FLINN SCIENTIFIC

LAB SAFETY 101: PART 2

A RESOURCE FOR EDUCATORS

2020

Lab Safety 101 with Flinn Scientific

Flinn has been the Safer Source for Science for over 40 years, dedicated to making school laboratories a safe environment for both students and instructors.

Part 2 of this safety series addresses common science department safety concerns including chemical storage issues, labelling, GHS, inventory controls, PPE usage and best practices in the lab and prep areas.

While not required, we recommend attending **Lab Safety 101: Part 1** prior to attending **Lab Safety 101: Part 2**

OVERVIEW OF THIS SESSION

12. GHS
13. Purchasing Decisions
14. Incorrect Chemical Storage
15. Broken Glass
16. Student Safety
17. Accidental Injury
18. First Aid Training
19. PPE & Safety Equipment
20. Employee Training Program
21. Best Practices
22. Checklists for Compliance
23. Flinn Safety Certified
24. Discussion
25. Conclusion

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Typical 16 Section GHS Compliant SDS

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! 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 Eight pictograms exist in the GHS classification scheme to call attention to physical and health hazards.

E This section includes the formula, formula weight, concentration and CAS#. The CAS# is the single identifying number for each specific substance. CAS# should match the CAS# 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 are common properties included in this section.

SECTION 1 — CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

n-Butyl Alcohol (A)

Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 (800) 452-1261

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 or 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	$CH_3(CH_2)_3CH_2OH$	74.12	
Synonyms: 1-Butanol, n-Butanol				

SECTION 4 — FIRST AID MEASURES

Call a POISON CENTER or physician if you feel unwell (P312). (F)

If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing (P304+P340).

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

(G)

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 tri-class dry chemical fire extinguisher (P370+P378).

NFPA Code

H-2

F-3 (H)

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)

H The NFPA code is a numerical code established by the National Fire Protection

I How to clean up a spill. Always remove unprotected personnel from

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. (J)
Keep container tightly closed (P233). Keep cool (P235). Use only in a hood or in a well-ventilated area (P271).

SECTION 8 — EXPOSURE CONTROLS, PERSONAL PROTECTION

Wear protective gloves, protective clothing, and eye protection (P280). Wash thoroughly after handling (P264). Use only in a hood or in a well-ventilated area (P271).
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.
Shelf life: Fair, substance may oxidize. See Section 7 for further information. (M)

SECTION 11 — TOXICOLOGICAL INFORMATION

Acute effects: Absorbed through skin. Eye, skin, respiratory tract irritation. Dizziness. CNS depression. (N)
Chronic effects: N.A.
Target organs: Eyes, skin, respiratory system, central nervous system.

ORL-RAT LD_{50}: 790 mg/kg
IHL-RAT LC_{50}: 8000 ppm4H (O)
SKN-RBT LD_{50}: 3400 mg/kg

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

Consult your copy of the *Flinn Science Catalog/Reference Manual* for additional information about laboratory chemicals.

S Regulatory information used by regulatory compliance personnel.

T Flinn Scientific has an ongoing program to update its SDS. As professional chemists, we try our best to provide science teachers

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.

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 Describes the conditions or reactions to be avoided. Also provides some indication about anticipated shelf life.

N 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.

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 Suggested disposal methods for laboratory quantities of chemicals.

R Department of Transportation shipping information is included for your school district, emergency responders, and transport/shipping departments.

What is GHS?

Developed by the United Nations, GHS (Global Harmonized System) :

- Defines and classifies the hazards of chemical products
- Provides health and safety information on labels and Safety Data Sheets (SDS's)
- Goal of GHS: That the same set of rules for classifying hazardous products; the same format and content for labels and SDS's, will be adopted and used around the world

1. OSHA GHS

Introducing the GHS Pictograms

Exploding bomb
(for explosion or reactivity hazards)

Flame over circle
(for oxidizing hazards)

Corrosion
(for corrosive damage to metals, as well as skin, eyes)

Health hazards
(may cause or suspected of causing serious health effects)

Environment*
(may cause damage to the aquatic environment)

Flame
(for fire hazards)

Gas cylinder
(for gases under pressure)

Skull and crossbones
(can cause death or toxicity with short exposure to small amt)

Exclamation mark
(may cause less serious health effects or damage ozone layer)

Biohazardous infectious material**
(for organism or toxins that can cause disease)

Typical Manufacturer Label for Sodium Hydroxide Pellets (NaOH)

PICTOGRAM in RED DIAMOND

DANGER! Causes severe skin burns and eye damage. Do not breathe dust. Wear protective gloves and eye protection. Wash thoroughly after handling. PEL: 2 mg/m^3.

FIRST AID: IF SWALLOWED: Rinse mouth. Contact POISON CENTER or physician if you feel unwell. IF ON SKIN: Flush affected area with water. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present, and continue rinsing.

770 N. Raddant Road, Batavia, IL 60510 U.S.A.
630-879-6900

FLINN SCIENTIFIC "Your Safer Source for Science"

S0076 **2 kg**

SODIUM HYDROXIDE

caustic soda, soda lye, pellets, reagent, NaOH, F.W. 40.00

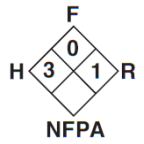
★ ***HAZARD ALERT:*** Causes severe skin burns and eye damage. Considerable heat evolves when added to water.

CORROSIVE TO BODY TISSUE

LOT: 999999
STORAGE: Inorganic #4

INORGANIC #4 I

DISPOSAL: #10
SHELF LIFE: Good; keep tightly closed.
SOLUBLE: Water and alcohol.
CAS NO: 1310-73-2
UN1823



Precautionary Statement

Chemicals

Should I Purchase This Chemical?

Are you prohibited from using 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 Canada 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 Should Be Asked Before Purchasing a Chemical.

Flinn's Big 6 Considerations…

1 What is the relative hazard level of the chemical?

Is the chemical water- or air-reactive? 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 activities such as 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?

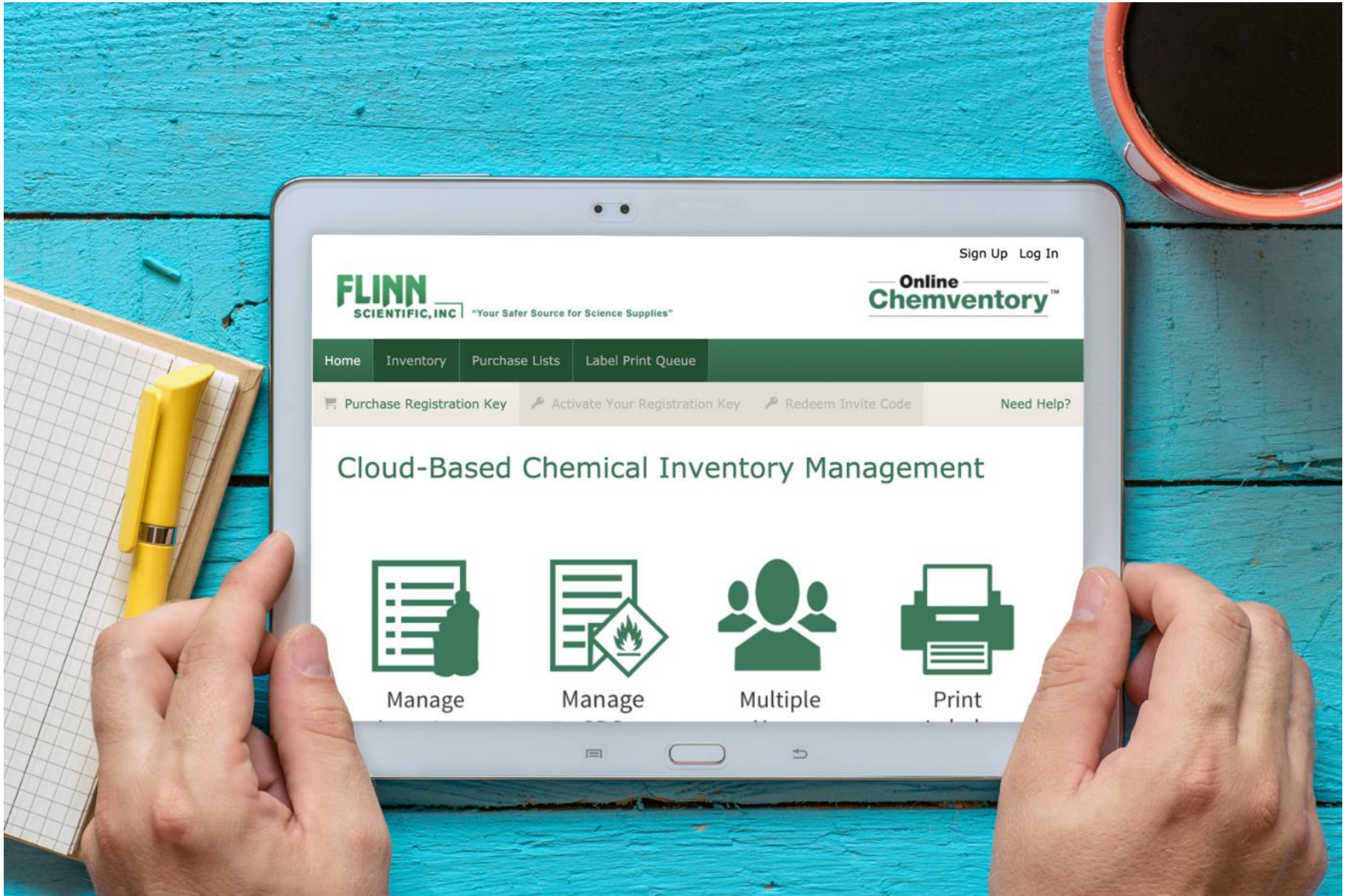
Do I have the correct type and size fire extinguisher? Do I have an eyewash? Is my room properly ventilated, etc.?

6 How will I dispose of this chemical?

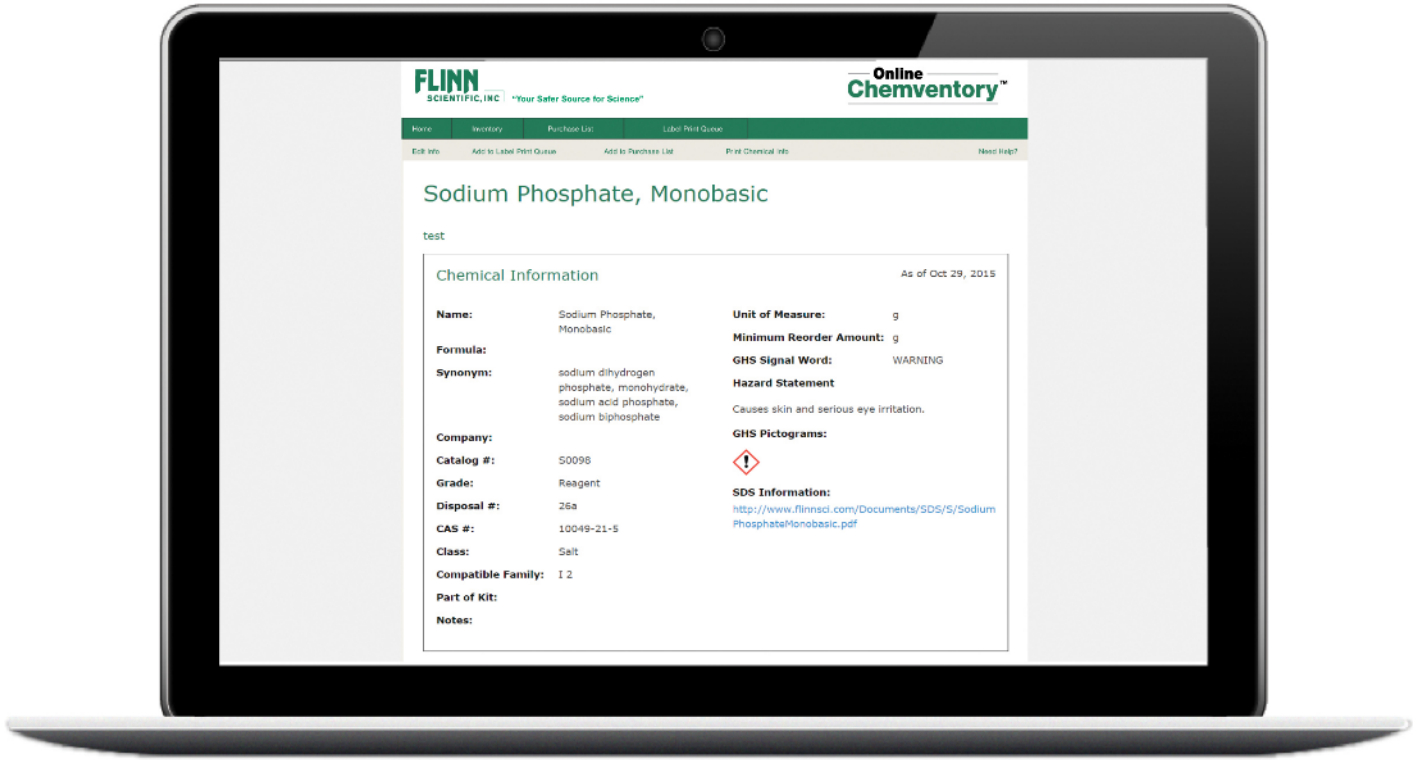
Will this chemical require special disposal procedures and does my school have a waste disposal program in place? Will the chemical have to be disposed of properly by a licenced hazardous waste disposal company?

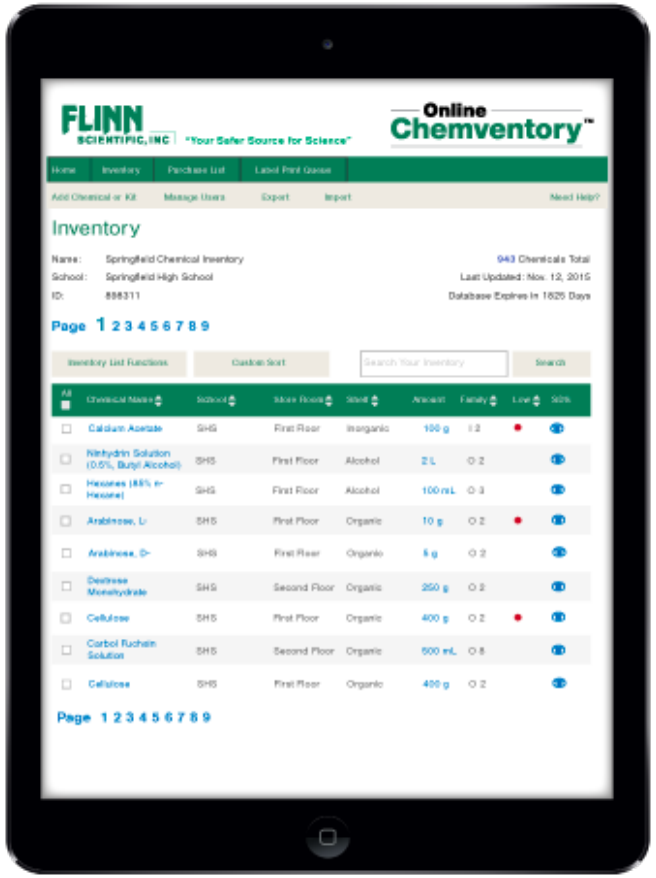
If you have trouble answering one or more of these six questions, call us. Our technical staff of chemists will be more than happy to give you expert advice!

Chemventory Online Chemical Management Software Service



Chemventory Online Chemical Management Software Service





Online Chemventory™

Organize Your Labs

Keep a clean organized lab and you will be much safer, and your lab will operate significantly smoother.

Be mindful of your purchases and think about the full cradle-to-grave costs with your selection (remember to factor in disposal costs).

Accurate chemical inventory is critical for organizing and managing safety in the science department.

1. Flinn Chemventory

Broken Glass

As spills occur, one result may include broken glass mixed in the solution.

Never use your bare hands to handle any pieces of broken glass.

Use a dustpan and either a small broom or brush to gather and transport the broken glass to the designated receptacle (Have a designated “Broken Glass Box”)

If the broken glass is mixed with a chemical, it should be disposed of with the chemical and not put in the “Broken Glass Box”

Accidental Injury

Report all injuries at once to the school administration.

Follow your local school board policies on injuries and reporting forms as applicable.

Should a student be injured in the lab, first determine if they are conscious and then take appropriate steps to assist them.

Where or When Do Most Accidents Occur in The Secondary Science Department?

- A 1996 survey was conducted to science teachers across the USA. Dr. Larry Duff from Nebraska commissioned the survey. The results were frightening.
- 70% of ALL accidents in the laboratory occurred in GRADE 9. That is both a concerning and preventable statistic.
- 93% of teachers responded that the grade 9 students failed to properly read and follow safety instructions in the classroom.
- Teachers need to both model and reinforce acceptable safe behaviors in the lab.

FIRST AID REVIEW

Do you have adequate First-Aid training?

How recent was your last review?

Who are your designated first responders?

Location of First Aid kit in classroom / prep area and contents of the kit

What are limits of First-Aid in the school?

Contact Administration / Emergency Services

PPE Considerations

Often, certain Personal Protective Equipment products are overlooked and not truly inspected for safety and compliance.

- Are your Safety Goggles ANSI Z87.1 certified? Are they functional?
- Do you have a Safety Shield for chemical Demonstrations?
- Use proper “Broken Glass” Boxes—Not used empty pails!
- Science Safety Manual / Chemical Hygiene Plan–annually updated?

Personal Protective Equipment

- ANSI Z87.1 certified goggles (chemical splash/impact resistant)
- Gloves (based on 8-hour exposure immersed in chemical)
- Aprons / Lab Coats --- Teacher and Student?
- Face Shield
- Ear protection
- Respirator – fitted properly & replacement cartridges

Mandatory Safety Equipment

- Eye wash station – plumbed in every lab
- Drench shower (one in department)
- First Aid kit – aligned to the # of people in lab (25/50)
- Safety chemical cabinets / storage
- Fume hood (minimum 100cfm face velocity)
- Fire Blanket in each room with gas jets
- Fire Extinguisher (ABC type, wall mounted)
- Safety Signage in each lab area
- Comprehensive Chemical Spill kit (Acid/Base/Solvent)

Engineering Control / Preventions

- Fume Hood
- Eyewash
- Drench Shower
- Chemical Safety Cabinets
- Chemical Spill Kit

Fire Safety

- Fire Extinguisher – type / location / PASS / training (local FD involvement)
- Fire Blanket – location / type / training
- Fire Detection – smoke alarm in lab / prep area (NFPA rules)
- Fire Alarm – location / functional
- Fire Suppression System – sprinkler vs powder vs carbon dioxide
- Emergency Signage posted and practice drills documented

Employee Training Program

Have the teachers been trained in the following areas?

- Chemical labelling (GHS) and SDS management
- Chemical storage (compatibility issues / space / location..)
- Chemical handling & dispensing techniques (solution dilution)
- Chemical disposal process and storage of hazardous wastes
- Chemical spills (acid / base / solvent)
- Fire / Flood / Broken Glass / Accidental Injury
- CHP Review and Updating annually – including administration
- First Aid
- Fire Extinguisher & Fire Blanket Safe and Proper Use
- Identifying hazards and prevention

Best Practices in the Science Department

Being consistent is critical to the on-going safety and success in the school science department.

- Current inventory of chemicals on-site and a manageable effective storage system
- All chemicals labelled according to GHS
- Organized lab areas – no clutter or leftover lab activities for weeks
- Safety training and compliance for ALL employees

Best Practices Continued…

- Always use (model) PPE when in the lab
- Use of a Lab Safety Contract with students to reinforce behavior.
- Follow procedures from the CHP / school district safety manual / DOE policy documents
- Ordering chemicals in smaller amounts in the lowest concentration possible to minimize storage and disposal

Common Concerns about Safety Regulatory Compliance

- Do we have the ‘right’ chemical storage cabinets?
- Do we have hazardous chemicals? (risk exceeds value)
- Do we have an accurate inventory?
- Do we have GHS labels on the chemicals?
- Do we have a Chemical Hygiene Plan in place? How current?
- Do we have a Chemical Hygiene Officer? Who is it?
- Do we have the necessary PPE? (Goggles / respirator / gloves etc.)
- Do we have a functional fume hood / eyewash / shower?
- Do we have an ongoing safety training program for employees?
- Do we have a Banned list of chemicals / activities that is communicated?

Compliance Concerns Continued…

- How do we make a Chemical Hygiene Plan?
- Who will be the Chemical Hygiene Officer?
- How do we label ALL of our chemicals for GHS compliance?
- How do we create an accurate inventory of our chemicals & SDS?
- How do we inspect PPE? (Goggles / respirator / gloves, etc.)
- How do we inspect our fume hood / eyewash / shower?
- How do we engage in an ongoing safety training program for employees?
- How do we create Banned list of chemicals / activities?
- How much is this going to cost?
- How long does this laboratory safety compliance take to implement?
- How do we start the process?

Flinn Scientific is Here to Help

Flinn Scientific has all of the resources you need to be as safe as possible and offer a very rigorous science program. We are here as a trusted lab partner to accelerate the culture of safety awareness in your school.

Flinn Scientific Checklist for Lab Safety 101

CRITERIA	YES	NO
1. Do you have only 'new' chemicals in the lab? (less than 3 years old)		
2. Is there a current chemical inventory? Are the new SDS's accessible to all?		
3. Are chemicals labelled and stored properly? (GHS labels & organized safely)		
4. Is there adequate PPE in the lab? (goggles/gloves/aprons etc.)		
5. Are there proper chemical storage cabinets? (acid, corrosive, flammables cabinets)		
6. Are teachers properly trained in safety protocols and procedures? (recertification?)		
7. Is a Safety Contract used with students in the lab?		
8. Is there adequate fire safety equipment in each room? (extinguisher / blanket etc.)		
9. Is there a current Chemical Hygiene Plan in place? Is there a CHO designated?		
10. Is there a hazardous waste procedure in place / scheduled pick-up for disposal?		
11. Is there a Banned/Restricted list of chemicals?		
12. Do you feel comfortable with the accountability for safety in the science department?		

Flinn's Exclusive Seven-Star Science Safety System

Science Essentials

- Science Safety Training & Certification (online & free)
- Science Room Safety Inspections (online & free)
- Chemical Storage & Inventory (Chemventory™)
- Student Safety Contracts (Flinn sample)
- Departmental Safety Notes (Flinn sample)
- Safety Calendar of To-do's (Flinn sample)
- Annual Safety Reviews

Purchase Guide (Safety First)

Flinn's Exclusive Seven-Star Science Safety System

Science Safety Training & Certification (online & free)

- 7-hour modular safety awareness course
- High School & Middle School Specific
- 20 Minute – Re-certification every 2 years
- Certified for Professional Learning File
- Addresses New Hires / New-to-Science
- Adult Learning Style – with Competence Confirmation and assessment built-in
- Custom PD training sessions in-person or on-demand specific to your safety needs

Flinn's Exclusive Seven-Star Science Safety System

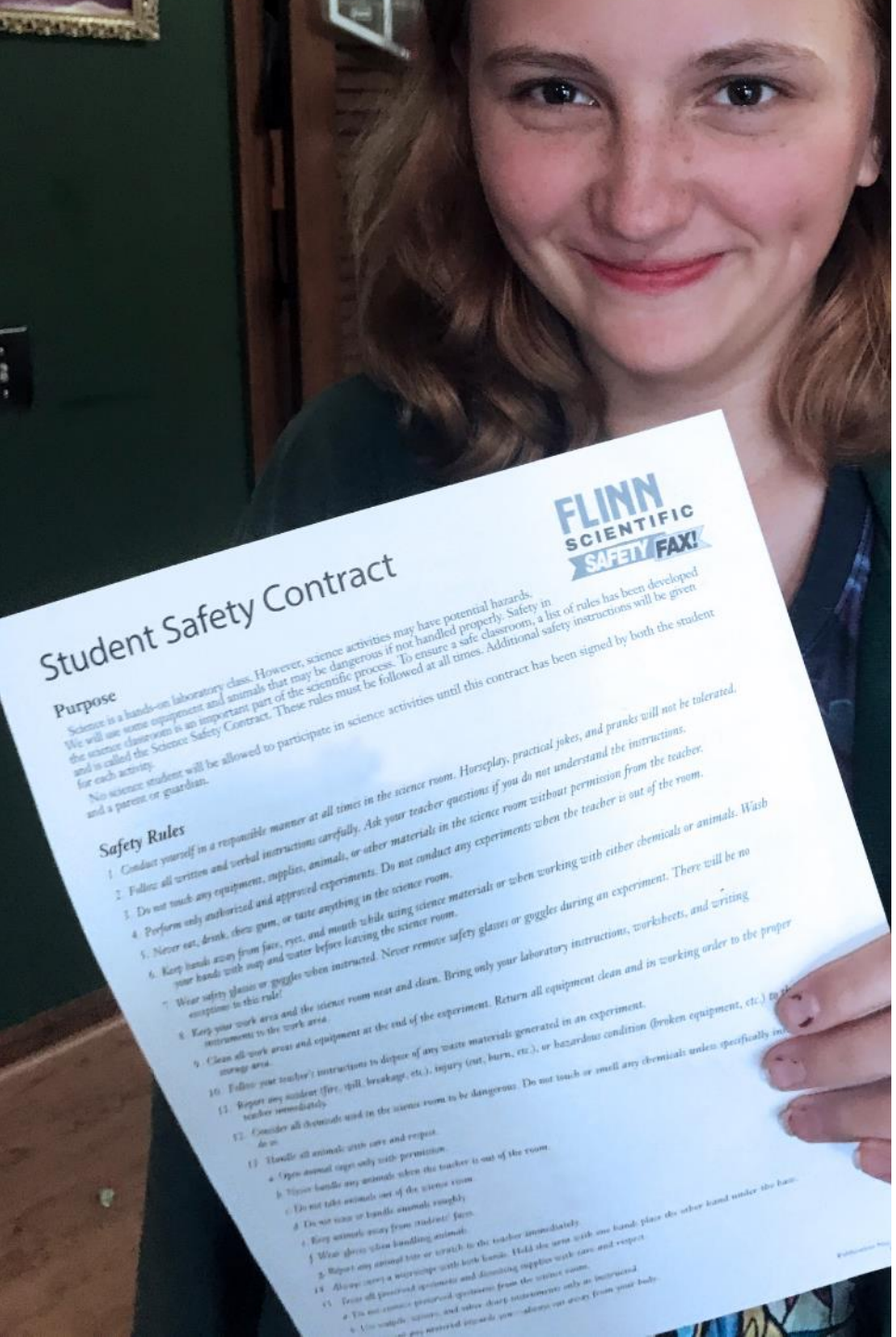
Science Room Safety Inspections (online & free)

- 220 Point Self-Inspection Safety Audit
- Used as Mock Physical Inspection / Audit to benchmark location needs
- Communication of Remediation Needs
- Creates an Expectation Standard
- Customizable for your schools
- Duty of Care Document

Flinn's Exclusive Seven-Star Science Safety System

Chemical Storage & Inventory (Chemventory™)

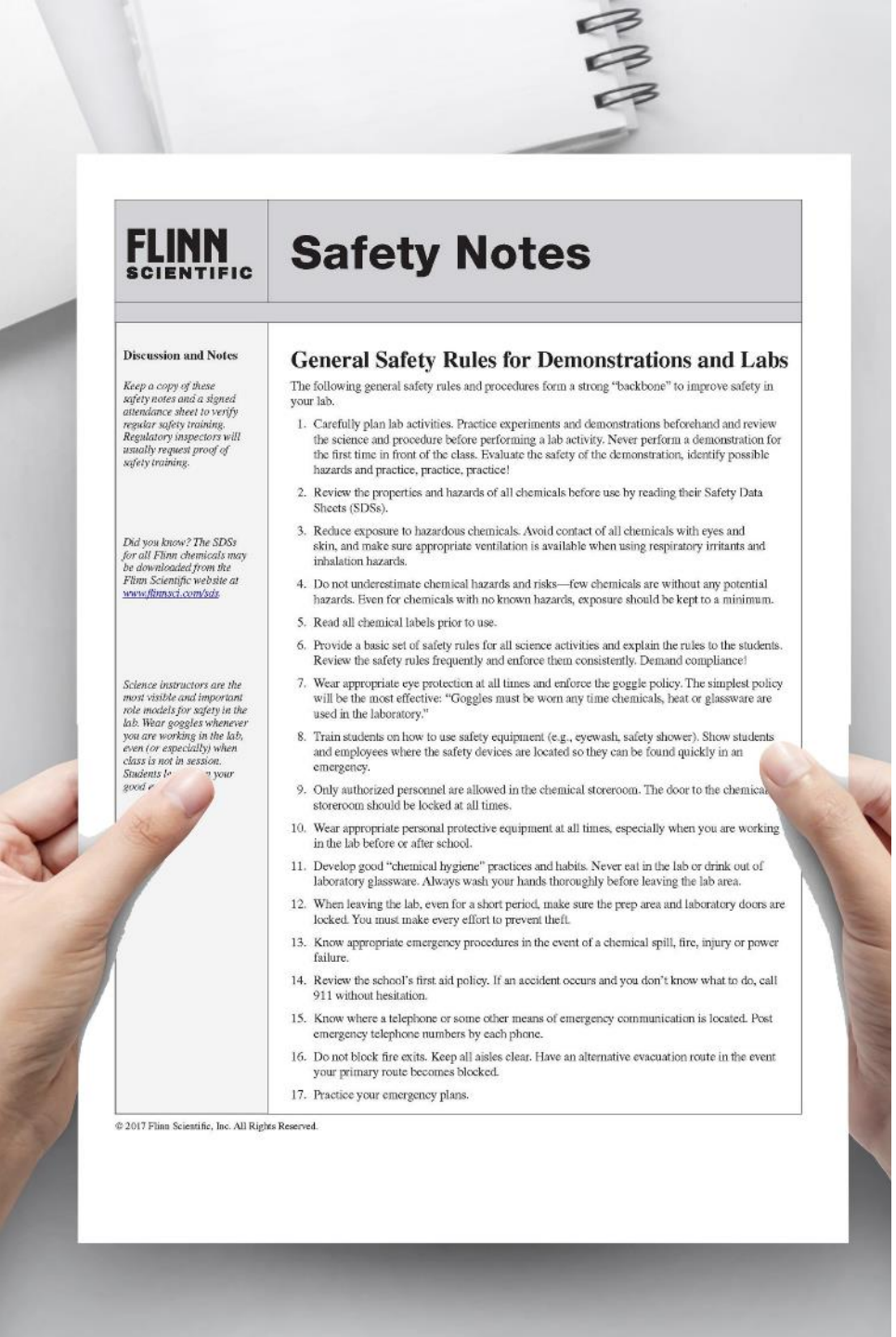
- OSHA Compliant Inventory Accessible & Updated
- SDS & GHS Output – Custom pdf for each School
- Fast & Easy Loading of Real-time Inventory
- Granted Access Permission from Users
- Administration, First-Responders, and Colleagues
- Multiple Chemical Storerooms



Flinn's Exclusive Seven-Star Science Safety System

Student Safety Contracts (Flinn sample)

- Confirms Student Review & Parent Consent
- Establishes Safety Expectations
- Documentation for Compliance & Duty of Care
- Establishes Standard of Expectation
- Preparations and Preventative Measures for Safety
- Reproduceable for Teachers
- Record of Responsibility



Flinn's Exclusive Seven-Star Science Safety System

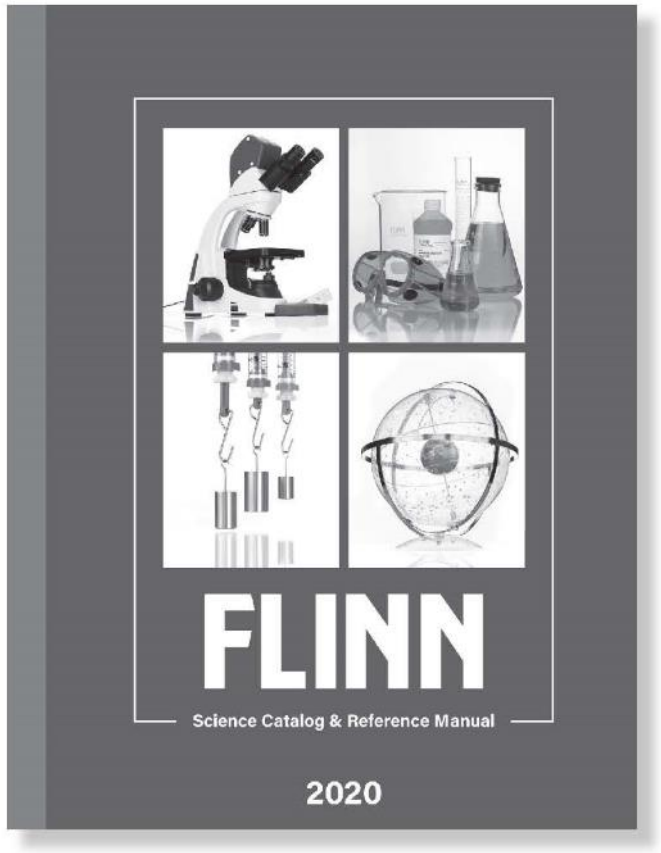
Departmental Safety Notes (Flinn sample)

- Makes Safety a Departmental Concern
- Creates professional cadence of Safety Discussions
- Reviews dissemination of timely information
- Past issues archived on FlinnSci.com Resources website
- Retained for future reference & recall
- Informative Ongoing Professional Development
- Addresses Professional Expectation Standards

Flinn's Exclusive Seven-Star Science Safety System

Safety Calendar of To-do's (Flinn sample)

- Shows tasks to complete and when
- Annual, Monthly, Weekly and Daily Responsibilities
- Holds accountability for safety with completions
- Establishes Professional Expectation & Standards
- Prompts on what & when actions are needed



PURCHASE GUIDE

A Quick and Easy Checklist of Science Essentials

2020

See your *Flinn Scientific Catalog/Reference Manual* or visit www.flinnsci.com for product details.

Flinn's Exclusive Seven-Star Science Safety System

Science Essentials Purchase Guide (Safety First)

- Features Teacher's Choice Products
- Begins with Science Safety for Annual Needs
- PPE – Personal Protective Equipment
- Communicates Needs to Administration
- Prompts on Items – Inventory, Grants, Reviews
- Addresses Equipment & Supply Standards

Flinn's Exclusive Seven-Star Science Safety System

Let FLINN be your trusted lab partner in your schools.

No other company has the resources, talent and experience that can assist you with making your labs and educators safer and more compliant with federal and state regulatory.

Please let FLINN know how we can help you achieve your science and safety objectives.

How can we help you?

What else do I need to worry about in the science lab?

You need to be aware of your surroundings and be aware of what to do in the preceding situations should they arise.

BY staying up to date on best safety practices, you are now better prepared to tackle the challenges these events and others may present in your classroom.

Becoming Flinn Certified

You owe it to yourself, your family, and your students to be as safety conscious as possible and Flinn Scientific wants to recognize you as an advocate of science lab safety. Flinn has developed a very comprehensive series of Safety sessions (40 Smart Modules) that go into details about the topics covered here and more. Please visit www.flinnsci.com to register for this self-paced online course. Be smart. Be safe. Be Flinn Certified.
(....and YES it's100% FREE!!!!)

Get Flinn Certified in Laboratory Safety Today for Free!

Make your laboratory a safe environment for both students and instructors. Choose from one of our 9 certificated courses below to gain an in-depth knowledge of laboratory safety for science educators.

High School and Middle School Certification Courses

Flinn Certified Lab Safety Course—On-line

You can participate in the Award-Winning Lab Safety Certification from Flinn—On-Line and FREE.

8-hour modular course covering every topic in the science lab in a practical and direct way.

You must pass each unit before proceeding—there are built-in evaluations to ensure knowledge transfer—and grow your safety awareness level.

Certificate of Completion provided and Re-certification course available as well. High School and Middle School versions are available.

Flinn Lab Safety Courses

FLINN SCIENTIFIC

Ask about our custom district solutions designed to support a safe return to school:

- Custom safety and professional development/learning proposals to ensure full school safety
- Full PPE for students, faculty, and support staff
- Blended science learning solutions that provide continuity of lab instruction for both onsite & remote learners

www.flinnsci.com | **1-800-452-1261**