloves may solve your problem. They are free of chemicals and residue that may cause contact dermatitis or skin irritations.



Latex Gloves AP4427, etc. AP4826, etc.



Nitrile, Disposable, Powder-Free Gloves AP7078, etc.

Gloves, Hand Protection, continued

Kimberly-Clark® Nitrile Gloves

Purple nitrile gloves are powder-free and made from a highly durable synthetic, eliminating the problem of exposure to latex gloves while maximizing protection against acid and base solutions and halogenated organic solvents. Textured fingertips with excellent dexterity and tactile sensitivity.

Catalog No.	Description	Size	Pkg. Size	Price/Pkg.
AP9358	Kimberly-Clark Nitrile Gloves	X-Small	100	$59.95
AP9359		Small	100	59.95
AP9360		Medium	100	59.95
AP9361		Large	100	59.95
AP9362		X-Large	90	59.95

Gloves, for Rough/Sharp Materials

A rugged glove for handling rough or sharp materials. These gloves have poor chemical resistance. Will outlast canvas or leather gloves. Glove is made of cotton with heavy latex coating. Glove is 10" long.

Catalog No.	Description	Price/Pair
SE1041	Gloves, for Rough/Sharp Materials	$21.25

Goggles, Eye and Face Protection

Bio-Glasses, Protective Eyewear

Safety glasses specifically designed for the life science or physical science classroom. Bio-Glasses are very comfortable to wear, have adjustable bows and are ANSI Z87+ approved. This exciting new look, with the choice of five different colors, ensures that your students will want to wear their Bio-Glasses for each and every lab.

Catalog No.	Description	Price/Each	Price/Each in quantities of 72-299	Price/Each in quantities of 300 or more
AP11079	Red, White and Blue	$8.55	$8.14	$7.75

Goggles, Chemical Splash

Fabricated from soft vinyl, a double flange cushion at the top and bottom of the goggle conforms to facial contours for extra comfort. The 2 mm thick clear lenses are made of durable polycarbonate. Ventilation is provided through the lens channels as well as the molded-in vents. Chemical splashes cannot enter the goggle. Lenses are easily replaced; replacement parts are listed below. AP3306 and AP3309 meet Z87+ D3 standards. AP3312 and AP3315 meet ANSI Z87.1–2003 standards. SE1049 meets Z87+D3, D4, D5 standards.

Catalog No.	Description	Price/Each	Price/Each in quantities of 72-299	Price/Each in quantities of 300 or more
AP3306	Standard Vented Goggle	$11.00	$10.34	$ 9.33
AP3309*	Standard Vented Goggle with fog-free lens	13.35	12.71	12.60
AP3312	Standard Vented Goggle, Small Size**	10.47	9.84	9.38
AP3315*	Standard Vented Goggle, Small Size with fog-free lens**	14.07	13.29	12.77
SE1049*	Standard Size, NON-VENTED, CLOSED, fog-free goggle. Some eye professionals say wearers of contact lenses should wear a non-vented goggle when organic solvent fumes are present.	11.50	10.01	9.53

* Denotes fog-free goggles.
** Small size goggles are suitable for petite individuals and younger students.

Goggles, Chemical Splash, Replacement Parts

Catalog No.	Description	Price/Each
AP3307	Lens for AP3306 Goggle	$ 5.45
AP3310	Lens for AP3309 and SE1049 Goggle	7.45
AP3317	Elastic Head Bands for all above Goggles (Pkg. of 12)	17.90
AP1549	Vent Covers for all Goggles	0.55

GOGGLES, EYE AND FACE PROTECTION continued on next page.



Kimberly-Clark Nitrile Gloves AP9358, etc.



Gloves for Rough/Sharp Materials SE1041

Invisible Gloves

Wear chemical-resistant gloves whenever working with hazardous substances. Consider applying a generous amount of protective hand cream to your hands just before donning the gloves. The hand cream acts as a barrier against corrosive or defatting organic solvents and provides a second line of defense if gloves tear or leak. See page 570.



Bio-Glasses, Protective Eyewear AP11079



Goggles, Chemical Splash AP3306, etc.



Goggles, Chemical Splash, Replacement Parts AP3307, etc.

Goggles, Eye and Face Protection, continued

Goggle Straps, Latex-Free

Latex-free headbands are here! These versatile straps can be used with Chemical Splash Goggles (including economy choice and colored goggles) and Flinn Visor Goggles. Approximately 19" in length. Package of 10.

Catalog No.	Description	Price/Pkg.
AP7646	Goggle Straps, Latex-Free, Pkg. of 10	$23.10

Make Your Own Colorful Goggles—Super Laboratory Value Kit

FLINN EXCLUSIVE

By: The Flinn Staff

Let the creativity flow as students create their own personalized "designer" goggles! With this colorful goggle-dyeing kit, students can choose their favorite colors, school colors or multi-colors and turn a standard pair of chemical-splash goggles into a pair with unique design. Students will have fun with this lab and will be much more likely to wear their goggles! This lab can help teach the chemistry of dyes and the dyeing process at the same time it stresses an important safety rule—wearing goggles is critical in laboratory situations! Five colored dyes—red, blue, purple, gold and black—are included in the kit. Teacher tips and a reproducible student handout are included. *Note:* Chemical-splash goggles and large beakers or pots are needed but not provided in the kit.

Super Value Kit is complete with enough dye for 5 classes of 30 students to each dye a pair of goggles.

Catalog No.	Description	Price/Each
AP5947	Make Your Own Colorful Goggles—Super Value Laboratory Kit	$35.95

Goggles, Chemical Splash, Economy Choice

The old saying "you get what you pay for" is especially true for chemical splash goggles. If you can afford the higher quality chemical splash goggles (i.e., AP3306, etc.) then we strongly encourage you to purchase them. However, for those schools on a very tight budget, we now have available the Flinn economy choice chemical splash goggle. This goggle is reasonably comfortable to wear and fits over most prescription glasses. Indirect ventilation prevents chemical splashes from ever entering the goggle. Goggles are clear with black vents and black straps. Meets ANSI Z87+D3 standards. Available in standard and fog-free lenses. AP8956 are ANSI Z87 certified.

Catalog No.	Description	Lens Type	Price/Each	Price/Each in quantities of 72-299	Price/Each in quantities of 300 or more
AP8955	Goggle, Chemical Splash, Economy Choice	Standard	$6.50	$6.20	$5.97
AP8956		Fog-Free	12.00	11.45	11.30

Goggles, Chemical Splash, Economy Choice, Colored

Colored economy choice goggles! These goggles are the same as our economy choice chemical splash goggles listed above. Comfortable and colorful, these goggles feature standard lenses and are sold in packages of 10. Three colors are available: pink, blue, and yellow. Meets ANSI Z87+D3 standards.

Catalog No.	Description	Color	Price/Pkg. of 10
AP7686	Goggles, Chemical Splash, Economy Choice, Colored	Pink	$68.50
AP7687		Blue	68.50
AP7688		Yellow	68.50

Goggles, Instructor's, Chemical Splash

Teachers! Finally a comfortable pair of chemical splash goggles you can wear all day long. Fog-free, impact-resistant polycarbonate lenses offer a 160° field of view for excellent peripheral vision. Designed to fit over glasses, these goggles filter 99.9% of all UV light and are UV sterilizable. Neoprene straps. Meet ANSI Z87+ and CSA Z94.3 standards.

Catalog No.	Description	Price/Each
AP8739	Goggles, Instructor's, Chemical Splash	$15.50

GOGGLES, EYE AND FACE PROTECTION continued on next page.



Goggle Straps, Latex-Free, Pkg. of 10
AP7646



Make Your Own Colorful Goggles—Super Value Laboratory Kit
AP5947

A Practical Goggle Policy

If the school owns the goggles, the school (which essentially means the teacher) is responsible for goggle hygiene. You invest in sterilizers, cleaning solutions and other means of assuring a sanitary goggle. Discuss with school administrators the practical aspects of students purchasing their own pair of goggles from the school. Your school saves money by not having to furnish goggles—and you don't need to worry about the hygiene problems associated with sharing goggles.



Goggles, Chemical Splash, Economy Choice
AP8955, etc.



Goggles, Chemical Splash, Economy Choice, Colored
AP7686, etc.



Goggles, Instructor's, Chemical Splash
AP8739

Eyewear for UV Protection

All of our safety glasses and goggles with polycarbonate lenses, including our popular Visor Goggles, filter out 99.9% of UV radiation and offer UV protection down to short-wavelength UV light. Safety glasses and goggles also offer protection when working with germicidal UV-C lamps. UV protection is included in the ANSI Z87.1 standard for protective eyewear.

Goggles, Eye and Face Protection, continued

Flinn Visor Goggles

FLINN EXCLUSIVE

Unique and approved eye protection device provides both a visor to reduce overhead light glare and good protection against chemical splash. A great advantage of Flinn Visor Goggles is that they can comfortably be worn over eyeglasses without fogging. The vents prevent chemical splash entry and provide cool air ventilation. Meets ANSI Z87+D3 standards.

Catalog No.	Description	Price/Each	Price/Each in quantities of 72-299	Price/Each in quantities of 300 or more
AP1362	Flinn Visor Goggles	$13.52	$12.91	$12.74

Students Like Visor Goggles

Visor Goggles
- Don't fog up.
- Have a modern look.
- Are brightly colored.
- Leave less of a mark on faces.

Would you like to try out the Visor Goggles? Drop us a note, e-mail us at flinn@flinnsci.com or call us, and we will send you a free sample. If trying something different will get more students to wear their goggles, then it is worth investigating.

Uvex® Safety Goggles

The most comfortable pair of goggles you will ever wear! Sleek, futuristic goggles have a low profile lens and a flexible polypropylene frame that molds perfectly to most facial contours. Contact points on face are soft and flexible and the neoprene strap is wide and well-textured. Easily fits over glasses. Goggles are anti-fog, anti-scratch, and anti-static with splash and impact protection as well as indirect ventilation and a UV rating of 99.9%. Meets ANSI Z87+ D3 standards. These are well worth the price!

Catalog No.	Description	Price/Each
AP7474	Uvex Safety Goggles	$25.00

Tall Lens Safety Glasses

These safety glasses offer a generous lens with an outstanding orbital seal. Soft and secure thermal plastic rubber nose pads provide long-lasting comfort, and the nonslip soft temple material holds the eyewear firmly in place. Meets ANSI Z87+ standards for high impact.

Catalog No.	Description	Type	Price/Each
AP10653	Tall Lens Safety Glasses	Standard	$10.12
AP10654		Anti-Fog	10.36

Bio-Glasses

Safety glasses specifically designed for the life science or physical science classroom. Bio-Glasses are very comfortable to wear, have adjustable bows and are ANSI Z87+ approved. This exciting new look, with the choice of five different colors, ensures that your students will want to wear their Bio-Glasses for each and every lab.

Catalog No.	Description	Color	Price/Each	Price/Each in quantities of 72-299	Price/Each in quantities of 300 or more
AP4661	Bio-Glasses	Black	$8.55	$8.13	$7.72
AP8575		Red	8.55	8.12	7.72
AP8576		Blue	8.55	8.13	7.72

Over-the-Glass Safety Glasses

For those who need over-the-glass safety eyewear protection, the Law® OTG (Over the Glass) eyewear is a stylish and sensible option. Nonslip thermal plastic rubber temples give the user comfort and grip, and the wraparound style allows improved angular coverage and peripheral vision. Meets ANSI Z87+ and CSA Z94.3 eyewear standards.

Catalog No.	Description	Price/Each
AP10655	Over-the-Glass Safety Glasses	$10.70

GOGGLES, EYE AND FACE PROTECTION continued on next page.

What does ANSI Z87+ mean?

See page 593 for complete details.



STUDENT'S #1 CHOICE!

Flinn Visor Goggles
AP1362





Uvex Safety Goggles
AP7474

Tall Lens Safety Glasses
AP10653, etc.

SAFETY TIP

Safety Glasses vs. Goggles

Safety Glasses, Bio-Glasses or Neon-Colored Safety Spectacles are not intended to replace the use of chemical splash goggles. They are designed for physical science or biology classes. While this eyewear will reduce the possibility of splashed fluids, it does not completely eliminate that hazard or the possibility of serious injury. You, the instructor, should decide what type of eyewear your students must wear in every case.



Over-the-Glass Safety Glasses
AP10655

Goggles, Eye and Face Protection, continued

Wraparound Safety Glasses

All visitors who enter your lab when experiments or demonstrations are in progress should wear eye protection. Demonstrate your commitment to safety by keeping these wraparound, aviator-style safety glasses at the ready for staff members, administrators and other visitors to your lab. Ultra-light, clear polycarbonate lenses are impact-resistant and provide UV protection. Glasses meet ANSI Z87+ standards but should not be considered full chemical splash goggles. Sleek design—these glasses will not fit over regular prescription glasses.

Catalog No.	Description	Price/Each
AP6576	Wraparound Safety Glasses	**$5.90**



Wraparound Safety Glasses AP6576

Full Face Shield

This lightweight face shield provides full face protection to the student or science teacher. The clear acetate window measures 8" high x 12" wide x 0.04" thick. Adjustable headgear has a tension control to hold the shield on the head. ANSI Z87.1-2003 (9.1) standards clearly state that "Face shields are secondary protectors and shall be used only with primary protectors" (i.e., goggles). Please keep this regulation in mind when purchasing a face shield. Meets ANSI Z87+ standards.

Catalog No.	Description	Price/Each
SE226	Full Face Shield	**$44.57**



Full Face Shield SE226, etc.

Flinn Goggle Sanitizers

FLINN EXCLUSIVE

Designed to meet the demanding needs of your science laboratory, this unique goggle sanitizer has been specifically designed by Flinn Scientific for science teachers. Special features:

- Racking system conveniently stores chemical splash goggles or safety glasses without stacking.
- The light viewing screen, 15-minute timer and instructions on the cabinet front allow for ease of use and save valuable bench/storage space as it can be placed up against other cabinets.
- Longer life, high-intensity ultraviolet 25-watt lightbulb improves sanitizing performance.
- Safety message silk-screened on the cabinet front reminds students "Safety First."
- A great price! You won't find a better price anywhere.

Using a goggle sanitizer allows several classes of students to safely share goggles. Five-minute exposure of UV light will kill over 99.5% of all bacteria present.

Safety and ease of use were the primary considerations in the Flinn goggle sanitizer design. A keyed lock allows the doors to be secured during sterilization. Safety door switches automatically shut off the UV light source if a door is accidentally opened. The light viewing screen confirms UV light is being generated.

Digital models available. Constructed of 24-gauge steel with a white baked enamel finish; comes fully assembled. A heavy-duty 8' (96") neoprene cord is provided. Can be shipped UPS. Goggles not included. See pages 571–573.

Dimensions:

- Large: 28½" H x 26¼" W x 10¼" D; holds 36 goggles.
- Small: 28½" H x 19" W x 10¼" D; holds 20 goggles.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each	Price/Each Qty. of 3 or more
SE1000	Flinn Goggle Sanitizer, Large	**$799.00**	**$757.26**
SE1094	Flinn Goggle Sanitizer, Digital, Small	**637.50**	**603.04**
SE1001	Replacement UV Lamp	**79.55**	**72.79**

SAFETY TIP

If a goggle sanitizer is not practical due to budget constraints, consider using Lysol® solution to sanitize goggles. Lysol is found on page 69. Add just 1¼ ounces of Lysol to one gallon of soft water. Dip the goggles in the Lysol solution for sanitizing, rinse and let air dry. If you use soft water (distilled or deionized water is soft), you should not have a lot of water spots. *Do not use this procedure with fog-free lens goggles.*



Flinn Goggle Sanitizers (Goggles sold separately)

Flinn Goggle Sanitizer, Large SE1000



Flinn Goggle Sanitizer, Digital, Small SE1094

Knob for SE1000 Goggle Sanitizer

This knob is for SE1000 goggle sanitizer.

Catalog No.	Description	Price/Each
AP11608	Knob for SE1000 Goggle Sanitizer	**$6.00**

GOGGLES, EYE AND FACE PROTECTION continued on next page.

Goggles, Eye and Face Protection, continued

Optical Lens Paper

Nonabrasive, soft, dust-free paper for cleaning lenses without scratching or harming optical surfaces. Perfect for use on goggles and all safety eyewear. High wet strength—ideal if liquid cleaners are used. Paper size 8" x 12". Supplied in tear-off tablet of 100 sheets.

Catalog No.	Description	Price/Each
SE1028	Optical Lens Paper	$8.00



Optical Lens Paper
SE1028

Lens Cleaning Towelettes

Easily remove smudges, fingerprints, and grease from goggles and glasses as well as clean and disinfect with these excellent towelettes. Not just for goggles and glasses, they can also be used to clean the surfaces of electronic equipment. Box opens into a convenient dispenser for simple and quick access while in the lab. 100 individually wrapped towelettes per box.

Catalog No.	Description	Price/Each
AP7473	Lens Cleaning Towelettes	$15.98



Lens Cleaning Towelettes
AP7473

Goggle Lens Cleaning Station

A single-location metal fixture that provides the source of water and a compartment for cleaning tissues. The tissues are chemically treated to prevent fogging. This antifogging is water-activated. Simply depress the spray water pump and apply water to the goggle. Next, remove a tissue from the tissue compartment to clean and antifog-treat your goggles.

Catalog No.	Description	Price/Each
SE232	Goggle Lens Cleaning Station	$105.10
AP1564	Replacement tissues for above station. 1000 Tissues per Package	37.95



Goggle Lens Cleaning Station
SE232, etc.

Gognest™

FLINN EXCLUSIVE

An entirely hardwood storage cabinet for goggles, glasses, and other safety eyewear. Gognest measures 11" H x 17" W x 7½" D and will accommodate 12 pairs of goggles. Several Gognests can be mounted together to accommodate larger storage needs. A set of blank labels is provided if you wish to assign specific nest locations to each student. Gognest can be mounted on the wall. Goggles not included.

Catalog No.	Description	Price/Each
AP1626	Gognest Goggle Storage Cabinet	$71.82



Gognest
AP1626

Adopt a firm goggle policy:

"Anytime chemicals, glassware or heat is used, students and teachers will wear their goggles. No exceptions!"

Hair Safety

Lab Safety Hair Bands

Tying back hair is a simple yet extremely important step in lab safety. Whether dissecting, using a Bunsen Burner, doing field work or using chemicals, personal protective equipment is a top priority. Be prepared down to the simplest lab safety item: elastic hair bands. 2-mm thickness, 40-mm diameter. Colors may vary.

Catalog No.	Description	Price/Each
AP11573	Lab Safety Hair Bands, Pkg. of 30	$3.25



Lab Safety Hair Bands
AP11573

Heat Protection

Hot Vessel Gripping Device

A unique silicone rubber device that is molded to fit the hand and enables teacher or student to grip hot vessels, such as beakers and flasks. Silicone rubber will withstand very high temperatures (260 °C). Fits any hand size. The gripping surface is studded to provide a positive grip. This safety device is also useful for handling very cold vessels.

▶ See free video at flinnsci.com.

Catalog No.	Description	Price/Each
SE039	Hot Vessel Gripping Device	$25.25

Hand Heat Protector, Economy Choice

Economy choice hand heat protector is made of silicone rubber and is similar in design to the more expensive model. Although slightly thinner in construction, this model still provides effective heat protection at an affordable price.

Catalog No.	Description	Price/Each
SE1070	Hand Heat Protector, Economy Choice	$12.24



Hot Vessel Gripping Device SE039

Hand Heat Protector, Economy Choice SE1070

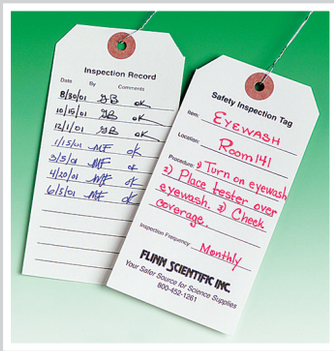
Inspection, Safety

Safety Inspection Tags

FLINN EXCLUSIVE

Do you know when your safety equipment was last inspected? With these tags, there will never be a question. Safety equipment must be tested on a routine basis to ensure that it's ready in case of emergency. These tags are made of heavyweight, white paper with reinforced metal eyelet and wire for easy attachment to all your safety equipment. Tag front includes item, location, test procedure and frequency while the inspection dates are recorded on the back. 3¼" x 1⅝". Package of 25.

Catalog No.	Description	Price/Each
AP4832	Safety Inspection Tags	$9.90



Safety Inspection Tags AP4832

Science Classroom Safety and the Law—A Handbook for Teachers

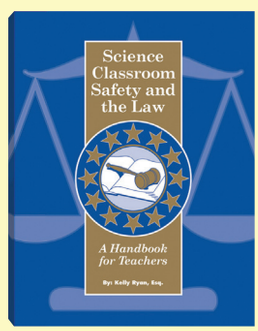
By: Kelly Ryan, Esq., Attorney at Law

Many safety problems exist in the science classroom. Lack of safety equipment, poorly designed laboratories, improper chemical storage and disposal, large class sizes, poor safety training and lack of classroom supervision are all major safety issues.

Science Classroom Safety and the Law was written to educate science teachers about court cases that apply to science education so you can successfully persuade school administrators to make the "right" decision regarding science safety. This book will give you the "ammunition" you need to correct safety problems at your school. Author Kelly Ryan understands firsthand the safety problems science teachers face since he was a chemistry teacher for 17 years at a large California high school before becoming an attorney.

The book is divided into five sections:

- An overview of negligence and other legal concepts you need to understand to successfully argue for science safety.
- The circumstances surrounding teacher liability in the science laboratory. Why do accidents happen and where do they occur?
- Practical solutions to everyday safety problems. An examination of how existing case law applies to different "safety situations."
- A review of 34 actual appellate court cases and how the law applies to science education. The facts of each case are described and the general principles are summarized in layman's terms.
- A discussion on the types of defenses a teacher can successfully use if sued.



Throughout the book, practical suggestions are made to improve science safety and reduce the potential for teacher and school district liability.

So often science teachers say they don't have enough evidence to successfully convince school administrators to correct a safety problem. This book will provide the necessary information you need to get safety problems corrected at your school. 156 pages, 8½" x 11", perfect bound.

Catalog No.	Description	Price/Each
AP6118	Science Classroom Safety and the Law—A Handbook for Teachers	$31.00

Flinn **Chem**ventory™

Chemical Inventory Management System

The Flinn Chemventory is a cloud-based laboratory chemical inventory system that allows multiple users access to the database from multiple locations and multiple devices! Maintaining an accurate laboratory chemical inventory has never been easier, more flexible and more convenient.

Chemventory **features:**

Secure Cloud-Based Service

Flinn's Chemventory is a secure cloud-based service that can be accessed by any computer or tablet with an internet connection, allowing you convenient access to your Chemventory database from your chemical storeroom, classroom or even your home. Plus you'll have peace of mind knowing that your data are stored on a secure server remotely and can be easily accessed 24/7. Revolutionize the way your school chemical inventories are managed! It's fast, it's easy, and it gives you all the flexibility you need.

Easily Add All Your Flinn Chemicals

You will find it simple to add Flinn chemicals to your Flinn Chemventory database. Just look up chemicals by keyword, catalog number or alphabetical index, and select what you have in stock to add to your database. We have also included the ability to manually enter any chemicals you have that may not have been purchased from Flinn, allowing you to easily keep track of all your inventory in one database.

Multiple Users

Do you share a storeroom with other teachers in your department? No problem! With Flinn Chemventory you can set up one database and invite other teachers, lab managers and/or administrators to view or update your Chemventory for no additional charge.

Print, Email and Export Your Inventory List

Certainly, having all your chemical inventory information stored on the cloud is incredibly convenient. In addition, many teachers and administrators would still like a hard copy list of their current inventory. Now with just one click of a button, you can print or email a formatted list of the chemicals in your inventory.

Link Databases Across Your District

If your school has multiple chemical storeroom locations or your district has multiple school locations, it will be more manageable to use more than one database. Flinn has made it easy to set up multiple databases and link access to users.

Customize Your Database

Keep track of all your chemicals in one database. Flinn Chemventory gives you the flexibility to classify each chemical in your inventory by the school name, chemical storeroom location and shelf/cabinet location. You can then sort your list by each of these categories.



Add Flinn Chemistry Kits to Your Inventory

When you purchase a kit from Flinn that includes chemicals, you can now add that complete kit to your inventory.

Add Kit Component Chemicals to Your Inventory

If you do not use all your kit chemicals, you can now easily add those kit component chemicals to your inventory.

Print Multiple SDS with One Click

Print all, some or just one Safety Data Sheet with one click. Simply select your chemicals and click print.

Low Stock Notifications on Inventory Page

Set a minimum reorder amount for your chemicals. When your stock drops below that number, a notification will appear in your inventory list.

Custom Sort Your Inventory List

Choose from seven fields and three sorting levels of your inventory list.

GHS Hazard Information Included

We have included new GHS pictograms and updated hazard information with every Flinn chemical in our Chemventory program. GHS pictograms and hazard statements can also be printed on chemical labels through the Chemventory program.



GHS Pictograms

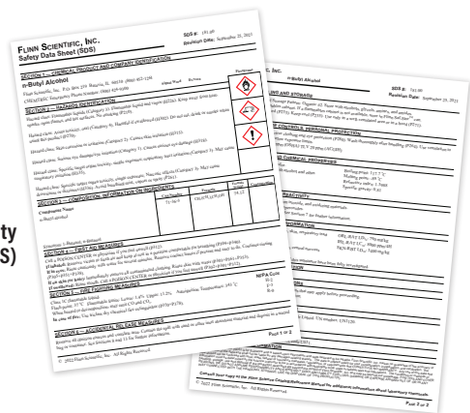
Print Chemical and Solution Labels

Print a chemical label for any chemical in your inventory or manually create a chemical label for any item not in your inventory. Even though OSHA will not require your current inventory of chemicals to be labeled with updated GHS labels, some districts have made this a requirement. With Flinn Chemventory you will have the ability to include GHS pictograms and hazard statements on labels for all 2,400+ Flinn listed chemicals. Also included in the label printing program is the option to print chemical solution labels. See below for labels.

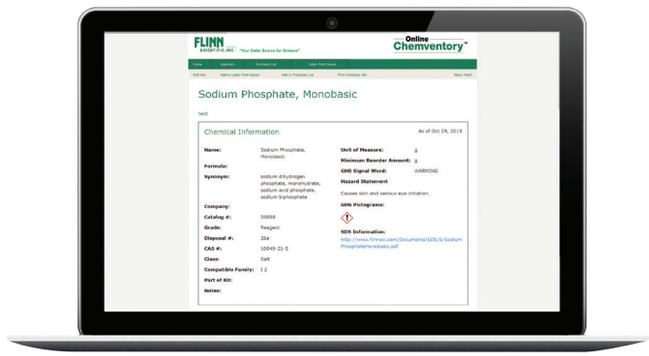
Catalog No.	Description	Price/Pkg.
AP6330	Labels, 1½" x 2¾", Pkg. of 2100	$81.64
AP4694	Labels, 2" x 4", Pkg. of 1000	71.66
AP7920	Labels, Chemical Resistant, 2" x 4", Pkg. of 100	21.40

Safety Data Sheets for Every Flinn Chemical

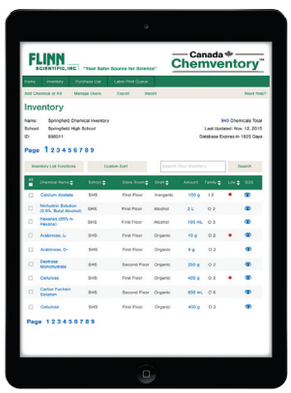
You will have access to all of the updated Flinn Scientific SDSs through the Chemventory program and via the Flinn website. When using our new Flinn Chemventory program, you will be able to simply click on the "View SDS" button in your chemical list or detail view screens to access a PDF for that SDS.



Flinn GHS Safety Data Sheets (SDS)



View Detailed Chemical Information



Access through your tablet's browser

New Feature! Chemical & Lab Match Up

The ability to match up chemicals with Flinn's digital labs is state-of-the-art addition. If you are a Flinn customer with digital lab access, simply select chemicals from your database and then search associated digital labs that use those chemicals. You can also select a lab and it will show you all the chemicals and materials required, your on-hand supplies and then options to purchase any items you may not have.

Create a Purchase List

Running low on a chemical or need to order more chemicals? Our new Chemventory program will give you an alert when your supply has dropped below a pre-determined inventory level. You can then add this chemical to a purchase list. When you are ready to place an order you can either print the list or easily convert it to a Flinn online shopping cart. Ordering laboratory chemicals has never been faster or easier!

Affordable and Convenient Price Options

A one-time purchase gets you 1, 3 or 5-years of access to build, view and update your chemical inventory database.

Flinn Chemventory is flexible enough to allow you to access your inventory information from multiple locations on multiple devices. Manage your chemical inventory safely and conveniently with Flinn's Chemventory program!

Catalog No.	Description	Price/Each
SE2998	Flinn Chemventory, 1-Year License	$ 99.00
SE2999	Flinn Chemventory, 3-Year License	249.00
SE3000	Flinn Chemventory`, 5-Year License	349.00

Labels, Chemical

Compatible Chemical Family Storage Labels, Shelf or Cabinet

FLINN EXCLUSIVE

Chemical labeling is easy with Flinn Compatible Chemical Family Shelf Labels. Made of heavy, vinylized paper, each chemical family label is color-coded. Large **I** or **O** designates inorganic or organic families. All families are included. Self-adhesive labels, 4" wide x 1" tall, will remain permanently affixed to your storage shelves or cabinets. Set includes 2 sheets of 20 labels; 40 labels in total.

Catalog No.	Description	Price/Each
SE4030	Labels, Compatible Chemical Family Storage	$9.25

Compatible Chemical Storage Labels, Bottle

FLINN EXCLUSIVE

Flinn chemicals have the appropriate compatible chemical family designation shown on the label. If you buy Flinn chemicals, you will not need additional labels. However, if you often prepare your own solutions, these are your labels. Self-adhesive labels are color-coded and printed on durable vinylized paper stock. Large letter **I** or **O** designates an inorganic or organic substance, with a separate color for each of the 11 inorganic and 10 organic families. Labels match the color codes used on our SE4030 shelf labels. Large printing ensures brightly colored labels can be read from a distance. Labels measure 1⅝" wide x ½" tall.

Available in individual packages of 40 labels or in a complete set of 840 labels containing all chemical family designations.

Catalog No.	Description	Price/Each
AP4246	Compatible Chemical Storage Labels, Bottle	$44.00

Catalog No.	Family Name	Price/Each	Catalog No.	Family Name	Price/Each
AP4247	Inorganic #1	$2.90	AP4257	Organic #1	$2.90
AP4248	Inorganic #2	2.90	AP4258	Organic #2	2.90
AP4249	Inorganic #3	2.90	AP4259	Organic #3	2.90
AP4250	Inorganic #4	2.90	AP4260	Organic #4	2.90
AP4251	Inorganic #5	2.90	AP4261	Organic #5	2.90
AP4252	Inorganic #6	2.90	AP4262	Organic #6	2.90
AP4253	Inorganic #7	2.90	AP4263	Organic #7	2.90
AP4254	Inorganic #8	2.90	AP4264	Organic #8	2.90
AP4255	Inorganic #9	2.90	AP1503	Miscellaneous Inorganic	2.64
AP4256	Inorganic #10	2.90			

Date Acquired Labels

FLINN EXCLUSIVE

These 1" diameter, gummed, white labels enable science teachers to date each product when received. All Flinn chemicals are dated when shipped to your school. You may acquire other products and thus need these labels. Sold in rolls of 100 labels.

Catalog No.	Description	Price/Pkg. of 100
AP4245	Date Acquired Labels	$14.95

Labels, Chemical-Resistant

Chemical-resistant labels for use with the Flinn Chemventory program. Labels are compatible with laser printers and measure 2" x 4". 10 labels per sheet; 10 sheets per package.

Catalog No.	Description	Price/Each
AP7920	Chemical-Resistant Labels, 2" x 4", Pkg. of 100	$21.40



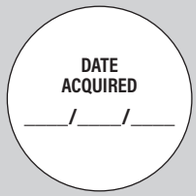


Compatible Chemical Family Storage Labels
SE4030



Labels, Compatible Chemical Storage, Bottle
AP4247, etc.





Date Acquired Labels
AP4245

Labels, Chemical-Resistant
AP7920

LABELS, CHEMICAL continued on next page.

HOW TO

Label Your Chemicals

A properly labeled chemical container contains a minimum of these four items:

1. **Chemical Name**—Spell out the name correctly and completely. Avoid using abbreviations or chemical formulas.
2. **Concentration**—If the chemical is in solution, indicate the solution's molarity or strength.
3. **Chemical Hazards**—List in clear terms how the chemical can hurt you and what target organs would be affected. This information can easily be found on your SDS. Avoid codes; use words that everyone can understand.
4. **Date Prepared**—Knowing the date the chemical was prepared is very important, especially for those chemicals which either have a limited shelf life or become more hazardous with age.

Use permanent marker; avoid using grease pencils. Write on a paper label that has a good adhesive; avoid writing directly on the bottle. Print clearly and initial the label so that everyone can read it and knows who prepared it.

For additional *Dos* and *Don'ts* of chemical labeling, consult page 706 in our Laboratory Safety Articles section.

Labels, Chemical, continued

GHS Pictogram Stickers

FLINN EXCLUSIVE

Create GHS labels using pictograms! Attach these handy 1" diameter stickers to chemical bottles to quickly indicate hazards to the user. Ideal as a quick reference for bottles of solutions in your chemical stockroom. Package of eight sheets with 63 stickers per sheet. Includes the following pictograms—health hazard, flame, exclamation mark, gas cylinder, corrosion, exploding bomb, flame over circle, and skull and crossbones.



See free video at flinnsci.com.

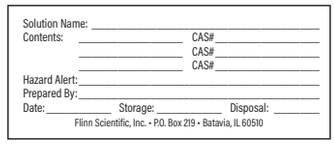
Catalog No.	Description	Price/Set
SE1080	GHS Pictogram Stickers	$19.70

How to Read a GHS Label, Poster See page 580.

Solution Labels, Blank

FLINN EXCLUSIVE

Properly label every solution you make by using Flinn Blank Solution Labels. These useful labels contain lines for the following pertinent information: solution name, contents, CAS Nos., hazard alert, preparer's name, date, storage and disposal codes. Self-adhesive; 6½" x 2¼"; package of 25.



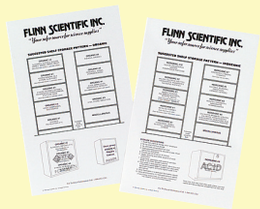
Catalog No.	Description	Price/Pkg. of 25
AP8677	Blank Solution Labels	$6.95

HOW TO

Properly Store Chemicals

The Flinn Suggested Chemical Storage Patterns have been adopted by many science teachers across the country.

For a complete and detailed explanation see pages 726–728 in our Chemical Inventory and Storage section.



Label Spray, Protective, Krylon®

A permanent, waterproof, protective coating. Perfect for chemical storeroom shelf clips and bottle labels. Spray shelf clips on a yearly basis to greatly reduce the chance of corrosion. Krylon sprayed on labels prevents smudging and label destruction. Will not yellow with age. Aerosol can, 13 ounces.

Catalog No.	Description	Price/Each
AP1559	Krylon Protective Label Spray	$14.85

NEED IT NOW?
RUSH ORDERS ARE OUR SPECIALTY

Ladders, Safety

Ladder, Safety

This safety ladder is mounted on four spring-loaded casters. When weight is applied, the casters retract, compressing the rubber-footed legs to the floor for secure footing. Tubular steel and cross bracing provide a safety ladder that will last for decades. These are rugged ladders built to take a beating. Meets OSHA requirements. Some assembly required.



Catalog No.	Description	Height at Top Step	Number of Steps	Price/Each
SE1051	Ladder, Safety	19"	2	$336.21
SE1052		28½"	3	427.50

Stool, Step, Kik Step®



A circular, two-step stool, 14" high, mounted on three spring-loaded casters for ease in moving. Casters retract when weight is applied to any part of either step. Body weight forces the stool friction rim to the floor to anchor the stool and support the user.

Heavy gauge steel, with powder epoxy finish. Both platforms have ribbed vinyl treads. The base is resilient and acts as a bumper when forced against a fixed object. Maximum base diameter 16"; upper platform diameter 11".

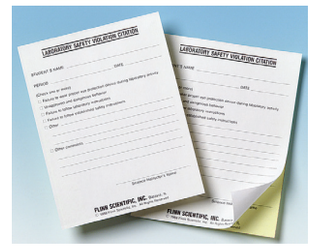
Catalog No.	Description	Price/Each
AP1711	Kik Step Step Stool	$144.78

Liability Reduction

Citation, Safety Violation

FLINN EXCLUSIVE

A helpful safety tool for the science teacher. If auto drivers violate the rules of the road, they receive a traffic ticket or citation. The same can be made to apply to students in the science laboratory. The safety violation citation is a package of 100 citations interleafed with carbonless yellow copies for your records. When you encounter a violation worthy of a citation, simply fill in the spaces and hand the student his or her citation. The penalty is entirely up to you to establish. A brief teacher's guide page is provided with each package of 100 two-part citations containing teacher record copies. 4¼" x 5½".



Catalog No.	Description	Price/Pkg. of 100
AP1557	Citation, Safety Violation	$11.82

Laboratory Safety Contract for Science Students

FLINN EXCLUSIVE

The foundation of any school science safety program is the development and use of a student safety contract—a contract clearly spelling out the safety rules of the science laboratory which students must follow. Flinn Scientific has developed the "ideal" safety contract—50 rules covering a wide variety of safety issues. It is the most complete contract ever developed.



Students are expected to read and sign the contract, which signifies that they have been instructed in the requirements for safety in the school laboratory. While such a contract between student and science teacher may not carry the weight of law, it nevertheless does provide evidence that the student has, in fact, been clearly told (in writing) what is expected and has signed off indicating his or her understanding of the rules and policies of the school science laboratory. A necessary safety and liability reduction aid! Pad of 50.

Catalog No.	Description	Price/Pad of 50
AP4236	Laboratory Safety Contract for Science Students	$7.97

Did You Know?

Federal OSHA rules and regulations do not apply to public schools. Yes, these federal regulations are applicable to private schools. There may be state regulations, however, that are applicable to your school. The state regulations may be similar to federal regulations. Why do we mention that here?

Because we do not want you to buy things you do not need to meet regulations that may not apply to your school. Get the facts before you buy. Call Flinn if you have questions.

Material Safety Data Sheets See page 581.

Mercury Safety Aids

Mercon™ Mercury Kit



The Mercon solution creates a "shell" over the mercury, immediately stopping it from emitting vapor. Once the "shell" is in place, the active ingredients in Mercon chemically convert vapor-producing elemental mercury into a non-vapor-producing mercuric salt. The Mercon Mercury Kit includes:

- Merconspray™ reduces airborne mercury vapor to provide a safer environment for cleaning up spills. 250-mL.
- Merconvap™ effective liquid mercury vapor suppressant and decontaminant.
- Mercury Aspirator – a simple and easy-to-use device to pick up mercury off the floor or countertop. Tapered suction tip allows access to hard-to-get areas where mercury can hide.
- Mercontainer™ for safe storage of mercury after cleanup. Special sponge lining coated with a Mercon solution allows for repeated uses.
- Merconwipes™ package of 70 towelettes pre-charged with Merconvap concentrate. Cleans and decontaminates mercury spill areas.

Catalog No.	Description	Price/Each
AP8771	Mercon Mercury Kit	$245.75

Zinc Dust



Once you have cleaned up the visible droplets of spilled mercury, how do you handle the remaining residue? One option is to sprinkle zinc dust onto the spill site. Zinc dust reacts with elemental mercury to form a very safe amalgam that is easy to handle.

Catalog No.	Description	Size	Price/Each
Z0005	Zinc Dust, Practical, Zn	500 g	$27.81

HOW TO

Use Mercon™ Mercury Spill Control Kits

1. Block off from foot traffic a large area around center of spill site (approximately 6-foot radius). Check clothing and footwear for mercury and mercury debris. Remove contaminated footwear at edge of spill site.
2. Remove the Merconspray™ from the spill kit and, while wearing gloves and goggles, proceed to spray the ambient zone above the spill radius. Spray generously (18–20 pumps) into the air starting at breathing level and working down toward the floor, concentrating on the actual spill itself. *CAUTION*: The floor surface may now be extremely slippery!
3. Remove the Merconvap™ bottle from the spill kit and replace shipping cap with squirt nozzle from kit. Cover all visible mercury with Merconvap, leaving a wide margin for any unseen droplets. Ensure that any cracks in flooring are saturated with Merconvap to suppress any droplets that may be out of sight. The spill is now safe to clean up.
4. Open Mercontainer™. Using the cleanup pad, carefully push the mercury droplets, broken glass and other contaminated debris toward the center of the spill to minimize mercury surface area. Using the Mercury Aspirator, collect the mercury and place it in the Mercontainer. The Mercury Aspirator is most effective when it has been emptied after each use. The Mercontainer may be reused, provided that the Mercontainer is no more than half full and there is a backup Mercontainer for larger spills. *Note*: Plastic Beral-type pipets work very well in picking up mercury droplets.
5. Decontaminate spill site. Reapply Merconvap liquid to former spill site and wipe up any residue with Merconwipes™.
6. Dispose of used Mercontainers and any contaminated items as per local environmental authority regulations. Do not incinerate. Wipe shoes, gloves and any other contaminated items with Merconwipes.

Respirator, Double Filter

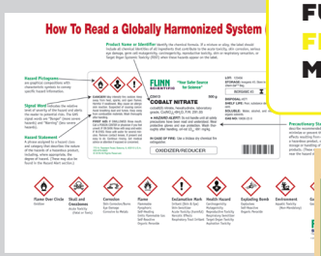


To protect the science teacher during brief periods of exposure to acid fumes, organic solvent vapor, and dust—these are NIOSH-approved respirators. The face mask is of pliable plastic and can be worn with glasses or chemical splash goggles. This is not a life-sustaining device and is meant only for use in an environment where the oxygen level is still quite good. Replacement cartridges—filters for acid, organic vapor, and dust protection—are available separately in packages of two filters.

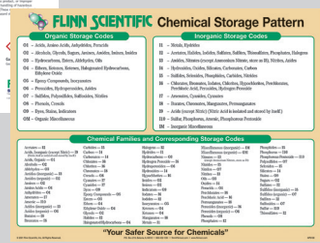
Catalog No.	Description	Price
SE1053	Respirator, Double Filter	$94.00/Each
SE1054	Replacement Filters for Respirator, Double Filter	53.55/Pkg. of 2

Posters, Safety

FULL DESCRIPTIONS, FREE RESOURCES AND MORE AT FLINNSCI.COM



How To Read a GHS Label, Poster
AP7650

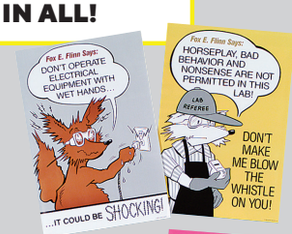


Flinn Chemical Storage Pattern Poster
AP6196

20 POSTERS IN ALL!









Flinn Favorite Goggle Safety Posters
AP7443



Fox E. Flinn Safety Poster Set
AP4336

FLINN EXCLUSIVE

See details at flinnsci.com.

Catalog No.	Description	Price/Set
AP7650	How To Read A GHS Label, Poster	$19.90
AP4336	Fox E. Flinn Safety Poster Set	35.26
AP7293	Laboratory Safety Poster Set	21.00
AP6196	Flinn Chemical Storage Pattern Poster	6.60
SE1074	Chart, Chemical Storage Patterns	21.00
AP7443	Flinn Favorite Goggle Safety Posters	24.40
AP6837	Laboratory in Progress Poster	10.75

Chart, Laboratory Safety

Reinforce safety continuously with this full-color illustrated "Safety Bible" for your laboratory wall. A list of safety rules is the center focus of the chart. Twenty-three panels illustrating proper safety techniques surround the list.

Proper laboratory dress, use of emergency equipment, storing flammable liquids and water-reactive metals, carrying equipment and chemicals, labeling chemicals, disposing of laboratory waste, handling mercury and other chemical spills, and many other pertinent safety concerns are highlighted. The concise captions are a constant reminder of the importance of safety.

Printed on tear-proof synthetic stock; top and bottom stiffening rods complete with eyelets make hanging in a prominent place easy; 36" x 44".

Catalog No.	Description	Price/Each	Price/Each 3 or more
SE9331	Chart, Laboratory Safety	$158.90	$148.87

Personal Protective Equipment

Lens Cleaning Station

Provides a durable and economic solution for your science lab. Work with glass, polycarbonate, anti-reflective, UV and glare free coated lenses. The solution and wipes are anti-static and won't leave streaks or lint. Comes with an 8 oz cleaning solution and 600 lint-free wipes.

Catalog No.	Description	Price/Each
AP10242	Lens Cleaning Station	$21.20

Lens Cleaning Solution

Spritz on glasses and wipe with a soft cloth. Solution leaves no visible residue and is safe to use on traditional, anti-fog and/or anti-static lenses of plastic, polycarbonate and glass.

Catalog No.	Description	Price/Each
AP11230	Lens Cleaning Solution	$5.25

Safety Data Sheets

Flinn SDS Library—Hard Copy

FLINN EXCLUSIVE

A collection of more than 1,000 Safety Data Sheets that provide detailed information about the chemicals used on school premises. The Flinn Safety Data Sheets meet ANSI and GHS standards. In March 2012, OSHA published the first major revision to the Hazard Communication Standard since its inception. In announcing the revision to incorporate what is known as GHS, OSHA stated that its goal was to transform the "right to know" into the right to understand chemical hazards. GHS stands for the Globally Harmonized System of Classification and Labeling of Chemicals. Each SDS includes the following information:

- Chemical name and contact information
- Hazard class identification
- GHS pictograms and signal word
- GHS hazard and precautionary statements
- Chemical synonyms and CAS number
- Chemical formula and formula weight
- First aid measures
- Fire hazards
- Spill and leak control
- Chemical storage and shelf life
- Compatible chemical family
- Required personal protective equipment
- Reactivity and conditions to avoid
- Color and odor
- Toxicological information (TLV, LD_{50})
- Disposal information
- DOT shipping information
- Special precautions

Flinn SDS are written by our technical staff to specifically meet the needs of all science teachers. Entries are written in common, easy-to-understand terms. Every substance commonly found in an elementary or secondary school is included. The library is housed in three binders. The binders are very heavy-duty vinylite plastic that will stand up to years of repeated use. 8½" x 11".

Catalog No.	Description	Price/Each	Price/Each Quantity 2–5	Price/Each Quantity 6 or more
AP7703	Flinn Safety Data Sheet (SDS) Library	$331.50	$298.89	$283.67

Safety Shield

FLINN EXCLUSIVE

Great and necessary safety aid to protect students or observers from dangerous demonstrations. Made of thick polycarbonate plastic. The clear shield attaches to a heavy steel base. Bent design provides good containment of fragments and splashes. Polycarbonate plastic is also an effective ultraviolet shield in UV range of 200 to 360 nm. Three sizes are available.

See free video at flinnsci.com.



Catalog No.	Description	Height x Width	Price/Each
SE260	Safety Shield	17¾" x 16"	$307.07
SE225		30" x 16"	371.07
SE261		36" x 24"	515.00

OSHA and the Use of Safety Shields

"Protective shields shall be used wherever chemical hazards are encountered in a manner capable of causing injury."

OSHA 29 CFR Ch XVII, Subpart 1

Sharps Container

Safely dispose of used, contaminated medical sharps in this affordable enclosure. Unique lid design facilitates one-handed disposal, and container's horizontal design allows for maximum capacity to fill line. Grooves allow the lid to be tightly secured onto the base. Once locked, the container should not be able to be re-opened. Easy-to-see fill lines allow you to know when it is time to dispose of the sharps properly in accordance with local regulations. 5 qt.



Catalog No.	Description	Price/Pkg.
AP8071	Sharps Container	$11.30

Shelf Lips

FLINN EXCLUSIVE

Prevent bottles of chemicals from rolling off your shelves. These raised edges can easily be installed on any wood or metal shelf. Shelf lips are polypropylene and three feet long. The lips are pre-drilled with holes for easy installation. Fasteners are provided. 10 strips per package.

See free video at flinnsci.com.

Catalog No.	Description	Price/Pkg.
SE1069	Shelf Lips	$45.00

HOW TO

Make Your Own Shelf Lips

Shelf lips can help prevent chemical bottles from rolling off the shelves. You can easily fabricate your own shelf lips. Buy 1½" x ¼" firring strips from your local lumber store. Cut each strip to fit the width of the shelves and then attach the strips to the front of each shelf using nails or an adhesive like Liquid Nails®. Shelf lips will save you a lot of time and trouble.

Laboratory Safety Essentials

FLINN EXCLUSIVE

The most important lesson for students to learn in science is also the first—safety first! Engage students' interest in the essential rules of laboratory safety with this set of four persuasive demonstrations.

- **Acid in the Eye**—Put on your goggles! Adding strong acid to egg white causes irreversible damage, just as it would to proteins in body tissue. Wearing proper laboratory protection is non-negotiable!
- **Grease Fire**—Never use water to extinguish a grease fire. Pouring water on melted candle wax causes a fireball to erupt and jaws to drop!
- **Flaming Vapor Ramp**—The hardest concepts to understand are those we cannot see! Reveal the invisible hazards of flammable gases by igniting hexane vapor poured down a metal track.
- **SDS Challenge**—Students identify a mystery chemical by applying the information found on the Safety Data Sheets. A great inquiry-based activity!

A great value—four safe ways to illustrate common laboratory safety hazards.



Catalog No.	Description	Price/Each
AP7308	Laboratory Safety Essentials—Multiple Demonstration Kit	$57.80

Shower/Drench, Body, Safety

Body Shower/Drench



We can't think of a device more needed on school premises to *protect you and your students* than this body shower/drench hose. A body drench is a wonderful safety device to provide a flow of water to handle lower body splashes. Certainly it can also be used for the upper body and even a face drench. The unit must be connected to an existing water supply and will deliver four gallons of water per minute. Units must be connected to a ¾" IPS water pipe. Drench hose is 6 feet long. ANSI Z358.1–1998, SEI certified.

Catalog No.	Description	Price/Each
SE1013	Body Shower/Drench	$344.10

HOW TO

Maintain Your Safety Shower

A safety shower is an absolute necessity in a science classroom where chemicals will be used. Maintenance of a safety shower should be done on a routine basis to ensure it is in good working condition. Is the valve easy to open? Does it stay open until you shut it off? Is the flow of water constant and consistent? Is the shower available via an unobstructed path?

How often you check the emergency shower depends on the quality of water and age of the shower. Once a semester is a good starting point. Also, always remember to document when you test your safety shower or any other safety equipment.

Emergency Body Shower/Drench/ Eye/Face Wash Combination



AP2264

This versatile eyewash can be converted into a drench shower for the entire body by simply lifting the spray head. Provides a continuous dual stream of drenching water wherever aimed. Bayonet mounted for stationary flushing, or removable for spot body drenching. Both units are ANSI Z358.1–2009, SEI certified.

Wall Mounted Type: Fixed position wall mount allows for easy installation on a wall or the side of a laboratory bench. Mounting bracket includes spring clips to ensure that the spray heads face forward at all times. Unit may be left in the mounting bracket for use as a fixed eyewash, leaving the user's hands free or removed for use as a drench hose. Each spray head has a flip-top dust cover, internal flow control and filter to remove impurities from the water flow. Features a chrome-plated brass stay-open ball valve with PTFE seals and a retractable 12' reinforced-nylon hose. Requires a ⅜" NPT connection to water supply.

Swivel Benchtop Type: Mounted onto the top of the lab bench next to a sink. When needed, the eyewash swivels over the sink so the water will go down the drain. Features include ½" chrome-plated bronze stay-open ball valve with chrome-plated ball and stainless steel pushplate; plastic, dual stream heads with chrome-plated brass yoke; plastic float-off covers with stainless steel bead chains; 6' coiled hose stores neatly when not in use; self-adjusting regulator assures a constant, even flow of 8 gallons per minute under varying conditions. Requires a ½" NPT connection to water supply.

Catalog No.	Description	Price/Each
AP2264	Emergency Body Shower/Drench/Eye/Face Wash Combination, Wall Mounted Type	$542.41
AP8731	Emergency Body Shower/Drench/Eyewash Combination, Swivel Benchtop Type	505.24

Emergency Shower



SE1021

Every chemical laboratory needs a safety shower in case of emergency. The bright orange shower head on this easy-to-activate stainless steel shower ensures shower visibility. The shower head will deliver an 8" diameter column of water. A 29" stainless steel pull rod and actuating arm will activate the stay-open valve assembly. Units are designed without screens or small openings which might impede water flow. Piping is 1" and shower must be connected to that same size pipe. A floor drain is recommended. Two models are available—SE1020 is intended to be connected to an overhead water source; SE1021 is designed to be connected to a source of water that would come out of a wall.

Catalog No.	Description	Price/Each
SE1020	Emergency Shower, Ceiling Mount	$370.00
SE1021	Emergency Shower, Wall Mount	393.37

Eyewashes See pages 654–655.

Americans with Disabilities Act

ADA-compliant eyewashes and showers are available. Please call Flinn at 1-800-452-1261 for ordering information.

Emergency Shower/Eyewash Combination



The best of both worlds—two important safety aids in one location. Designed to flush contaminants from eyes, face, or the entire body. The eyewash has two large nozzles to irrigate both eyes and a portion of the face. The orange push plate valve, when pressed down, activates the flow of water and will remain on until manually closed, allowing both hands to be free. 11½" bowl and nozzles are constructed of a durable, high-visibility orange ABS plastic. Stay-open valve is chrome-plated brass with PTFE seals. The overhead shower delivers a 10" diameter column of water. 29" stainless steel pull rod is easy to reach and activates the shower. The valve will stay open until manually closed. Shower head is made of a high-visibility orange ABS plastic.

The Emergency Shower/Eyewash Combination is easy to install and is mounted to the floor with an 9" flange. Water supply inlet is 1¼" at the top or the side. All components and the entire unit are ANSI Z358.1–2009, SEI certified.

Catalog No.	Description	Price/Each
SE1025	Emergency Shower/Eyewash Combination	$1150.15
SE1081	Emergency Shower/Eyewash Combination, ADA-Compliant	1420.00

Shower, Safety Tester



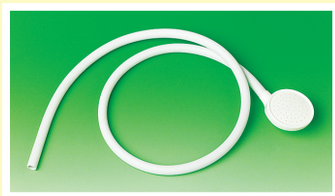
Emergency showers should be tested on a regular basis. However, sometimes a real mess can be created when the testing is being done. Consider the purchase of a Shower Safety Tester. Simply attach this 12" diameter, 7' long, "water funnel" to your shower. Place the bottom of the tester into a bucket. The deluge of water will be directed into the bucket. Allow the tester to dry thoroughly, fold it up and store it until the next safety audit.

Catalog No.	Description	Price/Each
SE1055	Shower, Safety Tester	$127.81

SAFETY TIP

Inexpensive Body Drench

Don't go without a body drench! If your school budget can't afford a body drench, consider this suggestion. Acquire a handheld shower attachment at your local hardware store. These shower attachments will have a shower head on one end and a plastic adapter on the other end to fit over your bathtub fixture. Cut off the adapter, and now the plastic tubing will fit over your serrated hose connection on your laboratory water faucets. This inexpensive body drench/eyewash may save you or your students from serious personal injury. Don't do without this inexpensive protection!



Signs, Safety

Promote safety in the laboratory—OSHA regulations require you to placard the location of all personal safety and emergency equipment including eyewashes, showers and fire extinguishers.

- Comply with OSHA and ANSI standards
- All corners rounded and mounting holes provided



SE1917



SE1916



SE332



SE331



SE1908



SE320

Sign Description	Size	Color	Catalog No.	Price/Each
Personal Safety Signs				
Safety First—Wear Your Goggles	10" x 14"	Green/White/Black	**SE1917**	**$29.49**
Fire Extinguisher Signs				
Fire Extinguisher	24" x 4"	Red/White	**SE320**	**32.20**
Fire Extinguisher	7" x 17"	Red/White	**SE1916**	**16.45**
First Aid Signs				
Fire Blanket	3½" x 14"	Green/White/Black	**SE331**	**27.63**
Safety First—Safety Shower and Eye Wash Station	10" x 14"	Green/White/Black	**SE1908**	**29.65**
Chemical Storeroom No Admittance Signs				
Notice—Authorized Personnel Only	10" x 14"	Blue/White/Black	**SE332**	**30.85**

Personal Safety and Emergency Equipment Signs

FLINN EXCLUSIVE

Promote safety in the science laboratory. OSHA regulations require schools to placard the location of all personal safety and emergency equipment in the science area. Flinn Scientific has developed nine different signs for common safety equipment—all meeting ANSI and OSHA regulations. Simply mount the signs on the wall where safety equipment is located. Signs are 8½" x 11" and laminated. Set of 9 signs.



Catalog No.	Description	Price/Set
AP4519	Personal Safety and Emergency Equipment Signs	**$30.69**

Use smoke generators to check your lab's ventilation.

NFPA Sign

Several states now require that NFPA hazard labels be placed on chemical storage doors and cabinets. This large NFPA sign can be customized to fit your needs. Simply mark your hazard information on the sign with a marker. Printed on heavy-duty vinyl. 10¾" x 10¾".



Catalog No.	Description	Price/Set
AP6491	NFPA Sign	**$9.85**

Smoke Generator See page 566.

Spill Control and Cleanup Materials

Absorbent Chemical Pads



Capillary action allows this unique synthetic material to absorb and retain up to 12 times its weight. Pads will not disintegrate or deteriorate and can be used with almost any liquid spill. Cut pads to fit your lab bench for extra safety when using hazardous liquids. Keep a supply in the storeroom to absorb spills. Inert material will not react with common chemicals in the high school lab. The absorbent pad can be safely transported for treatment and recycling after use. In the case of an acid spill, wash the acid out of the pad and allow the pad to air dry for later use. 12" x 12" pads, six pads per package.

Catalog No.	Description	Price/ Pkg. of 6 Pads
SE121	Absorbent Chemical Pads	**$11.20**

Absorbent, Spill Pillows



A great absorbing system for most chemical spills. Each spill pillow consists of a porous, polyolefin bag filled with an inert, amorphous silicate. Bag design allows spilled material to flow into the bag contents, which will absorb 10–20 times its weight. Spill pillows will absorb 98% of their capacity in 30 seconds and can be used for all hazardous spills ***except*** hydrofluoric acid. No messy cleanup since the spill is contained within the pillow. Disposal is easy—the spilled material can be eluted, evaporated or incinerated. Spill pillows are acceptable as solid waste in most landfills. Available in two sizes, 250 mL and 1 liter.

Catalog No.	Description	Price/Carton
SE150	Absorbent, Spill Pillows, 250 mL Pillows	**$126.05/20**
SE155	Absorbent, Spill Pillows, 1 L Pillows	**157.00/10**

Spill Control and Cleanup Materials, continued

Pail (Bucket)

This useful pail might be used to store dry sand or other treatment-containment materials. Rigid plastic. Five-gallon capacity with friction lid. Some teachers use these large pails as vessels for chemical disposal reactions such as neutralization of acids or bases.

Catalog No.	Description	Price/Each
SE1057	Pail (Bucket)	$16.00

FLINN EXCLUSIVE



E-Z Pour Base Neutralizer

Citric acid (2.5 kg) packaged in an easy-to-use clear plastic bottle with sturdy handle.

Catalog No.	Description	Price/Each
SE107	E-Z Pour Base Neutralizer	$50.85

E-Z Pour Spill Control Kit

FLINN EXCLUSIVE

Kit contains sand, SuperSorb® absorbent and acid neutralizer (sodium carbonate) to handle any spill emergency. Packaged in easy-to-use clear plastic bottles with sturdy handles with lids, this spill control kit ensures quick and safe responses to dangerous lab spills. Individual bottles of sand, Super Sorb® and acid neutralizer are also available.

Catalog No.	Description	Price/Each
SE102	E-Z Pour Spill Control Kit	$56.35
SE103	E-Z Pour Acid Neutralizer—Bottle	24.20
SE104	E-Z Pour Absorbent—Bottle	18.80
SE105	E-Z Pour Sand—Bottle	19.95

Flinn Spill Control Center



Contains sand, Super-Sorb® absorbent and acid neutralizer in easy-to-use, clear plastic bottles. Pull-out plastic bin holds absorbent pads, biohazard spill kit, acid-resistant gloves and goggles. A counter brush, dust pan and laminated instructions complete the center. All components are easily replaced after use. This furniture-quality center is made from rugged and durable exterior-grade plywood and finished with chemical-resistant Super Chem-Tuff™ paint—virtually indestructible. Can be hung on a wall or placed on a countertop. Cabinet dimensions 17½" W x 15" H x 9" D.

Catalog No.	Description	Price/Each
AP6448	Flinn Spill Control Center	$250.00

Sand

A plastic pail containing 25 pounds of dry sand useful for a variety of purposes from spill containment to fire extinguishing. No chemical storage area should be without a convenient source of dry sand.

Catalog No.	Description	Price/Each
S0005	Sand	$42.65

Absorbent, Super Sorb®

FLINN EXCLUSIVE

An effective, inexpensive absorbing agent. Sprinkle this low-density, highly absorbent material on a spill for rapid absorption and ultimately for transport, treatment and disposal. Ideal for flammable solvent spills. Convenient plastic pail contains 20 lbs of Super Sorb.

Catalog No.	Description	Price/Each
SE101	Absorbent, Super Sorb	$41.00

Neutralizer, Sodium Carbonate and Calcium Hydroxide Mixture

FLINN EXCLUSIVE

A plastic pail containing a 25-lb mixture of sodium carbonate and calcium hydroxide. This mixture is useful for neutralizing an inorganic acid spill (hydrochloric, nitric and sulfuric acids).

Catalog No.	Description	Price/Each
SE106	Neutralizer, Sodium Carbonate and Calcium Hydroxide Mixture	$83.40

Protex™ Ultra Disinfectant Wipes

A one-step cleaner and disinfectant, Protex Ultra Disinfectant Wipes eliminate 99.9% of bacteria in 15 seconds and disinfect in just 4 minutes. Effective against a broad spectrum of pathogens, including HIV, H1N1, MRSA and more. These nonabrasive premoistened wipes are free of alcohol, bleach and solvents. Dimensions: 7" x 10".

Catalog No.	Description	Price/Pkg.
AP10032	Protex Ultra Disinfectant Wipes, Pkg 75	$16.21

Broom, Spill Cleanup, Polypropylene

Inert bristles won't react with the chemicals in a spill. Our polypropylene broom with stiff bristles will allow you to easily sweep up your solid chemical spills or breakages.

Catalog No.	Description	Price/Each
AP1663	Broom, Polypropylene	$33.25

Brush, Counter

Synthetic fiber brush is resistant to most chemicals. Length of brush portion 7¼". Fibers extend 1⅞" from brush handle. Overall length 12".

Catalog No.	Description	Price/Each
AP1228	Brush, Counter	$12.58

Dustpan, Polypropylene

Chemical-resistant, polypropylene dustpan is perfect for cleaning up the remnants of a chemical spill or broken glassware. Dustpan has groove for broom attachment and folds down to floor for easier pickup.

Catalog No.	Description	Price/Each
AP1662	Dustpan, Polypropylene	$10.85

Spill Mat, Laboratory

Protects lab and prep area work surfaces from spills, stains, and wear. Mat consists of a plastic-backed absorbent paper. The absorbent upper layer traps water, dye, and corrosive chemical(s), but won't allow liquids to soak through. The surface is ribbed to hold the lab vessel slightly above the surface. The plastic backing makes the mat non-skid. This mat material is 20" wide and is packed in a dispenser box containing a 50' roll. Pull the required length from the dispenser and, using scissors, cut off the amount you need.

Catalog No.	Description	Price/Each
SE265	Spill Mat, Laboratory	$72.75

Ribbed Matting

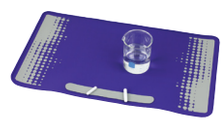
NEW!



Clear polyethylene ribbed matting. Ribs hold dirt until it can be wiped away. Heavy weight matting is 5x as thick as normal shelf liner. Easily cut with regular scissors but it won't tear. Heavy weight matting .036" thick. Provided as a 15-foot roll and 30" wide.

Catalog No.	Description	Price/Each
AP11841	Ribbed Matting, 15' Roll	$44.40

Silicone Lab Mat



Made of durable, stain-resistant silicone for long lasting use. Contains built-in metal inserts to store stir bars. Features 14" x 23.5" x 0.1", protects bench tops from hot items up to 200°C (392°F), washable with standard disinfectants in sinks or dishwashers, and autoclavable at 121°C for 15 minutes.

Catalog No.	Description	Price/Each
AP9893	Silicone Lab Mat	$53.00

Videos and Books, Safety

Science Classroom Safety and the Law—A Handbook for Teachers

FLINN EXCLUSIVE



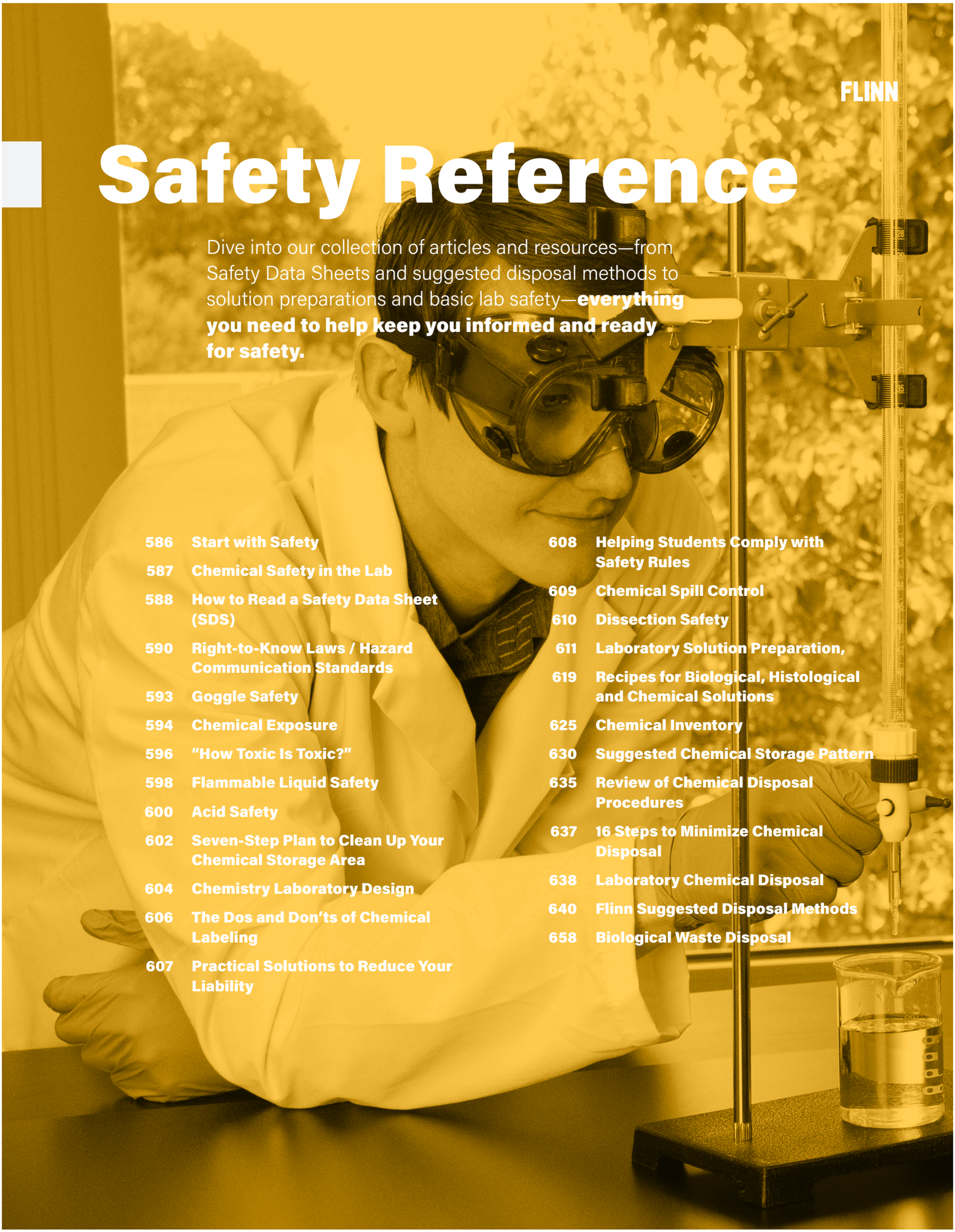
By: Kelly Ryan, Esq., Attorney at Law

Science Classroom Safety and the Law was written to educate science teachers about court cases that apply to science education so you can successfully persuade school administrators to make the "right" decision regarding science safety. This book will give you the "ammunition" you need to correct safety problems at your school. Author Kelly Ryan taught chemistry for 17 years at a large California high school before becoming an attorney. 156 pages, 8½" x 11", perfect bound.

Catalog No.	Description	Price/Each
AP6118	Science Classroom Safety and the Law—A Handbook for Teachers	$31.00

Safety Reference

Dive into our collection of articles and resources—from Safety Data Sheets and suggested disposal methods to solution preparations and basic lab safety—**everything you need to help keep you informed and ready for safety.**



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Start with **Safety**

The ability to work with students in the lab—allowing them to observe, question, engage and discover—is one of the most rewarding aspects of any science teacher's responsibilities. It is also potentially one of the most dangerous. Understanding their safety roles and responsibilities will help science teachers increase safety awareness, reduce accidents and improve science education.

General Safety Responsibilities

Science teachers owe it to their students to care about anticipating dangers that are reasonably foreseeable and to take the necessary precautions to prevent accidents and protect students from harm. The teacher's responsibilities include the following:

- Supervising students in the classroom and lab.
- Providing adequate instructions for students to perform the tasks required of them.
- Warning students of the possible dangers involved in performing lab activities.
- Providing safe laboratory facilities for performing experiments and demonstrations.
- Maintaining laboratory equipment in proper working order.

The Safety Contract

The first step in creating a safe laboratory environment is to develop a safety contract that describes the rules of the laboratory that your students must follow. The safety contract is the foundation of any school science safety program. Before a student ever sets foot in the lab, the safety contract should be discussed in class and then signed by the student and a parent or guardian. Review the rules but on a regular basis. Incorporate safety into each class or laboratory exercise—begin every lab period, in particular, with a discussion of the procedures or chemicals used in the experiment and the general and special safety precautions that must be observed. Prelab assignments are another way to ensure that students are prepared for lab and understand the safety requirements.

The Flinn Scientific Student Safety Contract was developed in collaboration and consultation with experienced science teachers from all across the country. This comprehensive safety contract is available in high school and middle school versions in both English and Spanish. Visit our website at www.flinnsci.com.

Proper instruction is not just for beginning students. Imagine that you are teaching a senior biology elective—should you assume that students know how to use a Bunsen burner to sterilize an inoculating loop?

Supervision

Teachers must be physically present at all times to supervise students wherever and whenever laboratory equipment or chemicals are being used. Never leave students unattended—be prepared and remain alert to what students are doing in order to prevent accidents before they happen. The best defense is a good offense!

Proper Instruction

It is not enough to merely give students lab directions or procedures in the form of a handout or textbook reading assignment. Proper instruction requires that teachers explain the nature of the equipment or chemicals that students will be using and how they are to perform tasks in the lab. Proper instruction also includes demonstrating new or unusual laboratory procedures and teaching students the safe way to handle chemicals, glassware and other equipment. Remember to record all safety instruction in your lesson plans. Being able to provide evidence of documented safety instruction reduces your liability in the unlikely event of an accident.

Warning Students of Hazards

Teachers have a responsibility to identify hazards and warn students about the possible dangers of working with chemicals or performing tasks in the lab. Consider the following chemical hazard warning: *Hydrochloric acid is corrosive—avoid contact with eyes and skin.* What is the first thing students think of when they hear the term corrosion? Rust! Students do not always understand the proper meaning of hazard warnings or safety precautions. Warning students requires showing them what these words mean in the context of lab safety. Just as with any instruction, it is important to demonstrate the concepts and to assess student understanding of the safety concepts.

Maintaining a Safe Lab Environment

The school administration and science teachers share a responsibility to maintain a safe lab environment for students. The school must provide safety equipment that is appropriate for the hazards and maintain the equipment in proper working order. The science teacher's duty of care in this respect is to communicate with the administration, keep them informed about the safety requirements, recommend safety equipment, practices and procedures and inspect safety equipment on a regular basis. All equipment and glassware must be in good working order before it is used in the lab. Inspect equipment before setting it out for student use, and remove any defective materials. Instruct students to check glassware regularly for cracks and chips, especially if glassware will be heated or subjected to pressure differences (e.g., vacuum).

Helping Students Meet Their Responsibilities

Students are required to follow all rules, guidelines and instructions provided by the school district and their teacher. Signing the safety contract signifies that students have read the contract, understand the rules and agree to abide by the safety requirements in the school science laboratory. The safety contract should also be signed by a parent or guardian to document that they are aware of the rules their child must follow and the potential consequences of not following them. Students have a responsibility to come to class prepared for the laboratory activity. One of the leading causes of laboratory accidents is students' failure to carefully read and understand lab instructions. Students must wear all the required personal protective equipment, including safety glasses or chemical splash goggles and chemical-resistant gloves and aprons, as instructed by the teacher.

FLINN LOVE

I'm so impressed with your efforts to make our instruction easier and provide us with such helpful resources, such as the safety video on quality lab materials. I will continue to order from Flinn from now on!

MONA ALKADI
LOUISIANA SCHOOL FOR THE DEAF, LA

Chemical Safety **in the Lab**

Make Your Lab a Safer Place for Everyone.

The overall safety profile of your school will be drastically improved if you adopt and follow carefully written purchasing specifications for laboratory chemicals. Your goals should be to establish uniformity and high standards with respect to the information shown on the chemical label, the type of chemical packaging used and the amount of chemical purchased.

Chemical Labeling

Begin by specifying that certain information be clearly shown on all chemical bottle labels. The required information should include:

- Chemical Name, Grade, Purity and Concentration
- Hazard Alert
- A Chemical Safety Guide showing what safety aids should be available when using the chemical
- Warning Information
- First Aid Procedures
- Lot Number
- Compatible Chemical Storage Family
- Suggested Disposal Method
- Shelf Life
- Solubility
- Date Purchased
- CAS Number
- NFPA Code

A consistent labeling system makes proper storage and maintenance of your chemical inventory much easier. It also helps you to quickly identify hazards and proper safety procedures.

Flinn Scientific is the only science supply company that provides such comprehensive labeling on its chemicals. The Flinn chemical safety label has been specifically designed to fit the needs of the middle and high school science teacher. The above specifications will help you acquire the quality product you expect and the safety information you need.

Chemical Packaging

The second category to incorporate into your chemical purchasing specifications is the safety packaging of the chemicals. Chemicals must be supplied in packaging designed to give the chemical and the user maximum protection. The packaging should maximize the chemical's freshness and shelf life. Flinn also uses packaging that will reduce or eliminate expensive hazard shipping charges.

Incorporate chemical packaging concerns into your purchasing considerations. Does the supplier package most chemicals in safe plastic containers, versus glass bottles, which can be broken? All Flinn chemicals are packaged in unbreakable plastic bottles or PVC-coated glass containers for safety.

The type of container in which a hazardous chemical is packaged may determine whether you purchase the chemical in the first place. For instance, most chemical suppliers package magnesium ribbon in a wax paper bag. Flinn Scientific packages it in an air-tight zipper-lock bag to prevent the magnesium ribbon from oxidizing.

Does your supplier offer acids in safer, PVC-coated bottles? Does your supplier package small, precut pieces of sodium or potassium under mineral oil in PVC-coated glass bottles and then in a metal can for safer storage? Flinn Scientific's state-of-the-art chemical packaging containers are the safest in the industry.

Chemical Package Sizes

Does your chemical supplier offer smaller chemical package sizes so you can purchase only the quantity you actually need? Excess chemicals sitting on your shelves year after year increase your overall storage risks, tie up valuable budget dollars, create hazardous clutter and result in costly disposal methods.

The shelf life of your chemicals is an important concern. Some chemicals become more hazardous with age. Purchasing in small quantities allows you to have new, "fresh" chemicals on the shelf at all times. It is recommended to mark any chemical labels with the purchase date. Having this information available helps you know how old your chemicals are and if a shelf life problem exists.

Yes, safety has its costs, but these costs are always short term! In the long run, purchasing chemicals in smaller package sizes saves you money because you are storing less material, ultimately leading to lower disposal costs. You might even save money on insurance premiums—some insurance companies may offer lower premiums to schools that have adopted chemical purchasing practices designed to promote safety.

Flinn Scientific has more than 500 chemicals available in small package sizes.

Conclusion

Purchasing chemicals is not like buying finger paints or copier paper. You need to establish uniformity among the chemicals you purchase, use and store. When you buy chemicals from ten different companies you are going to get ten different levels of quality. This all adds up to confusion for your science department staff and lowers your school's overall safety standards.

If you are serious about getting your "chemical act" together, look at more than just the price of the chemicals you purchase. What does one chemical accident cost in terms of lost time, cleanup, injury and in today's world—litigation? Will a court of law have sympathy for your school when an accident occurs and they find out that you purchased a "lesser quality" chemical package because it was $1.17 cheaper than the package you should have purchased? You must ask yourself if the money saved is worth the increased risk.

Improve the overall safety profile of your school by adopting stringent purchasing specifications for your laboratory chemicals. Not all chemicals are equal in quality, packaging or labeling. Science teachers can obtain laboratory chemicals that are properly packaged and labeled if the purchasing specifications are carefully written with the science teachers' and students' safety in mind. Flinn Scientific's suggestions for chemical packaging specifications help the safety conscious science teacher achieve the goal of obtaining chemicals provided in "safe to use" chemical containers, properly labeled and at a competitive price.

Please ask yourself the question, "In the best interest of my students and teaching staff, where can I purchase laboratory chemicals with specialized chemical safety packaging and labeling?" The answer is Flinn Scientific! Discover why Flinn Scientific is truly your "Safer Source" for laboratory chemicals. Purchase your chemicals from Flinn Scientific and help make your laboratory a safer place to teach and learn.



No Need to Repackage

Flinn sodium is packaged ready-to-use and ready-to-store. Five small pieces of sodium (0.3–0.5 g each), perfect for demonstrations, are packaged under mineral oil in a plastic bottle. The bottle is placed in a plastic bag within a metal can for safer storage. Count on Flinn for the safest package.

How to Read a **Safety Data Sheet (SDS)**

Safety Data Sheets (SDSs) are an important requirement of the OSHA Hazard Communication Standard. SDSs are essential documents that are used to inform employees, students and the general public about how materials can be safely handled, used and stored. Since Flinn provides chemicals only to schools, we have written Flinn SDSs specifically for teachers and their students. Using clear and straightforward language, each Flinn SDS provides all the relevant safety and hazard information in a consistent, useful and easy-to-read two-page format. Flinn SDSs follow the Globally Harmonized System of Classification and Labeling of Chemicals (GHS). The 16 sections are divided into four major areas, each designed to answer a specific question.

What is the material and what do I need to know immediately in an emergency?

Sections 1–3

A It is important that the chemical name on the label match the name on the SDS. Many chemicals have similar names but very different properties.

B The most important section! It provides an overview of the physical and health hazard risks associated with using the material.

C Signal words, either Danger or Warning, heighten the awareness of the relative risk when using certain chemicals. Danger is the more severe warning!

D Nine pictograms exist in the GHS classification scheme to call attention to physical and health hazards. See page 606 for more information about GHS pictograms.

E This section includes the formula, formula weight, concentration and CAS No. The CAS No. is the single identifying number for each specific substance. The CAS No. should match the CAS No. on the bottle label.

What should I do if a hazardous situation occurs?

Sections 4–6

F Seek medical attention. These first-aid measures are only meant for immediate first aid and should always be followed up with professional medical care.

G This section is written for the firefighter. Flash point (the lowest temperature at which enough vapor is present to form an ignitable mixture with air); upper and lower flammable limits; and the auto ignition temperature (AIT) are common properties included in this section.

FLINN SCIENTIFIC, INC.
Safety Data Sheet (SDS)

SDS #: 181.00
Revision Date: September 25, 2024

SECTION 1 — CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

n-Butyl Alcohol (A)

Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 (800) 452-126l
CHEMTREC Emergency Phone Number: (800) 424-9300

(C) **Signal Word** DANGER

(D) Pictograms



SECTION 2 — HAZARDS IDENTIFICATION

Hazard class: Flammable liquids (Category 3). Flammable liquid and vapor (H226). Keep away from heat, sparks, open flames, and hot surfaces. No smoking (P210).

(B)

Hazard class: Acute toxicity, oral (Category 4). Harmful if swallowed (H302). Do not eat, drink or smoke when using this product (P270).

Hazard class: Skin corrosion or irritation (Category 2). Causes skin irritation (H315).

Hazard class: Serious eye damage/eye irritation (Category 1). Causes serious eye damage (H318).

Hazard class: Specific target organ toxicity, single exposure; respiratory tract irritation (Category 3). May cause respiratory irritation (H335).

Hazard class: Specific target organ toxicity, single exposure; Narcotic effects (Category 3). May cause drowsiness or dizziness (H336). Avoid breathing mist, vapors or spray (P261).

SECTION 3 — COMPOSITION, INFORMATION ON INGREDIENTS

Component Name	CAS Number	Formula	Formula Weight	Concentration
n-Butyl alcohol (E)	71-36-3	$CH_3(CH_2)_2CH_2OH$	74.12	
Synonym: 1-Butanol; n-Butanol				

SECTION 4 — FIRST AID MEASURES

Call a POISON CENTER or physician if you feel unwell (P312).
If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing (P304+P340). (F)
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing (P305+P351+P338).
If on skin (or hair): Immediately remove all contaminated clothing. Rinse skin with water (P303+P361+P353).
If swallowed: Rinse mouth. Call a POISON CENTER or physician if you feel unwell (P302+P301+P312).

SECTION 5 — FIRE FIGHTING MEASURES

Class 1C flammable liquid.
Flash point: 37 °C Flammable limits: Lower: 1.4% Upper: 11.2% Autoignition Temperature: 343 °C
When heated to decomposition, may emit toxic fumes.
In case of fire: Use triclass dry chemical fire extinguisher (P370+P378). (G)

NFPA CODE (H)
H-2
F-3
R-0

SECTION 6 — ACCIDENTAL RELEASE MEASURES

Remove all ignition sources and ventilate area. Contain the spill with sand or other inert absorbent material and deposit in a sealed bag or container. See Sections 8 and 13 for further information. (I)

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H The NFPA code is a numerical code established by the National Fire Protection Association (NFPA). It rates the substance *under fire conditions* in four categories. **H**ealth, **F**lammability, **R**eactivity and **U**nusual reactivity: 4 is a severe hazard; 0 is no hazard.

I How to clean up a spill. Always remove unprotected personnel from the area and make sure all students are safe. Contain the spill with sand or absorbent materials.

HOW TO READ A SAFTEY DATA SHEET (SDS) continued on next page.

How to Read a Safety Data Sheet (SDS), continued

Each Flinn SDS follows the same format, and the information is always found in the same location, making it a valuable resource in the event of an emergency. With your first chemical order of the year, every teacher will receive a CD from Flinn Scientific containing all of our SDSs. You may also request another CD at any time. Flinn SDSs are updated on a regular basis, guaranteeing the most up-to-date safety information possible. Flinn sells a complete SDS Library in two versions, a hard copy version in two binders (Catalog No. AP7703, page 581) or as part of the Flinn Chemventory™ program. For a more detailed description of the Flinn Chemventory program, please refer to page 574. For our customers' convenience, Flinn has also placed a free complete set of digital versions of all the SDSs on our website. Simply go to www.flinnsci.com and click on the *SDS* button—individual SDSs are easy to find and copies may be printed from your computer.

FLINN SCIENTIFIC, INC.
Safety Data Sheet **n-Butyl Alcohol**

SDS #: 181.00
Revision Date: September 25, 2024

SECTION 7 — HANDLING AND STORAGE

Flinn Suggested Chemical Storage Pattern: Organic #2. Store with alcohols, glycols, amines, and amides. Store in a dedicated flammables cabinet. If a flammables cabinet is not available, store in Flinn Saf-Stor™ can. Keep container tightly closed (P233). Keep cool (P235). Use only in a well-ventilated area or in a hood (P271). **J**

SECTION 8 — EXPOSURE CONTROLS, PERSONAL PROTECTION

Wear protective gloves, protective clothing and eye protection (P280). Wash thoroughly after handling (P264). Use ventilation to keep airborne concentrations below exposure limits.
Exposure guidelines: PEL 100 ppm (OSHA) TLV 20 ppm (ACGIH) **K**

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

Clear colorless liquid. Wine-like odor.
Soluble: Water (20%). Miscible with alcohol and ether. **L**

Boiling point: 117.7 °C
Melting point: -89 °C
Refractive index: 1.3988
Specific gravity: 0.81

SECTION 10 — STABILITY AND REACTIVITY

Avoid contact with aluminum, chromium trioxide, and oxidizing materials.
Substance may develop explosive hydroperoxides. **M**
Shelf life: Fair, substance may oxidize. See Section 7 for further information.

SECTION 11 — TOXICOLOGICAL INFORMATION

Acute effects: Absorbed through skin. Eye, skin, respiratory tract irritation. Dizziness. CNS depression.
Chronic effects: N.A. **N**
Target organs: Eyes, skin, respiratory system, central nervous system.

ORL-RAT LD_{50}: 790 mg/kg
IHL-RAT LC_{50}: 8000 ppm/4H
SKN-RBT LD_{50}: 3400 mg/kg **O**

N.A. = Not available, not all health aspects of this substance have been fully investigated.

SECTION 12 — ECOLOGICAL INFORMATION

Data not yet available. **P**

SECTION 13 — DISPOSAL CONSIDERATIONS

Please review all federal, state and local regulations that may apply before proceeding.
Flinn Suggested Disposal Method #18b is one option. **Q**

SECTION 14 — TRANSPORT INFORMATION

Shipping name: Butanols. Hazard class: 3, Flammable Liquid. UN number: UN1120.

N/A = Not applicable **R**

SECTION 15 — REGULATORY INFORMATION

TSCA-listed, EINECS-listed (200-751-6), RCRA code U031. **S**

SECTION 16 — OTHER INFORMATION

This Safety Data Sheet (SDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific, Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. The data should not be confused with local, state, federal or insurance mandates, regulations, or requirements and CONSTITUTE NO WARRANTY. Any use of this data and information must be determined by the science instructor to be in accordance with applicable local, state or federal laws and regulations. The conditions or methods of handling, storage, use and disposal of the product(s) described are beyond the control of Flinn Scientific, Inc. and may be beyond our knowledge. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE HANDLING, STORAGE, USE OR DISPOSAL OF THIS PRODUCT(S). **T**

Consult your copy of the *Flinn Science Catalog/Reference Manual* for additional information about laboratory chemicals.

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How can I prevent hazardous situations from occurring?

Sections 7–11

J Use the Flinn Suggested Chemical Storage Pattern to prevent accidents and improve safety. Special storage and usage tips are also included.

K Wear personal protective equipment, such as goggles, gloves and an apron. See page 594 for an explanation of any exposure guidelines.

L Clear, concise and useful physical and chemical properties help you learn more about the chemicals you use. The first part describes the material's appearance. If it doesn't look like this, STOP. Do not use it. It may be more or less hazardous.

M This describes the conditions or reactions to be avoided and also provides some indication about anticipated shelf life.

N Here is more detail on how the material may injure you. Acute (short exposure) and chronic (long-term) effects are listed along with their target organs.

O Oral (ORL), inhalation (IHL) and skin absorption (SKN) toxicity data on test animals is included. For more information on LD_{50}, see page 596.

Other useful information.

Sections 12–16

P Ecological impact if large amounts (e.g., tank car) of the chemical spill near a river or lake.

Q We offer suggested disposal methods for laboratory quantities of chemicals. See page 640 for explanations of the Flinn Suggested Disposal Methods.

R Department of Transportation shipping information is included for your school district, emergency responders and transport/shipping departments.

S This includes regulatory information used by regulatory compliance personnel.

T Flinn Scientific has an ongoing program to update its SDSs. As professional chemists, we try our best to provide science teachers with the most accurate and useful safety information. Call Flinn with any questions. We can help!

Right-to-Know Laws* or **Hazard Communication Standards**

There is some confusion about the use of hazardous chemicals in schools and about how the relevant "Right-to-Know" laws apply to schools. Let's set the record straight for public schools. The U.S. government has passed the Hazard Communication Standard (usually referred to as the "Right-to-Know" law) and the Laboratory Standard, but these laws do not extend coverage to state and local governments. However, almost all state governments have either passed their own version of the Hazard Communication Standard or put their stamp of approval on the federal laws and extended their jurisdiction to cover local and state governmental bodies—including public schools. Federal jurisdiction does apply to all private schools.

The purpose of these laws is to inform employees about any hazards associated with an employee's work. Employees have the "Right-to-Know" about all the hazards they might deal with in the workplace.

Flinn Scientific is Your Safer Source...

Flinn will help you meet all the requirements of the Right-to-Know Laws with easy-to-use and affordable solutions. From the teacher favorite *Flinn Scientific Catalog/Reference Manual* to the informative Flinn website at www.flinnsci.com to our helpful Technical Services department, you are never more than a phone call (800-452-1261) or email (flinn@flinnsci.com) away from the best safety advice available. We have more than 40 years of experience helping teachers solve their safety problems, so let us help you meet your legal requirements of the Right-to-Know Laws.

GHS Revision

In March 2012, OSHA published the first major revision to the Hazard Communication Standard since its inception. In announcing the revision to incorporate what is known as GHS, OSHA stated that its goal was to transform the "Right-to-Know" into the right to understand chemical hazards. GHS stands for the Globally Harmonized System of Classification and Labeling of Chemicals. GHS is a document that establishes objective criteria for classifying and identifying chemical hazards. The overarching goal is to ensure the safe use of chemicals by providing practical, reliable and comprehensible information on their hazards. GHS provides a set of objective criteria for classifying the physical and health hazards of chemicals. To remove ambiguity about the degree of risk inherent in using a chemical, GHS further specifies the use of standard symbols and language elements to convey the hazard information on chemical labels. Hazardous chemical labels are now required to include pictograms, a signal word and specific hazard and precautionary statements.

Major Requirements

The federal and most statutory Right-to-Know laws contain the following six requirements or provisions.

1. **Safety Data Sheets (SDSs)**
   SDSs are the primary way of communicating the hazards of a chemical to an employee or an employer. The SDS provision of the law requires the employer to acquire, update and maintain SDSs for all of the hazardous chemicals used or stored in the facility and to make those SDSs available to the employee for informational purposes.

The minimum standards for an SDS include:

- Written in English
- Chemical name
- Hazards identification with GHS signal word, pictograms, hazard class and applicable hazard statements
- Hazardous components
- Physical characteristics (e.g., density, flash point)
- Physical hazards (e.g., fire, explosion, reactivity)
- Health hazards (both chronic and acute)—All signs or symptoms of exposure must be listed. Carcinogens must be identified.
- Primary routes of entry and target organs
- Permissible exposure limits or Threshold Limit Value (TLV)
- Any applicable precautions (e.g., gloves, goggles, fume hood)
- First aid and emergency procedures (e.g., chemical splash, spill handling)
- Date prepared
- Name and address of the manufacturer or SDS preparer, including the phone number

2. **Hazardous Materials List**
   A list of all hazardous chemicals must be assembled. In most states, this list is kept only by the employer, and access is given to the employee upon request. Some states require a copy of this list to be given to the fire department or some other state agency. See the state-by-state breakdown of the Right-to-Know laws on page 590 for further details.

3. **Inventory**
   The hazardous materials list and an up-to-date inventory usually go hand in hand. Both the list and the inventory must be continually updated. An inventory of all hazardous chemicals is an essential requirement of most Right-to-Know laws. An inventory consists of the name of the chemical, how much you have and where it is stored.

4. **Notification**
   All laws require the employer to notify the employee of any potential exposure or actual exposure to a hazardous substance. This initially is accomplished by posting the Right-to-Know regulations on a poster where it easily can be read and will be noticed by the employee. Notification is also accomplished through training and employee access to SDSs.

Flinn Is Your Source for Safety Training

Annual safety training is required in most states. Flinn Scientific trains more than 5,000 teachers every year through the Flinn Scientific Laboratory Safety Seminars. This safety seminar is also available as a fast-paced, two-hour video that is perfect for in-service programs or new teacher training. To help satisfy annual training requirements, Flinn provides free monthly safety training through the Flinn Science Department Safety Training Notes. These safety notes are sent out every month via email. To receive this valuable training aid, please call Flinn or sign up on our website at www.flinnsci.com.

Many teachers consider the *Flinn Scientific Catalog/Reference Manual* their "safety bible" and use it as the source of their informal safety training. The Flinn technical staff also writes numerous safety articles every year that are emailed to our customers or available on the Flinn website. Count on Flinn for your safety training needs.

*** The Right-to-Know law summary information listed here was obtained from reliable sources. For more information, go to www.flinnsci.com/safety for the name and address of the agency in your state that regulates these laws and standards.**

RIGHT-TO-KNOW LAWS OR HAZARD COMMUNICATION STANDARDS continued on next page.

Right-to-Know Laws, continued

5. Training

Many state laws are very detailed and specific in the area of training requirements of employees. Most states require training to be done annually or when exposure to a new hazard is anticipated. Some states require this training to be in written form while others allow verbal training or some combination of both types. Training includes:

a. Learning to read labels and SDSs
b. Providing the locations of hazardous materials
c. Learning the hazards, both chronic and acute, associated with the materials in the workplace
d. Safe handling of chemicals
e. Using protective equipment (e.g., fire extinguishers, respirators)
f. Knowing first aid and emergency procedures (e.g., spills, exposure, splashes)

6. Labels and Labeling of Hazardous Materials

Most laws require that a minimum standard of labeling must be observed. This includes:

- Chemical name, concentration, target organ, effect and date prepared.
- Hazards, both physical and health.
- Hazards identification with GHS signal word, pictograms, hazard class and applicable hazard and precautionary statements.
- Name and address of the manufacturer.

All states indicate that if the product is purchased and the label meets the standard, no further labeling is necessary.

Flinn **Chem**ventory™

FLINN EXCLUSIVE

Chemical Inventory Management System

The Flinn Chemventory is a cloud-based laboratory chemical inventory system that allows multiple users access to the database from multiple locations and multiple devices! Maintaining an accurate laboratory chemical inventory has never been easier, more flexible and more convenient.

Catalog No.	Description	Price/ Database License
SE2998	Flinn Chemventory, 1-Year License	$ 99.00
SE2999	Flinn Chemventory, 3-Year License	249.00
SE3000	Flinn Chemventory, 5-Year License	349.00



The Chemical Hygiene Plan

In May 1990, the federal government passed an extension of the Hazard Communication Act written specifically for the research and academic laboratory. Most states also passed a version of the Laboratory Standard. Enforcement of the new Laboratory Standard began in January 1991. The Laboratory Standard is very similar in many ways to the original law. The major difference is the requirement to have a Chemical Hygiene Plan and a Chemical Hygiene Officer.

A Chemical Hygiene Plan (CHP) is a written report summarizing all your safety regulations, proper laboratory procedures for handling hazardous chemicals and training procedures. The CHP should include:

- General laboratory rules and procedures
- Personal protective equipment requirements
- Spill and accident procedures
- Chemical storage rules and procedures
- Safety equipment requirements and inspection procedures
- Employee safety training
- Exposure and medical evaluations
- Emergency evacuation plan

The CHP's listing of rules and procedures are your Standard Operating Procedures. These rules and procedures must be well thought out with the principal goal of always minimizing the exposure of employees and students to hazardous chemicals.

Flinn CHP Has Helped Thousands of Teachers

Developing a Chemical Hygiene Plan (CHP) does not have to be difficult. Thousands of schools have created their own individualized CHP starting with the Flinn Scientific Chemical Hygiene Plan as a model or template. This multi-page CHP model plan is available free from Flinn Scientific. It contains the basic safety laboratory regulations and procedures and is easy to alter to meet your individual school's needs. For a free copy of this important document, as either a paper hard copy or a Microsoft Word® document, send your request to Flinn Scientific, Inc., P.O. Box 219, Batavia, IL 60510. For an electronic version, please email us at flinn@flinnsci.com and request the CHP Word document.

Conclusion

The various state Right-to-Know laws are all very similar. The six major requirements or provisions discussed here are always included along with minor modifications concerning who must be trained and how and to whom you will have to send SDSs and hazardous materials lists. The paperwork requirements (SDS and reporting lists) can be overwhelming, but they are mandated by the laws. The science teacher's five major steps include:

1. Take an inventory (develop a list of hazards).
2. Acquire, update and maintain SDSs.
3. Label all chemicals properly.
4. Train.
5. Develop a Chemical Hygiene Plan.

Following these five steps will not only help you comply with your respective state's Right-to-Know law, but it will also improve the safety in your classroom.

RIGHT-TO-KNOW LAWS OR HAZARD COMMUNICATION STANDARDS continued on next page.

Right-to-Know Law Analysis

State	Chemical Hygiene Plan	SDS Required	List/Inventory Required	Training Required	Labeling Required	Special Comments
Federal OSHA	✓	✓	✓	✓	✓	
Alabama	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Alaska	✓	✓	✓	✓	✓	Very similar to the Federal OSHA Standard
Arizona	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Arkansas	✓	✓	✓	✓	✓	Written hazard communication program required
California	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Colorado	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Connecticut	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Delaware	No	✓	✓	✓	✓	An employee Right-to-Know Law
District of Columbia	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Florida	✓	✓	✓	✓	✓	Requires providing a list of hazardous materials to fire department
Georgia	No	✓	✓	✓	✓	Written school safety plan required
Hawaii	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Idaho	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Illinois	✓	✓	✓	✓	✓	Notify your fire department regarding any toxic materials
Indiana	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Iowa	✓	✓	✓	✓	✓	Follows Federal OSHA Standard; requires a written training program
Kansas	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Kentucky	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Louisiana	✓	✓	✓	✓	✓	Requires an emergency response guidebook
Maine	✓	✓	✓	✓	✓	Requires a written training and hazardous communication program
Maryland	✓	✓	✓	✓	✓	Requires a list of hazardous materials sent to the MD Department of Environment
Massachusetts	No	✓	✓	✓	✓	Written hazard communication program recommended
Michigan	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Minnesota	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Mississippi	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Missouri	✓	✓	✓	No	No	Provide SDS to fire department
Montana	✓	✓	✓	✓	✓	A list of hazardous materials provided to the county
Nebraska	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Nevada	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
New Hampshire	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
New Jersey	✓	✓	✓	✓	✓	A hazardous materials list submitted to the NJ Department of Health
New Mexico	✓	✓	✓	✓	✓	Requires the written hazard communication program
New York	✓	✓	✓	✓	✓	Requires the written hazard communication program
North Carolina	✓	✓	✓	✓	✓	Given to your fire department for large quantities of chemicals on premises
North Dakota	No	✓	✓	✓	✓	Requires a written training and hazardous materials communication program
Ohio	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Oklahoma	✓	✓	✓	✓	✓	Requires a written training program; requires the CAS number be on the label
Oregon	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Pennsylvania	✓	✓	✓	✓	✓	Give a list of the hazardous materials to your fire and police departments
Rhode Island	✓	✓	✓	✓	✓	Hazardous materials list must be sent to RI Deptartment of Labor and fire department
South Carolina	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
South Dakota	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Tennessee	✓	✓	✓	✓	✓	Similar to the Federal OSHA Standard
Texas	No	✓	✓	✓	✓	May provide SDS or a list of hazardous agents to your fire department
Utah	✓	✓	✓	✓	✓	Requires a written hazard communication program
Vermont	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Virginia	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Washington	✓	✓	✓	✓	✓	Requires a written hazard communication program
West Virginia	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard
Wisconsin	✓	✓	✓	✓	✓	An employee Right-to-Know Law
Wyoming	✓	✓	✓	✓	✓	Identical to the Federal OSHA Standard

Goggle **Safety**

What Do the ANSI Standards Really Mean?

Appropriate eye protection is extremely important in the science classroom. As you compare the wide array of goggles and safety glasses, you often see the phrase "Meets ANSI Z87+ Standards." In the *Flinn Scientific Catalog/Reference Manual*, we list several eyewear styles, all of which meet the ANSI standard. Obviously, there must be more to choosing safe eyewear than merely picking any style that meets this standard. To choose the most suitable eyewear for yourself and your students, it is helpful to understand ANSI and its relationship to school laboratory regulations.

What Is ANSI Z87+?

The American National Standards Institute (ANSI) is a nonprofit association that publishes standards covering a broad range of equipment and industries. The complete title of the current ANSI document pertaining to eyewear is American National Standard for Occupational and Educational Personal Eye and Face Protection, ANSI Z87.1–2010. This document includes standards for several different styles of safety eyewear ranging from eyeglass-type spectacles to heavy-duty welding helmets. The document is organized according to the hazards that might be faced and allows an instructor or employer to select the appropriate safety eyewear based on the hazards they expect to encounter. These hazards include impact and coverage, droplet/splash, dust, fine dust and optical radiation. The previous versions of this standard did not include tests to determine protection against splash, dust or fine dust.

For a clear understanding of how these standards relate to your choice of laboratory eyewear, it is helpful to know more about ANSI and Z87+.



Popular Flinn Visor Goggles offer comfort and coverage (see page 572).

- ANSI is not a federal agency. As an independent association, it is not involved in establishing or enforcing the OSHA Laboratory Standard.
- ANSI does not test, inspect or approve eyewear. The eye protection manufacturer can choose to contract an independent testing facility to conduct tests to determine whether their products meet ANSI standards.
- There are important factors that are difficult to measure and are not covered in Z87+ that must be considered when choosing eyewear. Among these are durability, comfort and antifog performance.

The easiest way to determine the type of protection the eyewear provides is to look at the frames of the goggles. Molded into each frame is a series of letters and numbers that refer to the level of protection the eyewear is certified.

- Z87—The eyewear meets the basic criteria of the standard.
- Z87+—The eyewear is able to withstand the impact of a high-velocity projectile without compromising user's safety.
- D3—The eyewear protects the eyes and face from droplets and splashes.
- D4—The eyewear protects against dust.
- D5—The eyewear protects against fine dust (vapor).

An example of the markings you can expect to see on a goggle frame that protects against splash and high impact is Z87+D3.

Keep in mind that not all eyewear is created equal. There are a lot of cheaply made goggles on the market that will not survive even one semester. Still, how safe are goggles that meet ANSI standards but will be left in a desk drawer, unworn, because they are broken or uncomfortable?

- Eyewear should fit comfortably and securely. Try different styles and sizes to find the right fit.
- Chemical splash goggles should have a soft, pliable flange that seals around the eyes. The hard plastic edge on models lacking a flange becomes extremely uncomfortable.
- Availability of replacement parts (e.g., headbands, lenses, vent covers) is a real cost-saving advantage.
- Antifog performance is affected by temperature and humidity. Experiment with different eyewear styles and features (vented and fog-free lenses) to find the best eyewear for your classroom.

The Choice Is Up to You

As a responsible science teacher, you must select eyewear that provides you and your students the most suitable protection from the hazards involved in your laboratory activities. The following regulations address the role of the teacher's judgment in selecting suitable eye protection:

Occupational Safety and Health Administration OSHA 1910.1450 (Laboratory Standard) Section D(6)

School laboratories should include "protective apparel compatible with the required degree of protection for substances being handled."

As you ponder which type of protective eyewear to purchase, or whether eye protection is needed at all, keep the following suggestions in mind:

- Will you be using heat, glassware or chemicals in the lab? If so, it is a good basic policy to use protective eyewear.
- Chemical splash goggles carrying the D3 rating should be worn whenever hazardous chemicals are used.
- The educational laboratory is a unique environment where each student is often surrounded by other students conducting experiments. Hazards could come from any direction. Protective eyewear should provide sufficient angular coverage.
- Face shields that provide added splash protection coverage should not be worn alone. Always wear the appropriate goggles or safety glasses underneath a face shield.

Conclusion

While ANSI has established many standards for a variety of protective eyewear, it does not provide specific standards for several factors important to the science teacher. Among those are durability and comfort. It is the teacher's responsibility to keep these factors in mind when selecting eyewear. As clearly stated in the *Flinn Scientific Catalog/Reference Manual*, "You, the instructor, should decide what type of eyewear your students must wear in every case." The information and high-quality eye and face protection Flinn provides will help you make an informed, responsible choice.

QUESTIONS? CALL US AT
1-800-452-1261

Chemical **Exposure**

When Are Vapors Harmful to You and Your Students?

Threshold Limit Value (TLV) and Permissible Exposure Limit (PEL) refer to the levels of a chemical above which a person should avoid repeated and prolonged exposure. TLVs and PELs were originally structured to provide guidelines for industrial workers who may be repeatedly exposed to the same chemicals day after day. Science teachers can use these values to provide guidance on which chemicals to use and when to take precautions. TLVs and PELs should be regarded as general standards since different individuals respond differently to exposure. The amount of exposure and the time period of exposure are the critical issues.

The difference between TLVs and PELs is the agencies from which they come. TLVs are developed by the American Conference of Governmental Industrial Hygienists (ACGIH). PELs are developed by the Occupational Safety and Health Administration (OSHA). They both serve the same purpose, and their values are very similar or even identical in many cases. For the remainder of this article, we will refer only to TLVs for simplicity.

TLVs for vapors or gases are reported in units of either parts per million (ppm) or milligrams per cubic meter (mg/m^3) of air. A cubic meter is approximately the size of a small telephone booth. Exposure limits for dust, particulate matter or mist are always reported as milligrams per cubic meter of air.

Many substances have effects that are acute and fast-acting. A ceiling limit has been established for these items. This ceiling suggests that the limit not be exceeded even for an instant. For example, the ceiling TLV for iodine is 0.1 ppm or 1 mg/m^3.

For chemicals that are acute or fast-acting through skin absorption, gloves must be worn; the substances also must be handled in either an operating fume hood or a well-ventilated room.

The threshold of smell of many chemicals is usually below that of the TLV. A strong smell may act as a warning that the TLV is being approached. Since human smelling ability can be impaired by some odors, one should not depend on smell as a reliable indicator of a hazard. Chlorine gas, as an example, has a TLV of 0.5 ppm or 1.5 mg/m3. The odor threshold for chlorine is approximately 0.3 ppm. If you can smell chlorine, you are probably at or near the level of concern.

Biology teachers in particular should note the very low TLV for formaldehyde (0.3 ppm) and make plans to eliminate formaldehyde from their program, use it only under a hood or be sure the room air in their laboratory is being changed (not recirculated) a minimum of 10–12 times per hour. Fortunately, many preserved materials now contain only very small amounts of free formaldehyde.

The best practice is to maintain concentrations of all atmospheric contaminants to the lowest practical levels. Three primary steps will help reduce your exposure to volatile or other airborne chemical substances.

1. **Ventilation.** Ventilation of the school science laboratory should be of paramount importance to the science teacher. Two types of ventilation should be incorporated in the science laboratory. A purge ventilation system (see page 566) should be available to provide a quick air exchange in the laboratory should the level of a hazardous chemical vapor or dust approach the TLV. Also fume hoods should be available and used whenever volatile and hazardous materials are used. A reaction that is performed in a properly operating fume hood will not release any vapors into the laboratory.



2. **Substitution.** Use the TLV table on the following page to substitute a less hazardous chemical for the experiment or activity. For example, if an alcohol is required for an experiment and methyl, ethyl or isopropyl alcohol can be used, the smart choice is to use ethyl alcohol because it has the highest TLV. Another example is melting point determinations. Many teachers have used naphthalene or *para*-dichlorobenzene, both of which have a TLV of 10 ppm. Why not substitute a less hazardous material, such as cetyl alcohol, stearic acid or *t*-octyl phenol?

3. **Microscale.** Scaling down the quantity of material used will reduce the amount that will volatilize into the atmosphere. If a typical class (15 lab groups, 280 m^3 room) performs a lab where sulfur is burned to form sulfur dioxide and the lab is microscaled to use only 0.05 g of sulfur, the average level of sulfur dioxide in the room will probably not exceed 3 mg/m^3, below the TLV of 5.2 mg/m^3. However, if 0.2 g or more are used by each group, the TLV quickly would be exceeded.

TLVs are not well-defined limits between what is safe or unsafe. Rather they should be used as guidelines for the teacher. Most students are in the laboratory for only short periods each week. The teacher's exposure is, of course, much greater. Following these steps greatly will reduce your exposure to hazardous chemicals.

The following page offers a list of common school laboratory chemicals and their TLV values. This is not a comprehensive listing. TLV values are subject to change as new information is developed.

CHEMICAL EXPOSURE continued on next page.

Flinn **Chem**ventory™

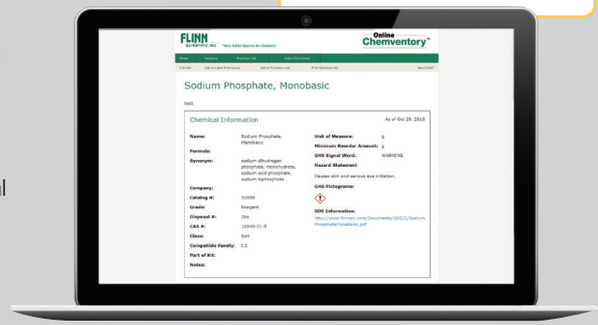
Chemical Inventory Management System

The Flinn Chemventory is a cloud-based laboratory chemical inventory system that allows multiple users access to the database from multiple locations and multiple devices! Maintaining an accurate laboratory chemical inventory has never been easier, more flexible and more convenient.

The Flinn Chemventory program features:

- Secure Cloud-Based Service
- Easily Add All Your Flinn Chemicals
- Multiple Users
- Print, Email and Export Your Inventory List
- Customize Your Database
- Link Databases Across Your District
- GHS Hazard Information Included
- Safety Data Sheets for Every Flinn Chemical
- Print Chemical and Solution Labels
- Import Data from Previous Chemventory Versions
- Create a Purchase List

SEE PAGE 576 FOR FULL DETAILS!



Some Common Chemical TLVs

Substance	TLV (ppm)	TLV (mg/m^3)
Acetic Acid	10	25
Acetic Anhydride[1]	5	21
Acetone	750	1188
Alumina[2]	—	10
Aluminum Metal[2]	—	10
Ammonia	25	17
Ammonium Chloride[2]	—	10
Ammonium Dichromate[2]	—	0.5
n-Amyl Acetate	100	532
Aniline and Homologs[3]	2	7.6
Antimony and Compounds	—	0.5
Arsenic and Soluble Compounds	—	0.01
Barium and Barium Compounds	—	0.5
Barium Sulfate	—	10
Benzene	0.5	1.6
Benzoyl Peroxide	—	5
Bromine and Bromine Water	0.1	0.66
Bromoform	0.5	5.2
Butane	800	1900
2-Butanone	200	590
n-Butyl Alcohol[1,3]	50	152
sec-Butyl Alcohol	100	300
tert-Butyl Alcohol	100	303
Cadmium and Cadmium Compounds[2]	—	0.01
Calcium Carbonate	—	10
Calcium Hydroxide	—	5
Calcium Oxide	—	2
Calcium Sulfate	—	10
Camphor, synthetic	2	12
Carbon Dioxide	5000	9000
Carbon Disulfide[3]	10	31
Cellulose	—	10
Charcoal	—	3.5
Chlorine, gas	0.5	1.5
Chloroform	10	49
Chromates and Dichromates	—	0.05
Chromium (III) Compounds	—	0.5
Chromium Metal and Insoluble Salts	—	0.5
Cobalt	—	0.02
Copper[2]	—	1
Cyclohexane	300	1030
Cyclohexanol[3]	50	206
Cyclohexanone[3]	25	100
Cyclohexene	300	1010
p-Dichlorobenzene	10	60
Dioxane[3]	25	90
Ether, Ethyl	400	1210
Ethyl Acetate	400	1440
Ethyl Alcohol	1000	1880
Ethylenediamine[3]	10	25
Ethylene Dichloride[3]	10	40
Ethylene Glycol[1]	—	100
Formaldehyde	0.3	0.37
Formic Acid	5	9.4
n-Heptane	400	1640
n-Hexane	50	176
Hydrochloric Acid[1]	5	7.5
Hydrogen Fluoride[1]	3	2.3
Hydrogen Peroxide	1	1.4
Hydrogen Sulfide (gas)	10	14
Hydroquinone	—	2
Iodine[1]	0.1	1
Isoamyl alcohol	100	361
Isopropyl Alcohol	400	983
Lead, Metal and Compounds[2]	—	0.05
Magnesium Oxide[2]	—	10
Manganese[2]	—	0.2
Mercury	—	0.025
Methyl Alcohol[3]	200	262
Methyl Chloroform	350	1910
Methyl-t-Butyl Ether	40	144
Methyl Ethyl Ketone	200	590
Methyl Isobutyl Ketone	50	205
Methyl Methacrylate	100	410
Naphthalene	10	52
Nicotine[3]	—	0.5
Nitric Acid	2	5.2
Oxalic Acid	—	1
Pentane	600	1770
Phenol[3]	5	19
Phosphorus	0.02	0.1
Phthalic Anhydride[1]	1	6.1
Potassium Hydroxide[1]	—	2
Propane	2500	4508
n-Propyl Alcohol[3]	200	492
Pyridine	5	16
Silver Nitrate (as silver)	—	0.01
Sodium Bisulfite	—	5
Sodium Hydroxide[1]	—	2
Styrene[3]	50	213
Sulfur Dioxide (gas)	2	5.2
Sulfur Hexafluoride	1000	5970
Sulfuric Acid	—	1
Tetrahydrofuran	200	590
Tin (inorganic)	—	2
Titanium Dioxide[2]	—	10
Toluene	50	188
Trichloroethylene	50	269
Turpentine	100	556
Xylenes	100	434
Zinc Chloride[2]	—	1
Zinc Oxide[2]	—	5

A responsible teacher will use a fume hood!

[1]Ceiling TLVs. Chemicals where the TLVs should not be exceeded even for a second. These substances are acute and fast-acting.
[2]TLV for dust or fume.
[3]These chemicals are rapidly absorbed by the skin, eyes and mucous membranes. TLVs should be strictly observed for these substances.

"How Toxic **Is Toxic?**"

Toxicology is defined as the study of the adverse effects of natural and synthetic chemical substances on living organisms. In evaluating the relative toxicity of chemicals, scientists study their mode of action, physical and biological effects and how they can be detected. All chemicals are toxic at some level. Thus every chemical will be toxic under some set of exposure conditions. The reverse, however, is also true—every chemical has some set of exposure conditions in which it is not toxic. The risk or hazard posed by a chemical is further determined by the route and duration of exposure. There are three major routes by which a chemical can enter the body: by ingestion, inhalation and skin absorption. Practicing strict chemical hygiene is thus the most effective way to reduce the hazards and work safely with chemicals.

Acute toxicity, which is defined as the immediate effect of a substance as a result of a single dose, can be measured experimentally. Chronic toxicity, resulting from low doses of a chemical repeated over long periods of time, is more difficult to test and is usually evaluated based on epidemiological evidence. Acute toxicity is determined on the basis of test dosages made on experimental animals under controlled conditions. The most common measure toxicologists use to compare acute toxicity is the LD_{50} value, which stands for "lethal dose, 50%." The LD_{50} value for a chemical is the amount of chemical that can be expected to cause death in one-half (50%) of a group of a particular animal species. Since the amount required to cause death is related to body weight, the LD_{50} value is expressed in milligrams of chemical per kilogram of body weight (mg/kg). A typical LD_{50} statement includes the substance, the route of entry and the animal species as follows: Aniline LD_{50} oral-rat: 250 mg/kg. In plain English, this LD_{50} statement says that 250 mg of aniline for every kilogram body weight of rat, when administered in a single dose by mouth, will cause the death of 50% of the test animals. LD_{50} values are commonly determined for the following routes of exposure: ingestion (oral), skin absorption, subcutaneous or intravenous injection and inhalation.

GHS (Globally Harmonized System of Classification and Labeling of Chemicals) classifies the health hazards due to the acute toxicity of chemicals into four categories:

- Fatal if swallowed: 0–50 mg/kg
- Toxic if swallowed: 0–300 mg/kg
- Harmful if swallowed: 300–2000 mg/kg
- May be harmful if swallowed: > 2000 mg/kg

It should be noted that no LD_{50} data exists for humans. Data from test animals is used to estimate the possible acute toxicity of a chemical on a human being. Toxicity data should therefore be used to evaluate the relative toxicity of various chemicals and which chemicals may require greater precautions when handled. The lower the LD_{50} value, the more toxic the substance. The following chart lists the LD_{50} values for common chemicals. LD_{50} values have not been measured for all chemicals—even some known hazardous chemicals, such as lead compounds, do not have published LD_{50} values.

Substance LD_{50}	per kilogram
Acetaldehyde	661 mg
Acetanilide	800 mg
Acetic Acid	3310 mg
Acetic Anhydride	1780 mg
Acetone	5800 mg
Acetyl Salicylic Acid	200 mg
Adenine	227 mg
Aluminum Chloride	3311 mg
Aluminum Nitrate	3671 mg
Ammonium Chloride	1650 mg
Ammonium Hydroxide	350 mg
Ammonium Molybdate	333 mg
Ammonium Nitrate	2217 mg
Ammonium Persulfate	689 mg
Ammonium Sulfate	2840 mg
Ammonium Thiocyanate	750 mg
n-Amyl Alcohol	5.66 mL
Aniline	250 mg
Aniline Hydrochloride	840 mg
Anthranilic Acid	5410 mg
Antimony Trichloride	525 mg
Arsenic Trioxide	14.6 mg
Barium Acetate	921 mg
Barium Carbonate	418 mg
Barium Chloride (intraperitoneal mouse)	51 mg
Barium Nitrate	355 mg
Benzaldehyde	1300 mg
Benzene	930 mg
Benzoic Acid	1700 mg
Benzyl Alcohol	1230 mg
Bismuth	5000 mg
Bismuth Nitrate	4042 mg
Boric Acid	2660 mg
Brilliant Green	313 mg
Bromine	2600 mg
Bromobenzene	2383 mg
Bromoform	1147 mg
n-Butyl Alcohol	790 mg
sec-Butyl Alcohol	2193 mg
tert-Butyl Alcohol	2743 mg
Butyric Acid	2000 mg
Cadmium	2330 mg
Cadmium Chloride	88 mg
Cadmium Nitrate	300 mg
Caffeine	192 mg
Calcium Chloride, dihydrate	1000 mg
Calcium Chloride, anhydrous	1000 mg
Calcium Fluoride	4250 mg
Calcium Hypochlorite	850 mg
Calcium Nitrate	3900 mg
Camphor (mouse)	1310 mg
Carbon Disulfide	1200 mg
Cesium Chloride	2600 mg
Cetyl Alcohol	5000 mg
Chloroform	695 mg

Never ingest any laboratory chemical, no matter the LD_{50}.

Chromium(ic) Chloride	1790 mg
Chromium(ic) Nitrate	3250 mg
Chromium Trioxide	80 mg
Cinnamaldehyde	2220 mg
Citric Acid, anhydrous	3000 mg
Cobalt Carbonate	640 mg
Cobalt Chloride	766 mg
Cobalt Nitrate	691 mg
Cobalt Oxide	5000 mg
Cobalt Sulfate	582 mg
Colchicine (mouse)	6 mg
Copper(I) Chloride	140 mg
Copper(I) Oxide	470 mg
Copper(II) Acetate	710 mg
Copper(II) Carbonate	1350 mg
Copper(II) Chloride	140 mg
Copper(II) Nitrate	940 mg
Copper (II) Sulfate	300 mg
Crystal Violet	420 mg
Cyclohexanol	1400 mg
Cyclohexene	1920 mg
2,6-Di-t-Butyl-4-Methyl Phenol	890 mg
p-Dichlorobenzene	500 mg
2,4-Dichlorophenoxy Acetic Acid	375 mg
1,4 Dioxane	4200 mg
Diphenylamine	1120 mg
Dodecyl Alcohol	12800 mg
Dodecyl Sulfate, Sodium Salt	1300 mg
Eosin Y	2344 mg
Erythrosin B	1840 mg
Ethyl Acetate	5620 mg
Ethyl Ether	1215 mg
Ethylenediamine	1200 mg
Ethylenediaminetetraacetic Acid (mouse)	30 mg
Ethylene Dichloride	670 mg
Ethylene Glycol	4700 mg
Fast Green FCF	2000 mg
Ferrous Ammonium Sulfate	3250 mg
Formaldehyde	100 mg
Formic Acid	1100 mg
Glutaraldehyde	134 mg
Glyoxal	2960 mg
Hexamethylenediamine	750 mg
Hexyl Alcohol	720 mg
Hydroquinone	302 mg
Hydroxylamine Hydrochloride	141 mg

"HOW TOXIC IS TOXIC?" continued on next page.

"How Toxic Is Toxic?", continued

Substance	LD_{50} per kilogram
Indigo Carmine	2000 mg
Indole-3-Butyric Acid	100 mg
Iron(II) Sulfate (mouse)	1520 mg
Iron(III) Chloride	1278 mg
Iron(III) Nitrate	3250 mg
Isobutyl Alcohol	2460 mg
Isopentyl Alcohol	1300 mg
Isopropyl Alcohol	5045 mg
Isoraleric Acid	1850 mg
Kerosene (rabbit)	2835 mg
Lactic Acid	3543 mg
Lead Acetate	4665 mg
Lithium Carbonate	525 mg
Lithium Chloride	526 mg
Lithium Sulfate (anhydrous salt)	613 mg
Magnesium Nitrate	5440 mg
Malachite Green Oxalate	275 mg
Maleic Acid	708 mg
Malonic Acid	1310 mg
Manganese(II) Chloride	1484 mg
Menthol	3180 mg
Methyl Alcohol	5628 mg
Methyl-t-Butyl Ether	4000 mg
Methyl Ethyl Ketone	2737 mg
Methyl Isobutyl Ketone	2080 mg
Methyl Orange	60 mg
Methyl Salicylate	887 mg
Methyl Violet 2B	413 mg
Methylene Blue	1180 mg
Methylene Chloride	1600 mg
Naphthalene	490 mg
Naphthalene Acetic Acid	1000 mg
1-Naphthol	1870 mg
Nickel Ammonium Sulfate	400 mg
Nickel Chloride	105 mg
Nickel Nitrate	1620 mg
Nicotine	50 mg
o-Nitrobenzaldehyde	600 mg
meta-Nitrophenol	328 mg
para-Nitrophenol	202 mg
1-Octanol (mouse)	1790 mg
4-(t-Octyl) Phenol	3210 mg
Orcinol (guinea pig)	600 mg
Oxalic Acid	375 mg
Pentane	400 mg
Peppermint Oil	2426 mg
Perchloroethylene	2629 mg
1,10-Phenanthroline	132 mg
Phenol	317 mg
Phenyl Salicylate	3000 mg
Phenyl Thiocarbamide (mouse)	10 mg
Phosphoric Acid	1530 mg
Phosphorous Pentoxide (inhalation, LD_{50})	1217 mg/m^3
Phthalic Anhydride	4020 mg
Potassium Acetate	3250 mg
Potassium Bisulfate	2340 mg
Potassium Bromate	157 mg
Potassium Bromide	3070 mg
Potassium Carbonate	1870 mg
Potassium Chlorate	400 mg
Potassium Chloride	2600 mg
Potassium Chromate (mouse)	180 mg
Potassium Cyanide	5 mg
Potassium Dichromate	25 mg
Potassium Ferricyanide	1600 mg
Potassium Ferrocyanide	6400 mg
Potassium Fluoride	245 mg
Potassium Hydroxide	273 mg
Potassium Iodate	531 mg
Potassium Nitrate	3750 mg
Potassium Nitrite	200 mg
Potassium Permanganate	1090 mg
Potassium Persulfate	802 mg
Potassium Thiocyanate	854 mg
Propionic Acid	2600 mg
n-Propyl Alcohol	1870 mg
Pyridine	891 mg
Pyrogallol (mouse)	300 mg
Resorcinol	301 mg
Rhodamine B (mouse)	887 mg
Salicylic Acid (mouse)	480 mg
Sebacoyl Chloride	400 mg
Silicon	3160 mg
Silver Nitrate	1173 mg
Silver Oxide	2820 mg
Soda Lime	3530 mg
Sodium Acetate	3530 mg
Sodium Arsenite	41 mg
Sodium Benzoate	4070 mg
Sodium Bicarbonate	4220 mg
Sodium Bismuthate	420 mg
Sodium Bisulfite	2000 mg
Sodium Borate	2660 mg
Sodium Bromate	300 mg
Sodium Bromide	3500 mg
Sodium Carbonate	4090 mg
Sodium Chlorate	1200 mg
Sodium Chloride	3000 mg
Sodium Chromate, tetrahydrate	52 mg
Sodium Chromate, anhydrous	136 mg
Sodium Dichromate	52 mg
Sodium Fluoride (mouse)	57 mg
Sodium Hexametaphosphate (mouse)	4320 mg
Sodium Iodide	4340 mg
Sodium Metabisulfite	1131 mg
Sodium Metasilicate	1153 mg
Sodium Nitrate	1267 mg
Sodium Nitrite	180 mg
Sodium Oxalate (mouse)	5094 mg
Sodium Perborate	1200 mg
Sodium Salicylate	930 mg
Sodium Sulfide (anhydrous salt)	208 mg
Sodium Sulfite	3560 mg
Sodium Thiocyanate	764 mg
Streptomycin Sulfate	430 mg
Strontium Chloride (anhydrous salt)	2250 mg
Strontium Nitrate	2750 mg
Styrene, Monomer	2650 mg
Succinic Acid	2260 mg
Sulfamic Acid	3160 mg
Sulfanilamide	3900 mg
5-Sulfosalicylic Acid	2450 mg
Sulfuric Acid	2140 mg

To put toxicity into perspective, compare the LD_{50} to that of sodium chloride (3000 mg).

Tannic Acid	2260 mg
Tetrahydrofuran	1650 mg
Thioacetamide	301 mg
Thiourea	125 mg
Thymol	980 mg
Tin(II) Chloride	700 mg
Toluene	636 mg
Trichloroethylene	4920 mg
Triethanolamine	4.92 mL
Urethane	1809 mg
Xylenes	4300 mg
Zinc Acetate	794 mg
Zinc Chloride	350 mg
Zinc Nitrate	1190 mg
Zinc Sulfate	1260 mg

Safer Storage

Provide extra safety for the storage of severe poisons. Chemicals that have an LD_{50} of less than 300 mg/kg may be described as fatal or toxic if swallowed. These should be stored in a separate and secure storage cabinet to protect against theft, vandalism, or fire.

The Flinn/SciMatCo® Poison Cabinet is compact and will fit into an existing storage cabinet or shelf.

Severe poisons must be locked up. The Flinn/SciMatCo® Poison Cabinet is a "must" safety aid for any high school chemical storage area.



Catalog No.	Description	Price/Each
SE6080	Flinn/SciMatCo® Wooden Poison Cabinet	**$591.65**

See flinnsci.com for more information.

Flammable **Liquid Safety**

Safety Tips for Using Flammable Liquids in School Laboratories

Introduction

The use of flammable liquids is an important part of most chemical laboratories. Understanding the properties and hazards of these materials is an important first step for the safe purchase, storage, use and disposal of flammable liquids.

Safety Precautions

All flammable liquids found in school environments are also organic compounds. Their principal hazard is flammability. Many are also slightly toxic by inhalation and are body tissue irritants. Mild headaches or dizziness may be a symptom of overexposure to an organic vapor. Good ventilation is highly recommended whenever volatile organic compounds are used. Specific hazards for common organic solvents are presented in this review. Always wear chemical splash goggles, chemical-resistant gloves and chemical-resistant apron whenever using flammable liquids. Consult current Safety Data Sheets for specific safety, handling and disposal information.

Purchase

- Before purchasing any organic liquid, ask the following questions:
  - — Do I understand the hazards of this material?
  - — How often is this chemical used in a school setting?
  - — What is the educational value of this chemical?
  - — Have I used this chemical before?
  - — Is my lab equipped for the safe use and storage of this chemical?

  If these questions cannot be answered positively, please reconsider purchasing the chemical.
- Organic compounds are not easy to dispose of and frequently require costly disposal methods. Purchase only what is required for 1–2 years' usage.
- Purchase smaller-size bottles of flammable liquids whenever possible to keep them fresh and to make storage and handling easier. It is easier to handle a 100- or 500-mL bottle than a 1- or 4-L jug. Smaller bottles also contain less liquid that can spill in the event of an accident and thus will add less fuel to a potential fire.
- Always purchase flammable liquids in plastic or PVC-coated glass bottles. PVC-coated bottles will not shatter and spill material when dropped.

Storage

- Store all flammable liquids, solids and gases in a dedicated flammables cabinet. The best flammables cabinets are built using high-density wood. Metal is a heat conductor while wood is an insulator. Applying intense heat to a metal flammables cabinet may cause the door to warp and release flammable liquids and vapors into the fire. A wooden flammables cabinet insulates the chemicals inside the cabinet and will withstand a fire better than a metal cabinet. Wooden flammable cabinets have been reviewed and approved by the major standard-setting organizations, including OSHA and NFPA, and by many major city fire departments.
- Flammables storage cabinets should be located in a locked chemical storeroom to prevent theft. The cabinets should also be secured with a lock.
- Within the flammables cabinet, all the materials should be stored using the Flinn Scientific Chemical Storage Pattern.
- A chemical storeroom that contains flammable materials should be equipped with an ABC fire extinguisher, fire blanket and smoke detector.
- The chemical storeroom should also be equipped with a small, corrosive-resistant exhaust system.

Store all flammable liquids in a dedicated flammables cabinet.

Flinn Scientific recommends a fan that will provide four air changes per hour. The fan should be placed near the ceiling of the storeroom. Since organic vapors are heavier than air, the exhaust system must draw vapors up from the floor. Use a galvanized sheet metal duct to draw air from the floor to the exhaust fan near the ceiling.

- If a flammables cabinet is not available, store all flammable liquids in Flinn *Saf-Stor*™ cans (see page 561). This will provide good secondary containment and protection during fires.
- Never store flammable or combustible materials near strong oxidizing agents. As these materials react with one another, heat is evolved and a fire can occur. Use the Flinn Scientific Chemical Storage Pattern to prevent storage accidents (see page 629).
- Diethyl ether may form explosive peroxides over the course of 1–2 years. Buy and store only small quantities of this material.
- Never store flammable liquids in a household refrigerator or freezer. Vapors can build up inside the refrigerator, and a spark from the compressor, thermostat, lightbulb or electrical switch can ignite the vapors. Explosion-proof refrigerators can be purchased, but they cost 3–4 times more than household refrigerators.
- Some alcohols also will form peroxides upon standing. These peroxides can be explosive if they are allowed to accumulate or are concentrated. Do not distill these materials. Consult the *Flinn Scientific Catalog/Reference Manual* or SDSs to determine storage recommendations for specific alcohols.



Transporting

- Secondary containment is critical in preventing major spills or accidents when transporting flammable liquids. Make sure all flammable and combustible liquids are in unbreakable plastic or PVC-coated glass bottles, or transport them in unbreakable bottle carriers.
- Always carry large flammable liquid bottles with one hand underneath the bottle and the other hand around the neck of the bottle. This keeps the bottle closer to your body and decreases the risk of hitting a sharp object like a desk corner.
- If a cart is used to transport hazardous chemicals, place compatible chemicals inside an unbreakable secondary containment vessel, such as a plastic tote. The cart should be equipped with guardrails to prevent plastic totes or bottles from sliding off.
- If hazardous chemicals are moved from one floor to another, use an elevator if possible. Only the teacher transporting the chemicals should be on the elevator. Although elevator accidents are rare, should a dangerous material be released in an elevator while passengers are trapped inside, the results could be catastrophic.

Using and Dispensing Flammable Liquids

- If volatile organic solvents are going to be used, the lab must be well ventilated or have a working purge fan to ventilate the lab. The laboratory should also be equipped with one or two ABC dry-chemical fire extinguishers and fire blankets in addition to the other normal safety equipment (e.g., safety eyewash, safety shower).
- Always review SDSs before using any hazardous materials in the laboratory.
- Flammable liquids should not be mixed with strong oxidizing agents. As the organic material is oxidized, heat is evolved and may ignite the material, resulting in a fire.

FLAMMABLE LIQUID SAFETY continued on next page.

Flammable Liquid Safety, continued

- Extreme care must be taken when using flammable liquids around any heat source, flames or electrical equipment. Laboratory equipment (e.g., stirrers, meters) are designed to be sparkproof, but limiting vapors is always a good safety precaution.
- Organic vapors are heavier than air and will quickly travel along a lab bench or floor to an ignition source. Never use flammable liquids around any ignition source. Try to minimize the amount of volatile liquids used and be aware that organic vapors can travel great distances.
- Flammable liquids are very volatile. Dispense them in an operating fume hood.
- Use lab mats and/or plastic trays when dispensing organic solvents to contain spills and drips.
- Students should dispense flammable liquids from smaller bottles to limit spills and fumes. Do not allow students to dispense flammable liquids from containers larger than 1 liter. Larger volume containers increase the possibility of contamination and also increase the amount of fuel that will be available in case of a fire.
- During lab, dispense the flammable liquid from a central dispensing location and have students bring a graduated cylinder or test tube to the dispensing area. This will help minimize spills and accidents as well as limit the amount of flammable liquid being brought back to the lab bench.

Dispense flammable liquids in an operating fume hood.

- Instruct students to remove from the bottle only the amount of flammable liquid needed for the experiment. Never add chemicals back to reagent bottles.
- Have spill clean-up materials readily available whenever flammable liquids are used. If a spill occurs, immediately restrict unprotected personnel from the area, remove all ignition sources and ventilate the area. If the spill is too large to contain, the vapors are overpowering or ignition sources cannot be completely removed, immediately evacuate the school and call the fire department. If the spill is small, contain the spill with sand or an absorbent material. Depending on the spill material and the amount, allow the spilled material to evaporate off the sand or absorbent material in a fume hood or deposit it in a sealed bag or container.
- Absorbent spill pillows are great absorbents for most organic spills. The pillows quickly absorb 10–20 times their weight, making disposal very easy (see page 583).

Personal Protective Equipment and Safety Aids

- Consult the SDSs for the specific personal protective equipment required and other safety precautions for the flammable material being used.
- Neoprene rubber gloves are recommended when handling organic solvents. Plastic or vinyl gloves will provide some protection against the occasional splash, small spill and splatter that may occur when using or dispensing solvents.
- Operating eyewashes must be available in any classroom or laboratory where chemicals are used. Approved eyewashes must treat both eyes and provide a stream of clean, potable water for at least 15 minutes.
- Chemical splash goggles must be worn anytime flammable liquids are used. Safety glasses are not adequate protection.
- During demonstrations, it is very important that students wear chemical splash goggles anytime flammable liquids are used. The possibility of an explosion or fire always exists, and both students and teachers must be protected. If safety goggles are not available, use a heavy-duty safety shield to protect your students.

First Aid

- Always seek professional medical attention upon exposure to any hazardous chemical, especially volatile organic solvents. For most organic solvents, the major hazards are flammability and inhalation. If there is a spill or accident, immediately remove any flames, heat or electrical equipment from the area and begin to ventilate the space.
- If an organic liquid is splashed in the eyes, use an eyewash to irrigate the eyes with fresh, potable water for at least 15 minutes. Make sure the eyelids are held open to properly irrigate them. Ask the victim to look up, down and sideways to better reach all parts of the eye. After using the eyewash, immediately seek professional medical help.
- If a flammable liquid is splashed onto bare skin, rinse the area with cool water for at least 15 minutes. Many organic solvents will "dry out" the skin and cause minor dermatitis. If the liquid causes burns or other skin irritations, seek medical help immediately.
- If a large amount of flammable liquid is splashed onto clothing, consider removing the clothing immediately and placing the clothing in a fume hood or outdoors. If flammable liquid splashes onto your skin and clothing, remove clothing and then begin rinsing the affected areas with water (using a safety shower is ideal).
- If an organic liquid is ingested, please consult the SDS and immediately call the poison control center (1-800-222-1222) or local hospital emergency room. Follow their directions and seek medical attention as soon as possible. For most organic solvents, the goal is to trap the chemical in the stomach and prevent further injury caused by vomiting. Activated charcoal is sometimes given to help trap the chemical. Do not give the victim anything to drink or induce vomiting unless instructed by a medical professional.

Disposal

- Consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory wastes. For small amounts of most volatile organic liquids, Flinn Suggested Disposal Method #18a, evaporation in an operating fume hood, can be used. For larger amounts, a professional chemical waste disposal firm will have to be used.
- Waste crocks or "slop" buckets are used in many schools for liquid laboratory wastes. Organic wastes should be kept separate from aqueous wastes to prevent any accidental reactions. For organic waste containers, it is best to separate halogenated organic solvents (e.g., methylene chloride) from other organic solvents (e.g., ethyl alcohol) for disposal. Sometimes volatile organic solvents can be evaporated in a fume hood from the organic waste container. Be sure to label all waste containers with their approximate contents. Dispose of all waste solutions as soon as possible.



Acid **Safety**

Safety Tips for Using Acids in School Labs

Introduction

The use of acids is an important component of most chemical laboratories. Understanding the properties and hazards of acids is an important first step for the safe purchase, storage, use and disposal of acids.

Safety Precautions

Concentrated acids are strongly corrosive to all body tissue, especially eyes and skin. Concentrated acids are highly toxic due to their extreme corrosiveness. Hydrochloric and acetic acids are also toxic by inhalation. Other hazards are presented in this review. Always wear chemical splash goggles, chemical-resistant gloves and a chemical-resistant apron whenever using concentrated acids or acid solutions.

Purchase

- Purchase dilute acids whenever possible. Dilute acid solutions are safer and easier to handle, use and store than concentrated acids. They also will save valuable prep time.
- Purchase small quantities of acids to help keep your acid fresh and make storage and handling safer and easier. It is easier to clean up a 100-mL acid spill than a 2.5-L one.
- Always purchase concentrated acids in PVC-coated glass bottles, which will not shatter and spill acid when dropped. The PVC creates a plastic envelope around the bottle that greatly reduces spills and breakage. The PVC coating may discolor over time, especially when exposed to hydrochloric acid fumes. This discoloration does not affect the PVC coating or the quality of the acid inside the bottle.

Storage

- Store all acids in a dedicated corrosives or acid cabinet. The best acid cabinets are built with wood because metal cabinets will quickly corrode from acid fumes. Wood cabinets will provide years of safe and durable acid storage. The cabinet should be located in a locked chemical storeroom. If not, the cabinet must be secured with a lock.
- Storing acids and bases together in one corrosives cabinet is acceptable if they are physically separated on different shelves or isolated from one another. Bottles may become covered with ammonium chloride from hydrochloric acid and ammonia fumes. The cabinet and bottles should be washed with TSP (trisodium phosphate) or other strong cleaners to remove the white film.
- Label all prepared acid solutions before storing them with at least the name of the acid, concentration, hazard warning or how the acid can hurt you and date prepared.
- Always keep the appropriate color-coded acid bottle cap on the concentrated acid bottle. Never use these caps on other bottles. Color-coded bottle caps provide an extra safety measure to identify concentrated acids if the label gets removed or destroyed. If an acid bottle cap becomes cracked or discolored, always replace the cap with the proper color-coded cap. The following colors are used on all concentrated reagent bottles sold in the United States.
  - Acetic Acid — Brown
  - Phosphoric Acid — White
  - Hydrochloric Acid — Blue
  - Sulfuric Acid — Yellow
  - Nitric Acid — Red
  - Ammonium Hydroxide — Green
- Concentrated hydrochloric acid fumes continuously so it cannot be stored without releasing hydrochloric acid fumes. These fumes are responsible for most of the corrosion damage in your chemical storeroom. Storing hydrochloric acid in a wood acid cabinet is a must. Hydrochloric acid fumes will quickly corrode metal cabinets.
- Nitric acid is a strong oxidizing agent. Concentrated nitric acid must be stored in a separate liquid-tight compartment within an acid cabinet. If nitric acid is mixed with a flammable organic compound, such as acetic acid, the heat from the oxidation and neutralization reactions is enough to ignite the flammable material. Nitric acid also slowly destroys its red plastic bottle cap. Always replace it with a new red cap. Nitric acid may turn yellow over time because of the release of nitrogen dioxide on exposure to light. The yellow color does not affect the product's usefulness in the school laboratory.
- Glacial acetic acid is a flammable liquid. It should be stored in an acid cabinet but in a location isolated from possible contact with nitric acid. Glacial acetic acid freezes at 16.6 °C; the material may crystallize in a cool storeroom. If this occurs, allow the bottle to warm up to ambient (25 °C) temperature.
- Concentrated sulfuric acid is a strong dehydrating agent. Because of its strong ability to remove water, it reacts violently with many organic materials, such as sugar, wood and paper. If sulfuric acid has turned brown, it has probably been contaminated with an organic material, and its purity should be in question.
- Concentrated phosphoric acid has a melting point close to ambient temperature and may also crystallize in a cool storeroom. Phosphoric acid is hygroscopic and will absorb water over time. Keep it tightly sealed.



Transporting

- Secondary containment is critical to prevent major spills or accidents when transporting acids. Use PVC-coated acid bottles or unbreakable bottle carriers.
- A good habit is to check the acid bottle for cracks before touching or picking it up. Also check for spilled acid on the handle or bottle.
- Always carry 2.5-L acid bottles with one hand underneath the bottle and the other hand around the neck or finger hole. This keeps it closer to your body and decreases the risk of hitting a sharp object, like a desk corner, and breaking the bottle.
- Plastic or rubber safety bottle carriers should be used whenever acids are transported from one laboratory to another or from the storeroom to a laboratory.

ACID SAFETY continued on next page.

Properties of Acids

Acid	Formula	F.W. g/mol	Specific Gravity	Concentrated Acid	
				wt% Acid	Molarity
Acetic	$HC_2H_3O_2$	60.05	1.05	99.8	17.4
Hydrochloric	HCl	36.46	1.19	37.2	12.1
Nitric	HNO_3	63.02	1.42	69.5	15.8
Phosphoric	H_3PO_4	98.00	1.70	86	14.8
Sulfuric	H_2SO_4	98.08	1.84	96	18.0

Acid Safety, continued

- If a cart is used to transport hazardous chemicals, including acids, place compatible chemicals inside an unbreakable secondary containment vessel, such as a plastic tote. The cart should be equipped with guardrails to prevent plastic totes or bottles from sliding off the cart.
- If hazardous chemicals are moved from one floor to another, use an elevator if possible. Only the teacher transporting the chemicals should be on the elevator. Although elevator accidents are rare, should a dangerous material be released in an elevator while passengers are trapped inside, the results could be catastrophic.

Preparation of Acid Solutions

See page 617.

To Prepare a Solution

1. Add the appropriate amount of acid to about ⅔ of the required amount of distilled or deionized water.
2. Always add acid to water! Never add water to concentrated acids. The acid may splatter and generate acidic steam.
3. Always use borosilicate (e.g., Pyrex®) glassware.
4. Stir to mix the solution.
5. Once the solution has cooled to ambient temperature, dilute the solution to the proper volume with water.
6. Use a volumetric flask for accuracy, if needed.
7. When diluting sulfuric acid, place the borosilicate beaker or flask in an ice bath. The heat of dilution of sulfuric acid is very high and may melt plastic containers or crack nonborosilicate glassware.

Using and Dispensing Acids

- Always review the Safety Data Sheet (SDS) before using any hazardous material in the laboratory.
- Students should dispense acids from smaller bottles to limit spills and fumes.
- Use lab mats and or plastic trays when dispensing acids to contain acid spills and drips.
- Dispense acids, especially hydrochloric, nitric and acetic acids, in an operating fume hood.
- During lab, set the acid bottle in a central dispensing location and have students bring a graduated cylinder or test tube to the dispensing area. This will help minimize spills and accidents and will limit the amount of acid that is brought back to the lab bench.
- Instruct students to remove from the bottle only the amount of acid needed for the experiment. Chemicals are never added back to the reagent bottle.
- Have acid spill clean-up materials readily available whenever acids are used.
- Attach a test tube to the reagent bottle to store the pipet for dispensing an acid.
- Acids are corrosive and will eat through most fabrics, resulting in small holes in clothing. This process does not occur instantly, but rather over several hours, and may not become apparent until the clothes are washed. Always wear a chemical-resistant apron or laboratory coat when working with acids.



Personal Protection Equipment and Safety Aids

- Nitrile rubber gloves are acid-resistant and are the best choice to use when handling concentrated acids. However, any plastic or vinyl glove will provide some protection against the occasional splash, small spill and splatter that may occur when using or dispensing acids.
- Operating eyewashes must be available in any classroom or laboratory where acids or acid solutions are used. An approved eyewash must treat both eyes and provide clean potable water for at least 15–20 minutes.
- Chemical splash goggles must be worn anytime acids or acid solutions are used. Safety glasses are not adequate protection.
- Good ventilation should be available whenever hydrochloric, nitric or acetic acid will be used in the lab.
- Spill control materials (e.g., sand, absorbent and neutralizer) must be available whenever acids or acid solutions are used.

First Aid

- Always seek professional medical attention upon exposure to any hazardous chemical, especially concentrated acids.
- The best first aid for any chemical exposure to body tissue or eyes is immediate dilution with water.
- If an acid is splashed in the eyes, use an eyewash to irrigate the eyes for at least 15–20 minutes. Make sure the eyelids are held open to properly irrigate them. Ask the victim to look up, down and sideways to better reach all parts of the eye.

Always add acid to water…

- If an acid is splashed onto bare skin, rinse with water for at least 15–20 minutes.
- If an acid is splashed onto clothing, remove the clothing immediately before the acid soaks through the clothing and reacts with the skin. If an acid splashes onto your skin and clothing, immediately begin rinsing the affected skin with water (a safety shower is ideal) and then begin to remove affected clothing. Modesty must take a back seat to potential chemical burns that can occur.
- If acid is ingested, the primary goal is to dilute the acid in the stomach and prevent further injury caused by vomiting. If the victim is conscious, immediately have the victim rinse their mouth out with water. Have the victim drink one or two cups of water or milk. Gastric antacids, such as milk of magnesia or aluminum hydroxide, can also be given. Do not induce vomiting, do not try to neutralize the acid with a strong base, and do not give the victim any sodium bicarbonate or any carbonated drinks. Call poison control center (1-800-222-1222) or hospital emergency room and follow their directions.

Always dilute and neutralize acids before disposal.

Disposal

- Always dilute and neutralize all acids before disposal.
- See Flinn Suggested Disposal Methods #24a and #24b in the *Flinn Scientific Catalog/Reference Manual* for detailed disposal procedures and warnings.

Seven-Step Plan to Clean Up **Your Chemical Storage Area**

For years you have wanted to clean up and organize your chemical storage area. But it's such a huge job, where do you begin? Our seven-step plan will give you the direction and guidance you need to get this job done safely, quickly and efficiently.

Before we begin, some ground rules need to be established:

- Teachers cleaning up the chemical storage area should do so in teams. This work should never be done alone. Students should never be involved.
- Teachers doing this work should be from the school where the work is being done. The best time to do this type of work is immediately after school gets out in the spring.
- Teachers should be hired on an extended contract during the summer months to undertake this project. For an average-size school of 1,000 students, it will take a team of 3–4 teachers two weeks to clean up the chemical storage area.
- Teachers on an extended contract also should be covered by the school's insurance policy in the unlikely event of an injury.

It's very important that the teachers be paid for the work they are about to undertake. This problem of old chemicals may have existed long before the teachers started working at the school. Compensation from the school district is only fair.

STEP 1: Take an Inventory

The most important step in cleaning up a chemical storage area is taking an accurate and complete inventory of every chemical in every chemical storage area, laboratory and classroom. Without a complete inventory, you will not be able to proceed to step 2. Don't forget to check closets and drawers. Details on how to take an inventory can be found on page 625 of this *Flinn Scientific Catalog/Reference Manual*. Please read these instructions carefully!

Critical information will be needed from your inventory. Most particularly, you will want to know: (1) the name of the chemical, (2) its shelf location and (3) the approximate amount of chemical estimated to be in each container.

The shelf location of each chemical is important because it is likely that the same chemical will be found in several locations. Shelf location information will help you track down and consolidate these chemicals.

STEP 2: What Chemicals Do You Really Use?

It is fair to say that 40% of the chemicals you have in your chemical storage area have not been used in the last five years and probably won't be used in the next five years. Now is the time to decide which chemicals are really used. Once the inventory is complete, review your laboratory manuals, textbooks, demonstrations and science fair projects to decide which chemicals are used and which chemicals are not.



As you review your inventory, you may discover an excessive amount of some chemicals. Calculate what quantities of these chemicals you use every year and then decide to keep no more than a two- to five-year supply. Determining how much chemical to keep will be influenced by two factors: the chemical shelf life and the hazardous nature of the chemical. The poorer the shelf life or the more hazardous the chemical, the less you will want to keep on hand. Shelf life and hazard information may be found in the *Flinn Scientific Catalog/Reference Manual* under each chemical listing.

If the chemical is not hazardous and has an indefinite shelf life, keep a four- to five-year supply. However, if the chemical is hazardous and the shelf life is poor, keep only a one-year supply on hand. Look carefully at each bottle, try to determine which bottle looks the freshest or has the best shelf life and only keep the amount you really think you need. Let the shelf life and chemical hazard information found in the *Flinn Scientific Catalog/Reference Manual* guide the way.

STEP 3: Organizing Your Chemical Storage Area

You now know which chemicals you use, which chemicals you want to keep and which chemicals you don't want. Let's now physically move all of the chemicals in the chemical storage area (and anywhere else you found chemicals) out into the laboratory area and onto the lab benches. (The laboratory next to the chemical storage area works best.) The right side of the laboratory will become an area for chemicals you either no longer use or have in excessive amounts and would like to dispose of.

The left side of the laboratory will be chemicals you want to keep. It's important that only authorized people working on this project be allowed to enter this room. Administrators, maintenance people and others must not be allowed into this laboratory area unless they are accompanied by one of the teachers involved in the clean-up project. This laboratory should be locked when not in use. If you discover chemicals that you feel uncomfortable moving or handling, please call Flinn Scientific for further advice.

STEP 4: Bag and Can Dangerous Chemicals or Practice "Devil Control"

There are certain chemicals found on school premises that Flinn Scientific considers to be "devils." A "devil" is any chemical that has a severe hazard alert. Severely poisonous, severely toxic, severely flammable, severely corrosive, strong oxidizer, carcinogen or strong stench are all characteristics that may qualify a chemical as a "devil."

To practice "devil control," purchase some clear, heavyweight plastic bags with twist ties, cat litter and a selection of clean (empty) quart and gallon paint cans.

The first step in practicing "devil control" is to place each chemical container considered to be a "devil" into a clear plastic bag. Secure the bag with a twist tie. Should the bottle break, the spill will be contained in the plastic bag.

Once the chemical bottle is in the plastic bag, spread a thin layer of cat litter in the bottom of a paint can, place the sealed bag with the chemical container into the paint can and fill the remaining portion of the can with cat litter. Place the lid on the paint can and label the can clearly with the chemical

SEVEN-STEP PLAN continued on next page.

Seven-Step Plan to Clean Up Your Chemical Storage Area, continued

name, chemical formula and hazard risk. Your "devil" chemical is now well protected! The metal paint can may be dropped, kicked or even involved in a fire and the chemical container inside will not break. Should a leak occur, the cat litter will absorb the chemical and the spill will be contained inside the can.

Most "devils" may only be used once or twice during the school year, but you need to properly protect and store these chemicals when they are not being used. Bags and cans are a very effective yet inexpensive way to protect these "devil" chemicals.

STEP 5: Improve the Chemical Storage Area Facility

Now that the chemicals have been moved out of the chemical storage area and into the laboratory, you have an opportunity to make some improvements to the chemical storage area. First of all, give the room a good cleaning. Make sure the shelves are firmly attached to the wall and in good condition. If the shelves are not in good condition, some type of repair or replacement should be made. Check the shelf clips carefully to make sure they are in good condition and not corroded. Better yet, replace the "adjustable" shelves with permanent shelves that will never collapse. Put "lips" on the shelves to prevent bottle roll-off. Inspect the rest of the chemical storage area. Do any other improvements need to be made?

STEP 6: Organize Chemicals by Compatible Families

Now that the "devil" chemicals have been bagged and canned and the storage area has been improved, it's time to return the chemicals you want to keep back into the chemical storage area. Before these chemicals are moved back in, you must decide how they are to be stored and organized. In the past, they may have been stored alphabetically. This is wrong! Chemicals should be stored and organized by compatible chemical families. Page 629 of this *Flinn Scientific Catalog/Reference Manual* describe how to properly store laboratory chemicals. Thousands of schools across the United States have adopted the Flinn Suggested Chemical Storage Patterns for the storage of their laboratory chemicals. Many states and insurance companies recommend the Flinn Suggested Chemical Storage Patterns as the preferred method of chemical storage.

First, separate your chemicals into compatible families by dividing the chemicals into inorganic and organic families then subdividing them further into their unique compatible chemical families. For instance, oxidizers are broken into five different families. Nitrates are stored in Inorganic #3, except ammonium nitrate, which is isolated. Chromates and permanganates are stored in Inorganic #8. Chlorates and perchlorates are stored in Inorganic #6, and nitric acid is stored separately in a dedicated acid cabinet.

Before the chemicals are moved back into the chemical storage area, it is very helpful to label each chemical bottle with the appropriate compatible chemical family storage number. It is also helpful to label each shelf with the compatible family number. Labeling both the chemical shelving and the chemical bottles with the appropriate Flinn compatible chemical family number will allow you to easily locate and return any chemical to its appropriate storage location. Without this labeling, you'll soon find your chemical storage area in disarray. You make your own bottle and shelf labels or purchase preprinted labels from Flinn Scientific, Inc. (All Flinn chemicals are already labeled with this information.)

STEP 7: Chemical Disposal—Your Options

Now that your chemicals have been properly bagged, canned, labeled and placed back into the chemical storage area using Flinn's Suggested Compatible Family Shelf Storage Patterns, your task is now complete...almost.

As you walk out of the chemical storage area feeling good about what you have accomplished, you soon realize you still have all of those chemicals that need to be disposed of. What are your options for chemical disposal? Flinn has devoted 30 pages in this catalog/reference manual to disposal procedures. First read about your options on page 635, and if you want to dispose of small quantities of chemicals, refer to the disposal procedures found on pages 635.

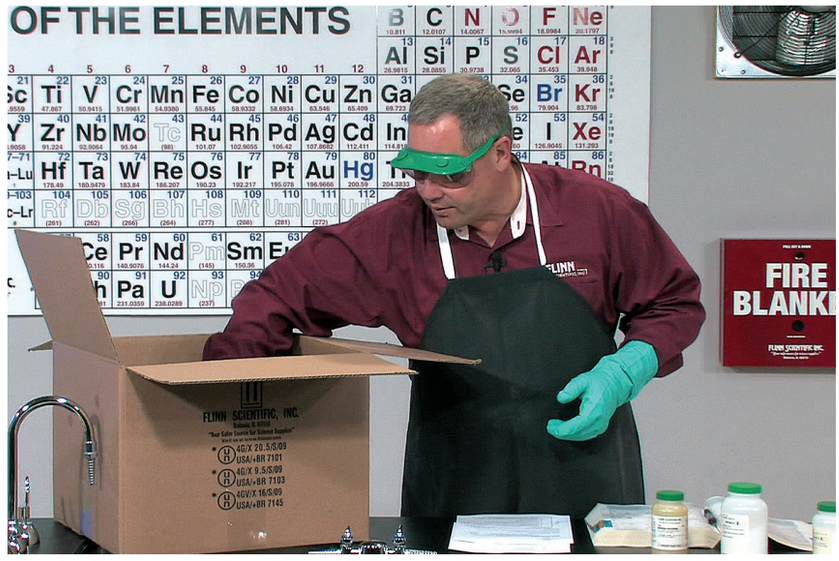
We hope our seven-step plan to clean up your chemical storage area has given you the direction and courage needed to improve the safety profile of your school. It's no small task to clean up a chemical storage area, but with a well-defined plan and the support of your school administration, this job can be done.

Good luck! If you have any questions, please feel free to call us. We're here to help!

FREE! Seven-Step Plan to Clean Up the Chemical Storage Area Video

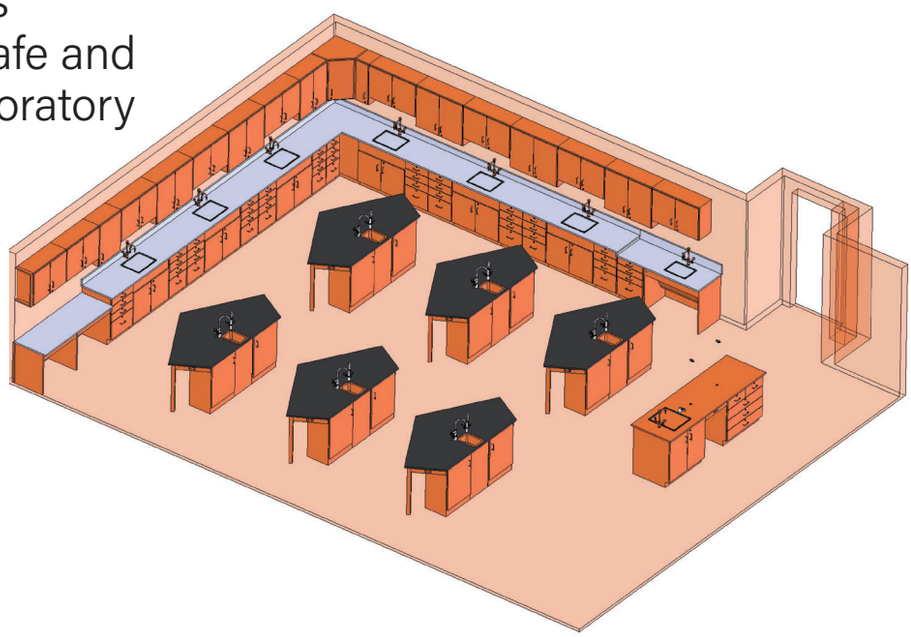
Flinn Scientific has created a free online video series describing a seven-step plan to help you clean up your chemical storage area. Each video chapter covers one step of the process, from taking a chemical inventory to storing chemicals safely and understanding chemical treatment or disposal options. By following the steps in each video, you will gain the confidence of knowing your chemical storeroom is safe and organized. We also provide suggestions on how to convince your administration to allocate the time and money necessary for you to take a chemical inventory and clean up the chemical storeroom.

VISIT FLINNSCI.COM TO VIEW TODAY!



Chemistry **Laboratory Design**

45 Ideas, Tips and Hints to Help You Design a Safe and Efficient Chemistry Laboratory



The overall safety profile of your school would be greatly improved if the chemistry laboratory, preparation room and chemical stores area were properly designed in the first place. Many schools are now in the process of renovating or building new chemistry labs. As the chemistry teacher who will work in these labs, you want them properly designed. Where are you to learn about chemistry lab designs that work? Who knows which designs are best for your specific laboratory needs? The answer is simple—Flinn Scientific!

Typically a local architect is hired to design a new school or science lab. It's assumed that the architect will ask the right questions and will have all the correct answers. Unfortunately, the architect may have little or no experience designing a chemistry lab. Are architects up-to-date on the specific needs of today's chemistry teacher and the laboratories they work in? Do they understand what is required to design a science lab in the 21st century? Do architects understand the need to have great laboratory ventilation, a separate room where you can safely store laboratory chemicals, ample preparation area and ample space at student lab stations so overcrowded conditions won't cause accidents?

We've developed a list of requirements we think make for an efficient and safe chemistry laboratory. This list by no means is complete, but it will give you a good start. Please remember that many of your design questions and concerns can be solved by calling Flinn Scientific. Our staff is ready to help answer your questions. Call us toll-free at 1-800-452-1261.

Chemistry Laboratory

1. Will the laboratory have a fume hood? Will the fume hood have gas, electricity, water and a sink? Where will the fume hood be located in the laboratory? A good rule of thumb is to keep the fume hood away from heavy student traffic areas and main exits.
2. Table tops should be black epoxy resin.
3. Floors should be vinyl tile. Properly installed, they are easily cleaned and relatively chemical resistant. Consider using nonskid wax. Carpet should never be used in a chemistry laboratory!
4. A handicap access lab station should be provided in at least one chemistry lab.
5. Ventilation in the chemistry lab is a must. Each laboratory must have its own ventilation purge fan that removes at least 3,200 cubic feet of air per minute. These fans should be vented directly to the outside and should not be interconnected between rooms. An on/off switch should be provided that allows the instructor to turn the fan on and off depending on the types of activities being conducted. The fans are not intended to be run all day long but on an as-needed basis. Your ultimate goal with a purge fan is to have a complete room air change in five minutes. The positioning of the fan will depend on your laboratory design. Remember fume hoods are not designed for general lab ventilation!
6. Make sure you have plenty of electrical outlets with ground fault interruption.
7. Will computer cables be run to each lab station for future use of computers?
8. Knowing that these labs are being built to last 30 or more years, should the lab be designed to include some common features so biology and physics may be taught there?
9. A fire blanket, fire extinguisher (ABC type), eyewash and a shower or body drench (with drain) should be placed in labs where hazardous chemicals will be used. Depending on where the teacher's demonstration table is located in relation to the general lab area, you may need two eyewashes, fire blankets and fire extinguishers.
10. Will you have a demonstration table? Will it have water, electricity, gas and a sink? A large sink is always nice to have in a demonstration table.
11. Master utility cut-off valves for gas and electricity are essential. Make sure they can be accessed easily in case of emergency.
12. Where will goggles be stored? Where will students hang or store their aprons?
13. Look at furniture designs that maximize student spacing at each lab station.
14. Good sight lines are critical for a chemistry teacher. Can you see most of the lab activity from one vantage point? Can you move easily from one lab station to another without going around student desks and chairs? Your ability to supervise students' lab activity must not be compromised.
15. Do you have ample storage for apparatus, hardware, equipment, etc.?
16. Are sinks a usable size? Do you want hot and cold water at each lab station?
17. All safety equipment must be marked with location placards/signs.
18. Do you need nonreactive waste receptacles? Fireproof trash cans?
19. Where will spill control materials be stored in the laboratory?
20. Do you want laboratory stools? For safety and space issues, stools are not used in many labs.
21. Do you want dry erase boards or chalkboards in the lab? Where do you want them located?
22. Does your state require two exits? If so, where will they be located?
23. Will the laboratory have ample lighting? Having 75–100 foot-candles is suggested at bench level.
24. Do exit doors have sturdy locks and self-closing return hardware?
25. Contact the five major laboratory furniture companies listed at the bottom of the next page. They are all fine companies that will provide free assistance in designing your labs. Their catalogs are valuable resources and provide lots of ideas. Make good use of these free resources.

CHEMISTRY LABORATORY DESIGN continued on next page.

Chemistry Laboratory Design, continued

Preparation/Chemical Storage Area

26. Will the preparation area have gas, electricity, water and a sink?
27. The preparation area should have a fire blanket, eyewash, fire extinguisher and possibly a body drench or shower.
28. Spill control materials should be located close to your main preparation area.
29. The prep/storage area should have a vinyl tile or concrete floor, double drywall ceiling and walls. The door should have self-return hardware with an automatic lock and a fire-rated door. The door should swing out if it is your only exit. You don't want the door to be blocked from opening if an "event" were to occur in this area. Signs on the door should say "Authorized Personnel Only."
30. A stepladder should be provided to help retrieve items from the top shelves.
31. Will your preparation area have a water still or water demineralizing system? If so, where will it be located?
32. Consider installing drying racks for glassware above the sink.
33. A good preparation area is just like your kitchen at home. You want plenty of counter and storage space.
34. Will a telephone or intercom system be available in case of emergency? You need a method to contact outside help.
35. There should be emergency lighting in the prep/chemical storage area in case the power goes out. If your labs do not have windows, emergency lighting should also be provided in the lab area.
36. Have smoke detectors installed in the chemical stores area and in an adjacent hallway. Both units should be line operated and go off together should fire/smoke develop in this area. This smoke alarm system will alert others in the school that a problem has developed.
37. Some architects are now installing acid dilution basins in chemistry labs. These can create a potential problem. Dilution basins should be checked, cleaned and recharged every six months to a year. If not, they could turn into a "chemical dump" or "hazardous waste site" and cause costly problems, (e.g., OSHA fines, clean-up costs). Does your state's law require that an acid dilution basin is put in the chemistry lab?
38. Will the prep area have a first aid kit?
39. Do you use laboratory carts? If so, the prep area should have space where the carts can be stored when not in use.
40. Consider building a separate chemical stores area next to the preparation area. Contained and secured chemical storage solves lots of problems.
41. Approved flammable liquid and acid storage cabinets should be in the chemical stores area.
42. Shelves in the chemical stores area should be firmly secured to the walls. Shelves should have a lip on the front to prevent bottles from rolling off.
43. Chemicals should not be stored more than six feet above the floor.
44. The chemical storage door should be a solid-core, fire-rated door (preferably hinged out). The door should have a good lock and be labeled to identify hazardous contents to alert and protect firefighters. Interior walls and the ceiling should be double drywall to make this a fire-rated room.
45. Chemical storeroom ventilation is a must. Four air changes per hour is a minimum. Air should be "pulled" from floor level and be exhausted directly to the outdoors.

The proper design of a chemistry lab can be very time-consuming. Acquaint yourself with as many ideas as possible and decide which ideas best fit your needs. Consider visiting other schools to look at their chemistry labs. What do other chemistry teachers like or dislike about their labs?

Contact the five major laboratory furniture companies discussed shown below. Their resources and ideas are invaluable.

Finally, depend on Flinn Scientific for suggestions, advice and help. We know what it takes to design a new chemistry lab and will be more than happy to help you.

IF YOU LIKE OUR
CATALOG
REFERENCE
MANUAL
SEND US YOUR ORDER



Laboratory Furniture Companies You Should Contact When Designing a Chemistry Laboratory

This list of laboratory furniture companies is not exhaustive. All of the companies listed are large manufacturers offering complete lines of laboratory furnishings and have sales representation in almost every state. While the companies listed are all fine companies, this list should not be considered recommendations by Flinn Scientific, Inc.

CampbellRhea Institutional Casework Inc.
1865 N. Market Street, Paris, TN 38242 • (731) 642-4251 • www.iciscientific.com

Diversified Woodcrafts, Inc.
P.O. Box 160, Suring, WI 54174–0160 • (920) 842-2136 • www.diversifiedinc.com

Kewaunee Scientific Equipment Corporation
P.O. Box 1842, Statesville, NC 28687 • (704) 873-7202 • www.kewaunee.com

Leonard Peterson
P.O. Box 2277, Auburn, AL 36831-2277 • (334) 821-6832 • www.lpco.com

Sheldon Division, General Equipment Manufacturers
P.O. Box 836, Crystal Springs, MS 39059 • (601) 892-2731 • www.sheldonlabs.com

The Dos and Don'ts of **Chemical Labeling**

Information on What's Required to Make Your Lab Safe

In 1983, OSHA implemented the Hazard Communication Standard (Right-to-Know law). This standard gives teachers, students and parents the Right-to-Know about the hazards associated with the chemicals they are using in the classroom/laboratory. The standard requires chemical manufacturers to transmit this safety information to their customers by the means of labels and Safety Data Sheets (SDSs).

In March 2012, OSHA updated the Hazard Communication Standard to incorporate the Globally Harmonized System of Classification and Labeling of Chemicals, better known as GHS. GHS provides a set of objective criteria for classifying the physical and health hazards of chemicals. Hazardous chemical labels will be required to include pictograms, a signal word and specific hazard and precautionary statements. The pictograms, signal words and hazard statements will help you quickly identify and describe the nature of the hazard(s). Precautionary statements provide guidance to prevent accidents and avoid exposure to chemicals. There are eight pictograms, shown below. In addition to the pictograms, GHS requires the use of signal words, either Danger or Warning, to heighten awareness of the relative risk when using certain chemicals. (Danger is the more severe warning!) Depending on their hazard rankings, not all chemicals will have a pictogram or signal word. GHS also assigns specific hazard statements to chemicals and applicable precautionary statements to prevent accidents and minimize exposure.

A well-written and designed chemical label will reduce accidents and may even save lives. For more than 40 years, you have counted on Flinn Scientific labels to help you safely store, handle and use laboratory chemicals. We naturally embraced the opportunity to further improve chemical safety by adding the GHS label elements while preserving the indispensable Flinn storage, disposal, shelf-life and hazard alert advice. See page 30 for a GHS-compliant Flinn Scientific label and a convenient guide to using this information.

Chemical Labels in Your Laboratory

You may be wondering, "What about the chemicals I already have and the solutions I prepare for my lab?" GHS-formatted labels are the responsibility of the chemical manufacturer and distributor. You do not have to reproduce proper GHS-formatted labels, and you don't have to relabel any chemicals you currently have in your storeroom. You must, however, ensure that the hazards of any chemical are easy to recognize and understand. We suggest the best approach to proper chemical-container labeling is to list these four items on the label:

1. **Chemical Name**—Spell out the name correctly and completely. Avoid using abbreviations or chemical formulas.
2. **Concentration**—If the chemical is in solution, indicate the solution's molarity or strength.
3. **How can the chemical hurt you?**—List in clear terms how the chemical can hurt you and what target organs will be affected. This information easily can be found on your SDS or in the *Flinn Scientific Catalog/Reference Manual*. Avoid numerical or alphabetical codes. These codes are difficult to remember and could easily be misinterpreted. Use words that everyone will understand.
4. **Date Prepared**—Knowing the date the chemical was prepared is very important, especially for those chemicals that have a limited shelf life or become more hazardous with age.

For example, let's say you just prepared a 6 M hydrochloric acid solution. The label should say:

Hydrocholoric Acid, 6 M solution
Corrosive to all body tissue, especially skin and eyes. Avoid all body contact.
2020

Flinn **Chem**ventory™

FLINN EXCLUSIVE

Chemical Inventory Management System

The Flinn Chemventory is a cloud-based laboratory chemical inventory system that allows multiple users access to the database from multiple locations and multiple devices! Maintaining an accurate laboratory chemical inventory has never been easier, more flexible and more convenient.

Catalog No.	Description	Price/ Database License
SE2998	Flinn Chemventory, 1-Year License	$ 99.00
SE2999	Flinn Chemventory, 3-Year License	249.00
SE3000	Flinn Chemventory, 5-Year License	349.00

Additional information may be required in your state. A few states require the National Fire Protection Association (NFPA) code on the label. Other states may require the Chemical Abstract Services (CAS) number to be on the label.

Finally, remember that this label may need to be on the chemical container for years to come. Avoid using grease pencils and writing directly on the bottle. Always use a permanent marker on label paper that has a good adhesive. Print clearly so everyone can read and understand the label you have prepared.

If you have questions regarding how to label chemical containers, please call us toll free at 1-800-452-1261. We'll gladly help in any way we can.

GHS Pictograms



Acutely toxic
Copper(II) Chloride



Oxidizer
Ammonium Nitrate



Gas under pressure
Oxygen



Corrosive to skin or eyes
Hydrochloric Acid



Explosive or self-reactive substance
Not in school science labs!



Irritant to skin, eyes or respiratory tract
Iodine



Flammable or self-reactive
Methyl Alcohol



Carcinogen, mutagen or reproductive toxin
Formaldehyde

GHS STICKERS
SEE PAGE 671

GHS pictogram stickers can be used to create GHS labels. Attach these handy stickers to chemical bottles to quickly indicate hazards to the user. They come in a package of eight sheets with 63 stickers per sheet.

Practical Solutions to **Reduce Your Liability**

Introduction

Teaching science is different than teaching other academic subjects because to properly teach science, students must receive instruction and engage in appropriate hands-on activities. More importantly, science teachers must teach in an environment using materials and equipment that have the potential to cause serious harm to both teacher and student. Science teachers must be trained in more than just teaching methods and classroom management. They also must receive specific training in laboratory safety. Science teachers must know, understand and follow many rules and regulations to ensure the safety of students in their classrooms. Science teachers also owe it to their students to properly supervise, instruct, maintain equipment and facilities and warn students of potential harm in their classrooms. Accidents will happen in the classroom. However, teachers can significantly reduce their risk of negligence liability and prevent classroom mishaps by following a few simple rules.

1. *Know the safety statutes that affect your classroom and carefully abide by them.*

   Check with your state and county departments of education, state department of labor or Occupational Safety and Health Administration for statutes and regulations that apply to your classroom. At a minimum, each school should have in place an up-to-date Chemical Hygiene Plan (CHP) that describes the safety procedures that are required at your school.

2. *Document all efforts to resolve safety issues in your classroom.*

   Any safety issues or equipment problems that need repair must be documented carefully in writing and submitted to the proper administrator for immediate action. If you cannot successfully resolve the issue at the site level, send a letter to the superintendent or school board describing the problem, your efforts to correct the condition and possible solutions for resolving the problem. Attach copies of your documentation. Save all letters and documentation.

3. *Do not leave your classroom during any instructional period.*

   Every teacher has a primary duty to properly supervise students. Never leave students unsupervised for any reason.

4. *All students should wear the appropriate personal protective equipment while working in the laboratory.*

   Chemical splash goggles and chemical-resistant aprons should be worn whenever any chemicals (no matter how minimal the risk of perceived injury) are to be used by students. Protective eyewear must be worn during all laboratory activities and demonstrations.

5. *Teach safety all year and review safety procedures often.*

   Teachers have a duty to provide proper safety instruction. Start the year with a student safety contract then get in the habit of reviewing a safety rule every day at the beginning of class. It is critical to review the appropriate safety precautions with students prior to beginning any laboratory activity. Remember to document all safety instruction you provide in your lesson plan book.

6. *Make safety a priority in the classroom by establishing and modeling safe chemical-handling practices.*

   Set a good example for your students by always wearing appropriate personal protective equipment and performing laboratory procedures in a safe manner. Not only will your actions speak louder than words to your students, but if an injury to a student occurs, their attorney will not be able to use your good practices against you.

7. *Use smaller volumes and amounts of chemicals.*

   Smaller chemical quantities result in smaller spills, reduced vapors and less material for disposal. Smaller chemical quantities also usually result in less severe injuries to your students. Microscale as many labs as possible, particularly those that use volatile or hazardous chemicals.

8. *Demand appropriate safety training related to your duty of care in the science classroom.*

   Science laboratories are industrial areas requiring specialized training and knowledge that must be updated frequently. Your school district is responsible for appropriate training to enable you to meet your duty of care in the classroom.

9. *Do not permit students to use damaged or defective equipment.*

   Damaged or defective equipment can cause serious harm to students. Until the equipment can be repaired, do not use it. If the conditions of your laboratory facility are unsafe, then document the safety issues and do not permit laboratory activities until the conditions are remedied. Perhaps calling the safety issue to the attention of parents, whose students will not receive adequate instruction because of existing unsafe conditions, may achieve quicker resolution of the problem.

10. *Do not permit students to take chemicals or any other school equipment home to perform "experiments."*

    Theft of unlocked chemicals, performance of unauthorized experiments and unsupervised home experiments expose students to potential injury and teachers to negligence liability.

11. *Be proactive rather than reactive.*

Acknowledgment

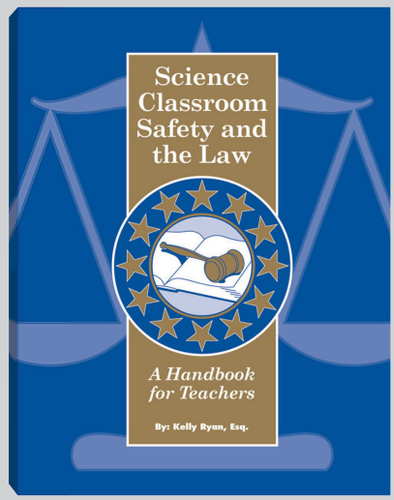
Kelly Ryan was a science teacher in San Gabriel High School in California for 17 years and is now a practicing attorney. He has written a book entitled *Science Classroom Safety and the Law—A Handbook for Teachers*.

Science Classroom Safety and the Law—A Handbook for Teachers

By: Kelly Ryan, Esq., Attorney at Law

Science Classroom Safety and the Law was written to educate science teachers about court cases that apply to science education so you can successfully persuade school administrators to make the "right" decision regarding science safety. This book will give you the "ammunition" you need to correct safety problems at your school. Author Kelly Ryan understands firsthand the safety problems science teachers face since he was a high school chemistry teacher for 17 years before becoming an attorney.

Throughout the book, practical suggestions are made to improve science safety and reduce the potential for teacher and school district liability.



Catalog No.	Description	Price/Each
AP6118	Science Classroom Safety and the Law	$31.00

Helping Students Comply With **Safety Rules**

The student safety contract, which should be signed by both the student and a parent or guardian, is the foundation of the laboratory science safety program in the school. It is not enough, however, to set the rules and to "cover" them on the first or second day of class. Safety rules should be reviewed continuously throughout the school year, and they must be consistently enforced on a daily basis.

DID YOU KNOW? The Flinn Scientific Student Safety Contract is available in both a middle school and a high school version and also in Spanish! Visit the Flinn Scientific website at www.flinnsci.com to download copies of the appropriate safety contract.

Start With Safety!

Here are some ideas teachers have shared with us for reviewing the student safety contract and helping students remember the safety rules.

1. At the start of every class, read aloud one rule from the safety contract. By discussing safety every day, your students quickly will learn that safety is indeed your No. 1 priority! Reading one rule daily will allow you to review the entire safety contract three times over the course of the school year.
2. Incorporate safety into each laboratory exercise. Begin each lab period with a discussion of the chemicals, equipment and procedures used in the experiment and the safety precautions that must be observed. Pay special attention to nonroutine hazards, such as working with dissection equipment, that students may not encounter during every lab period. Prelab assignments are an ideal mechanism to ensure that students are prepared for lab and understand the safety precautions.
3. Have students make safety posters, and decorate the classroom or lab with the students' artwork. Seeing their own bright, colorful safety posters throughout the lab will help remind students that safety is important for you and for themselves! Sure, you could buy posters, but how much better to engage the students and gain their perspectives. This is a great assignment for a "substitute-teacher day." Provide paper, markers and poster board and have students make safety posters to illustrate the rules in the student safety contract. You will be amazed at the students' creativity, insight—and humor!
4. Record all safety instruction in your lesson plan. Every time you discuss safety in class, take a moment to write down in your lesson plan book what you talked about. Your lesson plan is a very valuable document should you ever have to prove that you are a responsible science teacher.

Regular and routine review of the safety rules will increase both student and teacher awareness of their safety in the lab and in the classroom. Make safety a habit!

Enforcing the Safety Rules

Make sure students know the rules and, more importantly, that there are consequences if they break the rules. All safety rules must be enforced consistently without discrimination.

Many teachers will issue a verbal warning or "safety ticket" for a first rule violation. If a second violation occurs during the same lab period, the student may be removed from the lab and given a zero for the day. If a student repeatedly disregards the safety rules, you must make the consequences more severe. The student may serve a detention or in-school suspension, and the student's parents or guardian should be notified. Having the parents remind the students that they also signed the safety contract is often all it takes to correct the behavior. Repeated violations of the safety contract should be dealt with by the school administration.

Students who do not follow the safety rules endanger not only themselves but all of their fellow students. Courts have ruled that the teacher and the school will be considered negligent if they do not enforce safety rules on a consistent basis.

Make Safety a Habit

We are grateful to teachers who have shared their time-tested ideas for ensuring student compliance with safety. You know these ideas will work!

- Make safety a team effort! Empower lab teams to be responsible for each member's behavior. If a group member violates a safety rule, the entire group is warned and ultimately penalized. Peer pressure being what it is, you will find that the students themselves, rather than you, will begin to enforce the safety rules in the lab.
- Have students be in charge of presenting the safety lesson for a lab or classroom activity. Rotate this assignment among all the lab groups in the class so every group presents one safety lesson per quarter. Who knows better than teachers that the best way to learn something is to have to teach it!
- Students who wear their goggles around their necks or as "forehead protectors" should be assigned to wear their goggles during the next regular class period whether it's a test, a group activity or a lecture.
- Anyone caught not wearing their goggles must sing the "Goggle Song" in front of the class. Alternatively, have the entire class sing the song.

The Goggle Song

The Goggle Song is sung to the tune of "I'm a Little Teapot."

I'm a little chemist,
Short and stout,
Here are my goggles,
Here are my eyes.



If I don't wear my goggles, my teacher shouts:
Put them on or you get out!



Chemical **Spill Control**

Prevent and Respond to Laboratory Chemical Spills

No matter what precautions you take, sooner or later an accidental chemical spill will occur. A responsible science teacher will take steps to prevent spills, make sure proper safety equipment is available to contain and control the spill and understand how to use the safety equipment.

Spill Prevention

The first precaution to take for spill control is spill prevention. Experiments and laboratories should be designed to minimize the possibility of chemical spills. Experiments should use the minimal amount of chemicals whenever possible. The less chemical available, the smaller the spill.

Store and dispense chemicals in unbreakable bottles, such as plastic or PVC-coated glass bottles. Highly toxic materials should be stored in a secondary containment device, such as a *Chem-Saf*™ bag (heavy-duty plastic bag) or a *Saf-Stor*™ can (metal paint can). If a bottle is dropped, secondary containment will contain the spill and may actually prevent the spill from occurring.

Spill Control Equipment

Proper spill control equipment includes fire blankets, spill control materials (e.g., sand, absorbent and neutralizer) and a mercury spill control kit.

A 100% wool fire blanket is an excellent spill control device because it will contain and control a spill and its vapors. If a spill occurs and other spill control materials are not available, simply throw the fire blanket over the spill. The blanket will begin to absorb the liquid, contain the vapor and enable a person to walk over the spill without slipping. Remember, acid spilled on a tile floor will make the floor very slippery—the potential for slipping and falling into the acid spill is a real danger.

Every lab should have spill control materials that contain at least three components: sand, an absorbing agent and a neutralizer. Spill control materials should be capable of handling a spill from the largest bottle used in your laboratory, which is usually a 2.5-L acid bottle (remember, Murphy's Law states that the largest bottle is the one that will break). Sand is used to contain a spill, provide traction and prevent the spill from rapidly spreading across the tile floor. The absorbent contains and absorbs the liquid spill so it is easier to clean up, transport and dispose. Neutralizer is usually a base, such as sodium carbonate or calcium hydroxide, and is used to neutralize inorganic acid spills. If strong bases are used in your laboratory, it is also a good idea to keep a supply of citric acid on hand to neutralize base spills. A 2.5-kg bottle of citric acid is large enough to neutralize the entire contents of almost any bottle of base.

To save money, a homemade spill control kit is easily prepared using three 5-gallon plastic buckets. Fill the first 5-gallon bucket with 30 pounds of clean, dry sand (available as play sand at a discount or hardware store). Fill a second 5-gallon bucket with a 20-lb bag of unodorized kitty litter or oil absorbent. Fill the last bucket with 30 lbs of sodium carbonate, anhydrous, also known as soda ash. Soda ash is available at industrial chemical, building supply and swimming pool supply distributors. Label each bucket with the contents, and cover the top with plastic wrap to keep the contents fresh and so they aren't used as garbage cans. Place a plastic broom, plastic dustpan and several large heavy-duty plastic garbage bags near the spill control kit for cleanup and disposal.

If mercury or mercury thermometers are used in your classroom, mercury spill control materials should be readily available. Mercon spill control spray, wipes and sponges are available from Flinn and are ideal for cleaning up mercury spills. Small droplets of mercury also can be cleaned up by sprinkling zinc dust on the spill area. Zinc dust reacts with mercury to form a very stable and safe amalgam that is easy to handle and safe to dispose of in the trash.

Spill Control Procedures and Training

A written contingency plan on how to handle chemical spills should be part of every school's Chemical Hygiene Plan. The following procedure is an example of a contingency plan.

1. Quickly assess the spill, its hazards and the danger to yourself and your students and take appropriate action. If the spilled chemicals are unknown, assume the worst and evacuate.
2. Notify other laboratory personnel of the accident and, if necessary, evacuate the area. The safety of you and your students is always the top priority.
3. Tend to any injured or contaminated person and request help if necessary. If the chemical is splashed into an eye or onto skin, immediately irrigate using an eyewash or shower. If the chemical is splashed on your clothes, you may have time to first contain the spill with a fire blanket or spill control materials and then treat yourself. Remember, if you use a safety shower near a chemical spill, the water may expand the spill area.
4. Take steps to contain and limit the spill if this can be done without risk of injury or contamination.
5. Clean up the spill using appropriate procedure. Dispose of contaminated materials properly.
6. Call in emergency personnel if at any time your safety or your students' safety is in jeopardy.

To contain and control a chemical spill, the following procedure works well. Gently pour sand around the spill and onto the spill. The sand will contain the spill, prevent it from spreading and also provide traction if you need to walk over it. Next pour absorbent (kitty litter, oil absorbent) around the spill and onto the spill. This will absorb the liquid and also begin to contain any vapors. For both the absorbent and sand, it is best to gently drop or sprinkle the spill control material around the spill and then onto the spill to avoid spreading the spill. Lastly, if the spill is an inorganic acid or base, apply the appropriate neutralizer around the spill and onto the spill. The neutralizer needs to be mixed well with the sand and absorbent to come in contact with all of the spilled chemical—use a plastic broom to mix well.

After the spill is controlled, students are evacuated and injuries are addressed, then the clean-up begins. If the material is warm or still giving off vapors, ventilate the room and wait before cleaning up. Use a plastic dustpan and plastic broom to sweep up the now solid mess and place it into large, heavy-duty garbage or leaf bags for disposal. If at any time during the chemical spill containment or clean-up step you don't feel comfortable, leave the area and get help.

Make spill control containment and clean-up part of your annual safety training. Simulate a chemical spill with water and use sand as the control material. Note how quickly the "spill" spreads. Practice applying the spill control material around and then onto the spill. Determine the most convenient location for storing your spill control materials. Training is one of the most important components of an effective safety program.

Chemical spills will occur in you laboratory. With proper equipment, procedures and training, most spills can be prevented, and the spills that do occur can be handled safely and effectively.

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See page 552 for details!



Dissection **Safety**

Dissection is an important part of many biology and life science courses. Properly planned dissection activities with clear learning goals allow students to observe similarities and differences among organisms and improve student understanding of anatomy and physiology. Dissection safety requires knowledge of preservatives and preserved materials, careful attention to safety precautions, availability of required safety equipment and proper tools, instruction of dissection procedures and advanced planning for clean-up and disposal.

General Guidelines

The rationale for dissection work should be well thought out and available in written form to answer any student or community questions that may arise. Careful and clearly written directions are important for safe and meaningful dissection work. Some school districts or states may require that teachers provide alternative learning activities with full credit for students who do not participate in dissection labs.

Preservatives and Preserved Materials

Preserved specimens only should be purchased from reputable suppliers to ensure that organisms have been obtained in a responsible manner and handled in accordance with U.S. Department of Agriculture regulations and guidelines. Most specimens are initially fixed in formaldehyde, which chemically cross-links proteins and prevents cellular enzymes from breaking down tissues and organs. Fixation using formaldehyde results in the hardening of the tissues and creates more durable specimens. After the fixing process, excess formaldehyde is generally removed and replaced with a safer preservative that contains alcohol or propylene glycol. Formaldehyde is a known human carcinogen, and formaldehyde vapors are highly irritating to the eyes, skin and respiratory tract. Flinn Scientific laboratory specimens are packaged to the industry's highest standards and are 99.7% free of residual formaldehyde.

Rinsing procedures are usually specified with specimens. Follow directions carefully, especially if the preserved materials will be used over an extended period of time. With the extremely low levels of preservative in most specimens, odors are minimal, but the expected lifetime of a preserved specimen is also shortened. A certain degree of preservative odor is likely to linger—good ventilation of the laboratory is thus critical to protect the health and well-being of teachers and students engaged in dissection activities. Work with the school administration to ensure that laboratory ventilation is adequate to provide fresh air and to confine any lingering odor to the laboratory rather than to the entire school. Store all preserved materials in locked cabinets or stockroom to restrict student access. Keep the specimens in their original containers, and inspect all preserved materials before use. Discard any decaying or damaged specimens.

Safety Precautions and Dissection Procedures

- Wear chemical-resistant gloves, chemical-resistant aprons and chemical splash goggles or safety glasses for all dissection activities. Work in a well-ventilated lab only. Open the windows, if possible, and turn on the hood if one is available. There should be absolutely no eating, drinking or gum-chewing during dissection activities.
- Use only quality dissection tools that are sharp and free of rust. Scalpels are the preferred instruments—use single-edge scalpels with rigid, reinforced handles for increased safety. Handle scalpels, razor blades and other sharp instruments with care, and do not use excessive force when working with or cleaning sharp instruments.
- Inspect dissection tools on a routine basis. Dull and dirty scissors, scalpels or blades are much more dangerous than sharp, clean ones. Discard any damaged instruments that cannot be repaired.
- Rinse formaldehyde specimens with water before dissecting—keep specimens moist but not drenched. Use wet paper towels or a few milliliters of a formaldehyde substitute, such as Formalternate® or water, to wet the specimen during dissection. Do not use formaldehyde.
- Instruct students on proper dissection techniques and procedures as well as how to dispose of sharps. Always cut away from the body and away from other people. Reposition the specimen or move to ensure safety.
- Properly mount specimens to the dissection pan or tray. Do not dissect a specimen while holding it. Cut gently, and avoid using excessive force. Deep cuts are more dangerous and may slice through internal organs. Use scissors to cut bones, including the rib cage. Dissection pins are used to hold the skin back and improve visibility—they do not hold the specimen to the tray. The specimen may slide during dissection if too much pressure is used.
- Wash hands frequently and before leaving the laboratory. Teach students about the potential for inadvertent contamination when they are working with preserved specimens even while wearing gloves. Once a glove has touched the specimen or instrument, it is contaminated. Avoid unconscious gestures, such as scratching the face or adjusting safety glasses. Sanitize safety glasses as needed.

Cleanup and Disposal

- Provide adequate time for proper cleanup and disposal of all dissection materials and the lab. Rinse dissection tools and pans after each use. If dissection pans contain rubber inserts, wash and dry them separately.
- Remove scalpel blades at the end of each dissection unit and carefully dispose of them in a sharps container. Clean instruments with Alconox® detergent solution (1 teaspoon Alconox mixed with 1 L water) rinse with water, and dry thoroughly. Wash countertops with dilute Lysol® or bleach solution.
- Rinse specimens thoroughly with water and double-bag, along with gloves and disposable aprons, in opaque garbage bags. Discard in an appropriate, secure container.
- Local conditions (e.g., septic systems) and regulations will determine the proper procedure for disposal of preserved materials. Teachers and administrators have a responsibility to be fully aware of all state and local regulations governing the disposal of laboratory and biological waste.



Dissection Instruments—Classroom Set
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Dissection Instruments—Classroom Set

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Laboratory Solution **Preparation**

Many of the reagents used in science are in the form of solutions that need to be purchased or prepared. For many purposes, the exact value of concentration is not critical; in other cases, the concentration of the solution and its method of preparation must be as accurate as possible. The Flinn Laboratory Solution Preparation reference section is designed for both the novice and experienced solution maker. It provides valuable information on the basic concepts of preparing solutions and instructions for preparing most solutions required in the high school science laboratory. Professional-quality solutions are possible when high-quality and fresh chemicals and solvents are used and meticulous procedures are followed. Many of the solutions described in this section are available ready-made from Flinn Scientific to save valuable laboratory preparation time.

The section is divided into several parts for your convenience.

- Basic Concepts of Preparing Solutions
- Preparation of Simple Inorganic Salt Solutions
- Preparations of Acid and Base Solutions
- Recipes for Biological, Histological and Chemical Solutions

Basic Concepts of **Preparing Solutions**

Molarity

The most common unit of solution concentration is **molarity (M)**. The molarity of a solution is defined as the number of moles of solute per one liter of solution. Note that the unit of volume for molarity is *liters,* not milliliters or some other unit. Also note that one liter of solution contains both the solute and the solvent. Molarity, therefore, is a ratio between moles of solute and liters of solution. To prepare laboratory solutions, usually a given volume and molarity are required. To determine molarity, the formula weight or molar mass of the solute is needed. The following examples illustrate the calculations for preparing solutions.

If starting with a solid, use the following procedure:

1. Determine the mass in grams of one mole of solute, the molar mass, MM_s.
2. Decide volume of solution required, in liters, V.
3. Decide molarity of solution required, M.
4. Calculate grams of solute (g_s) required using Equation 1.

   Eq. 1. $g_s = MM_s \times M \times V$

   Example: Prepare 800 mL of 2 M sodium chloride.

   (MM_{NaCl} = 58.45 g/mol)

   $g_{NaCl} = 58.45 \text{ g/mol} \times 2 \text{ mol/L} \times 0.8 \text{ L}$

   $g_{NaCl} = 93.52 \text{ g NaCl}$
5. Dissolve 93.52 g of NaCl in about 400 mL of distilled water, then add more water until final volume is 800 mL.

If starting with a solution or liquid reagent:

1. When diluting more concentrated solutions, decide what volume (V_2) and molarity (M_2) the final solution should be. Volume can be expressed in liters or milliliters.
2. Determine molarity (M_1) of starting, more concentrated solution.
3. Calculate volume of starting solution (V_1) required using Equation 2.
   Note: V_1 must be in the same units as V_2.

   Eq. 2. $M_1V_1 = M_2V_2$

   Example: Prepare 100 mL of 1.0 M hydrochloric acid from concentrated (12.1 M) hydrochloric acid.

   $M_1V_1 = M_2V_2$

   $(12.1 \text{ M})(V_1) = (1.0 \text{ M})(100 \text{ mL})$

   $V_1 = 8.26 \text{ mL conc. HCl}$
4. Add 8.26 mL of concentrated HCl to about 50 mL of distilled water, stir, then add water up to 100 mL.

Percent Solutions

Mass percent solutions are defined based on the grams of solute per 100 grams of solution.

Example: 20 g of sodium chloride in 100 g of solution is a 20% by mass solution.

Volume percent solutions are defined as milliliters of solute per 100 mL of solution.

Example: 10 mL of ethyl alcohol plus 90 mL of H_2O (making approx. 100 mL of solution) is a 10% by volume solution.

Mass-volume percent solutions are also very common. These solutions are indicated by w/v% and are defined as the grams of solute per 100 milliliters of solution.

Example: 1 g of phenolphthalein in 100 mL of 95% ethyl alcohol is a 1 w/v% solution.

BASIC CONCEPTS OF PREPARING SOLUTIONS continued on next page.

Basic Concepts of Preparing Solutions, continued

Conversion Between Percent Solutions

You may wish to convert mass percent to volume percent or vice versa. If so, follow this procedure:

A 10% by mass solution of ethyl alcohol in water contains 10 g of ethyl alcohol and 90 g of water.

1. The formula for determining the volume of the component (ethyl alcohol in our example) is:

$$\text{Volume} = \frac{\text{mass of ethyl alcohol}}{\text{density of ethyl alcohol}}$$

2. Determine the volume of the total solution by dividing the mass of the solution by the density of the solution.
3. Determine the percent by volume by dividing the volume of the component by the volume of the solution.

Let's solve 1, 2 and 3 as follows:

1. Mass of ethyl alcohol = 10 g (given)

   Density of ethyl alcohol = 0.794 g/mL (from handbook)

$$\text{Volume} = \frac{\text{mass}}{\text{density}}$$

$$\text{Volume of ethyl alcohol} = \frac{10\text{ g}}{0.794\text{ g/mL}} = 12.6\text{ mL}$$

2. Mass of solution = 100 g (given)

   Density of solution (10% ethyl alcohol) = 0.983 g/mL (from handbook)

$$\text{Volume of solution} = \frac{100\text{ g}}{0.983\text{ g/mL}} = 101.8\text{ mL}^*$$

3. Volume percent of solution

$$\text{Percent} = \frac{\text{volume of ethyl alcohol}}{\text{total volume of solution}} = \frac{12.6}{101.8} = 12.4\%$$

Reverse the procedure to convert volume percent to mass percent.

Calculating Molarity From Percent Solutions

To determine the molarity of a mass percent solution, the density of the solution is required. Use the following procedure:

1. Determine the mass of solution by multiplying the volume of the solution by the density of the solution.

   mass = volume x density

2. Determine concentration in percent by mass of the solute in solution. *Change to the decimal equivalent.*
3. Calculate the molar mass of the compound, MM.
4. Multiply mass (step 1) by mass % (step 2) and divide by molecular mass (step 3) to find the number of moles present in the whole solution.
5. Divide the number of moles (step 4) by the volume in liters of the solution to find the molarity of the solution.

   Example: Determine molarity of 37.2% hydrochloric acid (density 1.19 g/mL).

1. Mass of solution = 1,000 mL x 1.19 g/mL = 1,190 g
2. Mass % = 37.2 % = 0.372
3. Molar mass of hydrochloric acid = 36.4 g/mol
4. $\frac{\text{mass x mass \%}}{MM_{HCl}} = \frac{1{,}190\text{ g x }0.372}{36.4\text{ g/mol}} = 12.1\text{ moles}$
5. Molarity = moles/liters = 12.1 moles/1 liter = 12.1 M

*** The volume percent statement generally is accurate but the volume percent is not always calculated directly from the volumes of the mixed ingredients because the final volume may not equal the sum of the separate volumes. In our solution (No. 2) note that if the alcohol volume (12.6 mL) is added to the water volume (90 mL), the final volume is less than 102.6 mL.**

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Definitions

Buffer: A solution that tends to maintain a constant pH when excess acid or base is added.

Concentrated: For some commonly used acids and bases, the maximum solubility (at room temperature) in an aqueous solution or as a pure liquid.

Concentration: The relative amount of solute and solvent in a solution.

Hydrates: Compounds containing water chemically combined in a definite ratio. Computations using formula weight must take the water molecules into account.

Miscible: The ability of two liquids to be completely soluble in one another.

Molality: A concentration unit (m); defined as the number of moles of solute divided by the number of kilograms of solvent.

Molar Mass: The mass of a mole of any element or compound.

Molarity: A concentration unit (M); defined as the number of moles of solute divided by liters of solution.

Preparation of Simple Inorganic Salt Solutions

Name / Formula / F.W.	Concentration	g/L
Aluminum chloride $AlCl_3 \cdot 6H_2O$ 241.43	0.2 M 0.05 M	48.3 g 12.1 g
Aluminum nitrate $Al(NO_3)_3 \cdot 9H_2O$ 375.13	0.1 M	37.5 g
Aluminum sulfate $Al_2(SO_4)_3 \cdot 18H_2O$ 666.42	0.1 M	66.6 g
Ammonium acetate $NH_4C_2H_3O_2$ 77.08	1.0 M 0.1 M	77.1 g 7.7 g
Ammonium chloride NH_4Cl 53.49	1.0 M 0.5 M	53.5 g 26.7 g
Ammonium nitrate NH_4NO_3 80.04	1.0 M 0.5 M 0.1 M	80.0 g 40.0 g 8.0 g
Ammonium sulfate $(NH_4)_2SO_4$ 132.1	0.1 M	13.2 g
Barium chloride $BaCl_2 \cdot 2H_2O$ 244.28	0.1 M	24.4 g
Barium hydroxide $Ba(OH)_2 \cdot 8H_2O$ 315.50	0.1 M	31.5 g
Barium nitrate $Ba(NO_3)_2$ 261.35	0.5 M 0.1 M	130.7 g 26.1 g
Bismuth nitrate $Bi(NO_3)_3 \cdot 5H_2O$ 485.1	0.1 M	48.5 g in 500 mL 6M HNO_3*
Bismuth trichloride $BiCl_3$ 315.34	0.2 M	63.1 g in 500 mL 3M HCl*
Cadmium chloride $CdCl_2 \cdot 2½H_2O$ 228.34	0.1 M	22.8 g
Cadmium nitrate $Cd(NO_3)_2 \cdot 4H_2O$ 308.49	0.1 M	30.8 g
Calcium acetate $Ca(C_2H_3O_2)_2 \cdot H_2O$ 176.19	0.5 M 0.1 M	88.1 g 17.6 g
Calcium chloride $CaCl_2 \cdot 2H_2O$ 147.02	1.0 M 0.1 M	147.0 g 14.7 g
Calcium hydroxide $Ca(OH)_2$ 74.10	saturated	2 g†
Calcium nitrate $Ca(NO_3)_2 \cdot 4H_2O$ 236.16	0.5 M 0.1 M	118.1 g 23.6 g
Chromium(III) chloride $CrCl_3 \cdot 6H_2O$ 266.48	0.1 M	26.6 g
Chromium(III) nitrate $Cr(NO_3)_3 \cdot 9H_2O$ 400.18	0.1 M	40.0 g
Cobalt(II) chloride $CoCl_2 \cdot 6H_2O$ 237.95	0.1 M	23.8 g
Cobalt(II) nitrate $Co(NO_3)_2 \cdot 6H_2O$ 291.05	0.1 M	29.1 g
Copper(II) chloride $CuCl_2 \cdot 2H_2O$ 170.49	0.5 M 0.1 M	85.2 g 17.0 g
Copper(II) nitrate $Cu(NO_3)_2 \cdot 3H_2O$ 241.6	0.5 M 0.1 M	120.8 g 24.2 g
Copper(II) sulfate $CuSO_4 \cdot 5H_2O$ 249.69	1.0 M 0.5 M	249.7 g 124.8 g
Iron(II) sulfate $FeSO_4 \cdot 7H_2O$ 278.03	0.01 M	2.8 g and 1 mL conc. H_2SO_4*
Iron(III) chloride $FeCl_3 \cdot 6H_2O$ 270.32	1.0 M 0.1 M	270.3 g 27.0 g
Iron(III) nitrate $Fe(NO_3)_3 \cdot 9H_2O$ 404.00	0.1 M	40.4 g

* Add solid to acid solution, stir, then add to water. Dilute to 1 L. Remember, always add acid to water.

† Approximate amount for 1 L of saturated solution. Keep adding solute until it no longer dissolves; stir for 1 hour, then filter.

Normality: A concentration unit (N); defined as the number of equivalents of solute per liter of solution (e.g., 1 M H_2SO_4 = 2 N H_2SO_4).

Saturated Solution: A solution that contains the maximum amount of a particular solute that will dissolve at that temperature.

Solute: The substance that is dissolved or has gone into solution (typically a solid).

Solution: A uniform homogeneous mixture of two or more substances. The individual substances may be present in varying amounts.

Solvent: The substance which does the dissolving (typically a liquid, such as water or alcohol). Must be greater than 50% of the solution.

Standard Solution: A very precise solution, usually to 3–4 significant figures, used in quantitative analysis or an analytical procedure.

Supersaturated Solution: A solution that contains more solute than equilibrium conditions allow; it is unstable and the solute may precipitate upon slight agitation or addition of a single crystal.

PREPARATION OF SIMPLE INORGANIC SALT SOLUTIONS
continued on next page.

Preparation of Simple Inorganic Salt Solutions, continued

Name / Formula / F.W.	Concentration	g/L
Lead acetate $Pb(C_2H_3O_2)_2 \cdot 3H_2O$ 379.34	0.1 M	38.0 g
Lead chloride $PbCl_2$ 278.12	saturated	12.0 g†
Lead nitrate $Pb(NO_3)_2$ 331.2	1 M 0.5 M 0.1 M	331.2 g§ 165.6 g 33.1 g
Lithium carbonate Li_2CO_3 73.89	0.1 M	7.4 g
Lithium chloride LiCl 42.40	1.0 M 0.1 M	42.4 g 4.2 g
Lithium nitrate $LiNO_3$ 68.95	1.0 M 0.5 M	69.0 g 34.5 g
Magnesium bromide $MgBr_2 \cdot 6H_2O$ 292.25	0.1 M	29.2 g
Magnesium chloride $MgCl_2 \cdot 6H_2O$ 203.33	1.0 M 0.1 M	203.3 g 20.3 g
Magnesium hydroxide $Mg(OH)_2$ 58.34	saturated	300 g†
Magnesium nitrate $Mg(NO_3)_2 \cdot 6H_2O$ 256.43	0.1 M	25.6 g
Magnesium sulfate $MgSO_4 \cdot 7H_2O$ 246.50	0.5 M 0.1 M	123.3 g 24.7 g
Manganese chloride $MnCl_2 \cdot 4H_2O$ 197.91	0.5 M 0.1 M	99.0 g 19.8 g
Manganese sulfate $MnSO_4 \cdot H_2O$ 169.01	0.2 M 0.1 M	33.8 g 16.9 g
Nickel chloride $NiCl_2 \cdot 6H_2O$ 237.72	0.25 M 0.1 M	59.4 g 23.8 g
Nickel nitrate $Ni(NO_3)_2 \cdot 6H_2O$ 290.82	1 M 0.2 M	290.8 g 58.2 g
Nickel sulfate $NiSO_4 \cdot 6H_2O$ 262.87	1.0 M 0.5 M	262.9 g 131.4 g
Potassium bromide KBr 119.02	0.5 M 0.1 M	59.5 g 11.9 g
Potassium carbonate K_2CO_3 138.21	0.5 M 0.1 M	69.1 g 13.8 g
Potassium chloride KCl 74.56	0.5 M 0.1 M	37.3 g 7.5 g

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Chemical Inventory Management System

The Flinn Chemventory is a cloud-based laboratory chemical inventory system that allows multiple users access to the database from multiple locations and multiple devices! Maintaining an accurate laboratory chemical inventory has never been easier, more flexible and more convenient.

Catalog No.	Description	Price/ Database License
SE2998	Flinn Chemventory, 1-Year License	$ 99.00
SE2999	Flinn Chemventory, 3-Year License	249.00
SE3000	Flinn Chemventory, 5-Year License	349.00

* Add solid to acid solution, stir, then add to water. Dilute to 1 L. Remember, always add acid to water.

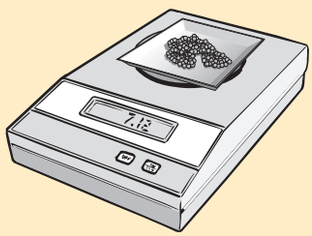
† Approximate amount for 1 L of saturated solution. Keep adding solute until it no longer dissolves; stir for 1 hour, then filter.

§ Use 7.5 mL conc. HNO_3 to help dissolve.

PREPARATION OF SIMPLE INORGANIC SALT SOLUTIONS continued on next page.

HOW TO **Make a Solution**

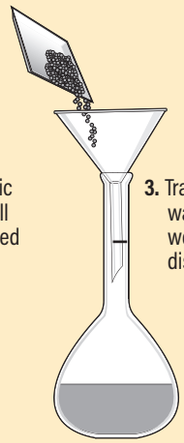
See free "How To" video at flinnsci.com.



1. Weigh solid.



2. Fill volumetric flask ⅓–½ full with deionized or distilled water.



3. Transfer solid, wash out weighing dish.



4. Stir until dissolved. Add more water if necessary.



5. Add deionized or distilled water up to mark.

Preparation of Simple Inorganic Salt Solutions, continued

Name / Formula / F.W.	Concentration	g/L
Potassium chromate K_2CrO_4 194.21	1.0 M 0.5 M 0.1 M	194.2 g 97.1 g 19.4 g
Potassium dichromate $K_2Cr_2O_7$ 294.22	0.1 M	29.4 g
Potassium ferricyanide $K_3Fe(CN)_6$ 329.26	0.5 M 0.1 M	164.6 g 32.9 g
Potassium ferrocyanide $K_4Fe(CN)_6 \cdot 3H_2O$ 422.41	0.1 M	42.2 g
Potassium hydrogen phthalate $KHC_8H_4O_4$ 204.23	0.1 M	20.4 g
Potassium hydroxide see page 595		
Potassium iodate KIO_3 214.01	saturated 0.2 M 0.1 M	214.0 g† 42.8 g 21.4 g
Potassium iodide KI 166.01	1 M 0.5 M 0.2 M	166.0 g 83.0 g 33.2 g
Potassium nitrate KNO_3 101.11	0.5 M 0.1 M	50.6 g 10.1 g
Potassium permanganate $KMnO_4$ 158.04	0.2 M 0.1 M 0.01 M	31.6 g 15.8 g 1.6 g
Potassium phosphate, monobasic KH_2PO_4 136.09	0.1 M	13.6 g
Potassium phosphate, dibasic K_2HPO_4 174.18	0.1 M	17.4 g
Potassium phosphate, tribasic K_3PO_4 212.27	0.1 M	21.2 g
Potassium sulfate K_2SO_4 174.27	0.5 M 0.1 M	87.1 g 17.4 g
Potassium thiocyanate KSCN 97.18	1.0 M 0.5 M 0.1 M	97.2 g 48.6 g 9.7 g
Silver nitrate $AgNO_3$ 169.87	0.5 M 0.1 M	84.9 g 17.0 g
Sodium acetate $NaC_2H_3O_2 \cdot 3H_2O$ 136.08	1 M 0.5 M	136.1 g 68.0 g
Sodium bicarbonate $NaHCO_3$ 84.01	0.5 M 0.1 M	42.0 g 8.4 g
Sodium borate $Na_2B_4O_7 \cdot 10H_2O$ 381.42	4 %	40.0 g
Sodium bromide NaBr 102.90	1.0 M 0.1 M	102.9 g 10.3 g
Sodium carbonate Na_2CO_3 105.99	saturated 1.0 M 0.1 M	214.0 g† 106.0 g 10.6 g
Sodium carbonate $Na_2CO_3 \cdot H_2O$ 124.00	1.0 M 0.1 M	124.0 g 12.4 g

* Add solid to acid solution, stir, then add to water. Dilute to 1 L. Remember, always add acid to water.

† Approximate amount for 1 L of saturated solution. Keep adding solute until it no longer dissolves; stir for 1 hour, then filter.

PREPARATION OF SIMPLE INORGANIC SALT SOLUTIONS continued on next page.

General Solubility Rules **for Inorganic Compounds**

Nitrates (NO_3^-): All nitrates are soluble.

Acetates ($C_2H_3O_2^-$): All acetates are soluble; silver acetate is moderately soluble.

Bromides (Br^-), **Chlorides** (Cl^-) and **Iodides** (I^-): Most are soluble except for salts containing silver, lead and mercury.

Sulfates (SO_4^{2-}): All sulfates are soluble except barium and lead. Silver, mercury(I) and calcium are slightly soluble.

Hydrogen sulfates (HSO_4^-): The hydrogen sulfates (aka bisulfates) are more soluble than the sulfates.

Carbonates (CO_3^{2-}), **phosphates** (PO_4^{3-}), **chromates** (CrO_4^{2-}) and **silicates** (SiO_4^{2-}): All carbonates, phosphates, chromates and silicates are insoluble, except those of sodium, potassium and ammonium. An exception is $MgCrO_4$, which is soluble.

Hydroxides (OH^-): All hydroxides (except lithium, sodium, potassium, cesium, rubidium and ammonium) are insoluble; $Ba(OH)_2$, $Ca(OH)_2$ and $Sr(OH)_2$ are slightly soluble.

Sulfides (S^{2-}): All sulfides (except sodium, potassium, ammonium, magnesium, calcium and barium) are insoluble. Aluminum and chromium sulfides are hydrolyzed and precipitate as hydroxides.

Sodium (Na^+), **potassium** (K^+) and **ammonium** (NH_4^+): All sodium, potassium, and ammonium salts are soluble (except some transition metal compounds).

Silver (Ag^+): All silver salts are insoluble. Exceptions are $AgNO_3$ and $AgClO_4$. $AgC_2H_3O_2$ and Ag_2SO_4 are moderately soluble.

Preparation of Simple Inorganic Salt Solutions, continued

Name / Formula / F.W.	Concentration	g/L
Sodium chloride	saturated	390.0 g†
NaCl	1.0 M	58.5 g
58.45	0.1 M	5.8 g
Sodium dichromate	0.1 M	29.8 g
$Na_2Cr_2O_7 \cdot 2H_2O$		
298.03		
Sodium fluoride	0.1 M	4.2 g
NaF		
41.99		

HOW TO

Increase the Rate of Dissolving Solids

A solvent will only dissolve a limited quantity of solute at a definite temperature. However, the rate at which the solute dissolves can be accelerated by the following methods:

1. Pulverize or grind up the solid to increase the surface area of the solid in contact with the liquid.
2. Heat the solvent. This will increase the rate of solution because the molecules of both the solvent and the solute move faster.
3. Stir vigorously.

Combinations of all three methods, when practical, will dissolve solids more quickly.

Sodium hydroxide see page 595

Sodium iodide	0.5 M	75.0 g
NaI	0.1 M	15.0 g
149.92		
Sodium nitrate	0.5 M	43.0 g
$NaNO_3$	0.1 M	8.5 g
84.99		
Sodium oxalate	0.1 M	13.4 g
$Na_2C_2O_4$		
134.00		
Sodium phosphate, monobasic	0.1 M	13.8 g
$NaH_2PO_4 \cdot H_2O$		
137.99		
Sodium phosphate, dibasic	0.5 M	134.0 g
$Na_2HPO_4 \cdot 7H_2O$	0.1 M	26.8 g
268.07		
Sodium phosphate, dibasic	0.5 M	71.0 g
Na_2HPO_4	0.1 M	14.2 g
141.96		
Sodium phosphate, tribasic	0.1 M	38.0 g
$Na_3PO_4 \cdot 12H_2O$		
380.12		
Sodium sulfate	saturated	600 g†
$Na_2SO_4 \cdot 10H_2O$	1.0 M	322.2 g
322.19	0.5 M	161.1 g

Name / Formula / F.W.	Concentration	g/L
Sodium sulfate	saturated*	260 g†
Na_2SO_4	1.0 M	142.0 g
142.02	0.5 M	71.0 g
Sodium sulfide	2.0 M	48.0 g§
$Na_2S \cdot 9H_2O$	1.0 M	24.0 g
240.18		
Sodium sulfite	1.0 M	126.1 g
Na_2SO_3		
126.05		
Sodium thiosulfate	0.5 M	124.1 g
$Na_2S_2O_3 \cdot 5H_2O$	0.1 M	24.8 g
248.19		
Strontium chloride	0.5 M	133.3 g
$SrCl_2 \cdot 6H_2O$	0.1 M	26.7 g
266.64		
Strontium hydroxide	saturated	220 g†
$Sr(OH)_2 \cdot 8H_2O$		
266.82		
Strontium nitrate	1.0 M	211.6 g
$Sr(NO_3)_2$	0.5 M	105.8 g
211.63		
Tin(II) chloride	0.1 M	22.6 g in 1 M HCl*
$SnCl_2 \cdot 2H_2O$		
225.65		
Tin(IV) chloride	0.1 M	35.1 g in 3 M HCl*
$SnCl_4 \cdot 5H_2O$		
350.61		
Zinc chloride	0.5 M	68.1 g and 1 mL 12 M HCl*
$ZnCl_2$		
136.29	0.1 M	13.6 g
Zinc nitrate	0.5 M	149.7 g
$Zn(NO_3)_2 \cdot 6H_2O$	0.1 M	29.7 g
297.49		
Zinc sulfate	1.0 M	287.6 g
$ZnSO_4 \cdot 7H_2O$	0.1 M	28.8 g
287.56		

* Add solid to acid solution, stir, then dilute to 1 L. Remember, always add acid to water.

† Approximate amount for 1 L of saturated solution. Keep adding solute until it no longer dissolves; stir for 1 hour, then filter.

§ Use hot water, stir vigorously.

Distilled or Deionized Water—Which Do I Need?

Distilled water is free of inorganic materials, suspended impurities and most organic contaminants. To make or buy distilled water is expensive. While there may be school laboratory applications where distilled water is required, in many applications, deionized (aka demineralized) water will do just as well. Deionized water, like distilled water, is free of inorganic materials and most suspended contaminants. If you need organic-free water, buy a still or buy distilled water.

Preparation of Acid Solutions

Name / Formula / F.W.	Concentration	Amount/Liter§
Acetic Acid*	6 M	345 mL
CH_3CO_2H	3 M	173
F.W. 60.05	1 M	58
99.7%, 17.4 M	0.5 M	29
sp. gr. 1.05	0.1 M	5.8
Hydrochloric Acid*	6 M	500 mL
HCl	3 M	250
F.W. 36.4	1 M	83
37.2%, 12.1 M	0.5 M	41
sp. gr. 1.19	0.1 M	8.3
Nitric Acid*	6 M	380 mL
HNO_3	3 M	190
F.W. 63.01	1 M	63
70.0%, 15.8 M	0.5 M	32
sp. gr. 1.42	0.1 M	6.3
Phosphoric Acid*	6 M	405 mL
H_3PO_4	3 M	203
F.W. 98.00	1 M	68
85.5%, 14.8 M	0.5 M	34
sp. gr. 1.70	0.1 M	6.8
Sulfuric Acid*	9 M	500 mL†
H_2SO_4	6 M	333†
F.W. 98.08	3 M	167†
96.0%, 18.0 M	1 M	56
sp. gr. 1.84	0.5 M	28
	0.1 M	5.6

* Always add acid to water. The addition of acid to water is an exothermic reaction. Use high temperature (e.g., Pyrex®) glassware.

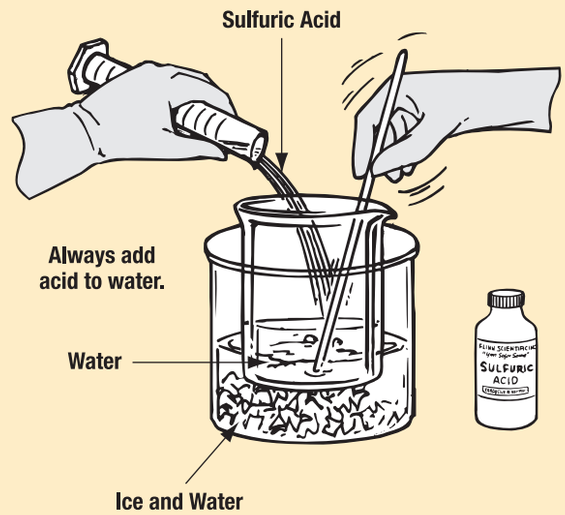
† Extremely exothermic, submerge mixing vessel in an ice bath. See adjacent box.

§ The amount of solute required to prepare one liter of solution.

Preparing Sulfuric Acid Solution?

Always **ADD ACID (AA)** to water! A great amount of heat is liberated when sulfuric acid is added to water. The temperature of the solution will rise rapidly. In fact, the temperature may rise so fast that the solution will boil and possibly spatter a strongly acidic solution. Consider immersing your mixing vessel in a bucket of ice to control the solution temperature. Always add the acid to water ***very*** slowly while stirring continuously.

See free How To video at flinnsci.com.



Safe Storage of Acids

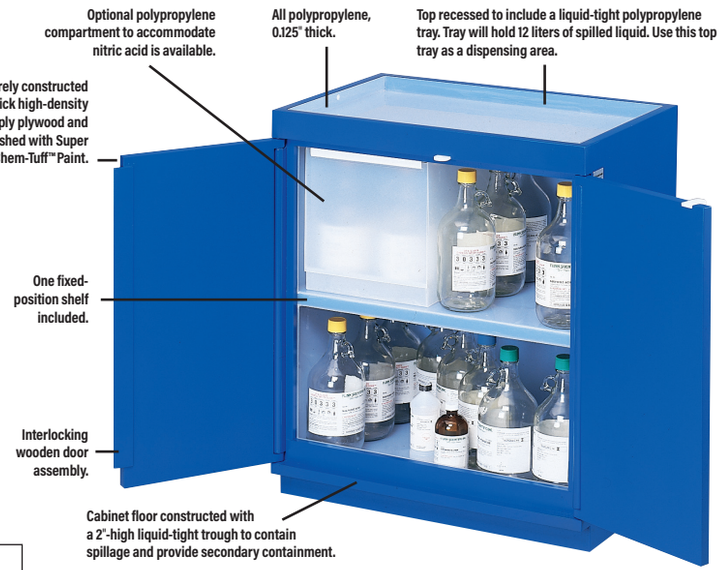
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Corrosive chemicals, such as strong acids and bases, must be isolated from other chemicals to prevent accidental contact and hazardous reaction conditions. The best way to isolate your corrosive chemicals is to store them in an approved corrosive storage cabinet like the Flinn/SciMatCo® wooden acid cabinet. Locked storage cabinets also provide security against theft and vandalism.

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See free video at flinnsci.com.



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* Must be shipped by motor truck freight.

Flinn Acid Cabinets

- Wooden acid cabinets are safer and more durable than metal cabinets.
- Acid attacks ALL metal cabinets.
- No metal is used anywhere in the interior construction of Flinn/SciMatCo® acid cabinets.

Preparation of Base Solutions

Name / Formula / F.W.	Concentration	Amount/Liter§
Ammonium Hydroxide*	6 M	405 mL
NH_4OH	3 M	203
F.W. 35.05	1 M	68
	0.5 M	34
	0.1 M	6.8
Potassium Hydroxide	6 M	337 g
KOH	3 M	168
F.W. 56.11	1 M	56
	0.5 M	28
	0.1 M	5.6
Sodium Hydroxide†	6 M	240 g
NaOH	3 M	120
F.W. 40.00	1 M	40
	0.5 M	20
	0.1 M	4.0

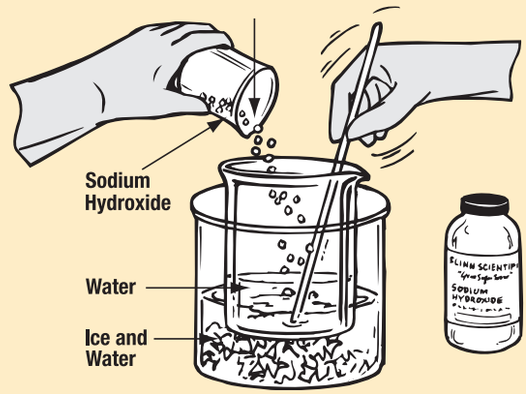
* Use concentrated (14.8 M) ammonium hydroxide.

† Exothermic reaction. Use high temperature (borosilicate) glassware.

§ The amount of solute required to prepare one liter of solution.

Preparing Sodium Hydroxide Solution?

A great amount of heat is liberated when sodium hydroxide and water are mixed. The temperature of the solution may rise very rapidly. In fact, the temperature may rise so fast that the solution may boil and possibly spatter a hot, caustic solution. Immerse the flask or beaker in an ice-water bath to control the solution temperature. In addition, pay special attention to the condition of the beaker or flask, you use to prepare these solutions. If you use a glass vessel it must be borosilicate glass and it must be free of any scratches, chips or breaks. Inspect the vessel carefully before use. Add ingredients slowly with continuous stirring.



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E A CD with up-to-date and specifically designed SDSs for science teachers is included with your first chemical order each year.

F A free Flinn Exclusive lab safety poster is also included with your first chemical order of each year!

Recipes for Biological, Histological and **Chemical Solutions**

Aceto-Carmine (Schneider)
Place 0.5 g of carmine and 55 mL of DI water in a 200-mL flask, bring to a boil and add 45 mL of glacial acetic acid. Plug flask with cotton wool, boil again, cool and filter. *(stain and fixative, good for protozoa and nuclei)*

Aceto-Orcein Staining Solution
Heat 31.5 mL of glacial acetic acid and 13.5 mL of DI water almost to boiling. When acid is hot, add 2 g of synthetic orcein and allow to cool. Dilute by adding 55 mL of DI water; stir and filter. *(connective tissue stain)*

Adrenaline Hydrochloride
Dissolve 0.1 g of adrenaline hydrochloride in 100 mL of Ringer's solution.

Adipoyl Chloride/Hexane Solution
Dissolve 4.6 g of adipoyl chloride in approximately 50 mL of hexane, stir, then dilute to 100 mL with hexane. *(nylon demonstration)*

Agar (Non-nutrient)
Suspend 15 g of agar in 1 L of DI water. Heat to a boil and stir until completely dissolved. Let cool to 50–55 °C and then dispense into desired containers. Agar will firm as it cools. Must add a nutrient if using for culture growth.

Agarose Gel
The standard concentration of agarose in the gel is 0.8%—a concentration that offers a compromise between band resolution and running time. The following directions are for 100 mL of an 0.8% agarose solution. Stir 0.8 g of agarose into 100 mL of working strength (1X) electrophoresis buffer (TBE or TAE) in a glass Erlenmeyer flask. Stopper with nonabsorbent cotton or foam plug. Dissolve agarose by heating in a microwave (30–40 seconds, stir, repeat) or on a hot plate. Heat until solution is clear and agarose appears to be fully dissolved. Stir frequently and do not allow solution to boil for more than a few seconds. Prepare the casting tray, place the well comb and pour the gel(s) when the agarose solution has cooled to approximately 60 °C. Allow the gel to fully solidify on a flat, level surface for 20–30 minutes. Gel should be opaque and firm to the touch.

See page 53 for a complete listing of culture media.

Alizarin
0.1% methanol solution: Dissolve 0.1 g of alizarin in 50 mL of methyl alcohol, then dilute to 100 mL with methyl alcohol. *(pH indicator)*

Alizarin Red S
1% aqueous: Dissolve 1 g of alizarin red S in 50 mL of DI water, then dilute to 100 mL. *(pH indicator)*

Alizarin Yellow R
0.1% aqueous: Dissolve 0.1 g of alizarin yellow R in 50 mL of DI water, then dilute to 100 mL. *(pH indicator)*

Aluminon
Dissolve 0.1 g of aurin tricarboxylic acid in 100 mL of DI water. *(qualitative reagent for aluminum)*

Amylase
0.5% aqueous: Dissolve 0.5 g of amylase in 50 mL of DI water, then dilute to 100 mL. Prepare fresh. *(starch digestion)*

Aniline Blue Alcohol Stain
1% alcohol: Dissolve 1 g of aniline blue in 100 mL 85% ethyl alcohol. *(stain for cellulose)*

Aniline Blue Aqueous Stain
0.5% aqueous: Dissolve 0.5 g aniline blue in 50 mL DI water, then dilute to 100 mL. Filter if necessary. *(stain for algae and fungi)*

Aniline Blue Indicator
0.1% aqueous: Dissolve 0.1 g aniline blue in 50 mL DI water, then dilute to 100 mL. *(pH indicator)*

Baker's Softening Fluid
Mix 10 mL of glycerol, 54 mL of 95% ethanol and 35 mL DI water. *(softening of animal structures)*

Barfoed's Reagent
Add 10 mL of glacial acetic acid to 1 L of DI water and stir. Add 66.5 g of cupric acetate monohydrate. Heat and stir until solid is completely dissolved. *(test for glucose)*

Benedict's Qualitative Solution
Dissolve 173 g of sodium citrate dihydrate and 100 g sodium carbonate anhydrous in 800 mL DI water. Warm and stir to aid dissolution. Filter if necessary. In a separate container, dissolve 17.3 g copper(II) sulfate pentahydrate in 100 mL DI water. Slowly, while stirring constantly, add the copper sulfate solution to the first solution. Let cool and dilute to 1 L with DI water. *(test for the presence of simple sugars)*

Benedict's Quantitative Solution
Dissolve 18.0 g of copper(II) sulfate pentahydrate in 100 mL of DI water and set aside. Dissolve 100.0 g of sodium carbonate anhydrous, 200.0 g of sodium citrate dihydrate and 125 g of potassium thiocyanate in 800 mL DI water. Heat, if necessary, to aid dissolution of the solids. Allow the solution to cool, then transfer to a 1-L volumetric flask. Slowly, while stirring constantly, add the copper sulfate solution to the 1-L flask. Prepare a 0.1 M potassium ferrocyanide solution by dissolving 0.25 g of potassium ferrocyanide trihydrate in 5 mL of DI water. Add to the 1-L volumetric flask, stir, then dilute to 1 L with DI water. Filter if necessary. 25 mL of this solution is reduced by 50 mg of glucose.

Bial's Reagent (Sumner)
Add 4 drops of 10% iron(III) chloride solution to 100 mL of 6 M hydrochloric acid. Add 0.03 g of orcinol and stir. *(test for pentoses and glycuronic acids)*

Note: DI water denotes either distilled or deionized water.

RECIPES continued on next page.

SAFETY TIP

Become a Label Fanatic!

- Do not use chemicals from unlabeled containers.
- Do not place labels on top of one another.
- Label chemicals clearly and permanently.

An unlabeled container will become tomorrow's "Mystery Substance." A grease pencil or label can help eliminate a future problem and a lot of expense.

You Make It—You Label It!

Minimum label requirements:

1. Identity of contents
2. Concentration
3. Your name
4. Date of preparation (if applicable)
5. Hazard alert (if applicable)



Recipes for Biological, Histological and Chemical Solutions, continued

Bile Salts

5% aqueous: Dissolve 5 g of bile salts in 50 mL of DI water, dilute to 100 mL. Mix gently to avoid foam. *(digestive studies)*

Bismark Brown Y

0.5% aqueous: Dissolve 0.5 g of bismark brown Y in 50 mL of DI water, dilute to 100 mL, stir and filter if necessary. *(stain for protozoa)*

Biuret Test Solution

Dissolve 2.3 g of copper(II) sulfate pentahydrate in 230 mL of DI water. Set aside. Dissolve 308 g sodium hydroxide in 770 mL of DI water (very exothermic; cool vessel in an ice water bath) and cool to room temperature. Add all the copper sulfate solution to the sodium hydroxide solution. Solution should be blue. *(test for proteins)*

Blood Agar Base Infusion

Suspend 40 g of blood agar base infusion in 1 L of DI water. Heat to a boil while stirring vigorously. Boil for one minute. Sterilize for 15 min at 121 °C (15 lbs. of pressure) in an autoclave or pressure cooker. Cool to 50–55 °C and pour into sterilized culture dishes. *(culture medium)*

Borax

Add 4 g Borax (sodium borate, $Na_2B_4O_7 \cdot 10H_2O$) to 100 mL of DI water. Stir. *(preparation of slime)*

Borax Carmine

Dissolve 2 g of Borax (aka sodium tetraborate) in 50 mL of DI water, add 1.5 g of carmine and boil for 30 minutes. Let cool, make up to 50 mL with DI water, then add 50 mL of 70% ethyl alcohol. Let stand for a few days, then filter. *(good general stain for plant and animal tissue)*

Borax Methylene Blue

Heat 100 mL of DI water to 60 °C and stir in 2 g methylene blue and 5 g Borax. Allow to cool slowly. Solution improves with age. *(connective tissue stain, Negri bodies)*

Bouin's Fixative

Mix together 75 mL of saturated aqueous picric acid solution, 25 mL of commercial formalin (10% formaldehyde solution), and 5 mL of glacial acetic acid. *(plant and animal tissue fixative)*

Brilliant Blue R-250

Dissolve 0.25 g of Coomassie brilliant blue R-250 in 40 mL methyl alcohol. Add 40 mL DI water, then 7 mL concentrated acetic acid. Dilute to 100 mL with DI water. *(staining proteins in polyacrylamide and agarose gels for electrophoresis)*

Brilliant Blue G-250

Dissolve 0.1 g of Coomassie brilliant blue G-250 in 25 mL methyl alcohol. Add 40 mL DI water, then 5 mL acetic acid. Dilute to 100 mL with DI water. *(staining proteins in polyacrylamide and agarose gels for electrophoresis)*

Brilliant Cresyl Blue

Dissolve 0.85 g sodium chloride in 75 mL of DI water. Add 1 g brilliant cresyl blue and stir to dissolve. Dilute to 100 mL with DI water. *(vital stain, general stain for protozoa and plant cells)*

Brilliant Green

1% aqueous: Dissolve 1 g of brilliant green in 50 mL of DI water, dilute to 100 mL, stir and filter if necessary. *(stain for plant cytoplasm and pH indicator)*

Bristol's Solution

Dissolve 1 g of potassium dihydrogen phosphate, 1 g sodium nitrate, 0.3 g of magnesium sulfate, 0.1 g calcium chloride, 0.1 g sodium chloride and a trace of ferric chloride in 1 L of DI water. (culture of algae)

See page 62 for a complete listing of indicators and pH ranges.

Bromcresol Green

0.1% alcoholic: Dissolve 0.1 g of bromcresol green in 75 mL of ethyl alcohol, then dilute to 100 mL. *(pH indicator)*

Bromcresol Green

0.04% aqueous: Dissolve 0.04 g of bromcresol green in 50 mL of DI water, then dilute to 100 mL. *(pH indicator)*

Bromcresol Purple

0.04% aqueous: Dissolve 0.04 g of bromcresol purple in 50 mL of DI water, then dilute to 100 mL. *(pH indicator)*

Bromine Water

Add 1 mL of bromine to 200 mL of DI water and stir. Keep in a tightly sealed bottle. The shelf life is poor due to evaporation of bromine. *(polar/nonpolar solubility studies)*

Bromphenol Blue

0.04% aqueous: Dissolve 0.04 g of bromphenol blue in 50 mL of DI water, then dilute to 100 mL. *(pH indicator)*

Bromthymol Blue

0.04% aqueous: Dissolve 0.04 g of bromthymol blue in 50 mL of DI water, then dilute to 100 mL. *(pH indicator)*

Carbol Fuchsin (Ziehl-Nielson)

Dissolve 1 g of basic fuchsin in 10 mL of 100% ethyl alcohol (absolute); set aside. Dissolve 5 g of phenol in 100 mL of DI water. Add the two solutions together and stir. *(bacterial stain, bacterial spores and various cytoplasmic inclusions)*

Carnoy's Fluid

Mix together 10 mL glacial acetic acid, 30 mL of chloroform and 60 mL of 100% ethyl alcohol. *(fixative for tissue used in chromosome studies)*

Chlorophenol Red

0.04% aqueous: Add 23.5 mL of 0.01 M sodium hydroxide to 226.5 mL of DI water. Dissolve 0.1 g of chlorophenol red in this solution. *(pH indicator)*

Clayton Yellow

1% aqueous: Dissolve 1 g of Clayton yellow in 50 mL of DI water, then dilute to 100 mL. *(pH indicator and fluorescent dye for microscopy)*

Note: DI water denotes either distilled or deionized water.

HOW TO Prepare Buffer Solutions

Buffer solutions are available from Flinn as premade solutions and ready-to-mix capsules and envelopes. Buffers are typically mixtures of a weak acid and the salt of the acid or a weak base and its salt. This combination is called a conjugate acid–base pair, and it will resist changes in pH upon addition of small amounts of acid or base. Recipes for three common buffer solutions are provided.

pH 4: Dissolve 5.10 g of potassium hydrogen phthalate ($KHC_8H_4O_4$) in 250 mL of DI water, add 0.50 mL of 0.10 M hydrochloric acid, then dilute to 500 mL.

pH 7: Prepare 0.10 M potassium phosphate monobasic (KH_2PO_4) solution by dissolving 3.40 g in 250 mL DI water. Prepare 0.20 M sodium hydroxide solution by dissolving 0.8 g in 100 mL DI water. Mix 250 mL of the 0.10 M potassium phosphate solution and 73 mL of 0.2 M sodium hydroxide solution, then dilute to 500 mL.

pH 10: Prepare 0.025 M sodium borate solution ($Na_2B_4O_7 \cdot 10H_2O$) by dissolving 2.38 g in 250 mL of DI water. Prepare 0.20 M sodium hydroxide solution by dissolving 0.8 g in 100 mL DI water. Mix 250 mL of the 0.025 M sodium borate solution and 27 mL of the 0.2 M sodium hydroxide solution, then dilute to 500 mL.

RECIPES continued on next page.

Recipes for Biological, Histological and Chemical Solutions, continued

Congo Red Indicator
0.1% aqueous: Dissolve 0.1 g of Congo red in 50 mL of DI water, then dilute to 100 mL. *(pH indicator)*

Congo Red Stain
1% aqueous: Dissolve 1 g of Congo red in 100 mL of DI to which a few drops of ammonium hydroxide solution have been added. *(plant tissue stain)*

m-Cresol Purple
Add 26.2 mL of 0.01 M sodium hydroxide to 200 mL of DI water. Dissolve 0.1 g of m-cresol purple in this solution, dilute to 250 mL. Can omit NaOH if using Na salt. *(pH indicator)*

Cresol Red
Add 26.2 mL of 0.01 M sodium hydroxide to 200 mL of DI water. Dissolve 0.1 g of cresol red in this solution, dilute to 250 mL. Can omit NaOH if using Na salt. *(pH indicator)*

Crystal Violet Indicator
0.02% aqueous: Dissolve 0.02 g of crystal violet in 80 mL of DI water, then dilute to 100 mL. *(pH indicator)*

Crystal Violet Stain (Gram)
Dissolve 2 g of crystal violet in 20 mL of 95% ethyl alcohol. Dissolve 0.8 g of ammonium oxalate monohydrate in 80 mL of DI water and then mix with the crystal violet solution. Filter if necessary. *(used in Gram staining procedure for bacteria)*

Destaining Solution
Add 70 mL glacial acetic acid to 400 mL methanol. Dilute to 1 L with DI water. *(removes stains from polyacrylamide gels)*

Dichloroindophenol
Dissolve 0.025 g of 2,6-dichloroindophenol, sodium salt in 80 mL DI water, then dilute to 100 mL. Prepare fresh. *(indicator for Vitamin C)*

Diphenylamine Reagent
Mix 1 g of diphenylamine in 100 mL glacial acetic acid and 2.75 mL of concentrated sulfuric acid. Store in an amber bottle at 2 °C. Warm to room temperature before using. *(DNA/RNA extractions)*

EMB Agar
Suspend 36 g of EMB agar in 1 L of DI water and heat to boiling to dissolve the solid. Sterilize for 15 min at 121 °C (15 lbs. of pressure) in an autoclave or pressure cooker. Cool to 50–55 °C and swirl to disperse the precipitate just prior to pouring into sterilized culture dishes. *(culture medium)*

Eosin Y Indicator
1% alcoholic: Dissolve 1 g eosin Y in 80 mL 95% ethyl alcohol, then dilute to 100 mL. Stir and filter if necessary. *(fluorescent pH indicator)*

Eosin Y Stain
0.5% aqueous: Dissolve 0.5 g of eosin Y in approximately 80 mL DI water, then dilute to 100 mL. Stir and filter if necessary. Add a few drops of hloroform as preservative. *(good cytoplasmic stain)*

See page 62 for a complete listing of indicators and pH ranges.

Eriochrome Black T Indicator
1% alcoholic: Dissolve 1 g of eriochrome black T in 80 mL of 95% ethyl alcohol, dilute to 100 mL with 95% ethyl alcohol. *(indicator for EDTA titrations)*

Erythrosin B Indicator
1% alcoholic: Dissolve 1 g of erythrosin B in 80 mL of 95% ethyl alcohol, dilute to 100 mL with 95% ethyl alcohol. *(indicator for EDTA titrations)*

Erythrosin B Stain
1% aqueous: Dissolve 0.1 g of erythrosin B in 100 mL of DI water. Stir and filter if necessary. Add chloroform as a preservative. *(biological stain)*

Fast Green
Dissolve 2 g of fast green in 100 mL of DI water containing 2 mL of glacial acetic acid. *(tissue cell staining)*

Fehlings Solution A
Dissolve 34.6 g of copper(II) sulfate pentahydrate in 500 mL DI water. Combine solution A and B (1:1) just before use. *(test for reducing sugars and aldehydes)*

Fehlings Solution B
Dissolve 125 g of potassium hydroxide and 173 g of potassium sodium tartrate tetrahydrate in 500 mL of DI water. Combine solution A and B (1:1) just before use. *(test for reducing sugars and aldehydes)*

Ferroin Solution
Dissolve 0.23 g of iron(II) sulfate heptahydrate in 100 mL of DI water. Add 0.46-g of 1,10-phenanthroline monohydrate and stir until dissolved. *(redox indicator)*

Fluorescein
0.1% alcoholic: Dissolve 0.1 g of fluorescein in 80 mL of 95% ethyl alcohol, then dilute to 100 mL. *(fluorescent pH indicator)*

Formalin-Aceto-Alcohol (FAA)
Mix together 50 mL of 95% ethyl alcohol, 2 mL of glacial acetic acid, 10 mL of 40% formaldehyde and 40 mL of DI water. *(preservative for algae, also a fixative)*

Fuchsin, Acid, Indicator
1% aqueous: Dissolve 1 g of acid fuchsin in 80 mL of DI water, then dilute up to 100 mL. *(pH indicator)*

Fuchsin, Acid, Stain
1% aqueous: Dissolve 1 g of acid fuchsin in 100 mL of DI water and 1 mL of glacial acetic acid. Filter if necessary. *(staining marine algae and small crustaceans)*

Fuchsin, Basic
1% aqueous: Dissolve 1 g of basic fuchsin in 80 mL of DI water, then dilute to 100 mL. Filter if necessary. *(pH indicator and biological stain)*

Fuchsin, New
1% aqueous: Dissolve 1 g of new fuchsin in 80 mL of DI water, then dilute to 100 mL. Filter if necessary. *(biological stain)*

Gastric Juice
Dissolve 5 g pepsin, 8.75 g concentrated hydrochloric acid, and 2.5 g of lactic acid in 500 mL of DI water. Dilute to 1 L and stir gently to avoid foaming. *(digestive studies)*

Gibberellic Acid
Dissolve 100 mg of gibberellic acid in 5.0 mL of ethyl alcohol. Dilute to 1 L with DI water. *(plant growth hormone)*

Note: DI water denotes either distilled or deionized water.

RECIPES continued on next page.

HOW TO

Set up a Prep Room

Equipment
- Electronic Balance
- Magnetic Stirrers
- Volumetric Flasks
- Graduated Cylinders
- Water Purification System
- Bottles
- Labels

Safety Essentials
- Eyewash/Body Drench
- Spill Control and Clean-up Materials
- Fire Extinguisher
- Chemical-Resistant Gloves and Aprons
- Chemical Splash Goggles
- Telephone Available for Emergency Use
- Chemical First Aid Kit
- Good Ventilation

See page 729 for a model storage/prep room diagram.

Recipes for Biological, Histological and Chemical Solutions, continued

Guar Gum
Dissolve 0.5 to 1.0 g of guar gum in 100 mL DI water. Make fresh. *(preparation of "slime")*

Hayem's Solution
Dissolve 0.25 g of mercury (II) chloride, 2.5 g of sodium sulfate, and 0.5 g of sodium chloride in 100 mL of DI water. *(diluting solution for red cell counts)*

Hematoxylin, Delafield's
Dissolve 4 g of hematoxylin in 25 mL of 100% ethyl alcohol. Add 400 mL of saturated aqueous aluminum ammonium sulfate solution. Expose to light for a few days in a cotton-stoppered bottle, then filter. Add 100 mL of methyl alcohol and 100 mL of glycerin. The stain must be ripened at room temperature for 2 months before use. Store in a well stoppered flask. *(good general stain for nonwoody plant tissue and animal tissue)*

Hexamethylenediamine/Sodium Hydroxide
Dissolve 60 g of 1,6-hexamethylenediamine in 500 mL of DI water. Add 20 g of sodium hydroxide, stir to dissolve and dilute to 1 L. *(nylon demonstration)*

Indigo Carmine
Dissolve 0.25 g of indigo carmine in 80 mL of 50% ethyl alcohol solution. Stir, dilute to 100 mL with 50% ethyl alcohol solution. Prepare fresh; shelf life is poor. *(pH indicator)*

Iodine, Tincture of
Dissolve 50 g of potassium iodide in 50 mL of DI water. Add 70 g iodine, stir to dissolve then dilute to 1 L with 95% ethyl alcohol. Store in a dark bottle.

Iodine–Potassium Iodide
Dissolve 15 g of potassium iodide in 125 mL of DI water. Add 3 g of iodine, stir to dissolve, then dilute to 1 L. Store in a dark bottle. *(starch test)*

HOW TO

Preparing an Iodine Solution?

Iodine crystals are not directly soluble in water, which is why most water-based iodine solutions call for potassium iodide as an ingredient. Iodine is soluble in potassium iodide solutions.

As a general rule, start with approximately one-fourth of the final volume of water and add the required amount of potassium iodide. Once the potassium iodide has dissolved, add the iodine crystals. Stir until completely dissolved and bring the solution up to its final volume.

Generally, the more concentrated the potassium iodide solution, the more readily the iodine crystals will dissolve. Iodine solutions should be prepared in a fume hood.

Always store iodine solutions in PVC-coated amber glass bottles.

Iodine Solution (0.05 M)
Dissolve 20 g of potassium iodide in 400 mL of DI water. Add 13 g of iodine, stir to dissolve, then dilute to 1 L. Store in a dark bottle.

Iodine Solution, Gram's
Dissolve 6.7 g of potassium iodide in 100 mL of DI water. Add 3.3 g of iodine, stir to dissolve, then dilute to 1 L. Store in a dark bottle. *(used in Gram staining procedure for bacteria)*

Iodine Solution, Lugol's
Dissolve 20 g of potassium iodide in 200 mL of DI water. Add 10 g of iodine, stir to dissolve then dilute to 1 L. Store in a dark bottle. *(General biological stain and vital stain stock solution, dilute 5:1 before use.)*

Knop's Solution
Add 1 g of potassium nitrate, 1 g of magnesium sulfate heptahydrate, 1 g of potassium phosphate dibasic and 3 g of calcium nitrate tetrahydrate to 500 mL distilled water. Stir then dilute to 1 L with distilled water. Shake solution before use to redissolve the calcium nitrate. Add 10 g of agar and 10 g of glucose to 500 mL of this solution for culturing algae. Only use distilled water when making this solution. *(culturing algae)*

Limewater
Add 25 g of calcium hydroxide to 1 liter of DI water and shake. Allow the solid to settle before use. Keep container tightly closed. *(detecting carbon dioxide gas)*

Litmus
0.5% aqueous: Dissolve 0.5 g of litmus in 80 mL of boiling DI water. Allow solution to cool to room temperature, dilute to 100 mL. Stir. Filter if necessary. *(pH indicator)*

Malachite Green
1% aqueous: Dissolve 1 g of malachite green oxalate in 50 mL of DI water. Stir gently to prevent foaming and dilute to 100 mL. Filter if necessary. *(pH indicator, stain for plant cytoplasm)*

Methyl Cellulose
3% aqueous: Heat 100 mL of DI water to 85 °C (not boiling), shake 3.0 g of methyl cellulose powder into hot water and stir rapidly while cooling the solution to 5 °C in an ice water bath. Solution is stable at room temperature, but store in tightly closed containers. *(slowing down protozoa for microscopy)*

Methylene Blue
1% aqueous: Dissolve 1 g of methylene blue in 75 mL of DI water, then dilute to 100 mL. *(pH indicator and stain)*

Methylene Blue, Loeffler's
Dissolve 0.3 g of methylene blue in 30 mL of 95% ethyl alcohol. Add 0.01 g of potassium hydroxide and 100 mL of DI water, stir and filter. *(bacterial stain)*

Methyl Green
1% aqueous, acidified: Dissolve 1 g of methyl green in 75 mL of DI water, add 1 mL of glacial acetic acid, then dilute to 100 mL with DI water. Stir, filter if necessary. *(1% acidified aqueous solution as a general nuclear stain, plant stain or cytoplasm stain)*

Methyl Orange
0.1% aqueous: Dissolve 0.1 g of methyl orange in 75 mL of DI water, then dilute to 100 mL. *(pH indicator)*

Methyl Red
0.1% alcoholic: Dissolve 0.1 g of methyl red in 75 mL 95% ethyl alcohol, then dilute to 100 mL. *(pH indicator)*

Methyl Red
0.04% aqueous: Dissolve 0.1 g of methyl red in 11.8 mL of 0.02 M sodium hydroxide solution, then dilute to 250 mL with DI water. If using Na salt, omit NaOH. *(pH indicator)*

Methyl Violet 2B, Indicator
0.04% aqueous: Dissolve 0.1 g of methyl violet 2B in 200 mL of DI water, then dilute to 250 mL. *(pH indicator)*

Methyl Violet 2B, Stain
Dissolve 0.05 g of methyl violet 2B in 100 mL of 0.7% sodium chloride solution and 1 mL of 1 M acetic acid. Stir and filter if necessary. Use 0.9% sodium chloride solution if staining human blood cells. *(staining amphibian and human blood cells)*

Methyl Violet 6B, Indicator
1% aqueous: Dissolve 1 g of methyl violet 6B in 75 mL of DI water, then dilute to 100 mL. Stir and filter if necessary. *(biological stain)*

Millon Reagent
Dissolve 1 part by weight mercury in 2 parts concentrated nitric acid; when mercury has dissolved, add to 2 parts water; stir. **Note:** always add acid to water. *(test for proteins)*

Molisch Reagent
Dissolve 5 g 1-naphthol in 100 mL of 95% ethyl alcohol. *(test for aldehydes, sugars and carbohydrates)*

Neutral Red
Dissolve 0.1 g of neutral red in 60 mL of 95% ethyl alcohol, then dilute to 100 mL with DI water. Stir and filter if necessary. *(pH indicator and vital stain stock solution)*

Note: DI water denotes either distilled or deionized water.

RECIPES continued on next page.

Recipes for Biological, Histological and Chemical Solutions, continued

Nigrosin

Saturated: Dissolve 3 g of nigrosin (water soluble) in 100 mL of DI water. Stir and filter if necessary. *(biological stain for protozoa)*

Ninhydrin

Add 2.5 g of ninhydrin to 50 mL of n-butyl alcohol in a 600-mL beaker. Gently heat and stir the solution using a magnetic stirrer/hot plate in a fume hood until all the solid is dissolved. Dilute to 500 mL with n-butyl alcohol. Use extreme caution when heating n-butyl alcohol, extreme fire risk. *(test for proteins)*

m-Nitrophenol

0.3% aqueous: dissolve 0.3 g of m-nitrophenol in 75 mL DI water, then dilute to 100 mL. *(pH indicator)*

p-Nitrophenol

0.1% aqueous: dissolve 0.1 g of p-nitrophenol in 75 mL DI water, then dilute to 100 mL. *(pH indicator)*

4-(p-Nitrophenylazo) Resorcinol

Dissolve 0.01 g of 4–(p-nitrophenylazo) resorcinol in 100 mL of 1 M sodium hydroxide solution and stir. *(indicator solution for magnesium and molybdenum)*

Nutrient Agar

Mix together 23 g of nutrient agar with 1 L of DI water. Sterilize for 15 minutes at 121 °C (15 lbs of pressure) in an autoclave or pressure cooker. Nutrient agar should be sterilized if it is being used as culture media. Cool to 50–55 °C and pour into sterilized culture dishes. *(culture medium)*

Nutrient Agar (using plain agar)

Dissolve 5 g peptone, 3 g meat extract and 15 g of plain agar in 850 mL of distilled water. Adjust pH to 7.0. Bring to 1 L with distilled water. Autoclave or filter sterilize.

Orange G

1% aqueous: Dissolve 1 g of orange G in 75 mL of DI water, then dilute to 100 mL. Stir and filter if necessary. *(staining plant sections)*

Orange IV

0.1% aqueous: Dissolve 0.1 g of orange IV in 75 mL of DI water, then dilute to 100 mL. Stir and filter if necessary. *(pH indicator and biological stain)*

Orcein

Mix together 1 g of orcein, 1 mL of concentrated hydrochloric acid and 100 mL of 100% ethyl alcohol. Shake to dissolve, let sit over night and filter. *(stain for elastic fibers)*

Pancreatin

Dissolve 5.0 g of pancreatin in 500 mL of DI water, then dilute to 1 L. Add 0.5 M sodium bicarbonate solution dropwise until solution is neutral. *(digestive studies)*

Phenantholine

See Ferroin Solution, page 621.

Phenolphthalein

1% alcoholic: Dissolve 1 g of phenolphthalein in 50 mL of 95% ethyl alcohol, then dilute to 100 mL with 95% ethyl alcohol. For a 0.5% solution, only use 0.5 g of phenolphthalein. *(pH indicator)*

Phenol Red

0.02% alcoholic: Dissolve 0.1 g of phenol red in 400 mL of 95% ethyl alcohol, then dilute to 500 mL with 95% ethyl alcohol. *(pH indicator)*

Phenol Red, Sodium Salt

0.02% aqueous: Dissolve 0.1 g of phenol red, sodium salt in 400 mL of DI water, then dilute to 500 mL. *(pH indicator)*

Phloroglucinol

Mix 0.5 g phloroglucinol and 50 mL of DI water. Add 50 mL of concentrated hydrochloric acid and stir. Use within 5–7 days. Always add acid to water. *(test for pentose or galactose)*

Polyvinyl Alcohol

4% aqueous: Add 40 g of polyvinyl alcohol to 1 L of hot tap water. Microwave on high for about 2 minutes; stir and heat for additional 1–2 minute increments until dissolved. Allow solution to cool before use. *(preparation of "slime")*

Potato Dextrose Agar

Suspend 39 g of potato dextrose agar in 1 L of DI water. Heat to a boil while stirring constantly. Boil for 1 minute. Sterilize for 15 minutes at 121 °C (15 lbs of pressure) in an autoclave or pressure cooker. Cool to 50–55 °C and pour into sterilized culture dishes. If using for plate counts of yeasts and molds, adjust the pH to 3.5 with sterile 10% tartaric acid. *(culture medium for plate counts of yeasts and molds)*

Pyrogallol

Dissolve 80 g of potassium hydroxide in 65 mL of DI water, add 5 g of pyrogallol, stir, then dilute to 100 mL. Poor shelf life, make fresh. *(determining oxygen content)*

Resazurin

1% aqueous: Dissolve 1 g of resazurin in 50 mL DI water, then dilute to 100 mL. Stir and filter if necessary. *(biological stain and pH indicator)*

Richard's Solution

Dissolve 6.6 g of potassium nitrate, 3.3 g of potassium dihydrogen phosphate, 33.3 g sucrose and 1.7 g of magnesium sulfate in 1 L of DI water. *(culture of molds)*

Rhodamine B

1% aqueous: Dissolve 1 g of rhodamine B in 50 mL DI water, then dilute to 100 mL. Stir and filter if necessary. *(biological stain)*

Ringer's Solution for Frogs

Dissolve 0.14 g of potassium chloride, 6.5 g of sodium chloride, 0.12 g calcium chloride and 0.2 g sodium bicarbonate in 1 L of DI water. *(mounting fluid and examination of blood cells)*

Ringer's Solution for Mammals

Dissolve 0.42 g of potassium chloride, 9.0 g of sodium chloride, 0.24 g calcium chloride and 0.2 g sodium bicarbonate in 1 L of DI water. *(mounting fluid and examination of blood cells)*

Rose Bengal

1% aqueous: Dissolve 1 g of rose bengal in 50 mL DI water, then dilute to 100 mL with distilled water. Stir and filter if necessary. *(biological stain)*

Sabouraud Dextrose Agar

Suspend 65 g of sabouraud dextrose agar in 1 L of DI water. Heat to boiling while stirring. Boil for 1 minute. Sterilize for 15 minutes at 121 °C (15 lbs of pressure) in an autoclave or pressure cooker. Cool to 50–55 °C and pour into sterilized culture dishes. *(microbiological culture medium)*

Safranin O

Dissolve 0.1 g safranin in 75 mL of DI water, then dilute to 100 mL. Filter before use. *(Gram counter stain)*

Saline Solution

0.75% aqueous: Dissolve 7.5 g of sodium chloride in 750 mL of DI water, then dilute to 1 L. *(Saline solution for birds and invertebrates, use 0.8% for frogs and 0.9% for mammals)*

Note: DI water denotes either distilled or deionized water.

RECIPES continued on next page.

HOW TO

Slow Microorganisms

Solutions of methyl cellulose are commonly used in microscopy to slow the movements of microorganisms—making them more readily observable. Generally offered as a 2–3% solution in water, its high viscosity physically inhibits the organism. In use, the resulting dilution will depend on the amount of water present on the slide when the slowing agent is added. Some experimentation may be required to find the optimal dilution for a particular organism. One technique involves dropping the methyl cellulose onto a clean slide in the form of a ring. A drop of the culture being studied is then placed into the center of the ring and a cover glass applied. As an alternative, see the listing for polyvinyl alcohol solution.

Recipes for Biological, Histological and Chemical Solutions, continued

Seawater (Hale's)
Dissolve 23.991 g sodium chloride, 0.742 g potassium chloride, 2.240 g calcium chloride dihydrate, 10.893 g magnesium chloride hexahydrate, 9.10 g sodium sulfate decahydrate, 0.197 g sodium bicarbonate, 0.085 g sodium bromide, 0.018 g strontium chloride hexahydrate and 0.027 g boric acid in 800 mL DI water. Dilute up to 1 L. Final solution has a salinity of 34.33 0/00 (ppt) and a chlorinity of 19 0/00. *(not for aquaria, only for technical purposes)*

Seawater
Dissolve 29.42 g of sodium chloride, 0.5 g of potassium chloride, 3.22 g magnesium chloride, 0.56 g sodium bromide, 1.36 g calcium sulfate, 2.4 g magnesium sulfate, 0.11 g calcium carbonate and 0.003 g ferric oxide in 1 L DI water. *(not for aquaria, only for technical purposes)*

Schiff's Reagent
Dissolve 0.5 g of fuchsin in 500 mL of DI water. Decolorize solution by passing sulfur dioxide gas through the solution or add 9 g of sodium bisulfite and 20 mL of 2 M hydrochloric acid to the fuchsin solution. *(test for aldehydes)*

Schweitzer's Reagent
Boil a solution of 5 g of copper(II) sulfate pentahydrate in 100 mL of DI water and slowly add 2 M sodium hydroxide solution until precipitation is complete. Filter the copper oxide precipitate, wash with water then dissolve in the minimum volume of 4 M ammonium hydroxide. Also called ammoniacal copper oxide solution. *(reagent for dissolving cellulose)*

Sebacoyl Chloride/Hexane Solution
Mix 4 mL of sebacoyl chloride with 96 mL of hexanes. *(nylon demonstration)*

Starch Solution
1% aqueous: Make a smooth paste with 10 g of soluble starch and DI water. Pour the starch paste into 1 L of boiling water while stirring. Cool to room temperature before use. Poor shelf life, always prepare fresh solution. An easier way to make a starch solution is to generously spray ordinary spray starch (the type used for ironing) into DI water. Make fresh. *(indicator for iodine)*

Sudan III
Warm 73.5 mL of 95% ethyl alcohol in a warm water bath. Add 0.5 g of sudan III and stir. Add 75 °C DI water to just below the 100-mL mark. Stir and cool to room temperature then dilute to 100 mL with DI water. Filter if necessary. *(biological stain for fats and lipids)*

Sudan IV
Warm 75 mL of 95% ethyl alcohol in a warm water bath. Add 0.5 g sudan IV and stir. Cool to room temperature then dilute to 100 mL with DI water. Filter if necessary. *(biological stain for fats and lipids)*

10X TBE Electrophoresis Buffer
Dissolve 108 g of Tris base [tris(hydroxymethyl) aminomethane], 55 g of boric acid and 7.5 g of EDTA, disodium salt in 800 mL of DI water, then dilute to 1 L. There is no need to sterilize the solution. If white clumps begin to precipitate in the solution, place the bottle in hot water until the clumps dissolve. Stored at room temperature. To use as a buffer, dilute 100-mL of 10X stock to 1 L with DI water.

10X TAE Electrophoresis Buffer
Dissolve 48.4 g of Tris base [tris(hydroxymethyl) aminomethane], 11.4 mL of glacial acetic acid (17.4 M) and 3.7 g of EDTA, disodium salt in 800 mL of DI water, then dilute to 1 L. There is no need to sterilize the solution. Stored at room temperature. To use as a buffer, dilute 100-mL of 10X stock to 1 L with DI water.

Thymol Blue
0.04% aqueous: Mix together 0.04 g of thymol blue and 50 mL of DI water. Add 5 mL of 0.01 M sodium hydroxide solution; stir until all the solid has dissolved. Dilute to 100 mL with DI water. *(pH indicator)*

Thymol Blue
0.04% aqueous: Dissolve 0.04 g of thymol blue, sodium salt in 75 mL of DI water, then dilute to 100 mL. *(pH indicator)*

Thymolphthalein
0.04% alcoholic: Dissolve 0.04 g of thymolphthalein in 75 mL of anhydrous ethyl alcohol, then dilute to 100 mL with anhydrous ethyl alcohol. *(pH indicator)*

Tollen's Reagent
Add 2–3 drops of 2 M sodium hydroxide solution to 5 mL of 0.2 M silver nitrate solution; add 2 M ammonium hydroxide solution dropwise until precipitate dissolves. Prepare and use this solution immediately; explosive fulminating silver will form if solution is allowed to stand for any period of time. *(test for aldehydes and reducing sugars)*

Toluidine Blue O
Mix 1 g of toluidine blue O and 0.5 mL of concentrated hydrochloric acid into a homogeneous paste. While stirring, gradually add the paste to 50 mL of DI water, then dilute to 100 mL of DI water. *(biological stain for bacteria)*

Universal Indicator
Add 0.18 g of methyl red and 0.36 g of phenolphthalein to 550 mL of 95% ethyl alcohol (C_2H_5OH); stir to dissolve. In a separate container, add 0.43 g of bromthymol blue to 200 mL of distilled water; stir to dissolve. Mix together the two solutions; dilute to 1 liter with distilled water. Add 1 M sodium hydroxide solution dropwise until the solution's color is dark green; stir. *(Use: pH indicator, pH 4 = red, pH 5 = orange, pH 6 = yellow, pH 7 = light green, pH 8 = green-blue, pH 9 = dark blue-green, pH 10 = purple)*

Winkler's Solution #1
Dissolve 480 g of manganese(II) sulfate tetrahydrate in 500 mL of DI water, then dilute to 1 L. *(determining dissolved oxygen)*

Winkler's Solution #2
Dissolve 500 g of sodium hydroxide and 135 g of sodium iodide in 700 mL of DI water, then dilute to 1 L. A large amount of heat is generated, place the mixing container in an ice water bath. Store in a plastic container. *(determining dissolved oxygen)*

Wright's Stain
Dissolve 2.5 g of Wright's stain in 5 mL of absolute methyl alcohol, then dilute to 100 mL with absolute methyl alcohol. Stir and filter if necessary. *(biological stain for blood)*

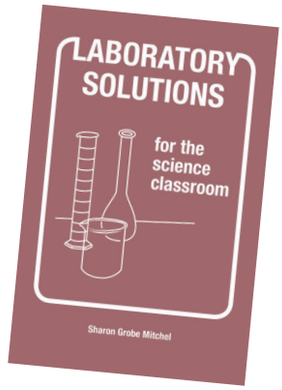
Note: DI water denotes either distilled or deionized water.

Laboratory Solutions for the Science Classroom

The Teacher's Handbook to Solution Preparation

Need a more complete guide on solution preparation? *Laboratory Solutions for the Science Classroom* has been the science teacher's No. 1 handbook for years. Includes explanations of basic concepts and vocabulary terms, detailed recipes of more than 300 commonly used solutions and practical solution-making techniques. Recipes cover biology (culture media and biological stains), chemistry and physical science solutions used in high schools. If you happen to come across a solution for which a recipe is not included, then the explanation section of the book will guide you through the steps of determining the correct procedure for making the solution. A must for all science teachers! Illustrated, appendices, glossary, index. 189 pages, 5¾" x 8¾", soft cover.

Catalog No.	Description	Price/Each
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Suggestions for Taking a Chemical Inventory **in the School Science Department**

- **Plan before you start.**
- **Have spill/breakage aids available.**
- **Make sure the room is well-lit.**
- **Alert school administrators about the inventory.**
- **Use safe ladders.**
- **Wear appropriate clothing.**
- **Avoid involving students.**
- **Work slowly.**

Responsible science teachers and school administrators agree that it is necessary to know exactly what chemical substances are present on school premises and in what quantities. Such an inventory would serve many valuable purposes such as (but not limited to):

- To comply with regulatory requirements
- To make the school safer
- To efficiently use (and perhaps share) the existing inventory
- To rid the premises of excess/unused chemical substances
- To implement the storage of all remaining substances in compatible chemical families
- To isolate and safely store particularly hazardous substances
- To create and maintain a perpetual inventory of all chemical substances
- To identify substances (e.g., severe toxins, carcinogens) that should not be found on school premises and get rid of these materials
- To identify substances as a function of their specific hazardous character (e.g., flammables, acids, oxidizers) and provide their dedicated and approved storage

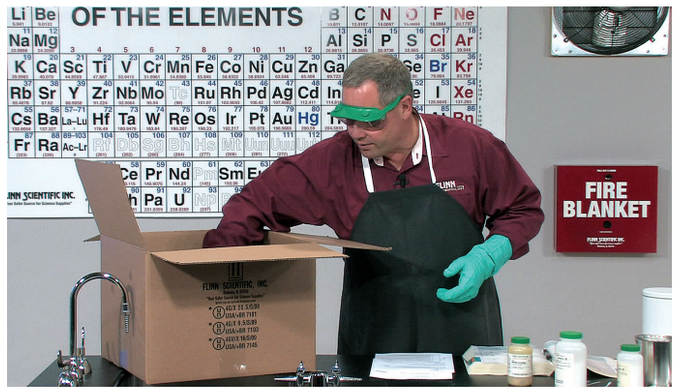
In our opinion, just plain old-fashioned "good sense" suggests that it is time for action! Action demands that you know what you have and how much of it you have. Once this inventory is accomplished, a great many benefits will follow.

It is very important to point out that laboratory chemicals should ***no longer be purchased like other routine school supplies!*** The normal routine of most schools is to acquire a year's supply of needed chemicals at one time along with other routine science supply needs. The result of this process is that dozens of chemical items, many in very large quantities, arrive at the school and are then stored in science storerooms never designed to handle such quantities and rarely equipped to meet even minimum standards of safe storage. We are sure your conventional wisdom says that the smaller the quantities of these materials found in schools at any given time, the smaller the problem.

We cannot emphasize strongly enough the need for science teachers, science department heads and, most particularly, school administrators and business managers to recognize the problems created by lumping hazardous chemicals into the buying routine. To continue to apply the same buying routine to hazards simply aggravates and perpetuates the problem. Those in the school with science backgrounds must educate the non-science-trained administrators about the severe problems created by continuing to buy hazardous chemicals in the same manner as they buy routine school supplies.

It can also accurately be stated that when a large school with many science teachers has no one in charge of managing the chemical storeroom, the problem is made more severe. When every science teacher or multiple science teachers are in charge of this matter—then, in fact, no one is in charge.

School districts with multiple school buildings also should give very serious consideration to establishing a central "chemical ordering committee." This committee could routinely see every chemical requisition. Their review would be aimed at completely eliminating or reducing the quantity of some substances purchased. No, we are not suggesting that science teachers be denied access to needed reagents. We are, however, suggesting that the matter be well managed. Who better to manage the problem than the knowledgeable users (i.e., the science teachers meeting as a committee).



It is common to find, among multiple school buildings, an excess of a chemical in Building A while the science teacher in Building B just placed an order for the very same chemical. Why can't inventories be shared with the goal of better systemwide chemical management? If the impediment to better, safer and more efficient substance management is the "established system" or the "established bureaucracy" then the "system" or the "bureaucracy" must be educated and its methods changed. An efficient method of chemical management in a science department or in a multiple-building school is to provide inventory-level information to all users and allow all users access to excess inventories. One building or department should not be allowed to rob another's inventory. However, excesses should be identified and shared. The science teacher who is a good substance or inventory manager should not be penalized to serve the poor manager in another department or building. Conventional wisdom suggests that excess substances can be better managed by sharing knowledge of their existence. For more efficient management of chemical supplies, a good inventory and communication is critical.

Once you have decided it is time to take an inventory, plan for the event using the Inventory Planning Checklist that follows on the next page. A very effective means of taking and temporarily recording your inventory is by using your phone or tablet as a recording device.

It is an absolute that you ***never undertake an inventory alone***. You must always have a teammate. The teammate is there to help you, to hold a ladder, to go for help or just to be there—but, in any case, you should never work alone. We urge against recruiting students. It is also an absolute that the right kind and type of fire extinguishers be in the room with you and immediately available for use.

Another absolute is that you are appropriately dressed and spill materials are present. In general, we assume you have done all the preplanning and all the plans have been implemented.

Record on paper or computer, the chemical name, bottle size, bottle type and approximate amount of chemical present. For example, a typical description might read, "one 5-lb bottle, glass, of acacia, about one-half full." You may opt to use Flinn Chemventory™, which is a cloud-based laboratory chemical inventory system that allows multiple users access to a single chemical inventory database from multiple

CHEMICAL INVENTORY continued on next page.

Chemical Inventory, continued

locations and devices. The program comes fully loaded with GHS pictograms, hazard codes and signal word information for more than 2,400 Flinn chemicals. You can build your inventory by selecting from a list of Flinn chemicals or add your own chemical information manually. You can build an inventory database for your school and invite other teachers, lab assistants and administrators to join for free. The program also includes a label printing feature to print GHS-compliant labels for any of the 2,400+ Flinn chemicals listed in the program. You also can take advantage of the chemical solution label printing options to easily keep track of all the solutions you prepare in your lab.

To the extent you can, you should avoid actually touching or moving bottles to take this inventory. If your shelves are loaded, you may have to remove some bottles in order to see the bottles at the rear of the shelf or cabinet. Try to avoid as much moving or transfer as possible.

It is unlikely that you will want to reorganize your shelves at this time since your primary goal is to determine what you have and how much of it you have. Once the inventory is complete and has been converted to hard copy then you can begin to think about the reorganization process. At this point focus on just discovering and recording what and how much you have. You really should not consider major reorganization until you know the "what and how much" since these facts may cause you to elect not to set shelf space aside for substances you wish to eliminate from your inventory. It is our experience that in an average school (if there is such a thing as an average school), four out of ten bottles on the shelves have not been used in the last five years and will not be used in the next five years. There is no need to dedicate shelf space to such excess substances.

If your shelves and cabinets are just loaded and a lot of movement of substances is required to inventory all the materials, then the task will require several hours. If however, most substances can be viewed and recorded with little bottle shifting or relocation then even a very large high school chemical stores facility will not require much more than about 2–2½ hours to record all of these substances and their pertinent information.

We recommend aquiring the Flinn Chemventory™. This system can be used to track and describe chemical information and on-hand amounts while also providing easy, electronic access to chemical information form on- and off-site locations.

CHEMICAL INVENTORY continued on next page.

QUESTIONS? CALL US AT
1-800-452-1261

Inventory **Planning Checklist**

- Who will be the team members to perform the inventory?
- How much time will you allow to perform this task?
- As materials are taken from the shelf (if you elect to do this at this time), where and how will they then be housed?
- Do you have the requisite safety items to protect yourselves during the process?
- Will this be simply an inventory of what substances you have, or will it be a major reorganization of the chemical stores facility?
- Are flashlights, ladders and other such devices available?
- Will the room be properly ventilated during the process?
- Will a means of communicating with the outside be available in case of a serious problem like spill, breakage or fire.
- How will you record the chemicals on a substance-by-substance basis?
- How will you handle unknowns or "mystery" substances as these are encountered?
- Will spill materials (e.g., sand, neutralizers) be available? If yes, which have you chosen?
- Will alternate containers (e.g., empty bottles, cans, bags) be available when a broken container is encountered?
- Is there a plastic broom, plastic dust pan and plastic receptacle available for cleanup?
- Have you made arrangements for the removal of unwanted substances or, if you want to isolate these materials, have you planned for temporary and safe storage methods while you examine your disposal options?
- Will a fume hood be available to very temporarily store a substance that, upon discovery, needs your immediate attention?
- Have you undertaken and completed as much storeroom housekeeping as possible prior to the inventory so you are not faced with obstacles that would lead to an accident?
- Have school authorities and maintenance people been alerted to this inventory undertaking?
- If you elect to do some disposal during the inventory process (we urge against this), are the reacting chemicals available?
- Have you arranged for the process to be free of interruptions that might distract you at a critical moment?
- Will the team members performing the inventory be wearing appropriate clothing?
- Will all sources of ignition be eliminated?
- Is it your plan to add some form of label or other kind of identification to each chemical container, and, if so, have you decided how this is to be done and do you have the means to do it available?
- Will you have a supply of replacement caps available for containers with bad closures? If you expect to transfer some substances to alternate containers, are some available?
- What will be done with the many bottles of solutions that have been prepared and stored for lab use over the past years? Will you include these in your inventory? How?
- If you expect to rearrange your chemical shelves during the process, are shelf labels available?
- Do you expect to identify substances by their hazardous character during the process? If yes, will you then house them (e.g., flammables, acids) in dedicated and approved cabinets? Are the cabinets now available? Is there sufficient space in the existing cabinets?
- Will the method you select to record this inventory allow you, if you elect to do so, to perpetually maintain the inventory?
- Will you have tape or an adhesive of some kind available to affix loose labels? Will you have blank labels available to place on currently unlabeled materials that you can identify with accuracy?

Chemical Inventory, continued

Next assign compatible chemical family designations and hazard data to each listing. Our online chemical inventory system has established 15 alpha designations to identify hazards. You may wish to use this same system to code your list. The designations follow.

Flinn Hazard Caution Codes

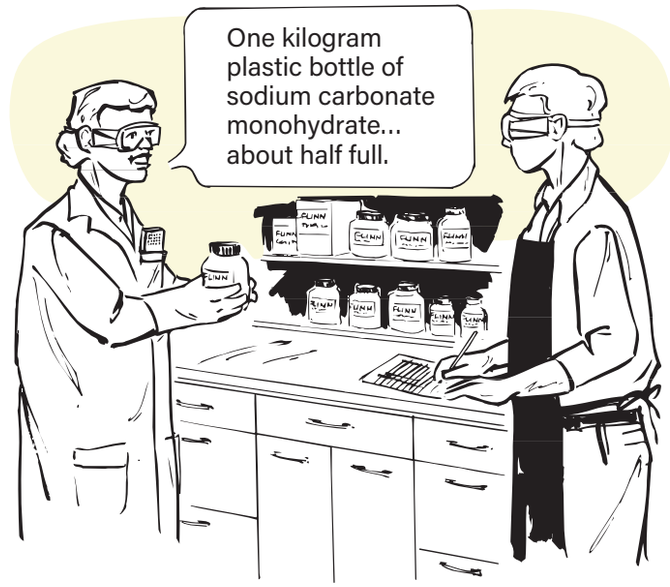
A — Flammable
B — Volatile
C — Toxic
D — Strong oxidizer or reducer
E — Carcinogenic
F — Produces peroxides
G — Skin and/or eye irritant
H — Contains harmful impurities
I — Unpredictable explosive
J — Harmful dust or vapors
K — Avoid contact with water
L — Avoid contact with air
M — Corrosive
N — Allergen
O — Avoid contact with organic material

If you do not know either the hazardous character or compatible chemical family of a substance, you need look no further than the individual listings of any chemical in the *Flinn Scientific Catalog/Reference Manual*.

Your next step would be to decide what stays and what goes in this total inventory. We urge you to be ruthless in ridding your premises of these unused and unneeded chemicals. In fact, when you have made the decision about ridding yourself of many substances, then consider getting those items off your shelf first. Do not simply acquire some cartons and pile bottle upon bottle into cartons and create a new problem. Rather, use your conventional wisdom and ask yourself if the item is hazardous and then investigate its hazardous character.

Always be able to call for help!

Should a chemical be physically isolated? Let's assume you find a 500-gram bottle of aluminum chloride, anhydrous, and you wish to rid yourself of this substance. You do not know how to achieve this, but you want it off the shelf and yet protected and safe for later disposition. Place the bottle in three thicknesses of baggies. You can get baggies at your local grocery store. Flinn has heavy-duty plastic bags called *Chem-Saf* ™ Bags for this purpose. You will find *Chem-Saf* ™ Bags listed on page 561 in this catalog/reference manual. Next, acquire some clean, never-used, one-quart and one-gallon paint cans. Flinn has such containers called *Saf-Stor* ™ Cans. These are also listed on page 561 in this catalog/reference manual. You can acquire similar cans (less heavy duty) at a local paint or hardware store.



Now line the bottom of the can with just enough vermiculite or cat litter (cat litter is bentonite) to cushion the plastic bag–enclosed bottle. Place the plastic bag–enclosed bottle in the center of the can. Fill the remaining empty void of the can with vermiculite or cat litter. Place the friction lid on the can and label the outside of the can with the chemical formula of the substance contained therein. By using the chemical formula rather than the full name, you can thwart the potential vandal intent upon securing or using a hazardous chemical. The vandal simply will not be able to read the formula.

You have now provided a secure container for this unwanted substance. You may now assign an area in the storeroom where such hazards will be safe until you investigate and ultimately exercise your disposal or removal options. You will find that plastic bags and cans can be among your best friends for isolating and containing hazards during your investigation.

The cans will serve to protect against breakage and even act as a miniature fire cabinet to prevent these hazards from being directly involved in a conflagration.

Substances that remain on your shelves can now be reorganized into their compatible chemical families. We urge that you review all the details of appropriate and safe storage in the section of this catalog/reference manual dedicated to that subject.

Avoid distractions.

For the first time, you know exactly the substances and their quantities in your chemical stores area. It is from this base of knowledge that you can begin to manage this matter of chemicals on school premises. You needed to take this first, important step. You may need further help and advice. If you do, call Flinn.

CHEMICAL INVENTORY continued on next page.

Chemical Inventory, continued

FLINN COMPATIBLE **CHEMICAL FAMILY CODES**

When you assign compatible chemical family data, you may wish to use the system created by Flinn. The family designations are listed here and explained in more detail on the following pages. Family designations for individual chemicals are found in the individual chemical listings of this catalog/reference manual.

Flinn Organic Compatible Family Codes

01 – Acids, Amino Acids, Anhydrides, Peracids

02 – Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides

03 – Hydrocarbons, Esters, Aldehydes, Oils

04 – Ethers, Ketones, Halogenated Hydrocarbons

05 – Epoxy Compounds, Isocyanates

06 – Peroxides, Hydroperoxides

07 – Sulfides, Polysulfides, Sulfoxides, Nitriles

08 – Phenols, Cresols

09 – Dyes, Stains, Indicators

0M – Miscellaneous

Flinn Inorganic Compatible Family Codes

I1 – Metals, Hydrides

I2 – Acetates, Halides, Iodides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens, Oxalates, Phthalates, Oleates

I3 – Amides, Nitrates (except Ammonium Nitrate), Nitrites, Azides

I4 – Hydroxides, Oxides, Silicates, Carbonates, Carbon

I5 – Sulfides, Selenides, Phosphides, Carbides, Nitrides

I6 – Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide

I7 – Arsenates, Cyanides, Cyanates

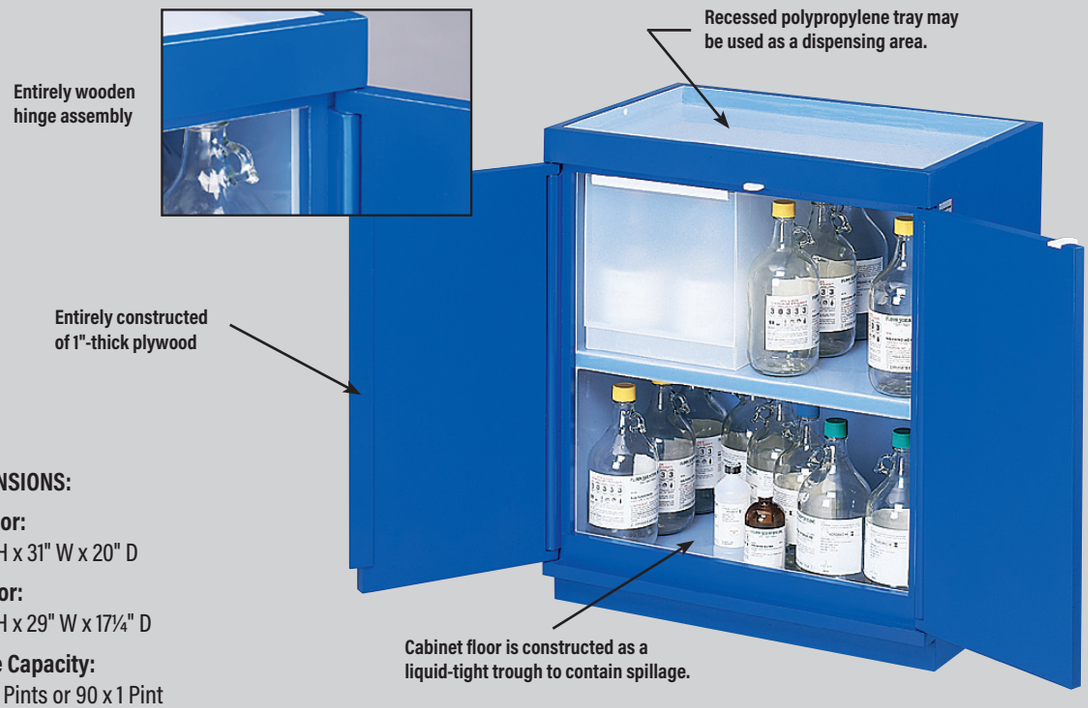
I8 – Borates, Chromates, Manganates, Permanganates, Molybdates, Vanadates

I9 – Acids (except Nitric)
(Nitric Acid is isolated and stored by itself.)

I10 – Sulfur, Phosphorus, Arsenic, Phosphorous Pentoxide

IM – Miscellaneous

Here's the Last Acid Cabinet **You'll Ever Need!**



DIMENSIONS:

Exterior:
36½" H x 31" W x 20" D

Interior:
28½" H x 29" W x 17¼" D

Bottle Capacity:
30 x 5 Pints or 90 x 1 Pint

Catalog No.	Description	Price/Each
SE8041	Flinn Acid Cabinet. Interior partially lined with polypropylene.	**$1275.00**
SE8051	Flinn Acid Cabinet. Interior fully lined with polypropylene.	**1479.00**
SE8071	Nitric Acid Compartment. Polypropylene.	**147.91**

Flinn Acid Cabinets will not rust or corrode. Many companies promise corrosion resistance; we'll guarantee it. How? Simple—we don't use metal hardware or hinges. We use only wood and plastic in our construction; therefore, there is no rust or corrosion. Our unique design and unsurpassed quality will give you an outstanding cabinet both now and for many years to come.

▶ See free video at flinnsci.com.

Suggested Sequence of Steps to More Safely **Organize Your School's Chemical Stores Area**

1 Take an inventory of all the chemicals in your school. You will never know the extent of your problem until you know exactly what you have. Record the inventory. You may want to consider the purchase of the Flinn Chemventory™ system to facilitate this task.

2 Decide what products you will need for the next year (at best, two years). Ruthlessly rid yourselves of the remaining the accumulated materials.

3 Reorganize the remaining products into their compatible chemical families (see our Suggested Chemical Storage Pattern on pages 630–631). The actual sequence of compatible families on your shelves is not critical. What is important is to keep the compatible families separate and to keep the organic and inorganic families as far apart as possible. The Suggested Shelf Storage Pattern shown on pages 631–632 is only one suggested sequence you can use. If shelf space is a problem, you are permitted to place more than one compatible family on a shelf. Make sure you either have a physical divider or leave a 3" space between each family.

Hundreds of teachers who have reorganized their shelves, using these patterns, tell us products are easier to find versus the alphabetical system previously used. When you reorganize, you may need some estimate of the percentage of shelf space each family might occupy. If yours is a "typical" high school, the following profile may be a helpful guide.

Inorganic Families

Families	Percentage of Shelf Space Occupied	Families	Percentage of Shelf Space Occupied
Acids (Inorganic 9)	Store away from all other items. Store in a dedicated acid cabinet. Store nitric acid away from all other materials.	Sulfides, etc. (Inorganic 5)	Less than 1%
Metals, etc. (Inorganic 1)	Less than 5%	Chlorates, Perchlorates, etc. (Inorganic 6)	5+%
Halides, Sulfates, Phosphates, Acetates, etc. (Inorganic 2)	Could be 35–40% of available space. This is usually the largest family.	Arsenates, etc. (Inorganic 7)	Less than 1%
Nitrates, etc. (Inorganic 3)	Approximately 8–10%	Borates, Chromates, etc. (Inorganic 8)	Less than 1%
Hydroxides, Oxides, etc. (Inorganic 4)	Approximately 10%	Sulfur, Phosphorus, etc. (Inorganic 10)	Approximately 3%

4 ### Organic Families

Organic acids (Organic 1) will probably occupy about 5+% of your organic shelf space except for acetic acid, which should be stored with the inorganic acids (e.g., hydrochloric) in a dedicated acid cabinet. Keep acetic acid *away* from nitric acid. If your school is "typical," the remainder of your organic materials may occupy about 15–20% of your total shelf space. You should store all flammable organics in a dedicated flammables cabinet.

5 ### Other Materials

There may be some very large space consumers in 2-kilogram (5-lb.) containers (e.g., calcium chloride, calcium hydroxide). Certainly you may wish to extend family storage in a separate location for such large volumes of large packages.

6 ### Congratulations! You have now reorganized your chemical stores facility to:

- Store compatible products together.
- Separate acids into dedicated storage.
- Separate flammables into dedicated storage.
- Lock up all poisons.
- Record all inventory.
- Rid yourselves of excess materials.

YOU NOW HAVE A SAFER FACILITY!

Suggested Chemical **Storage Pattern**

Storage of laboratory chemicals presents an ongoing safety hazard for school science departments. There are many chemicals that are incompatible with each other. The common method of storing these products in alphabetical order sometimes results in incompatible neighbors. For example, storing strong oxidizing materials next to organic chemicals can present a hazard.

A possible solution is to separate chemicals into their organic and inorganic families and then to further divide the materials into related and compatible families. Following is a list of compatible families. On the next page, you will find this family arrangement pictured as shelf areas in your chemical stores area. The pictured shelf arrangement will easily enable you to rearrange your inventory into a safer and more compatible environment.

Inorganic

1. Metals, Hydrides
2. Acetates, Halides, Iodides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens, Oxalates, Phthalates, Oleates
3. Amides, Nitrates (except Ammonium Nitrate), Nitrites, Azides
4. Hydroxides, Oxides, Silicates, Carbonates, Carbon
5. Sulfides, Selenides, Phosphides, Carbides, Nitrides
6. Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide
7. Arsenates, Cyanides, Cyanates
8. Borates, Chromates, Manganates, Permanganates, Molybdates, Vanadates
9. Acids (except Nitric) (Nitric Acid is isolated and stored by itself.)
10. Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide
11. Inorganic miscellaneous

Organic

1. Acids, Amino Acids, Anhydrides, Peracids
2. Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides
3. Hydrocarbons, Esters, Aldehydes, Oils
4. Ethers, Ketones, Halogenated Hydrocarbons
5. Epoxy Compounds, Isocyanates
6. Peroxides, Hydroperoxides
7. Sulfides, Polysulfides, Sulfoxides, Nitriles
8. Phenols, Cresols
9. Dyes, Stains, Indicators
10. Organic miscellaneous

NOTE: If you store volatile materials (e.g., ether, hydrocarbons) in a refrigerator, the refrigerator must be explosion-proof. The thermostat switch or light switch in a standard refrigerator may spark and set off the volatile fumes inside and thus cause an explosion.

This list is not complete and is intended only to cover the materials possibly found in an average school situation. This is not the only method of arranging these materials and is only offered as a suggestion.

See the next few pages for detailed inventory and storage steps you might follow to vastly improve the safety profile of your chemical storage.



SUGGESTED SHELF STORAGE PATTERN—**INORGANIC**

INORGANIC #10
Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide

INORGANIC #2
Halides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens, Acetates, Oxalates, Phthalates, Oleates, Iodides

INORGANIC #3
Amides, Nitrates (not Ammonium Nitrate), Nitrites, Azides
(Store Ammonium Nitrate away from all other substances—*ISOLATE IT!*)

INORGANIC #1
Metals & Hydrides
(Store away from any water.)
(Store flammable solids in flammables cabinet.)

INORGANIC #4
Hydroxides, Oxides, Silicates, Carbonates, Carbon

If possible avoid using the floor.

INORGANIC #7
Arsenates, Cyanides, Cyanates
(Store away from any water.)

INORGANIC #5
Sulfides, Selenides, Phosphides, Carbides, Nitrides

INORGANIC #8
Borates, Chromates, Manganates, Permanganates, Molybdates, Vanadates

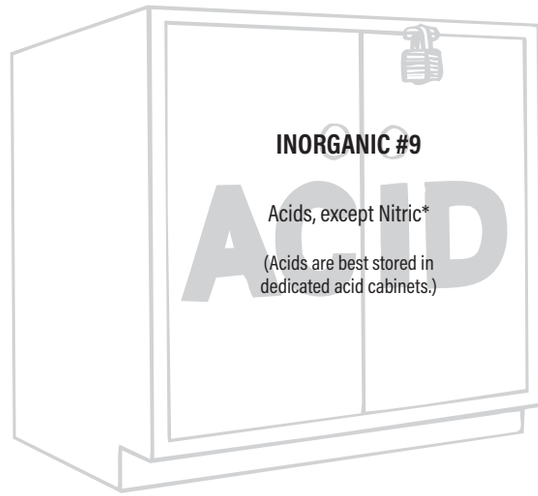
INORGANIC #6
Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide

MISCELLANEOUS

Storage Suggestions

1. Avoid storing chemicals on the floor (even temporarily).
2. Do not use the top shelf for chemical storage.
3. Do not store chemicals above eye level.
4. Firmly secure shelf assemblies to walls. Avoid island shelf assemblies.
5. Provide anti-roll-off lips on all shelves (Catalog No. SE1069).
6. Ideally, shelving assemblies should be of wood construction.
7. Avoid adjustable metal shelf supports and clips. It is better to use fixed, wooden supports.
8. Store acids in a dedicated acid cabinet. Store nitric acid in the same cabinet **only** if isolated from other acids. Store both inorganic and some organic acids in the acid cabinet.
9. Store flammables in a dedicated flammables cabinet.
10. Store severe poisons in a dedicated poisons cabinet.

OTHER STORAGE SUGGESTIONS ARE CONTAINED THROUGHOUT THIS CATALOG/REFERENCE MANUAL.



*Store nitric acid away from other acids unless your acid cabinet provides a separate compartment for nitric acid.

SUGGESTED SHELF STORAGE PATTERN—**ORGANIC**

ORGANIC #2
Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides
(Store flammables in a dedicated cabinet.)

ORGANIC #3
Hydrocarbons, Oils, Esters, Aldehydes
(Store flammables in a dedicated cabinet.)

ORGANIC #4
Ethers, Ketones, Halogenated Hydrocarbons, Ethylene Oxide
(Store flammables in a dedicated cabinet.)

ORGANIC #5
Epoxy Compounds, Isocyanates

ORGANIC #7
Sulfides, Polysulfides

ORGANIC #8
Phenols, Cresols

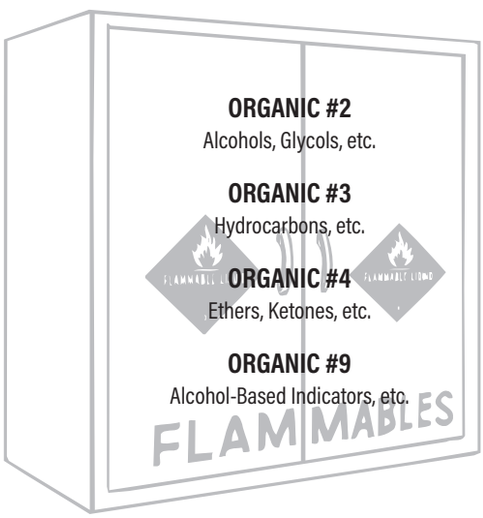
ORGANIC #6
Peroxides, Hydroperoxides

ORGANIC #1
Acids, Amino Acids, Anhydrides, Peracids
(Store **certain** organic acids in acid cabinet.)

ORGANIC #9
Dyes, Stains, Indicators
(Store alcohol-based solutions in flammables cabinet.)

MISCELLANEOUS

If possible avoid using the floor.





HOW TO

Maximize Storage Space

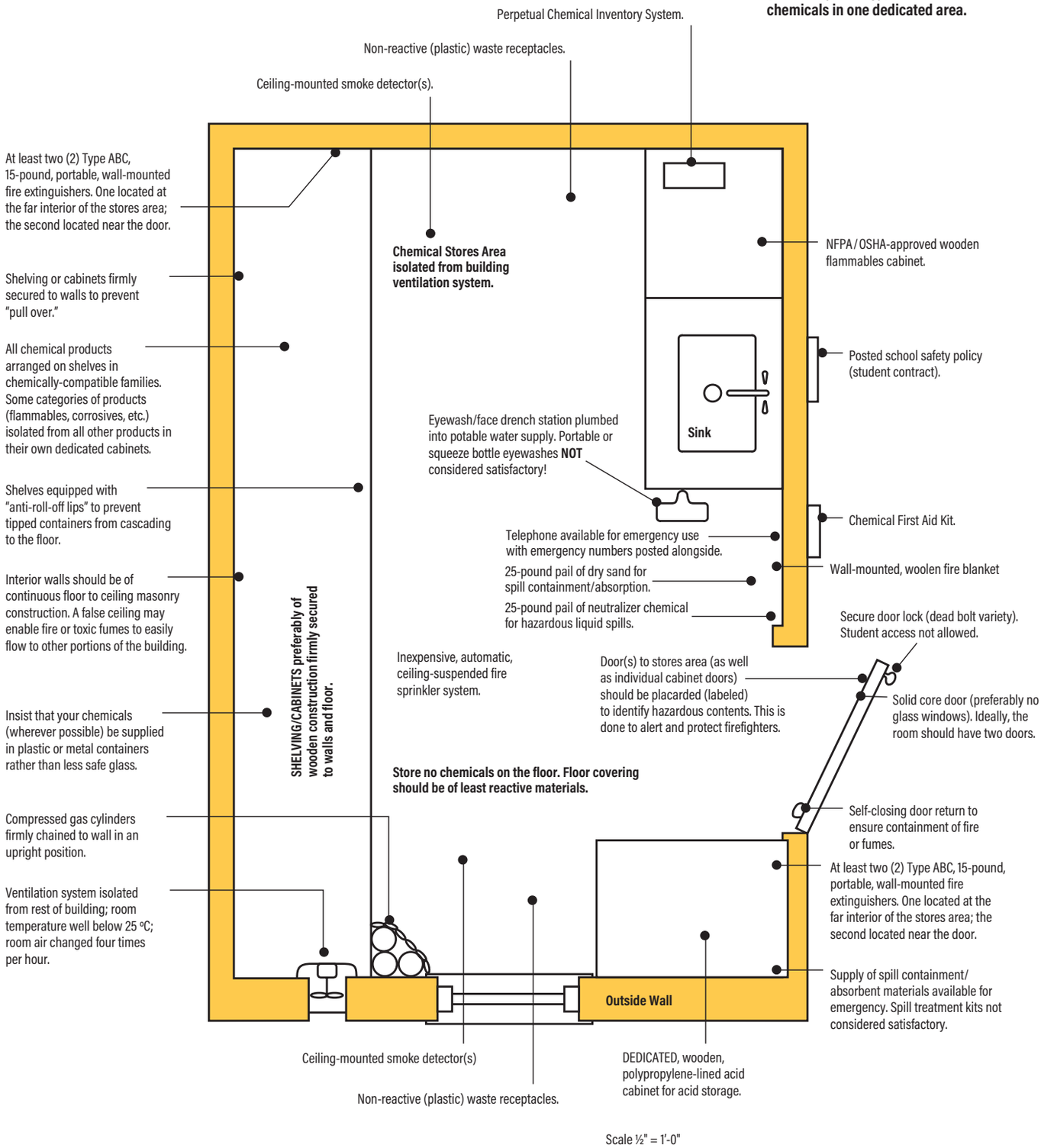
If shelf space is a problem, you are permitted to place more than one compatible chemical family on a shelf. Make sure you either have a physical divider or leave a 3" space between each family. This will maximize your tight shelf space while keeping each compatible chemical family separate from one another.

See page 602 for complete instructions on organizing your chemical stores area.

MODEL CHEMICAL STORES AREA

Please compare your facility to this model.

- **Never store chemicals in a fume hood.**
- **No chemicals routinely stored in classrooms.**
- **VARIOUS SCIENCE DEPARTMENTS (chemistry, biology) should store their chemicals in one dedicated area.**



Scale ½" = 1'-0"

DO NOT STORE CHEMICALS IN ALPHABETICAL ORDER!

IF PRODUCTS ARE STORED TOGETHER	POSSIBLE REACTIONS
Acetic acid + acetaldehyde	**Small amounts of acetic acid will cause the acetaldehyde to polymerize, releasing great amounts of heat.**
Acetic anhydride + acetaldehyde	**Reaction can be violently explosive.**
Aluminum metal + ammonium nitrate	**Potentially explosive results.**
Aluminum metal powder + antimony trichloride	**Aluminum metal burns in the presence of antimony trichloride.**
Aluminum metal + any bromate, chlorate or iodate	**Finely divided aluminum metal in contact with a bromate, chlorate or iodate can be easily detonated by heat, shock or friction.**
Aluminum + bromine vapor	**Aluminum foil reacts with bromine vapor at room temperature and incandesces.**
Aluminum chloride, anhydrous	**$AlCl_3$, anhydrous, is constantly generating hydrochloric acid. After long storage, tightly closed containers have been known to explode when opened.**
Ammonia vapor + bromine vapor	**Unstable nitrogen tribromide is formed and explosion may result.**
Ammonium nitrate + acetic acid	**A mixture may result in ignition, especially if the acetic acid is concentrated.**
Antimony + bromine	**Antimony is spontaneously flammable in the presence of any halogen vapor.**
Arsenic + any bromate, chlorate or iodate	**A potentially explosive combination results if detonated by heat, shock or friction.**
Barium + carbon tetrachloride	**A violent reaction may occur.**
Calcium hypochlorite + charcoal	**A mixture can result in an explosion if heated.**
Carbon + any bromate, chlorate or iodate	**A potentially explosive combination results if detonated by heat, shock or friction.**
Carbon disulfide + aluminum	**Finely divided aluminum will spontaneously burst into flame in the presence of carbon disulfide.**
Chromium trioxide and glycerol	**Violent reaction may cause mixture to ignite.**
Copper + bromate, chlorate or iodate	**A potentially explosive combination results if detonated by heat, shock or friction.**
Hydrogen peroxide (6% or more) + iron(II) sulfide	**A vigorous, highly exothermic reaction results.**
Hydrogen peroxide (6% or more) + lead(II) or (IV) oxide	**Violent, possibly explosive reaction results.**
Lead sulfide + hydrogen peroxide (6% or more)	**Vigorous, potentially explosive reaction results.**
Magnesium hydroxide + maleic anhydride	**Potentially explosive reaction results.**
Mercury(II) nitrate + methyl alcohol	**May form mercury fulminate—an explosive.**
Mercury(II) oxide + magnesium metal	**An explosion may result if heated.**
Mercury(II) oxide + phosphorus	**Percussion may ignite this mixture.**
Nitric acid + magnesium metal powder	**Will react with explosive force.**
Nitric acid + phosphorus	**Phosphorus will burn spontaneously in the presence of nitric acid.**
Potassium cyanide + potassium nitrite	**A potentially explosive mixture results if heated.**
Silver metal + tartaric acid	**An explosive mixture results.**
Silver oxide + sulfur	**A potentially explosive mixture results.**
Sodium + sulfur	**Under the right conditions the reaction can proceed with explosive violence.**
Sodium nitrate + sodium thiosulfate	**A mixture of dry materials can result in explosion.**
Tin(IV) chloride + turpentine	**A flame-producing, exothermic reaction results.**

Review of Chemical **Disposal Procedures**

Responsible management of the chemical resources of school science labs encompasses best practices for the purchase, storage, use and disposal of chemicals. It is a shared responsibility of the administration, faculty and staff. Chemical disposal procedures require compliance with a variety of federal, state and local laws and regulations and are therefore a particular challenge for many science departments.

The Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) is the key law dealing with the identification, management and disposal of hazardous waste. All institutions are required to have a policy for identifying hazardous waste and complying with the requirements of RCRA, which was enacted in 1976. The overarching goals of the law are to reduce the amount and toxicity of hazardous waste and thus protect human health and the environment. In writing the regulations to ensure that the goals of RCRA are achieved, the Environmental Protection Agency (EPA) also has the mandate to promote methods to minimize the amount of hazardous waste and reduce its environmental impact. These methods include source reduction, reuse and recycling of wastes and chemical treatment that will eliminate hazardous waste characteristics.

Knowing Your RCRA Status and Requirements

In most cases, authority for implementing and enforcing the law has been delegated to individual states that have adopted the RCRA guidelines. Some states may be more restrictive or impose additional conditions than federal guidelines require. The Federal EPA recognizes three classes of hazardous waste generators based on the amount and kinds of hazardous waste generated in one month. The storage and reporting regulations become increasingly more stringent as the amount of hazardous waste increases. Schools that generate less than 100 kg (220 lbs) of hazardous waste per month—and no more than 1 kg of acutely hazardous waste in any month—would fall into the least regulated "conditionally exempt small quantity generator" class. The EPA defines hazardous waste as a subset of solid waste, where solid waste is anything that will be discarded or may enter the environment—by burning, for example. (It's confusing, but the term solid waste thus includes solids, liquids or gases!) Obviously, all schools and other institutions produce solid waste. Regardless of their RCRA status, all schools are required to determine which types of solid waste must be classified as hazardous waste. (The definitions for these types of waste are summarized in the following sections.)

Identifying Hazardous Waste

The first step in managing chemical disposal is identifying which discarded chemicals, as well as chemical reaction mixtures or byproducts that will not be reused, must be considered hazardous waste. There are two broad categories of hazardous waste—characteristic wastes and listed wastes. *Characteristic wastes* have one or more of the following properties:

- *Ignitable* wastes include flammable or combustible liquids (flash point <140 °F) as well as flammable compressed gases and solid oxidizers. Organic solvents, such as acetone or toluene, compressed gases, such as hydrogen, and solid ammonium nitrate are examples of ignitable wastes.
- *Corrosive* wastes are acidic or basic solutions that have a pH <2 or >12.5, respectively.
- *Reactive* wastes are substances that react violently with air or water, are capable of detonation or can generate toxic gases under relatively neutral conditions. Examples include the alkali metals sodium and potassium, diethyl ether and other peroxide-forming organic compounds and cyanides or sulfides.
- *Toxic* chemical wastes are substances that, if disposed in a landfill, are capable of leaching threshold amounts of specific chemicals into groundwater. There are 40 substances in this category (also known as toxicity characteristic wastes). Although many of the substances on this list are pesticides, the list includes common heavy metals, including lead, barium and silver.

There are four categories of *listed wastes*. Two categories include chemical byproducts from manufacturing processes and do not generally apply to schools. The other two categories, designated by the codes P and U, identify by name specific discarded commercial chemical products. All academic institutions should be aware of the chemicals on the P- (acutely toxic) and U- (toxic) lists. The P-listed, or *acutely toxic,* wastes are especially important because any school generating more than 1 kg (2.2 pounds or approximately one quart of liquid) of acutely hazardous waste per month will be subject to the most stringent generator requirements for listing, storing and reporting all their hazardous waste. Most institutions do not use many P-list chemicals. The exceptions, which some schools might use, are sodium cyanide, potassium cyanide, arsenic trioxide, sodium azide, ammonium vanadate and carbon disulfide. Recall that listed wastes refer to *discarded* or unused commercial chemical products where the chemical is the sole active ingredient. Make sure your school has effective chemical purchasing and inventory controls in place if you use P-listed chemicals in your science labs. This will prevent the school from accumulating excess chemicals that must be discarded.

Treating Chemicals in the Lab

The EPA encourages all waste generators, including academic institutions and laboratories, to minimize the amount of hazardous waste. Treating materials in the lab to reduce or eliminate chemical and physical hazards is one strategy for accomplishing this goal. Chemicals or chemical byproducts that are stored in the lab or remain in the lab after a lab activity is finished are not generally regulated as solid waste. The treatment of hazardous waste without a permit is generally not allowed. To avoid restrictions on treating hazardous waste, **always incorporate treatment or disposal of excess reagents or chemical byproducts from a chemical reaction into the lab procedure itself**. The Flinn Suggested Disposal Methods described on pages 640–641 frequently may be used to treat chemicals and eliminate potential hazards. Before undertaking any of these methods, it is important to read, review and understand the general principles and guidelines governing the disposal of laboratory chemicals:

- Check all federal, state and local guidelines that may apply.
- All procedures should be carried out by skilled and trained personnel who are familiar with the physical and chemical properties of the chemicals and understand the procedure.
- Observe all safety precautions, including the requirements for personal protective equipment.
- Carry out all reactions that may generate gases in the hood.
- Provide secondary containment to protect against spills.
- Consult current Safety Data Sheets for storage, handling and disposal information.
- Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

Examples of generally allowed chemical treatment methods include neutralization of acids and bases (Flinn Suggested Disposal Methods #24a, #24b and #10, respectively); redox reactions for oxidizing agents and reducing agents (Flinn Suggested Disposal Methods #12a and #12b); and precipitation reactions for metals (Flinn Suggested Disposal Methods #11 and #27h).

As an example of this strategy, some experiments or demonstrations, such as the iodine clock reaction, may produce small amounts of iodine as a byproduct. Incorporate reduction of the iodine, an oxidizer, at the conclusion of the experiment. (Halogens may be reduced with sodium thiosulfate according to Flinn Suggested Disposal Method #12a.) In reviewing this treatment method, make sure you know the balanced chemical equation so the appropriate molar excess of reducing agent, as well as any acid or base needed for the reaction, will be used.

QUESTIONS? CALL US AT
1-800-452-1261

REVIEW OF CHEMICAL DISPOSAL PROCEDURES continued on next page.

Review of Chemical Disposal Procedures, continued

Reducing the Amount and Toxicity of Hazardous Waste

Not all potentially hazardous waste must be shipped off-site for treatment or disposal. EPA and many states provide several regulatory exclusions that allow generators to treat hazardous waste without a permit as part of a broader mandate to further waste reduction efforts. In its publication "Little Known but Allowable Ways to Deal with Hazardous Waste," published in 2000, the EPA describes five strategies for minimizing hazardous waste. These include the domestic sewage exclusion, elementary neutralization, recycling, treatment in accumulation containers and burning in small boilers. Recall that each state sets its own requirements for compliance with RCRA regulations. Requirements cannot be less strict than federal law, but states may impose more limitations than federal law. Thus 28 states allow treatment in accumulation containers, two prohibit it, and the others impose some conditions or restrictions on treatment methods. (A complete state-by-state listing of all allowable waste reduction strategies can be found in the Appendix to the EPA publication cited.)

Source reduction, or pollution prevention, is the preferred method for reducing the environmental burden of hazardous wastes. Materials also may be reclaimed by processing them to recover useful products. When source reduction and reuse or recycling are not feasible, waste may be treated to reduce its volume and toxicity. EPA allows drain disposal of even hazardous wastes via the "domestic sewage exclusion" provided that amounts and chemicals are in compliance with all wastewater standards and discharge limits imposed by publicly owned water treatment works. Among the allowed chemical treatments are elementary neutralization of acids and bases, precipitating metals from solution to obtain insoluble salts and oxidation–reduction reactions. Treatment residues may still require management as a hazardous waste, and residues destined for land disposal are subject to land disposal restriction standards. **Never dispose of chemicals in a septic system or storm sewer.** Make sure chemicals will not react with piping systems, and do not specifically rely on dilution to reduce the reactivity of chemicals or render them nonhazardous.

Licensed Hazardous Waste Disposal

Some chemicals always will require licensed hazardous waste disposal. These include toxic heavy metal salts and their solutions, including mercury, lead, cadmium and chromium; arsenic and its compounds; halogenated organic solvents, such as methylene chloride, chloroform, trichloroethylene or perchloroethylene; and various pesticides.

Summary

Most schools and many small colleges will fall into the least regulated "conditionally exempt small quantity generator" class for complying with EPA regulations regarding the storage and disposal of hazardous waste; however, it is important to know your status. It is the responsibility of every school to identify all types of hazardous waste that they generate—whether characteristic wastes or listed wastes. An accurate and up-to-date chemical inventory is the most effective means of keeping track of all chemicals and thus preventing the accumulation of unused chemicals that will need to be discarded. This is especially important for discarded chemicals that would be designated as P-list, or acutely toxic, hazardous waste. Of the more than 2,400 chemicals that Flinn Scientific sells, only six are on the P-list. Laboratory chemicals or chemical byproducts are not generally considered to be waste until they have left the lab. To avoid restrictions on treating hazardous waste, always incorporate treatment of excess chemicals or chemical byproducts from a lab activity into the lab procedure itself. Please consult this *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. In its effort to reduce the amount and toxicity of hazardous waste, the EPA provides several exclusions for the treatment of hazardous waste without a permit. However, not all states allow all of these procedures. Among the generally allowed treatment methods are acid–base neutralization reactions, oxidation–reduction reactions and precipitating metals to obtain insoluble salts. Some chemicals always will require licensed hazardous waste disposal. Please call or email Flinn Scientific if you have any questions or if we can offer additional assistance.



Review of Chemical Disposal Procedures

The administration, faculty and staff share responsibility for minimizing the amount of hazardous waste and disposing of those wastes in a way that safeguards human health, protects the environment and complies with all relevant environmental laws and regulations.

It is suggested that regular safety meetings are conducted. The discussion period will vary depending on the issues that need to be addressed.

It is important to keep a copy of safety training notes and a signed attendance sheet to verify that regular safety training meetings were held. The sign-up sheet is almost as important as the training notes and is usually the first thing that is requested and reviewed by regulatory inspectors. A copy of the sign-up sheet that we suggest using may be found at www.flinnsci.com/forms/signup.aspx.

References

1. "Hazardous Waste Management for School Laboratories and Classrooms," EPA Publication 908-F-06-001, February 2006. Available online (accessed August 2015)
2. "Chemical Management Resource Guide for School Administrators," EPA Publication 747-R-06-002, December 2006. Available online (accessed August 2015)
3. "Little Known but Allowable Ways to Deal with Hazardous Waste," EPA Publication 233-B-00-002, May 2000. Available online (accessed August 2015)
4. ACS Task Force on Laboratory Waste Management; *Laboratory Waste Management: A Guidebook;* American Chemical Society: Washington, DC (2012).
5. Margaret-Ann Armour, *Hazardous Laboratory Chemicals Disposal Guide,* Third Edition; CRC Press, Lewis Publishers: Boca Raton, FL (2003).
6. National Research Council; *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards;* National Academies Press: Washington, D.C. (2011).

16 Steps to Minimize **Chemical Disposal**

Smart, Inexpensive Practices to Reduce Hazardous Waste

The single largest chemical problem facing most academic institutions today is chemical disposal. Purchasing chemicals in large package sizes, poor chemical inventory management, faculty and staff turnover and changes in the curriculum are just a few of the many reasons why your school may have a chemical disposal problem. Every school, college and university needs a plan to minimize future laboratory chemical/disposal issues. Chemical disposal is a necessary part of any chemical laboratory activity. The following 16 steps will help reduce the amount of chemicals that need to be disposed and make the disposal process easier to manage.

1. **Maintain an up-to-date inventory of your chemicals.**
   Maintaining a good chemical inventory will eliminate buying excess or unneeded chemicals.
2. **Purchase chemicals carefully.**
   Careful purchasing is the first step in decreasing the amount of unwanted chemicals and subsequent chemical disposal. To reduce unwanted chemicals, purchase smaller size packages of chemicals, only what is needed for the next 1 to 3 years and only from chemical suppliers that will guarantee fresh chemicals. If you only need a dilute solution of a chemical, buy the solution and not a large bottle of the solid. Buying chemicals in bulk to save a few dollars ends up costing more in the long term. Disposal of unused chemicals always will cost more than any cost savings from larger sized packages.
3. **Date label your chemicals, and only buy from chemical supply companies that date label their chemicals.**
   Chemicals age at different rates, and knowing the age of your chemicals may help you determine if they are still usable.
4. **Use older chemicals first before they decompose.**
   This requires date labeling of chemicals.
5. **Provide good climate control for the chemical storeroom.**
   Store chemicals in a cool, dry environment. Heat and humidity quickly degrade chemicals, resulting in materials that are unsuitable for laboratory use and require disposal. This is particularly important during the summer months when many schools may turn off their air conditioning.
6. **Ventilate your storeroom.**
   Providing a continuous air exchange in your storeroom is not only safer for you, but it will provide a better environment for storage of chemicals.
7. **Label all chemicals and laboratory solutions.**
   Any unlabeled bottle becomes a chemical disposal nightmare; first the chemical must be identified, then it must be discarded properly. To avoid unknown and unwanted solutions, replace or repair old labels and immediately label all prepared solutions.
8. **Prepare only enough solution for immediate use.**
   Preparing extra solution for storage frequently results in many bottles of unwanted solutions that ultimately require disposal.

Be proactive... Reduce chemical waste starting today.

9. **Never store chemicals or solutions in "homemade" bottles.**
   Storing solutions in containers not designed for chemical storage leads to a shorter shelf life of the laboratory chemical. "Homemade" bottles may not provide suitable protection from the environment or may not be compatible with the chemical. Using proper chemical containers will provide safer storage and allow for longer storage of chemical solutions.
10. **Store hygroscopic and deliquescent chemicals in *Chem-Saf*™ bags.**
    Make sure the caps are on tight and use Parafilm M® around the cap for extra protection. *Chem-Saf*™ bags and tight caps help keep moisture out of containers and greatly increases their shelf life.
11. **Follow good laboratory practices.**
    Never allow students to place chemicals back into a chemical reagent bottle. Contamination from student use will dramatically reduce purity and the shelf life of a chemical. To enforce this practice, place smaller amounts of chemicals in beakers or bottles for dispensing.
12. **Microscale your labs.**
    Microscale laboratory procedures can reduce your wastes a hundredfold. Many times the quantities produced in a microscale lab can be disposed of down the drain. If you microscale your labs, also microscale the quantity of chemicals you purchase (see step 2).
13. **Purchase chemical demonstration kits or student laboratory kits that contain the exact quantities of chemicals.**
    This eliminates storage and disposal of "extra" chemicals. Flinn chemical demonstration kits contain enough chemicals to present the demonstration seven times. At the end of the day, there are no unused or unwanted chemicals.
14. **Look at disposal procedures first.**
    When choosing a lab or demonstration, look at the disposal procedure first. If the disposal procedure is difficult, consider using microscale techniques or substituting less hazardous materials. Avoid the use of heavy metals whenever possible.
15. **Neutralize, reduce byproducts and dispose of chemicals immediately after they are generated.**
    Do not stockpile unwanted byproducts or other laboratory wastes from chemical reactions or experiments. Treat chemical byproducts or leftover solutions as part of the experimental procedure. This is safer and easier than stockpiling chemicals for a massive disposal at the end of the year.
16. **Identify hazardous waste, and keep waste solutions separate.**
    Never mix leftover chemicals or byproducts from different labs unless the materials have identical disposal methods and are chemically compatible. Adding a small amount of a lead compound to a waste bottle necessitates licensed hazardous waste disposal of the entire contents due to heavy metal contamination.

Implementing and following these 16 steps to minimize chemical waste will save money and improve the overall safety profile of your school.



Laboratory Chemical **Disposal**

The Basics of Laboratory Chemical Disposal

Before You Undertake Any Disposal Procedure—Please Read this Narrative!

Chemical disposal is a routine part of laboratory science programs. Most lab activities will generate some leftover chemicals, solutions and chemical byproducts that will require proper disposal. Advance planning and preparation will help you minimize the amount of hazardous waste generated and reduce the time and resources needed to dispose of excess nonhazardous chemicals or chemical byproducts.

Every school should have a Chemical Hygiene Plan that outlines appropriate policies and procedures for disposing of laboratory chemical byproducts and correctly identifying hazardous waste requiring licensed disposal. The first step in any laboratory waste policy should attack the problem at its source—where and when waste is generated. Careful planning, tailoring lab activities to clear curriculum objectives, adopting microscale lab techniques and substituting safer chemicals will help you reduce the amount of waste generated. (See the article "16 Steps to Minimize Chemical Disposal" on page 637.)

Laboratory chemical disposal requires specific knowledge and procedures. Knowing the type of sewer system your school has and understanding all federal state, and local regulations that may apply are important steps in laboratory chemical disposal. Before you choose a disposal method, it is absolutely essential that you review your plans with regulatory officials. Do not assume that because we publish a set of disposal methods that these methods are "approved" or have the "blessing" of regulatory officials—NOT SO! In publishing laboratory waste disposal methods, we assume that:

- ▶ You will consult with local regulatory officials before proceeding.
- ▶ You will act responsibly with respect to all regulations.
- ▶ The quantity of material involved is very small (i.e., laboratory quantities).
- ▶ Only trained personnel will attempt the methods.

DO NOT USE THESE METHODS if they do not meet local regulations, if the quantity of material is not small or if you are not comfortable with a disposal procedure.

Advance knowledge, preparation and planning also will allow you to dispose of laboratory waste safely and effectively. There are three main categories of laboratory waste generated:

- ▶ Biological or biomedical waste (preserved materials, "live" material remains, culture products)
- ▶ Chemical waste (unused testing solutions, reaction products, stains and indicators)
- ▶ Hazardous waste requiring licensed disposal

Biological Waste

Biological science experiments may produce hazardous waste. Special attention should be paid to all microbiological culture products since they may contain harmful organisms. Preserved materials, deceased living materials and all "sharps" also deserve special attention prior to disposal. To assist with handling biological wastes, Flinn Scientific has developed a biological waste disposal procedure. Please review pages 658–659 for a thorough discussion and detailed procedures for the safe disposal of of biological waste materials.

Chemical Waste From Laboratory Experiments

Before performing any laboratory activity, review the properties of the chemicals required and any products that may be generated. If the reactants or products present unique hazards or will require specialized disposal (e.g., flammable organic solvents), consider modifying the experiment or finding a different experiment that will teach the same concept. Flinn Scientific maintains an extensive library of tested laboratory activities. Please call (1-800-452-1261) or email us (flinn@flinnsci.com) for suggestions of safe laboratory activities.

The catalog entry for every chemical listed in the Chemicals section of this *Flinn Scientific Catalog/Reference Manual* includes a Flinn Suggested Disposal Method number in the product description. Simply look up the product in the alphabetical section of the chemical listings and determine the disposal number. Then refer to this Suggested Disposal Methods on page 640.

For best results, incorporate treatment of leftover chemicals and reaction byproducts into any laboratory activity involving chemicals. Collect all solutions or similar products in a centrally located container. For example, if students are working with acidic solutions with a pH <2, have them pour their products into one beaker placed in the hood or other central location. The acid solution may then be neutralized with base according to Flinn Suggested Disposal Method #24b at the end of the lab period. Making disposal a routine part of every lab activity teaches students that concern for the environment is everyone's responsibility and that scientists working in the lab also take this responsibility seriously.

Inventory Management and Laboratory Chemical Disposal

Chemicals, supplies and equipment tend to accumulate in the science department over time and can lead to hazardous situations. Effectively managing the chemical inventory in the school will help you reduce the amount of chemical waste and the potential impact of waste disposal on your school's budget and resources. The chemical storeroom should be cleaned out on a regular basis. Before you undertake chemical cleanout and disposal, enlist the active consent and participation of school or district administrators and facilities or risk managers to provide adequate resources. Hasty responses to chemical disposal are often expensive, unsafe or harmful to the environment.

Inspecting and Preparing the Inventory

Carry out a preliminary inspection to determine if cleanout and disposal are warranted. Look for the following:

- Bottles and containers that are broken, corroded or have crystals growing around the caps or liquid seeping out of closures.
- Inappropriate storage containers, such as beakers, flasks, buckets, plastic soda bottles or food jars.
- Poorly labeled containers used for storing solutions or transferring chemicals. Labels must have the chemical name, concentration, date and appropriate hazard information and warnings.

Prepare or update the annual chemical inventory and identify chemicals you want to keep. Laboratory chemicals and preserved materials that are no longer part of the curriculum should be removed as should chemicals that are dangerously toxic, potentially explosive, contaminated or decomposed, mislabeled, out-of-date or present in surplus amounts. Assemble a list of chemicals requiring disposal. Include the full name of the chemical, the quantity printed on the bottle's label and the number of bottles of each size. The size of the bottle is often more important than the quantity of material if the whole bottle must be removed and shipped to a disposal facility. The cost may be equal whether there are 1 or 100 bottles in a drum.

Chemical Disposal

Research the properties of unneeded chemicals to determine any that may be neutralized, reduced, precipitated and/or disposed of in the trash or down the drain. The description for each chemical in your current *Flinn Scientific Catalog/Reference Manual* includes a disposal number. This number refers to one of the generally allowed, suggested disposal methods listed in the reference section of the catalog. Please verify state and local regulations that may apply as some methods may not be permitted in particular areas. Disposal options also may be limited by the type of septic system the school has.

LABORATORY CHEMICAL DISPOSAL continued on next page.

Laboratory Chemical Disposal, continued

Review the following general guidelines and safety rules before attempting any disposal procedure.

- The quantity of material should be small—laboratory quantities only.
- Make sure you have read and understand the chemistry involved in the procedure.
- Never work alone!
- Always wear appropriate personal protective equipment.
- Perform all procedures in a laboratory environment with good ventilation.

Hazardous Waste Disposal

Some chemicals, such as heavy metal salts (e.g., Cr, Pb, Ba) and halogenated solvents, always will require licensed hazardous waste disposal assistance. The EPA has published a very thorough workbook to help you evaluate options with respect to chemical cleanout and hazardous waste disposal. "Building Successful Programs to Address Chemical Risks in Schools" available online at www.epa.gov/schools/workbk.pdf, encourages academic institutions to identify district and community stakeholders that are vested in safe chemical management. Local fire and police departments, area colleges and universities, industry partners and trade and professional organizations may be able to provide advice and assist with packaging chemicals for removal, removing mismanaged or unnecessary chemicals and properly disposing of chemicals. The following options will help you identify potential partners and resources to investigate, plan and carry out chemical disposal.

- Contact the facilities staff for information about ongoing chemical disposal programs.
- If applicable, get in touch with your state science supervisor or department of education. Many states have implemented chemical clean-up campaigns in recent years. The state EPA may also have an existing program.
- Work with the state and local associations. Use the experience of other teachers who have faced similar issues to help your school comply with chemical disposal requirements.
- Seek the advice of your Environmental Health and Safety Department or that of a nearby college or university. Most large universities have ongoing waste disposal programs and understand state and local requirements.
- Contract with a licensed hazardous waste disposal firm for removing chemicals. Because the institution has cradle-to-grave responsibility for its chemicals, even after they have been removed from the site, it is vital that you choose a licensed and reputable firm. Ask for and check references, and do not automatically choose the lowest bid. Request a certificate of disposal for the chemicals.

Flinn Suggested Laboratory Chemical Disposal Methods

Flinn Scientific has been publishing suggested laboratory chemical disposal methods for more than 40 years. Each chemical in the *Flinn Scientific Catalog/Reference Manual* has a disposal number under its name. The disposal number refers to one of the suggested disposal procedures listed in this section. As federal, state, and local regulations have changed, many disposal procedures have been updated or deleted. Before attempting any disposal procedure, it is essential that you check local regulations to determine if it is allowed in your locale.

Before attempting any disposal procedure, the following safety rules must be followed:

- ▶ Never work alone!
- ▶ Always were appropriate personal safety equipment.
- ▶ Perform all procedures in a laboratory environment with proper ventilation. Note that a fume hood is required for some procedures.

If you have any questions concerning laboratory chemical disposal methods, please call (1-800-452-1261) or email (flinn@flinnsci.com) the Technical Services department at Flinn Scientific, Inc.



Did You Know It Is Always Yours?



Hazardous waste chemicals are yours *FOREVER!* As the generator, your institution will be held responsible in perpetuity for hazardous waste. Even if you contract with a firm to remove the material from your school, it remains yours forever. With that in mind, always know and get references for the firm you hire to remove such materials. As one instructor belatedly said after a sad series of disposal events, "I should have known I was in trouble when they came in a rented truck."

IF YOU LIKE OUR
CATALOG
REFERENCE
MANUAL
SEND US YOUR ORDER

Flinn Suggested **Disposal Methods**

FLINN METHOD

#1a Organic Acid Halides and Acid Anhydrides

Products in this class readily react with water, amines and alcohols. They are also generally corrosive and their vapors are lachrymators. Acid halides and acid anhydrides may be RCRA listed and/or characteristic wastes due to their reactivity or flammability. Leftover organic acid derivatives remaining in an experiment may be hydrolyzed to water-soluble products of low toxicity that can be flushed down the drain. The reactions are exothermic; immerse the reaction vessel in ice water to control the heat.

Examples

Adipoyl chloride and acetic anhydride

Saturated solution of sodium carbonate (200 g Na_2CO_3/L)

Materials Required

Hydrochloric acid, HCl, 3 M
Ice–water bath (optional)
Large glass or polyethylene container
pH paper
Stirring rod

Overview

Acid halides and acid anhydrides are reacitve derivatives of carboxylic acids. These substances react with water to form the original organic acid or its conjugate base in basic solution. Excess acid halide or acid anhydride remaining in a reaciton mixture may be decomposed with saturated sodium carbonate solution. The acid anhydride or acid halide reacts with water, and the products of that reaction, which are acidic, immediately react with sodium carbonate to form a salt of the acid. Most carboxylic acid salts are innocuous and may be flushed down the drain. Gaseous carbon dioxide is also produced, also forms, which will produce a fizzing as the reaction proceeds. The reaction of acetic anhydride proceeds as follows:

$$(CH_3CO)_2O + H_2O \rightarrow 2CH_3COOH$$

$$2CH_3COOH + Na_2CO_3 \rightarrow 2NaCH_3COO + CO_2 + H_2O$$

Note that one mole of sodium carbonate is required to fully neutralize one mole of the original acid halide or acid anhydride. To push the reaction to completion, a twofold molar excess of sodium carbonate is recommended. At 25 °C, a saturated sodium carbonate solution contains about 2 moles of sodium carbonate per liter of solution. Sodium hydroxide solution (2 M) may be substituted for saturated sodium carbonate in this procedure.

Both adipoyl chloride and sebacoyl chloride contain two chlorine atoms per molecule. Use a fourfold molar excess of sodium carbonate solution to hydrolyze these compounds.

Procedure

1. Perform this procedure in a fume hood. Wear chemical splash goggles, chemicals-resistant gloves and a lab coat or chemical-resistant apron.

2. Place a saturated solution of sodium carbonate in a large glass or plastic container.

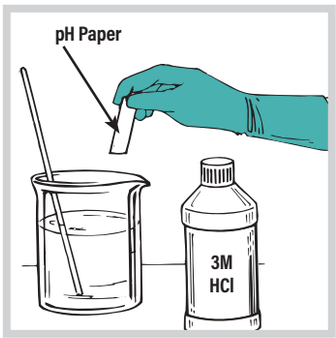
3. Slowly add a few milliliters or grams of the acid halide or anhydride to the container while constantly stirring. You can tell the decomposition reaction is occurring when the material begins to dissolve. The evolution of gaseous carbon dioxide should also be evident.

4. If a noticeable temperature rise is observed, place the container in an ice–water bath.



5. Continue slow addition of the acid derivative while stirring until all the compound has been consumed.

6. When a clear solution has been obtained, cool it to room temperature and neutralize to pH 7 with 3 M hydrochloric acid.



7. Flush the neutral mixture down the drain with a 20-fold excess of water.

QUESTIONS? CALL US AT
1-800-452-1261

Please... Read the Narratives

Important narratives precede these specific chemical disposal methods! Please read each narrative carefully! Do not use these procedures if you are not comfortable with the chemistry. Do not use these procedures without *first consulting with your local government regulatory officials*. These procedures may not be used in some jurisdictions. All procedures involve some hazards and risks. Once again... read the narratives that precede these specific chemical disposal methods.

FLINN METHOD

#1b Water-Reactive Metal Halides

Products in this class may react vigorously with water. The reactions generate heat and the reaction products are strongly acidic. Water-reactive metal halides may be decomposed to products suitable for flushing down the drain by reacting them with a large excess of cold water and neutralizing the resulting acidic solution.

Examples

Aluminum chloride (anhydrous) and tin(IV) chloride

Materials Required

Sodium hydroxide solution, NaOH, 3 M or saturated sodium carbonate solution, Na_2CO_3
Ice water
Large glass or polyethylene container
pH paper
Stirring rod

Overview

As described, these substances react with water, and the products are acidic. For example:

$$SnCl_4 + 2H_2O \rightarrow 4HCl + SnO_2$$

The HCl formed will dissolve in the excess water. It is neutralized with either sodium hydroxide (to form sodium chloride and water) or with sodium carbonate (to form sodium chloride, gaseous carbon dioxide and water).

Procedure

1

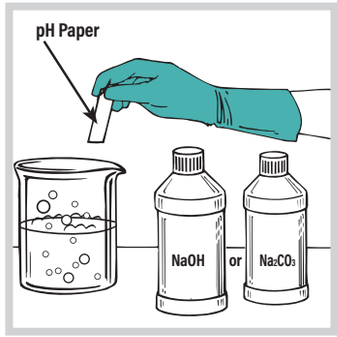
Perform this procedure in a fume hood. Wear chemical splash goggles, chemicals-resistant gloves and a lab coat or chemical-resistant apron.

2

Prepare an ice/water slush in a large glass or polyethylene container. Slowly add the water-reactive metal halide directly to the ice/water slush with constant stirring. Aluminum chloride reacts vigorously with water. Be cautious to avoid localized overheating.

3

When all the compound has been added to the water, allow the mixture to come to room temperature and neutralize to pH 7 with sodium hydroxide or sodium carbonate solution. If you use sodium carbonate solution, expect some evolution of carbon dioxide gas during neutralization. A thick white precipitate of aluminum or tin(IV) oxide will form. Let the mixture settle overnight.



4

Check local sewer discharge limits for any metal cation remaining in solution. Decant the liquid to the drain with a 20-fold excess of water if allowed. The solid residue may be suitable for landfill disposal if no RCRA toxic metals are present.

FLINN METHOD

#2 Aldehydes

Products in this class may be solids, liquids, gases or aqueous solutions. Low-molecular aldhydes may be water-soluble, but they are also fammable and likely Resource Conservation and Recovery Act (RCRA) characteristic wastes. Excess of leftover aldehyde in an experiment my be oxidized to render it nonhazardous.

Examples

Acetaldehyde and benzaldehyde

Materials Required

Potassium permanganate solution, $KMnO_4$, 0.3 M
Sodium sulfite solution, Na_2SO_3, 0.1 M
Sulfuric acid solution, H_2SO_4, 3 M
Beaker, 1-L
Magnetic stirrer/hot plate and stir bar
pH paper
Thermometer

Overview

The carbonyl group in an aldehyde is easily oxidized to a carboxylic acid, which is usually less toxic, less volatile and more water-soluble than the starting aldehyde.

Oxidation can be achieved using aqueous potassium permanganate, and the reaction can be followed by monitoring the color change. As the oxidation occurs, the purple permanganation (MnO_4^-) is reduced to brown, insoluble manganate dioxide. The oxidation of benzaldehyde, for example, leads to benzoic acid and its salt:

$$3C_6H_5CHO + 2KMnO_4 \rightarrow 2C_6H_5CO_2K + C_6H_5CO_2H + 2MnO_2 + H_2O$$

The reaction may need to be heated, and any excess permanganate should be reduced by sodium sulfite before disposal. The mole ratio is two moles of permanganate ion per mole of carbonyl group.

Procedure

1

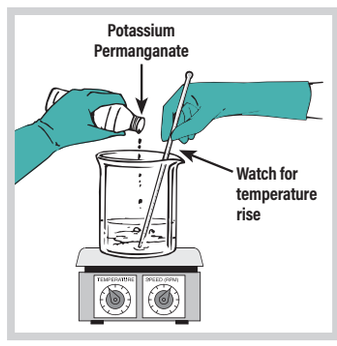
Perform this procedure in a fume hood. Wear chemical splash goggles, chemicals-resistant gloves and a lab coat or chemical-resistant apron.

2

Dilute any leftover aldehyde with 100 mL.

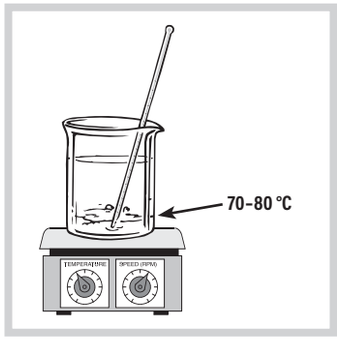
3

Add about 30 mL of 0.3 M potassium permanganate solution over a period of 10 minutes. If this addition is not accompanied by a rise in temperature and loss of purple permanganate color, then heat the mixture using a hot plate until the color changes.



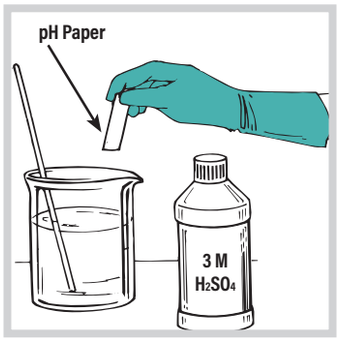
FLINN METHOD #2 continued on next page.

Flinn Method #2, continued



4

Slowly add additional potassium permanganate solution at 70–80 °C until the purple color does not dissipate. Stir for one hour.



5

Allow the mixture to cool to room temperature and acidify to pH 7 with 3 M sulfuric acid. If any purple color remains, add 0.1 M sodium sulfite until the mixture is brown.

6

Filter the mixture, if needed, to remove insoluble MnO_2, which may be placed in the trash. The remaining solution may be flushed down the drain with a 20-fold excess of water.

FLINN METHOD

#3 Alkali Metals and Alkaline Earth Metals

Materials in this class react with air and water as well as with alcohols and halogenated hydrocarbons. These metals should not be allowed to come into contact with wastes containing these liquids. Alkali metals are stored in a dry mineral oil to keep them from air. The alkaline earth metals are usually covered with a thin coat of metal oxide, which protects them from further oxidation. The alkali and alkaline earth metals are characteristic RCRA hazardous wastes due to their reactivity. Small pieces or shavings of alkali or alkaline earth metals remaining in an experiment may be rendered nonhazardous by **careful** reaction with an alcohol or water, respectively.

Examples

Alkali metals include lithium, sodium and potassium. Alkaline earth metals include magnesium and calcium.

Materials Required

tert-Butyl alcohol (for potassium)
Ethyl alcohol, anhydrous (for sodium and lithium)
Hydrochloric acid, HCl, 1 M
Sodium hydroxide solution, 3 M
Class D fire extinguisher or a large bucket of clean, dry sand
Knife to cut large pieces of metal (optional)
Large glass beaker
Magnetic stirrer and stir bar or stir rod
pH paper

Overview

Alkali metals are very reactive with water to produce a base (e.g., NaOH), hydrogen gas and heat. They also react with alcohols in a more controlled manner to give similar products. The reaction is slower in alcohol due to the lower acid dissociation constant of alcohol relative to water.

$$Na + CH_3CH_2OH \rightarrow CH_3CH_2O\,Na + \tfrac{1}{2}H_2$$

This procedure produces hydrogen gas, which is an explosion and fire hazard. The procedure also requires ethyl alcohol, another explosion and fire risk. Perform this procedure in a fume hood, behind a shield and with proper safeguards.

Anhydrous alcohols contain very little water and are preferred in this procedure. Use anhydrous ethyl alcohol for sodium or lithium and tert-butyl alcohol for potassium.

Leftover potassium is extremely dangerous due to its reactivity and tendency to form explosive peroxides. Appearance of a crumbly yellow coating indicates the formation of potassium superoxide (KO_2). Cutting or handling old potassium may result in a violent explosion. Do not attempt to destroy yellow-coated potassium. Contact a licensed hazardous waste disposal company.

Care must be taken in decomposing leftover alkali metals with alcohol. All the metals must be reacted with alcohol before water is added. Many laboratory accidents and fires have occurred by rushing this procedure and adding water too soon. The water will react with a small piece of metal generating substantial heat that autoignites the flammable alcohol.

Calcium and magnesium are less reactive with water. Leftover calcium is easily disposed of using a large amount of cold water, while excess magnesium requires dilute acid to catalyze the reaction.

$$Mg + 2H_2O + H^+ \rightarrow Mg(OH)_2 + H_2$$

Procedure A: For Sodium and Lithium Metal

1a

Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2a

Place small pieces of leftover or excess sodium or lithium in a 500-mL beaker and cover with mineral oil.

3a

Slowly add ethyl alcohol (at least 13 mL per g of sodium, 30 mL per g of lithium) to the metal at a rate to cause a reasonable hydrogen evolution. Do not add the ethyl alcohol too fast (causing excessive heat generation). Stir the mixture until all the pieces of metal have dissolved.



FLINN METHOD #3 continued on next page.

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Flinn Method #3, continued



4a

Only after all pieces of metal are gone, slowly add an equal volume of water to the mixture. Neutralize with 1 M hydrochloric acid.

5a

Flush the neutralized mixture down the drain with a 20-fold excess of water.

Procedure B: Potassium Metal

1b

Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2b

Place small pieces of leftover potassium metal in a 500-mL beaker and cover with mineral oil.

3b

Slowly add tert-butyl alcohol (at least 21 mL per g of potassium) to the metal at a rate to cause a reasonable hydrogen evolution. Stir the reaction mixture until all the pieces of metal have dissolved.





4b

Only after all pieces of potassium are gone, slowly add an equal volume of water to the reaction mixture. Neutralize with 1 M hydrochloric acid.

5b

Flush the neutralized mixture down the drain with a 20-fold excess of water.

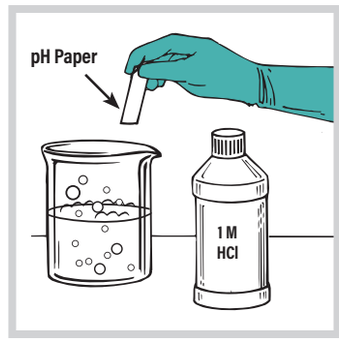
Procedure C: Calcium and Magnesium Metal

1c

Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2c

Add small increments of leftover metal (1–2 g) to 1 L of cold water (for calcium) or dilute (1 M) hydrochloric acid (for magnesium). Stir the mixture until all the metal has dissolved.



3c

Using pH paper, neutralize to pH 7 with 1 M hydrochloric acid.

4c

Flush the solution down the drain with a 20-fold excess of water.

FLINN METHOD

#4a Picric Acid

Picric acid is explosive when dry. Do not touch or handle. Picric acid cannot be disposed of by untrained personnel. You must contact a commercial waste disposal service, the local bomb squad or fire department. Bouin's solution contains picric acid; treat it just as carefully as pure picric acid.

Examples

Picric acid, Bouin's solution

Overview

Picric acid is normally sold containing 10–15% water, and in this state it is relatively safe to handle. However, dry picric acid is very explosive. The explosion can be initiated by friction, shock or sudden heating. Picric acid also reacts with metals to form explosive metal picrates, which are highly sensitive to detonation. **Do not attempt to dispose of picric acid by chemical means. This procedure merely provides a means to wet the picric acid to decrease its hazards.**

Procedure

1

Wear a full face shield, chemical-resistant gloves and a lab coat or chemical-resistant apron.

FLINN METHOD #4a continued on next page.

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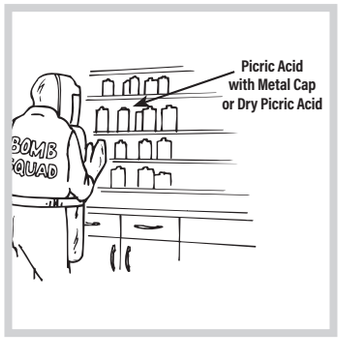
Flinn Method #4a, continued

2

Without touching the container of picric acid, determine if it has a metal cap. If it does, *do not touch the container at all.*

3

A metal-capped container of picric acid should be handled only by a trained expert, such as a member of a bomb squad. Call such an expert to remove the material from the premises as soon as possible. (Picric acid can form salts with the metal in the cap, and these salts are more explosive than picric acid itself. The friction caused in attempting to remove the metal cap from a container of picric acid has been reported to cause detonation of minute amounts of metal picrate trapped in the threads of the cap.)



4

If—and only if—the container of picric acid has a plastic cap **and** contains visible water, you may proceed.

5

Move the bottle to a fume hood and immerse the plastic-capped container upside-down in a beaker of water. Contact a licensed hazardous waste disposal company for further instructions and to remove the material.



FLINN METHOD

#4b Halogenated Hydrocarbons

Halogenated hydrocarbons require licensed hazardous waste disposal due to their characteristic toxicity or flammability. Halogenated organic waste should be segregated from other flammable organic solvents. The best route for disposal of nonvolatile halogenated hydrocarbons is through incineration. Use a licensed hazardous waste disposal company as described in Flinn Disposal Method #26c or #27j.

FLINN METHOD

#4c Organic Acids, Substituted

Substituted organic acids include amino acids and halogenated carboxylic acid (e.g., chloroacetic acid). Amino acids are nonhazardous, water-soluble and suitable for landfill or drain disposal using Flinn Disposal Method #26a or #26b. Water-soluble substituted carboxylic acids and their sodium, potassium, calcium or magnesium salts can be rinsed down the drain if local sewer discharge limits permit. See Flinn Disposal Method #26b.

FLINN METHOD

#5 Amines, Aromatic

Aromatic amines are relatively toxic and flammable materials. Common aromatic amines, such as, pyridine, aniline and diphenylamine, require licensed hazardous waste disposal according to Flinn Disposal Method #26c.

Many common dyes and pigments contain aromatic amine groups and do not present any unusual problems for incineration or burial in a landfill. Please consult your local regulations and Flinn Disposal Method #26a.

FLINN METHOD

#6 Substances Precipitated by Calcium Ion

Substances in this class include (a) soluble metal salts containing the fluoride ion and (b) soluble salts containing the oxyanion of a toxic heavy metal (e.g., Mo, W) for which the calcium salt is quite insoluble. Fluoride ion is highly poisonous.

Do not use procedure for hydrofluoric acid. Hydrofluoric acid is a poison and extremely dangerous in contact with human flesh. It requires licensed hazardous waste disposal.

Examples

Sodium fluoride, sodium molybdate, sodium tungstate

Materials Required

Calcium chloride solution, $CaCl_2$, 1 M, in threefold molar excess for disposal of fluoride or other salts
Hydrochloric acid, HCl, 3 M, or sodium hydroxide, NaOH, 3 M, as necessary to adjust pH
Funnel, filter paper and flask
Large plastic beaker or similar container (don't use glass for HF)
pH paper
Wood stirring stick

Procedure

1

Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2

Dissolve the soluble compound (metal salt) in the smallest amount of water possible.



3

Adjust the pH to 7 using pH indicator paper by adding 3 M sodium hydroxide or hydrochloric acid as necessary.

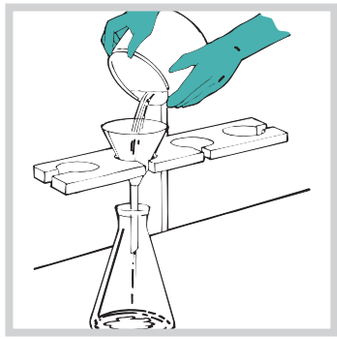
4

While stirring, add 1 M calcium chloride solution in a threefold molar excess to the neutral solution. Allow the resulting precipitate to stand about 15 minutes.



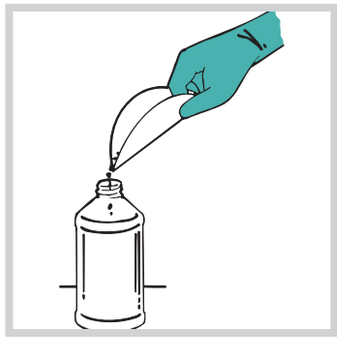
FLINN METHOD #6 continued on next page.

Flinn Method #6, continued



5

Filter or decant off the supernatant liquid. Flush the liquid down the drain with excess water.



6

Allow the solid to dry, place it in a plastic container, and send it to a landfill.

FLINN METHOD

#8 Azides and Azo- Compounds

Metal azides require licensed hazardous waste disposal as described in Flinn Disposal Method #26c. **Azides should NOT be drain-disposed.** They react with lead and copper in drain lines, solder joints and brass fittings to form unstable and explosive products. Drain systems have been destroyed by such explosions. In addition, azides are not biodegradable and will kill the necessary bacteria present in the digestion system of wastewater treatment plants. Stocks of these materials should be kept low. Sodium azide is a P-Listed acutely hazardous waste.

FLINN METHOD

#9 Carbon Disulfide

Carbon disulfide is a P-Listed acutely toxic hazardous waste (P022). Any discarded commercial chemical product containing carbon disulfide as the sole active ingredient will require licensed hazardous waste disposal. Proper management of P-Listed wastes is extremely important because institutions that accumulate more than 1 kg on site at anytime of acutely hazardous waste will be subject to the most stringent requirements for listing, storing and reporting all their hazardous waste.

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FLINN METHOD

#10 Bases, Strong and Weak and Basic Anhydrides

Elementary neutralization of corrosive acid and base solutions is a generally allowed disposal procedure. Two simple rules should be followed. First, the neutralization process should be mild. Any strong acids or bases should first be diluted to a concentration around 1 M or 10%. Second, the final product must be near neutral (pH 5–9) before discharge to the drain. In this procedure, bases are neutralized with dilute hydrochloric acid.

Examples

Ammonium hydroxide, sodium hydroxide

Materials Required

Hydrochloric acid, HCl, 3 M
Glass stirring rod
Ice/water slush (optional)
Large glass beaker
pH paper

Overview

Bases react with acids in aqueous solution to form a salt and water.

$$NaOH + HCl \rightarrow NaCl + H_2O$$

The neutral soluble salts formed are generally innocuous and can be rinsed down the drain with water.

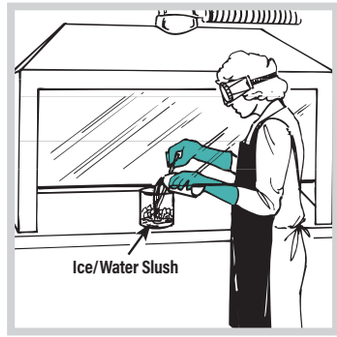
Procedure

1

Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron. Use a fume hood if neutralizing ammonia solutions.

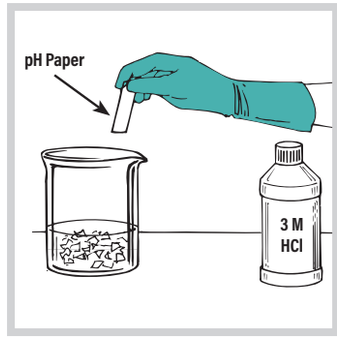
2

Prepare a dilute solution of (1 M or <10%) base by diluting a more concentrated solution or dissolving the solid into water. Considerable heat may be generated when dissolving a solid base. Use an ice/water slush if needed to dissolve solid sodium or potassium hydroxide.



3

When solution is complete, slowly add 3 M hydrochloric acid until the mixture is neutralized. Check with pH paper. More heat may be evolved in the neutralization process.



4

Rinse the neutral mixture down the drain with a 20-fold excess of water.

FLINN METHOD

#11 Silver Compounds

Silver and silver compounds are expensive and may be recovered or recycled but often can be reclaimed for future use. Silver compounds are characteristic hazardous wastes. Silver compounds are identified by the EPA as characteristic hazardous wastes due to their toxicity. According to the Resource Conservation and Recovery Act (RCRA), the concentration of silver ions in an extract of a solid suitable for landfill disposal cannot exceed 5 mg/L, based on the Toxicity Characteristic Leaching Procedure (TCLP). Federal guidelines also impose a concentration limit of 5 mg/L on industrial sewer disposal of silver ions in solution. Check with your local sewer authority for the allowable discharge limit in your area. In most cases, dilution with water is not an acceptable means of achieving the concentration limit.

Examples

Silver nitrate, silver chloride, silver oxide

Materials Required

Nitric acid, HNO_3, 8 M
Sodium chloride, NaCl, 1 M
Sodium hydroxide, NaOH, 2 M
Sodium hydroxide, NaOH, 6 M
Sucrose
Filtration apparatus
Glass stirring rod
Large glass beaker
Magnetic stirrer/hot plate with stir bar

Silver Recovery

Silver may be recovered and recycled for future use by dissolving the metal or metal compound in nitric acid, precipitating silver chloride and reducing the latter to silver metal. Recovery of silver metal from AgCl may be achieved by reduction with sucrose in basic solution or zinc metal in acid solution. The first step must be done in a fume hood due to the possible production of NO_2, a toxic brown gas. Note that $PbCl_2$ will co-precipitate with AgCl in the second step if the original silver is contaminated with lead. The third step may be omitted, and the silver reclaimed in the form of the precipitated silver chloride, if the original silver was relatively pure (see Procedure A).

The chemical reactions are as follows. Oxidation of silver metal may occur by one of two possible mechanisms:

$$2Ag(s) + 2HNO_3 \rightarrow 2AgNO_3(aq) + H_2(g)$$

or

$$Ag(s) + 2HNO_3(aq) \rightarrow AgNO_3(aq) + NO_2(g) + H_2O$$

$$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$$

$$AgCl + NaOH(aq) + Sucrose \rightarrow Ag(s)^*$$

*Sucrose is hydrolyzed to the reducing sugars glucose and fructose in basic solution. These sugars are oxidized to gluconic acids in the process of reducing Ag^+ ions to silver metal. The silver metal will be obtained in the form of a brown powder.

Silver(I) compounds, such as AgCl, are photosensitive and must be stored in dark bottles to prevent light-catalyzed reduction to silver.

Silver or silver ions may also be precipitated in the form of silver chloride to reduce the volume of hazardous waste requiring disposal (see Procedure B).

$$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$$

Procedure A: Silver Recovery Process

1a

Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

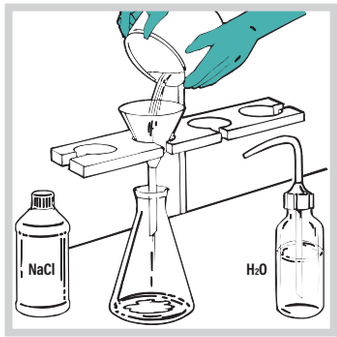
2a

Dissolve the silver metal or silver salts in 8 M nitric acid solution. For about 10 g of silver, use 20–30 mL of 8 M nitric acid.



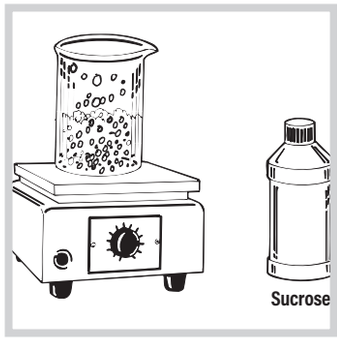
3a

Add sodium chloride (about 60 g per 100 g of Ag) to precipitate silver chloride. Filter and wash the precipitate. (This step is necessary to rid the silver of any copper contaminant.)



4a

Suspend the AgCl in 6 M NaOH (for 100 g of Ag, use about 500 mL of NaOH) and boil it for about 30 minutes, during which time add sucrose (about 250 g or 1 cup per 100 g of Ag) in small amounts at frequent intervals. Stirring is not necessary, only occasional swirling. At first there is considerable frothing, and then the solution becomes dark brown. Finally a heavy, gray precipitate forms.



5a

Filter, wash and dry this precipitate. Store in a dark bottle.



FLINN METHOD #11 continued on next page.

Flinn Method #11, continued

Procedure B: Disposal of Silver Salts

1b

Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2b

Dissolve the silver salt in water in a beaker.

3b

Add a 50% molar excess of sodium chloride solution and stir to ensure complete mixing.



4b

Decant or filter the resulting precipitate of silver chloride.



5b

Allow the precipitate to dry and dispose of it via licensed hazardous waste disposal.

6b

Check the supernatant liquid for residual silver, and rinse it down the drain with a 20-fold excess of water.

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FLINN METHOD

#12a Oxidizing Agents

Strong oxidizing agents, such as chlorates, permanganates and chromates, are hazardous when in contact with combustible materials. They should *never* be discarded with general refuse as they may cause fires or form explosive mixtures. Oxidizers are classified as characteristic hazardous wastes by the EPA due to their ignitability, (i.e., their ability to add oxygen to and sustain or intensify a fire involving a combustible material). Examples include nitrates, inorganic peroxides and permanganates.

Solid oxidizers will require licensed hazardous waste disposal. Leftover solutions of oxidizers remaining at the end of an experiment may be reduced as part of the experimental procedure to render them nonhazardous and suitable for drain disposal. Sodium thiosulfate is the recommended and most commonly used reducing agent for this purpose. Note that in the case of chromates, however, the reduced product will still require licensed hazardous waste disposal due to the chromium content. See Flinn Disposal Method #27f.

Examples

Bromine, iodine, sodium chlorate, potassium permanganate, sodium chromate

Materials Required

Sodium hydroxide solution, NaOH, 1 M
Sodium thiosulfate solution, $Na_2S_2O_3$, 4%
Sulfuric acid, H_2SO_4, 1 M
Glass stirring rod
Large glass beaker
pH paper

Overview

Oxidizing agents by definition oxidize other substances (i.e., they readily react with substances in low oxidation states to raise them to higher oxidation states). The oxidizing agent itself is reduced in this process.

The complementary processes of oxidation and reduction are often accompanied by the evolution of considerable heat. Leftover solutions of oxidizing agents may be reduced as part of an experimental procedure to render them nonhazardous.

Leftover oxidizing agents in solution may be safely reduced with sodium thiosulfate. The reactions proceed best in mildly basic, neutral, weakly acidic solutions. (Too much acid will react with the sodium thiosulfate directly, precipitating elemental sulfur from the mixture.) In the following example, thiosulfate ions react with the bromate ions to produce nonhazardous sulfate and bromide ions. Excess acid must be neutralized with base prior to drain disposal, if allowed.

$$3H_2O + 3S_2O_3^{-2} + 4BrO_3^- \rightarrow 6SO_4^{-2} + 4Br^- + 6H^+$$

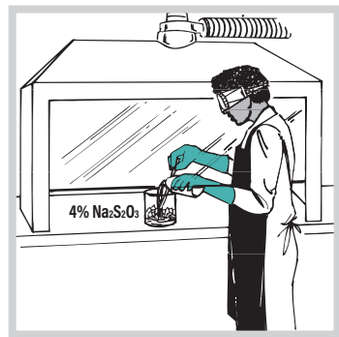
Procedure

1

Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2

This method is for small quantities of laboratory oxidizing agents only. Add the oxidizing agent to a twofold molar excess of a 4% aqueous solution of sodium thiosulfate (hypo) with continuous stirring.



FLINN METHOD #12a continued on next page.

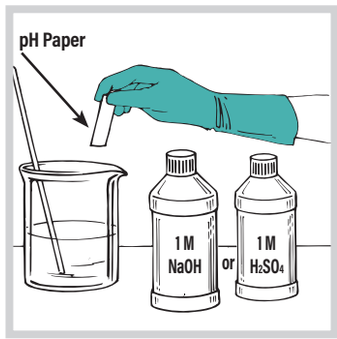
Flinn Method #12a, continued

3

Allow the mixture to stand for about one hour for the redox reaction to proceed to completion. There may be a temperature rise during the reaction.

4

Check the pH of the mixture using pH paper. Neutralize the solution with dilute sodium hydroxide solution or sulfuric acid solution, as needed.



5

The residues from this procedure must undergo further treatment if they contain chromium. The products from the reduction of chromates and dichromates are insoluble chromium hydroxide. These materials can be removed by filtration and require Flinn Disposal Method #27f. Solutions containing chromium ions may not be drain disposed.



6

Flush other solutions down the drain with large quantities of water.

FLINN METHOD

#12b Reducing Agents

Strong reducing agents will react vigorously with oxidizing agents to produce heat and possibly fire. Some reducing agents may cause a fire when in contact with moist combustible materials. A simple oxidation reaction will render most reducing agents safe for disposal.

Examples

Potassium nitrite, sodium sulfite, sodium thiosulfate

Materials Required

Ammonium hydroxide, NH_4OH (proc. B)
Hydrochloric acid, HCl, 1 M
Hydrochloric acid, HCl, 3 M (proc. B)
Sodium carbonate, Na_2CO_3
Sodium hydroxide, NaOH, 1 M
Sodium hypochlorite solution (bleach)
Glass stirring rod
Large glass beaker
pH paper

Overview

Reducing agents by definition reduce other substances (i.e., they readily change the oxidation state of a substance from a high value to a lower value). They are the opposite of oxidizing agents. In the example involving carbon reacting with oxygen, the oxygen was the oxidizing agent because it oxidized the carbon. On the other hand, in this same reaction, carbon is the reducing agent because it changed the oxidation state of oxygen from zero to negative 2 (–2). In the process, considerable heat is produced.

Many reducing agents may be safely reacted with an oxidizing agent that will destroy their reducing power prior to disposal. Sulfides are commonly oxidized using bleach or sodium hypochlorite. This works best in a weakly basic solution. **Never mix bleach with acid!** Dissolve the reducing agent in water, then make it basic with sodium carbonate and finally react it with the hypochlorite ion. After the material is oxidized, the pH is adjusted to neutral and the resulting mixture containing innocuous ions may be flushed down the drain. The reaction of sulfite ion with hypochlorite ion produces sulfate and chloride ions as shown. (see Procedure A).

$$SO_3^{-2} + ClO^- \rightarrow SO_4^{-2} + Cl^-$$

Nitrites are a unique class of compounds in that the nitrogen is in an intermediate oxidation state (+3). It can be either oxidized to the +5 state (NO_3^-) or reduced to a lower state (NO or N_2). Nitrites are easily destroyed by adding 50% excess ammonia and acidifying to pH 1. The resulting product is nitrogen gas. (see Procedure B).

$$HNO_2 + NH_4^+ \rightarrow N_2 + 2H_2O + H^+$$

Procedure A: Sulfites

1a

Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2a

In a large beaker, dissolve an equal amount of sodium carbonate and reducing agent in distilled water.



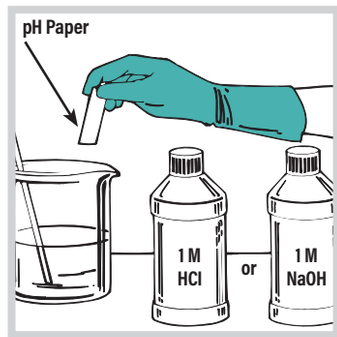
3a

Slowly add a 25% molar excess of bleach to the mixture with continuous stirring. Use caution as the reaction may be vigorous and produce heat. Allow the completed mixture to stand for several hours.



4a

Check the pH of the mixture using pH paper and neutralize as necessary. Use sodium hydroxide solution if acidic or hydrochloric acid solution if basic.



5a

Flush the neutral solution down the drain with a 20-fold excess of water.

FLINN METHOD #12b continued on next page.

Flinn Method #12b, continued

Procedure B: Nitrites

1b

Perform this reaction in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2b

Dissolve the inorganic nitrite salt in distilled water.



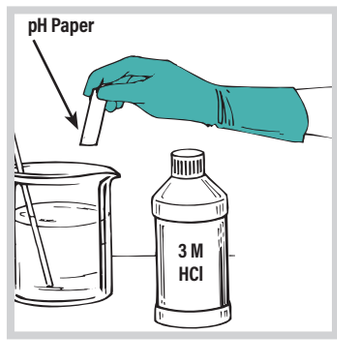
3b

Add a 50% molar excess of ammonium hydroxide solution.



4b

Using pH paper to monitor the process, acidify the solution to pH 1 with 3 M hydrochloric acid. Stir for two hours.



5b

Check the pH of the solution and neutralize to pH 5–10. Rinse the solution down the drain with excess water.

FLINN METHOD

#13 Organic Sulfides, Mercaptans and Thioamides

Organic sulfides and mercaptans are toxic and should not be drain disposed. Because of their toxicity, they should only be disposed of by a licensed hazardous waste disposal company as described in Flinn Disposal Method #26c.

FLINN METHOD

#14 Cyanides and Solid Metal Cyanide Complexes

All cyanides must be removed by licensed hazardous waste disposal. Cyanides are severe and rapid-acting poisons, being quickly absorbed into the body via the respiratory system, skin, eyes and mouth. Cyanides are identified as acutely hazardous, P-listed wastes by the EPA. They are also classified by the Resource Conservation and Recovery Act (RCRA) as characteristic hazardous wastes due to their reactivity with water to produce toxic hydrogen cyanide gas.

Compounds containing metal cyanide complex ions, such as potassium ferrocyanide or potassium ferricyanide, are generally considered nontoxic and are much less reactive than simple cyanide salts. Complex iron cyanides may generate hydrogen cyanide in contact with concentrated hydrochloric acid or when heated. Nevertheless, both potassium ferrocyanide and potassium ferricyanide are classified as P-listed wastes.

The following detoxification procedure using bleach only may be applied to leftover solutions containing ferri- or ferrocyanide ions as part of an experimental procedure. The detoxification procedure may NOT be used to treat any cyanide-containing hazardous waste.

Examples

Potassium ferrocyanide, potassium ferricyanide

Materials Required

Calcium hypochlorite solution, $Ca(OCl)_2$, 30%
Sodium hydroxide solution, NaOH, 3 M (twofold molar excess)
Sodium hypochlorite solution (bleach)
Glass stirring rod
Ice bath (optional)
Large glass beaker
pH paper

Overview

Ferro- and ferricyanides are much less toxic than cyanide salts and are oxidized to cyanates by hypochlorite. A 50% molar excess of bleach is required to assure complete destruction.

$$CN^- + OCl^- \rightarrow OCN^- + Cl^-$$

Commercial bleach (5.25% sodium hypochlorite) or a 30% calcium hypochlorite solution can be used for this procedure.

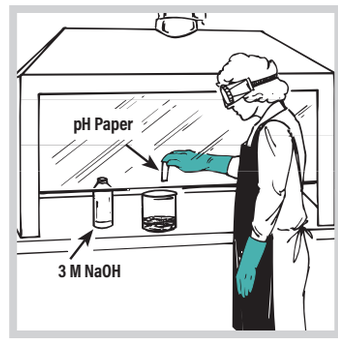
Procedure

1

Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2

Fill a large beaker ½ full of water and, using pH paper, make it basic (at least pH 12) by adding 3 M sodium hydroxide solution, as needed.



FLINN METHOD #14 continued on next page.

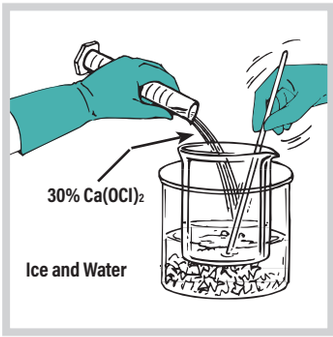
Flinn Method #14, continued

3

Dissolve the iron cyano-complex in the water.

4

While stirring, slowly add the sodium hypochlorite solution (about 100 mL per g of CN) or 30% calcium hypochlorite solution (20 mL per g of CN). Heat may be evolved; maintain the temperature below 50 °C by using an ice and water bath, if necessary. Once the addition of hypochlorite is completed (use a twofold molar excess), allow the mixture to stand for several hours.



5

Rinse the mixture down the drain with a 20-fold excess of water.

FLINN METHOD

#15 Ethers

Bottles of ethers that have been opened and are more than a year old may contain hazardous quantities of explosive peroxides. These bottles will require licensed hazardous waste disposal. Some companies will require that the peroxide level be verified before accepting ethers for disposal.

FLINN METHOD

#16 Hydrazines and Their Salts

Hydrazines contain a nitrogen–nitrogen single bond and are very reactive. Many hydrazines are also toxic and/or carcinogenic. Hydrazines should be disposed of by a licensed hazardous waste disposal company according to Flinn Disposal Method #26c.

FLINN METHOD

#18a Water-Soluble Alcohols, Ketones and Esters

Low-molecular weight, oxygen-containing organic compounds are volatile, soluble in water and biodegradable. Aqueous solutions and extracts containing less than 24% of volatile alcohols, ketones and esters—see the following examples—may be disposed in small quantities down the drain (sanitary sewer only) with excess water. Please check all federal, state and local regulations that may apply before proceeding. See Flinn Suggested Disposal Method #26b for more information on drain disposal.

Examples

Acetone, isopropyl alcohol, ethyl acetate

Please... Read the Narratives

Important narratives precede these specific chemical disposal methods! Please read each narrative carefully! Do not use these procedures if you are not comfortable with the chemistry. Do not use these procedures without *first consulting with your local government regulatory officials*. These procedures may not be used in some jurisdictions. All procedures involve some hazards and risks. Once again... read the narratives that precede these specific chemical disposal methods.

FLINN METHOD

#18b Hydrocarbons and Flammable Ketones, Esters, Alcohols

Nonvolatile organic compounds do not readily evaporate and are not easily converted into less toxic materials. The only disposal procedures available are disposal by a licensed hazardous waste company.

FLINN METHOD

#20 Organic Amides

Check the Safety Data Sheet (SDS) to determine whether the organic amide will be a characteristic ignitable waste (flash point <60 °C) or if it is a listed waste. Organic amides that are not hazardous wastes may be packaged for landfill disposal according to Flinn Suggested Disposal Method #26a. Characteristic and listed hazardous wastes require licensed hazardous waste disposal (see Flinn Suggested Disposal Method #26c.)

FLINN METHOD

#22a Peroxides, Inorganic

Inorganic peroxides are strong oxidizing agents and are classified by the EPA as ignitable characteristic wastes. Leftover inorganic peroxides may be reduced as part of an experimental procedure. When in contact or mixed with organic or combustible materials, fires or explosions are possible. Do not discard these materials in the trash!

Examples

Hydrogen peroxide, sodium peroxide

Materials Required

Hydrochloric acid, HCl, 3 M
Sodium metabisulfite, $Na_2S_2O_5$, 1 M
Large beaker, ¾ full of water
pH paper
Plastic spoon (optional)
Plastic stirring rod

Overview

Hydrogen peroxide may be reduced with sodium metabisulfite to render it suitable for drain disposal.

Sodium peroxide reacts violently with water to form oxygen gas and sodium hydroxide. Because of this reaction, sodium peroxide is stored in sealed containers to avoid reaction with moisture in the air. With fresh sodium peroxide the reaction with water is quite exothermic, but if used from a previously opened container, it may be less vigorous. Old sodium peroxide may have already slowly converted itself to sodium hydroxide. Test the materials for reactivity by adding a small amount (0.1 g) to water. Evolution of oxygen indicates an active peroxide. Leftover or excess sodium peroxide may be reduced.

$$Na_2O_2 + H_2O \longrightarrow 2NaOH + \tfrac{1}{2}O_2$$

$$Na_2O_2 + Na_2S_2O_5 + H_2O \longrightarrow 2NaOH + NaHSO_4$$

FLINN METHOD #22a continued on next page.

Flinn Method #22a, continued

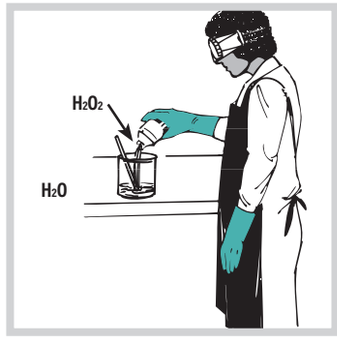
Procedure A: Water Dilution

1a

Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2a

Hydrogen peroxide of any concentration may be disposed of by pouring it into a large beaker containing at least a tenfold excess of water. Stir constantly.



3a

When the mixture is uniform, flush it down the drain with large amounts of extra water.

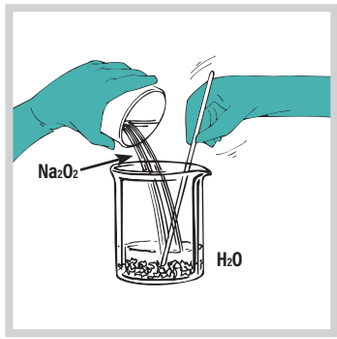
4a

If you are dealing with sodium peroxide, carefully add a small amount of water and break up any lumps with a plastic stirring rod.



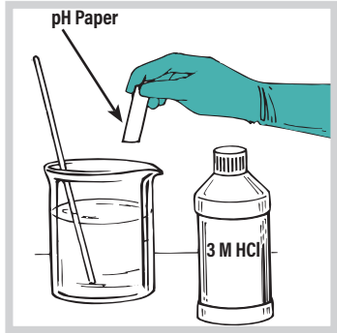
5a

Pour the material slowly with continuous stirring into a large beaker of water. Oxygen gas will evolve, and the solution will become strongly basic. The final amount of sodium peroxide in the water should be no more than 5%. (If you have more sodium peroxide than will fit into this concentration in your beaker, do the procedure again until all the material is disposed of.)



6a

Using pH paper as a monitor, neutralize the solution with 3 M hydrochloric acid.



7a

Flush the neutral solution down the drain with excess water.

Procedure B: Reduction

1b

Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2b

If you are dealing with solid sodium peroxide, carefully add a small amount of water and break up any lumps with a plastic stirring rod. Do **not** grind dry solid.



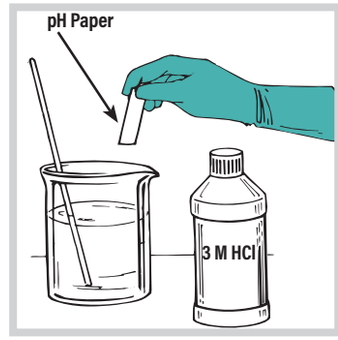
3b

Slowly add the sodium peroxide into a large beaker containing 1 M sodium metabisulfite (100 mL per g of Na_2O_2), and stir continuously.



4b

Using pH paper as a monitor, neutralize the solution with 3 M hydrochloric acid.



5b

Flush the neutral solution down the drain with excess water.

Please... Read the Narratives

Important narratives precede these specific chemical disposal methods! Please read each narrative carefully! Do not use these procedures if you are not comfortable with the chemistry. Do not use these procedures without *first consulting with your local government regulatory officials*. These procedures may not be used in some jurisdictions. All procedures involve some hazards and risks. Once again... read the narratives that precede these specific chemical disposal methods.

FLINN METHOD

#22b Peroxides, Organic

Organic peroxides are particularly dangerous materials that are highly flammable and explosive. Peroxides are sensitive to heat, shock, friction or contact with combustible materials. These materials are classified by the EPA as characteristic (reactive) hazardous wastes. Leftover organic peroxides may be hydrolyzed as part of an experimental procedure.

Examples

Benzoyl peroxide and lauroyl peroxide

Materials Required

Hydrochloric acid solution, HCl, 6 M
Sodium hydroxide solution, NaOH, 3 M—tenfold volume excess of the material to be destroyed, in a large glass beaker
Glass stirring rod
pH paper
Plastic spoon (optional)

Overview

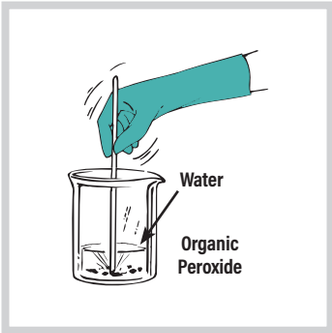
When reacted with base, benzoyl peroxide and lauroyl peroxide (the only substances we catalog for which this procedure is suggested) will cleave between the two joined oxygen atoms and form sodium benzoate or sodium laurate, which are soluble in water and innocuous. Use care not to go past the neutral point when adding acid to the aqueous solution. If the solution is acidic, some benzoic acid may precipitate out.

$$(C_6H_5CO_2)_2 + 2NaOH \rightarrow 2C_6H_5CO_2^-Na^+ + O_2$$

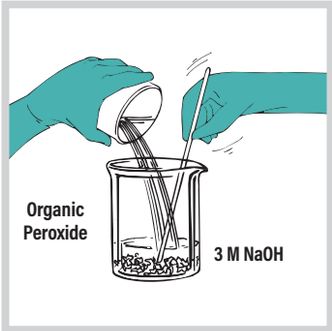
Procedure

1. Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron. Exercise caution working with dry organic peroxides—they are friction- and shock-sensitive.

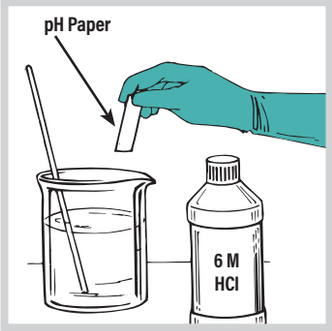
2. Carefully add a small amount of water and break up any lumps in the organic peroxide with a plastic stirring rod. Do **not** grind the dry solid.



3. Pour the material into 3 M sodium hydroxide solution. Allow to stand at least 24 hours, stirring frequently. Benzoyl peroxide has low water solubility, so frequent agitation is important to bring the decomposition reaction to completion.



4. Using pH paper as a monitor, neutralize the solution with 6 M hydrochloric acid.



5. Flush the neutral solution down the drain with excess water.

FLINN METHOD

#23 Sulfides, Inorganic

Inorganic sulfides release highly toxic hydrogen sulfide gas on treatment with acid. These materials are classified by the EPA as characteristic (reactive) hazardous wastes and may not be disposed of in the trash or drain. Leftover soluble inorganic sulfides may be oxidized as part of an experimental procedure.

Examples

Sodium sulfide, ammonium sulfide

Materials Required

Sodium hydroxide solution, NaOH, 0.5 M
Sodium hypochlorite solution, NaOCl
Glass stirring rod
Large glass beaker

Overview

Inorganic sulfides are easily oxidized to sulfate ions using sodium hypochlorite as an oxidizing agent.

$$Na_2S + 4OCl^- \rightarrow Na_2SO_4 + 4Cl^-$$

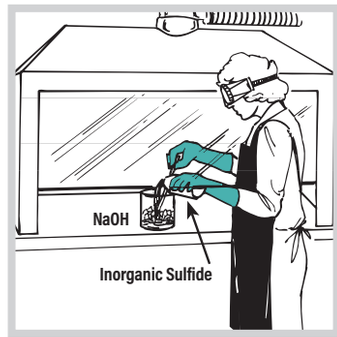
A small amount of base is added to keep the solution basic. A basic solution is needed because inorganic sulfides react with acid to produce highly toxic hydrogen sulfide gas and the hypochlorite ion is more stable at a higher pH.

The products from the reaction are sulfate salts, which are nonvolatile, odorless and have low toxicity. These materials can be rinsed down the drain.

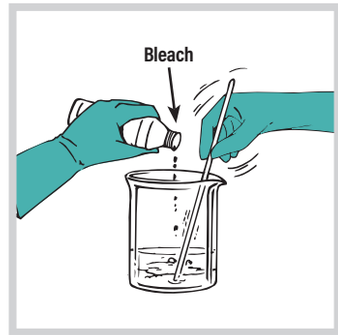
Procedure

1. Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2. Dissolve the inorganic sulfide in 0.5 M NaOH solution. For ammonium sulfide, use 100 mL of NaOH solution for every 10 mL of sulfide solution.



3. Slowly add sodium hypochlorite solution (bleach) to the inorganic sulfide. Add 200 mL bleach for each 10 mL of ammonium sulfide or 5 g of sodium sulfide.



FLINN METHOD #23 continued on next page.

Flinn Method #23, continued

4

Allow the solution to sit overnight in the fume hood. Flush the entire solution down the drain with a 20-fold excess of water.

Note: This procedure is **not** intended for use with hydrogen sulfide gas. Gas cylinders must be used completely, vented into a ferric chloride solution through a trap, in an operating fume hood, if needed (due to a leaking valve, for example) and then disposed of in the trash. Small lecture bottles cannot be reused.

FLINN METHOD

#24a Acids, Organic

Organic carboxylic acids can be disposed of by neutralization, solid waste disposal or incineration. Water-soluble organic acids are best disposed of by neutralization with a base to form water soluble sodium salts. Solid, long chain carboxylic acids (e.g., lauric, decanoic) and their salts are insoluble in water, but small quantities pose little risk to the environment. These can be disposed of using Flinn Disposal Method #26a. All other organic acids are best disposed of using a licensed hazardous waste disposal company. Note that all liquids having a pH ≤2 are classified as corrosive wastes and must be neutralized prior to drain disposal.

Use Neutralization Method for These Acids

Acetic acid
Aceto-orcein solution
Barfoed's reagent (Copper carbonate may be formed. Filter and landfill.)
Formic acid
Fumaric acid
Lactic acid
Malonic acid
Oxalic acid
Propionic acid
Succinic acid
Tartaric acid
Trichloroacetic acid

Materials Required

Sodium carbonate, Na_2CO_3, or sodium hydroxide solution, NaOH, 3 M
Glass stirring rod
Large glass beaker
pH paper

Overview

Organic acids that are water soluble readily react with bases to form soluble sodium salts. Some organic acids that have limited solubility in water may produce soluble sodium salts (e.g., benzoic acid) and are also disposed of by this method. Sodium hydroxide solutions or sodium bicarbonate are suitable bases. If sodium bicarbonate is used, carbon dioxide is also formed.

$$CH_3CO_2H + NaHCO_3 \longrightarrow CH_3CO_2Na + H_2O + CO_2$$

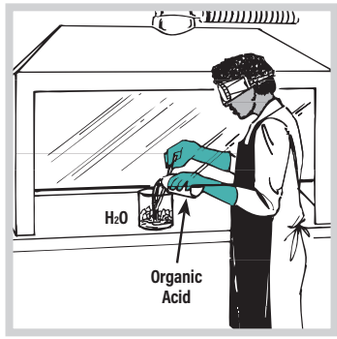
Procedure

1

Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

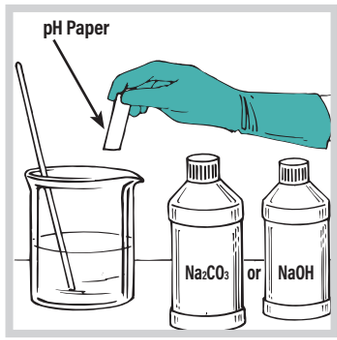
2

The organic acid may be diluted by adding it slowly to a 20-fold excess of water while stirring.



3

Neutralize the resulting solution with sodium carbonate or sodium hydroxide solution and check the pH of the final solution with pH paper. Stir the solution until all solid organic acids have dissolved.



4

Adjust the pH of the mixture to 5–9, if needed, and rinse the solution down the drain with an excess of water.

FLINN METHOD

#24b Acids, Inorganic

Neutralization of acid and base solutions (corrosive wastes) is a generally allowed disposal procedure and should present minimal problems. Two simple rules should be followed. First, the process should be mild. Any strong acids or bases should first be diluted to a concentration around 1 M or 10%. Remember, always add acid to water. Second, the final product must be near neutral (pH 5–9) before discharge to the drain. In this procedure, acids are neutralized with sodium carbonate.

Examples

Hydrochloric acid, sulfuric acid, nitric acid

Materials Required

Sodium carbonate solution, Na_2CO_3, 1 M
Glass stirring rod
Large borosilicate glass beaker less than ½ full of water
pH paper

Overview

This procedure is a standard neutralization of an acid with a carbonate. Neutralization may be highly exothermic. Immerse the reaction vessel in an ice bath to control the temperature, if needed.

$$2H_3PO_4 + 3Na_2CO_3 \longrightarrow 3CO_2 + 2Na_3PO_4 + 3H_2O$$

FLINN METHOD #24b continued on next page.

Please... Read the Narratives

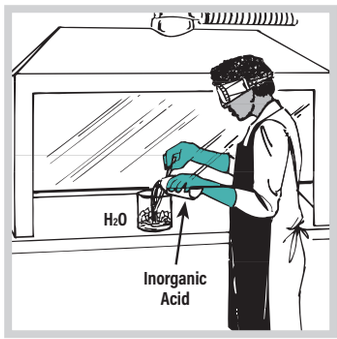
Important narratives precede these specific chemical disposal methods! Please read each narrative carefully! Do not use these procedures if you are not comfortable with the chemistry. Do not use these procedures without *first consulting with your local government regulatory officials*. These procedures may not be used in some jurisdictions. All procedures involve some hazards and risks. Once again... read the narratives that precede these specific chemical disposal methods.

Flinn Method #24b, continued

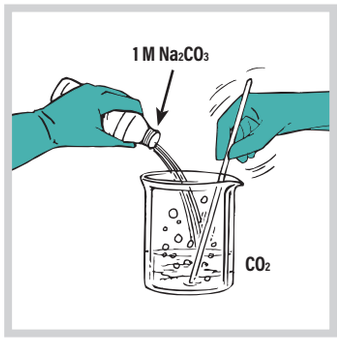
Procedure

1. Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2. Dilute the acid by pouring it into a large beaker containing water. The final concentration of the acid should be 1 M or less.



3. Slowly add 1 M sodium carbonate solution to the diluted acid while stirring. Carbon dioxide gas will be evolved. As the acid is neutralized by the sodium carbonate, the rate of gas evolution will decrease. When further additions of sodium carbonate solution yield no gas evolution, the neutralization is complete.



4. Rinse the neutral mixture down the drain with a 20-fold excess of water.

Flinn Suggested Laboratory Chemical Disposal Methods

Flinn Scientific has been publishing suggested laboratory chemical disposal methods for more than 40 years. Each chemical in the *Flinn Scientific Catalog/Reference Manual* has a disposal number under its name. The disposal number refers to one of the suggested disposal procedures listed in this section. As federal, state and local regulations have changed, some of the disposal procedures have been updated or deleted. Before attempting any disposal procedures, it is essential that you check local regulations to determine if it is still allowed in your locale.

If you have any questions concerning laboratory waste disposal methods, please call (800-452-1261) or email (flinn@flinnsci.com).

FLINN METHOD

#25 Carbides

Calcium carbide reacts with water to generate acetylene, a highly flammable gas. Leftover calcium carbide in an experimental procedure may be decomposed with water.

Example
Calcium carbide

Materials Required
Hydrochloric acid, HCl, 3 M
Dry chemical (ABC) fire extinguisher
Glass stirring rod
Large glass beaker ¾ full of water
pH paper

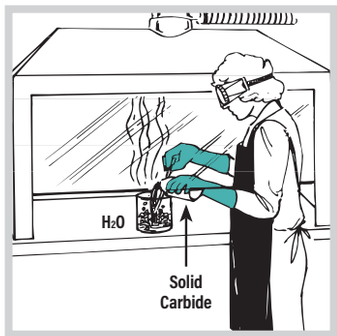
Overview
Calcium carbide reacts with water to form acetylene gas and calcium hydroxide, which is not very soluble in water. The addition of hydrochloric acid to the suspension of calcium hydroxide will dissolve it, forming water and calcium chloride. The resulting mixture should be neutralized if needed prior to drain disposal.

$$CaC_2 + 2H_2O \rightarrow C_2H_2 + Ca(OH)_2$$
$$Ca(OH)_2 + 2HCl \rightarrow CaCl_2 + 2H_2O$$

Procedure

1. Perform this procedure in a fume hood. Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

2. This procedure is intended for small amounts (<10 g) only! Carbides react with water, so keep these materials dry until ready for use or disposal. Slowly put the carbide granules into a large beaker of water with stirring. Flammable acetylene gas will be given off. Allow the acetylene to dissipate in the air, but avoid sources of possible ignition in the area. Allow the mixture to stand for several hours. The resulting solution will be strongly basic.



3. Using pH paper to monitor pH, neutralize the solution with 3 M hydrochloric acid.



4. Decant the neutral solution and rinse it down the drain with a 20-fold excess of water.

5. Dry any remaining solid and package it for disposal in a landfill suitable for chemical wastes.

FLINN METHOD

#26a Solid Waste Disposal in Landfill

The majority of inorganic solid wastes are salts consisting of a cation and an anion. In planning the disposal of these inorganic salts, the hazards associated with the cation and anion must be determined separately. If either part presents a potential hazard, the substance should not be disposed of in a municipal landfill.

Cations that have a relatively low level of toxicity are Al, Bi, Ca, Cu, Fe, Li, Mg, Mo(VI), K, Sc, Na, Sr, Ti, Zn and Zr. Anions that have relatively low hazards are:

Bisulfite (HSO_3^-)	Cyanate (OCN^-)	Phosphate (PO_4^{3-})
Borate (BO_3^{3-})	Hydroxide (OH^-)	Sulfate (SO_4^{2-})
Bromide (Br^-)	Iodide (I^-)	Sulfite (SO_3^{2-})
Carbonates (CO_3^{2-})	Oxide (O_2^-)	Thiocyanate (SCN^-)
Chloride (Cl^-)		

This list of less hazardous cations and anions is presented only as a guideline. Your chemical judgment, vlume of waste and local regulations must also be considered. For example, sodium hydroxide contains an acceptable cation (Na) and anion (OH), but is in fact a toxic and corrosive material that should be treated before disposal.

Materials Required

Cardboard boxes
Crumpled newspaper
Heavy tape to seal boxes

Procedure

Bury solids in a landfill site approved for the disposal of chemical waste. Do not mix different materials by removing them from their separate containers because unpredictable chemical reactions may occur. Pack separate containers into sturdy cardboard boxes, separating containers from each other with crumpled newspapers to avoid inadvertent breakage. Seal the cardboard boxes with heavy tape.

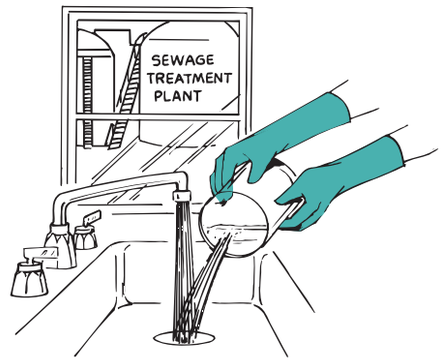
This procedure is recommended for a wide array of materials, from aspirin to zinc. We use the term "landfill site approved for the disposal of chemical waste" with the full realization that many of these substances can go into the school trash. However, regulations about landfill use change with great frequency. Local regulations should be consulted about exactly what you can and cannot place in the landfill in your area. You must determine what is permitted in your area. Do not assume that it is acceptable to dump materials into the school trash. Take the time to investigate. Some instructors have made this "investigation" a student project and have learned a great deal in the process.

If you have made aqueous solutions of the water-soluble or alcohol-soluble materials classified for disposal under this procedure, we recommend that you dispose of these solutions according to Flinn Disposal Method #26b.



FLINN METHOD

#26b Waste for Drain Disposal Without Pretreatment



Aqueous solutions containing nonhazardous wastes (as defined by the EPA) may be suitable for drain disposal if—and only if—the school drains are connected to a sanitary sewer system with a water treatment plant operating on the effluent from your drains. These guidelines must be followed:

- Do not use this procedure if your drains empty into groundwater through a septic system—or into a storm sewer.*
- These materials may generally be disposed of in quantities not to exceed 100 grams each day for each substance by rinsing them down the drain with a large excess of water.
- Do not put combinations of materials down the drain at one time.

Local regulations may be more strict on drain disposal than the practices we recommend. You must determine what is permitted in your area. Sewer disposal in your community is regulated by an ordinance of your local water treatment facility. The regulations will spell out in considerable detail the allowable limits for various waste components. Because each water treatment facility is unique, you must contact the facility and get a copy of the ordinance. We also recommend meeting with representatives of the local treatment facility if a major laboratory clean-up and disposal is planned. A good working relationship with the treatment facility will make everyone more comfortable with the appropriate use of the sewer as a disposal method. For example, in some areas, compounds of aluminum, copper and zinc are not permitted in sanitary sewers. In most cases, we recommend that you substitute Flinn Disposal Method #26a for this one. All the materials recommended for this procedure are water-soluble to the extent of at least 3% and represent a very low toxicity hazard. In addition, the organic materials are readily biodegradable.

**Note:* If your drain system does not empty into a wastewater treatment facility, do not put these substances down the drain. Rather, landfill the nonflammable substances and aqueous solutions according to Flinn Disposal Method #26a, and dispose of all others using a licensed hazardous waste disposal company according to Flinn Disposal Method #26c.

Please... Read the Narratives

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FLINN METHOD

#27c Licensed Hazardous Waste Disposal

Many hazardous laboratory wastes require licensed hazardous waste disposal. It is important to choose a licensed and reputable firm. Please read the introduction on page 639 for more information on choosing an acceptable disposal firm. Remember that the school has cradle-to-grave responsibility for its chemicals—documented proof that the chemicals have been properly disposed is required.

- ▶ Ask for and check references to make sure the firm is reputable and reliable.
- ▶ Do not automatically choose the low bid!
- ▶ Request a certificate of disposal for the chemicals.

Prior to licensed disposal, segregate and store hazardous waste in chemically resistant containers that are free of leaks or residues. Keep containers tightly closed at all times except when adding or removing waste. Label each container "Hazardous Waste" and add the name (identity) and amounts of all chemicals added to the container, along with the accumulation start date (the date you begin collecting waste in the container). Do not mix different types of characteristic hazardous wastes as unpredictable reactions may occur, generating heat and pressure inside the container. Check the chemical computability of all chemicals added to a waste container.

FLINN METHOD

#27a Scrap Metals

Some metals may have commercial value as scrap. If you do not wish to retain them, try to sell them. Otherwise dispose of them according to Flinn Disposal Method #26a.

FLINN METHOD

#27b Mercury Metal

Procedure

Mercury metal must not be disposed of by any means except to return it to a supplier for recycling. Mercury Waste Solutions, Inc. (1-800-741-3343) is a major mercury recycler and may be a disposal option. Under no circumstances should any other method of disposal be attempted. Metallic mercury is never buried, burned, placed down a drain or otherwise put into the environment. Mercury compounds also require licensed hazardous waste disposal according to Flinn Disposal Method #27f.

FLINN METHOD

#27c Phosphorus, Red and White (Yellow)

Phosphorus is a highly reactive and very flammable material. White phosphorus is pyrophoric, a poison and ignites spontaneously in air. Red phosphorus is not pyrophoric, but it is very flammable and can react explosively with strong oxidizing agents. Both chemicals must be handled with extreme caution and disposed of by a licensed hazardous waste disposal company.

FLINN METHOD

#27d Antimony, Vanadium and Their Compounds

Antimony and its compounds are toxic and may be harmful to the environment. The vanadium compounds vanadium pentoxide and ammonium meta-vanadate are classified as P-Listed acutely hazardous toxic wastes and require licensed hazardous waste disposal. Proper management of P-Listed wastes is extremely important. Institutions that generate more than 1 kg per month (in any month) of acutely hazardous waste will be subject to the most stringent generator requirements for all their hazardous wastes. They should be disposed of properly by a licensed hazardous waste disposal company according to Flinn Disposal Method #26c.

FLINN METHOD

#27f Heavy Metals and Their Salts and Compounds

Heavy metals require licensed hazardous waste disposal. The heavy metals listed here are classified by the EPA as toxicity characteristic hazardous wastes based on the Resource Conservation and Recovery Act (RCRA). Landfill disposal of heavy metals and all of their compounds is generally prohibited and subject to strict regulatory limits for the amount or concentration of the metal or metal ion that may be disposed. The regulatory limits are defined based on a test (laboratory procedure) called the Toxicity Characteristic Leaching Procedure (TCLP). TCLP limits for the various heavy metals in this category are included in the following list. Aqueous solutions of heavy metal ions are also restricted from sewer (drain) disposal by most publicly owned treatment works (POTW). Check with your local POTW for sewer discharge limits that apply in your area. General guidelines for hazardous waste disposal are described in Flinn Disposal Method #26c.

Metal	TCLP regulatory level
Barium (Flinn Method #27h)	100 mg/L
Cadmium	1 mg/L
Chromium	5 mg/L
Lead	5 mg/L
Mercury (Flinn Method #27b)	0.2 mg/L
Silver (Flinn Method #11)	5 mg/L

FLINN METHOD

#27h Barium Compounds

Soluble barium salts are extremely toxic and are classified by the EPA as characteristic (toxic) hazardous wastes. Aqueous solutions of barium salts may be precipitated in the form of barium sulfate to reduce the volume of hazardous waste requiring disposal.

Examples

All barium salts (i.e., barium nitrate, barium hydroxide, barium chloride)

Materials Required

Sodium carbonate, Na_2CO_3
Sulfuric acid, H_2SO_4, 3 M
Filtration apparatus (optional)
Glass stirring rod
Large beaker
pH paper
Wide-mouth plastic container with screw top

Overview

Barium sulfate is highly insoluble. This procedure produces barium sulfate in an acidic solution. Note that the only acid that will work in this procedure is sulfuric acid. The acid serves a double purpose in the case of barium hydroxide and barium peroxide in that it neutralizes the hydroxide ion in addition to its primary purpose of furnishing sulfate ion to react with the barium ion. Once the precipitation reaction is complete, the solid is separated from the supernatant liquid and any excess acid is neutralized with sodium carbonate. Solid barium sulfate requires licensed hazardous waste disposal. See the general guideline in Flinn Disposal Method #26c. The neutralized supernatant should be tested for residual barium and may be rinsed down the drain with excess water.

$$Ba^{+2} + SO_4^{-2} \longrightarrow BaSO_4 \text{ (solid)}$$
$$2H^+ + CO_3^{-2} \longrightarrow CO_2 \text{ (gas)} + H_2O$$

Procedure

1

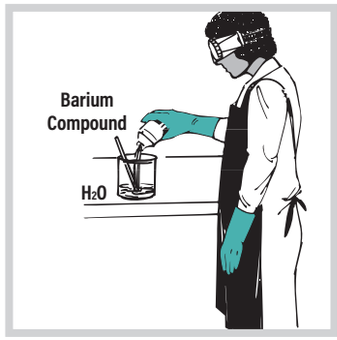
Wear chemical splash goggles, chemical-resistant gloves and a lab coat or chemical-resistant apron.

FLINN METHOD #27h continued on next page.

Flinn Method #27h, continued

2

Dissolve any leftover barium salt in a minimum amount of water. (Barium carbonate and barium peroxide are not soluble in water, so just suspend them in a tenfold excess of their weight in water.)



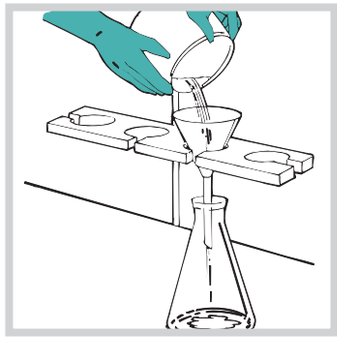
3

Add 3 M sulfuric acid to the solution while stirring until the precipitation of barium sulfate appears to be complete. Add at least a twofold molar excess of sulfuric acid.



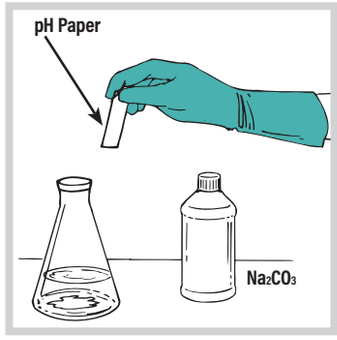
4

Allow the precipitate to settle, and decant off the supernatant liquid or filter off the precipitate.



5

The liquid will be acidic. Using pH indicator paper, neutralize it with sodium carbonate. Check that the neutral solution does not contain residual barium, and rinse it down the drain with excess water.



6

Allow the precipitate to dry and package it for licensed hazardous waste disposal.



FLINN METHOD

#27j Halogenated Solvents

Halogenated solvents are toxic compounds. They are immiscible with water and require licensed hazardous waste disposal (see Flinn Disposal Method #26c). Most halogenated solvents are characteristic (toxic) or U-Listed hazardous wastes.

REFERENCES

The disposal procedures listed in this section are obtained from the following reliable and highly regarded sources:

ACS Task Force in Laboratory Waste Management. *Laboratory Waste Management: A Guidebook*. Washington, D.C.: American Chemical Society, 2012.

Armour, Margaret-Ann. *Hazardous Laboratory Chemicals Disposal Guide*, 3rd Edition. Boca Raton, FL: CRC Press, Lewis Publishers, 2003.

"Little Known But Allowable Ways to Deal with Hazardous Waste." EPA Publication 233-B-00-002. May 2000, accessed August 2015. http://nepis.epa.gov.

Lunn, George and Eric B. Sansone. *Destruction of Hazardous Chemicals in the Laboratory*, 3rd Edition. New York: John Wiley and Sons, 2012.

National Research Council. *Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards*. Washington, D.C.: National Academies Press, 2011.

Please... Read the Narratives

Important narratives precede these specific chemical disposal methods! Please read each narrative carefully! Do not use these procedures if you are not comfortable with the chemistry. Do not use these procedures without *first consulting with your local government regulatory officials*. These procedures may not be used in some jurisdictions. All procedures involve some hazards and risks. Once again... read the narratives that precede these specific chemical disposal methods.

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Biological Waste **Disposal**

Ecological studies have repeatedly demonstrated the intertwined nature of all elements of the ecosystem. A basic ecological principle simply states—"You can't do just one thing." So when we dispose of materials we are likely to do more than just dispose of the materials. When considering the disposal of any material, our goal must be to minimize the environmental impact of the disposal (i.e., come as close to doing "one thing" as possible). Common sense, a knowledge of the material and a familiarity with local disposal regulations, procedures and policies must prevail. The general guidelines provided here are only intended to stimulate clear thinking about how to minimize our effects on the environment as we recycle Earth's materials.

One important first step is to formulate a biological waste disposal policy. General guidelines and parameters should be written prior to conducting actual disposal procedures. Follwing are some suggestions that might help in formulating a general biology disposal policy:

- Contact the facilities staff for information about ongoing disposal programs.
- If applicable, get in touch with your state science supervisor or department of education. Many states have implemented clean-up campaigns in recent years. The state EPA may also have an existing program.
- Work with the state and local associations. Use the experience of other experienced instructors to help your school comply with disposal requirements.
- Seek the advice of your Environmental Health and Safety Department or that of a nearby college or university. Most large universities have ongoing waste disposal programs and understand state and local requirements.
- Contract with a licensed hazardous waste disposal firm for removing chemicals. Because the institution has cradle-to-grave responsibility for its chemicals, even after they have been removed from the site, it is vital that you choose a licensed and reputable firm. Ask for and check references, and do not automatically choose the lowest bid. Request a certificate of disposal for the chemicals.

When conducting any disposal procedures, be sure to provide personal protection for yourself and others around you. Always wear proper personal protection equipment (e.g., goggles, aprons, gloves). Conduct disposal procedures in proper areas for the materials (e.g., hoods, ventilated areas, appropriate sinks). Where appropriate, follow sterile procedures and cautions relative to potential pathogens.

We have arbitrarily divided waste materials into six categories for the sake of discussion and clarity. Some situations might involve a combination of several of the categories. Specific federal, state and local regulations may apply to the disposal of biohazards from your lab. You must review your obligations and options with regulatory and school officials before developing a disposal procedure at your school.

Type I: Potentially harmful due to microorganism-type contamination
Type II: Potentially harmful due to dangerous chemical hazards
Type III: Preserved materials
Type IV: Living materials
Type V: Sharps and glass items
Type VI: Common garbage items

Type I — Potentially Harmful Wastes Due to Microorganism-Type Contamination

Biology, microbiology and biochemistry labs may generate wastes that must be managed as potentially infectious, biohazardous or regulated medical waste. Disposal of biohazardous wastes is subject to regulation by numerous authorities, including federal or state OSHA (for bloodborne pathogens), state environmental protection agencies and local wastewater treatment plants. Review the following general guidelines and essential equipment needed for the sterilization and ultimate disposal of biological wastes before planning laboratory activities involving the use of microorganisms, body fluids or recombinant DNA. Check with your state and local agencies for specific regulations regarding biohazardous waste disposal.

Examples

- Microbiological cultures and stocks, including all bacterial cultures and culture tubes
- Contaminated media and culture vessels (Petri dishes, inoculating loops) and personal protective equipment (PPE), such as disposable gloves
- Blood and other bodily or biological fluids
- Sharps and broken glass, including needles, razor or dissecting blades, glass pipets and glass tubing

★ HAZARDS

It is prudent practice to treat all microbial cultures and contaminated materials as if they may cause infection or pose an environmental risk if released. Microorganisms cultured directly from the environment should NOT be incubated at temperatures higher than 25 °C, and cultures should not be opened after they have been plated on agar. After incubation, a single microbial cell may multiply to more than one million, and at that level may present a risk if a culture is broken or carelessly handled. Universal precautions for microbiological wastes, biological fluids and contaminated labware include autoclaving, dry-heat sterilization or chemical disinfection.

Disposal Procedure

Sterilization is defined as the death of all living organisms, including spores, in or on an object. Chemical disinfection with diluted household bleach is effective at killing bacteria, fungi and algae, including bacterial spores and viruses. The required concentrations and time will vary for different organisms and spores. Use only fresh household bleach, dilute 1:10 with water immediately prior to disinfection, and immerse materials for at least 6 hours (overnight is best). For increased safety using bleach disinfection, open plates while they are under solution, not in air.

Autoclaving with steam and dry heat sterilization are the preferred methods for achieving sterilization. The following materials should never be placed in an autoclave: flammable, combustible or volatile liquids and any liquid in a sealed container. Check with local authorities to determine whether autoclaved bags may be disposed of as general waste.

- Objects to be autoclaved (e.g., Petri dishes, culture tubes) should be placed into the autoclave or biohazard bags without opening the containers.
- Loosely close but do not seal the bags—steam must penetrate the materials for effective sterilization—and place then on trays inside the autoclave to capture potential spills.
- Depending on the load density, typical sterilization conditions are 30 minutes at 121 °C and 15 psi pressure. The requirements for length of autoclaving and temperature increase at higher altitudes.
- Carefully follow the manufacturer's instructions and all safety precautions, including the use of PPE.
- The use of a biological or chemical indicator, such as autoclave indicator tape, is highly recommended. Some state authorities may require periodic validation of autoclave operation using bacterial strips or cultures.
- Do not place sharp objects into an autoclave bag.

Sharp objects, such as needles, razor blades and glass pipets, must be collected in a labeled, puncture-proof container. Sharps that are contaminated with potentially hazardous biological materials or fluids should be sterilized prior to collection and/or disposal.

Type II — Potentially Harmful Wastes Due to Dangerous Chemical Hazards

Examples

Solutions from electrophoresis or staining procedures, formaldehyde solutions or other chemical solutions or solids.

★ HAZARDS

Chemical wastes may be corrosive, toxic or flammable and should be handled accordingly. If the waste material is of unknown composition, assume the material is toxic, corrosive and flammable and take all precautions when handling the material. Contact Flinn Scientific for advice on how to identify and dispose of unknown chemical wastes.

Disposal Procedure

If the identity of the chemical waste is known, then consult the chemical waste disposal section of the *Flinn Scientific Catalog/Reference Manual* To find the

BIOLOGICAL WASTE DISPOSAL—TYPE II continued on next page.

Biological Waste Disposal, Type II, continued

proper disposal procedure, look up the chemical in the chemical section of the *Flinn Scientific Catalog/Reference Manual* and find the Flinn Suggested Disposal Procedure (e.g., Disposal: #26a) in the chemical listing. Then find the Flinn Suggested Disposal Procedure in the reference section of this manual. The disposal of chemical wastes is regulated by federal, state and local ordinances; do not perform any disposal procedure without first consulting with your local government regulatory officials.

Type III Preserved Materials

Examples

Preserved materials used in dissection activities, such as fetal pigs, frogs and rats, either before or after dissection. Museum mount display materials.

★ HAZARDS

Preserved materials are often fixed using formalin or formaldehyde. After the fixing process, the excess formaldehyde is usually removed and replaced with a nonformaldehyde preservative. The preservative solution and the preserved material both contain low levels of formaldehyde, a known carcinogen, and other chemicals. Many of these chemicals are also toxic by ingestion and inhalation.

Disposal Procedure

Do not perform this procedure if your school uses a septic system for waste water treatment. No chemicals should be placed down the drain unless your school is hooked up to a municipal water treatment facility. Prior to starting this procedure, check with your local water treatment facility for any rules or regulations concerning the disposal of formaldehyde solutions.

The first step in this disposal procedure is to rinse and wash away the preservative from the specimens. The room in which this process is undertaken should be well ventilated. Transfer the preserved specimens to a large plastic bucket or pail and place it in a large sink. Attach a length of tubing to the cold water outlet and, wearing gloves, force the exit end of the tubing into the very bottom of the bucket. If possible, use a water faucet equipped with a siphon breaker to eliminate the possibility of backflow.

Turn the water on slowly. You may want to start the water flowing before you force the tubing into the bucket to better gauge and control the water flow. A very slow but steady flow is desirable.

Allow the water to flow into the bottom of the bucket, forcing the preservative to overflow into the sink. Continue washing the specimens overnight or for a period of 10–12 hours to completely wash all preservative from the specimens.

After the wash cycle is complete, turn off the water, remove the tubing and drain all the remaining water from the container. Let the specimens drain for an hour and then double bag them in nontransparent plastic bags (black is preferred). Seal each bag completely and follow your local procedures for normal garbage disposal. Do not leave the specimens where students may find them, such as the trash can in the laboratory.

Type IV Living Materials

Examples

Animals, such as snakes, guinea pigs, fish

★ HAZARDS

Deceased living materials may contain diseases or pathogenic microorganisms that may spread to humans. Deceased animals should only be handled with gloves and disposed of as quickly as possible.

Disposal Procedure

Living animals, especially reptiles, amphibians and insects, should never be released to the environment unless first checking with local authorities. Introducing new species to your local environment may result in irreparable damage to local ecosystems.

Most areas prohibit the burial of dead animals, and you should review the local county's sanitation regulations for information on disposal of dead animals. For advice, consult your local Humane Society office, the local animal shelter, highway department or state natural resources department. A general disposal procedure is to wrap the deceased animal in newspaper, place it in a nontransparent plastic bag and then throw it in the main trash container if this is allowed. Do not leave the animal where it may be discovered by students.

Microorganism cultures, such as protozoans, should be sterilized by as outlined earlier and then flushed down the drain.

Very small dead fish can be simply flushed down the drain if the school is hooked up to a municipal water treatment facility.

Type V Sharps and Broken Glass

Examples

Sharps and broken glass items; needles, dissecting blades, glass tubing and glass pipets.

★ HAZARDS

Any sharp metal or glass object has the potential to puncture or cut the skin and deliver pathogenic organisms directly into the bloodstream in addition to creating a wound. These materials must be placed inside a hard plastic or metal container to prevent any possible physical injury.

Disposal Procedure

Check with a local hospital, health clinic or college for assistance in disposing of sharps. Hospitals and health clinics have rigorous programs to handle their sharps and may be willing to help a local school in safely disposing of sharps.

If outside help is not available, either purchase a sharps disposal container or obtain a hard plastic or metal container and add a large "sharps" label on the outside. If using a plastic container, make sure it is a hard plastic that is not flexible and cannot be easily squeezed. PET and PVC are usually better than LDPE or HDPE plastic containers. Ideally, the bottle should have a narrow neck to prevent any possibility of a student sticking hand into the sharps container. Another option is to cut a small hole in the top of the lid to allow the sharps to be added but not easily removed.

When the sharps container is full, the container and sharps must be sterilized before disposal. After sterilization, place a cap on the bottle, wrap the container in a heavy thickness of newspaper, place it in a nontransparent plastic bag and dispose of it following local disposal procedures. Never place a sharps container in a recycling bin.

Type VI Common Garbage Wastes

Examples

Paper products, plastic laboratory wastes that are not contaminated with chemicals or biological material.

★ HAZARDS

No hazards are associated with these materials beyond that of normal garbage.

Disposal Procedure

If a material has been used to dispense a chemical solution, rinse thoroughly before placing it in the trash. Dispose of all other materials that do not have chemical or biological wastes in the normal trash following your normal trash procedures. A good practice is to place disposable laboratory items in a black plastic garbage bag and then thoroughly close the plastic bag before throwing it in the trash. This may prevent laboratory items from being discovered in the trash by students and used for personal experiments or practical jokes.

HOW TO

Safety Tip/How To Box Index

Through our experiences, we have developed hundreds of different safety and procedural reference panels and articles. These panels and articles, many of which are illustrated, are located throughout the 2025 *Flinn Scientific Catalog/Reference Manual*. This index is by topic. Many teachers find it a worthwhile endeavor to read all the reference panels and articles in our catalog/reference manual. This index provides you with a simple means of finding references on specific topics.

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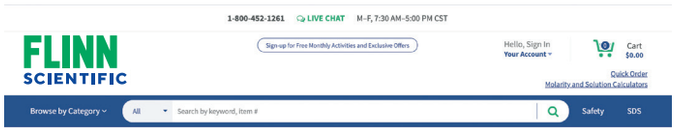
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