FLINN ELEMENTARY SCIENCE AND STEM SAFETY

FLINN SCIENTIFIC

THE COMMON SAFETY CONCERNS IN ELEMENTARY SCIENCE AND STEM PROGRAMS

Council of State Science Supervisors

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Guidance on Common science lab safety concerns in the elementary schools across the USA based on proven legal safety standards and better professional safety best-practices and trusted safety protocols.

Many science teachers and supervisors have asked for an updated safety resource to use in their elementary science classrooms and labs to raise the level of awareness, and compliance in an effort to prevent any potential unsafe situations in the science department.

FLINN and the CSSS understands the situation that you are in currently and we have compiled a listing of common concerns and remedies for them which you can use in your school.

James Palcik, Director of Education, Safety and Compliance, and Tom Trapp, Director of National Accounts, FLINN Scientific Inc.

These materials contain content provided by third parties and are being distributed for your convenience only. We make no representations about the accuracy of these materials and urge you to consult federal, state, and local public health and safety guidelines for the most up-to-date information on laboratory safety.

OVERVIEW OF THIS RESOURCE

A very special acknowledgement to Dr. Ken Roy for the professional guidance and safety review of these CSSS documents for use in K-12 schools across the USA. We appreciate your experience and direction.

Dr. Ken Roy
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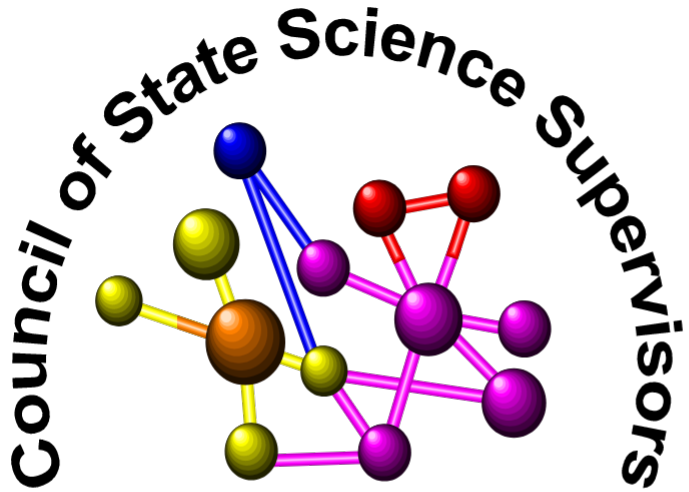


Our mission is to sustain and nurture a dynamic learning community that empowers its members to be effective and articulate advocates for quality science education at the local, state and national levels.

Council of State Science Supervisors

"The voice and vision of science education for the states"

CSSS is the only professional science organization whose members have direct accountability to the government agencies given the constitutional authority for education. Within their own jurisdictions, each of these supervisors plays a key role in directing efforts at improving school science and to ensure excellence and equity in science education.

CSSS can offer state and national organizations a direct science education link to every school building in their state or territory. These science supervisors can provide information on the types of science programs their schools are using and how well each of the programs are working in their state. Most of the members serve on the state science teacher's organizational boards and are on a first name basis with their leaders. The Council members are proactive change agents in science for their state. Their responsibilities link the Council members by leadership and service to a broad constituency.

1. http://cosss.org/
2. http://cosss.org/page-18148

Science & Safety: Making the Connection

With the increasing emphasis on hands-on, minds-on inquiry instruction at all grade levels in the multiple science education frameworks that exist across the various states as a baseline for scientific investigation and courses of study, it becomes more incumbent upon science teachers to be as knowledgeable as possible about laboratory safety issues and their own responsibilities and accountabilities.

As recognized science supervisors/specialists, the members of the Council of State Science Supervisors (CSSS) are constantly receiving questions from teachers and administrators about safety issues, responsibilities, and liability. This resource document, which addresses some of the most commonly asked questions, is one response to those frequent inquiries.

The objective of this document is to provide a handy, concise reference for science teachers, primarily at the elementary K-8 level.. They can refer to it for information and resources on some of the most commonly asked questions that concern science teachers. Resources cited are in paper, electronic, and web accessible forms. It should be clear that this document cannot be com prehensive because of limitations of the format and purpose. It is hoped that the most important information needed about the topics is incorporated.

1. http://cosss.org/
2. http://cosss.org/page-18148

Special Notice to the Reader About this Resource

No implication of endorsement or lack of omission of any referenced material within this document. For more information about specific questions in the document as they pertain to a particular locale or state, contact your local or state fire marshal, building commission, health department/poison control center, environmental regulatory and state Occupational Safety and Health Administration (OSHA) agency, or science specialist at the local or state board of education/education agency (DOE).

The Council of State Science Supervisors, an organization of state science supervisors/specialists throughout the United States, has a long history of working collaboratively with other science education organizations and professional groups to improve science education on a national scale.

For more information about CSSS and its membership, direct your browser to http://cosss.org/

1. http://cosss.org/
2. http://cosss.org/page-18148

Legal Disclaimer

DISCLAIMER: The materials contained in this safety resource document have been compiled using sources believed to be reliable and to represent the best opinions on the subject. As stated above, the goal of this document is to provide a handy, concise reference that science teachers, primarily at the elementary (K-8) level, can refer to for information and resources on some of the most commonly asked questions that concern elementary science and STEM teachers working in science departments in elementary schools.

The document as a whole does not purport to specify minimal legal standards. No warranty, guarantee, or representation is made by the Council of State Science Supervisors or its consulting partners as to the accuracy or sufficiency of the information contained herein, and the Council and its supporting partners assume no responsibility in connection therewith. The document is intended to provide basic guidelines for safe practices and facilities.

Therefore, it cannot be assumed that ALL necessary warnings and precautionary measures are contained in this document and that other or additional information or measures may not be required. It is advised that users of this document should also consult pertinent local, state, and federal laws pertaining to their specific jurisdictions, as well as legal counsel, prior to initiating any safety program. Registered names and trademarks, etc., used in this publication, even without specific indication thereof, are not to be considered unprotected by law.

Key Safety Checklist General Items to recognize

1. **Have** and enforce a safety contract or safety acknowledgement form signed by students and parents/guardians.
2. **Identify** medical and allergy problems for each student to foresee potential hazards.
3. **Assess and minimize** barriers for students with disabilities.
4. **Model, post, and enforce** all safety procedures. Display safety posters and the numbers for local poison control centers and emergency agencies.
5. **Know** district and state policies concerning administering first aid and have an adequately stocked first-aid kit accessible at all times.
6. **Report** all injuries, including animal scratches, bites, and allergic reactions, immediately to appropriate personnel.
7. **Be familiar** with your school's fire regulations, evacuation plans, and the location and use of fire fighting equipment.
8. **Post and discuss** emergency escape and notification plans/emergency phone numbers in each space used for science activity.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

General Safety Considerations

9. **Make certain** that the following items are easily accessible in elementary classrooms, classrooms with labs, and science resource rooms:
   - appropriate-size indirectly-vented chemical splash goggles that are American National Standards Institute (ANSI) Z87 or Z87.1 coded (D3)
   - non-allergenic gloves (nitrile are best choice)
   - non-absorbent, chemical-resistant protective aprons
   - eyewash units
   - safety spray hoses/shower
   - ABC tri-class fire extinguisher(s)
   - flame retardant treated fire blanket
10. **Make certain** that you, your students, and all visitors are adequately protected when investigations involving glass (not recommended), heat, chemicals, projectiles, or dust-raising materials are conducted.
11. **Implement** a goggle sanitation plan for goggles used by multiple classes.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

General Safety Considerations

12. **Keep** spaces where science activities are conducted uncluttered.
13. **Limit size** of student working groups to a number that can safely perform the activity without causing confusion and accidents.
14. **Prepare** records including Safety Data Sheets (SDS) on all chemicals used on safety training and laboratory incidents.
15. ***Provide** adequate workspace (45 square feet) per student as well as low table sections for wheelchair accessibility that can be supervised by recommended ratio of teacher to student of 1:24.
16. **Do not permit** eating and drinking in any space where science investigations are conducted.
17. **Do not store**, under any circumstances, chemicals and biological specimens in the same refrigerator used for food and beverages. **OSHA requires signage on refrigerators either – 'Chemicals or biologicals only' or, 'Food for human consumption only'.*
18. **Do not use** mercury thermometers with elementary students, since their use is inappropriate. Any mercury thermometers still present should be disposed of properly.

during the pandemic, spacing requirements are modified based on evidence-based research and prevention protocols

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Glassware concerns in the laboratory

1. **Substitute** plasticware for glassware in elementary classrooms, classrooms with labs, and science resource rooms.
2. **Possess** a whiskbroom, dust pan, and disposal container for broken glass when using glassware of any type (not recommended).
3. **Make certain** that students understand they are not to drink from glass/plasticware used for science experiments.
4. **Demonstrate** proper usage and handling of glassware if it is used in the elementary science program and have a fully-stocked first-aid kit nearby in case of accidental injury from broken glassware.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Chemical Precautionary Awareness

1. **Label** equipment and chemicals adequately with respect to hazards and other needed information. GHS legislation specifies how to create a workplace label for chemicals and the minimum information requirements for safety.
2. **Store** chemicals in appropriate places: e.g., in secured cabinet or stockroom, at or below eye level, on wooden shelves with a front lip, and without metal supports. Storage space should be kept cool, dry, and locked.
3. **Make certain** that students understand that chemicals are never to be mixed with ‘just to see what happens’ or ‘just for fun’; and that chemicals are never to be tasted or smelled without supervision and direction from the teacher; and that they must wash their hands thoroughly after handling chemicals in the school.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It’s Elementary!

Electrical Precautionary Awareness

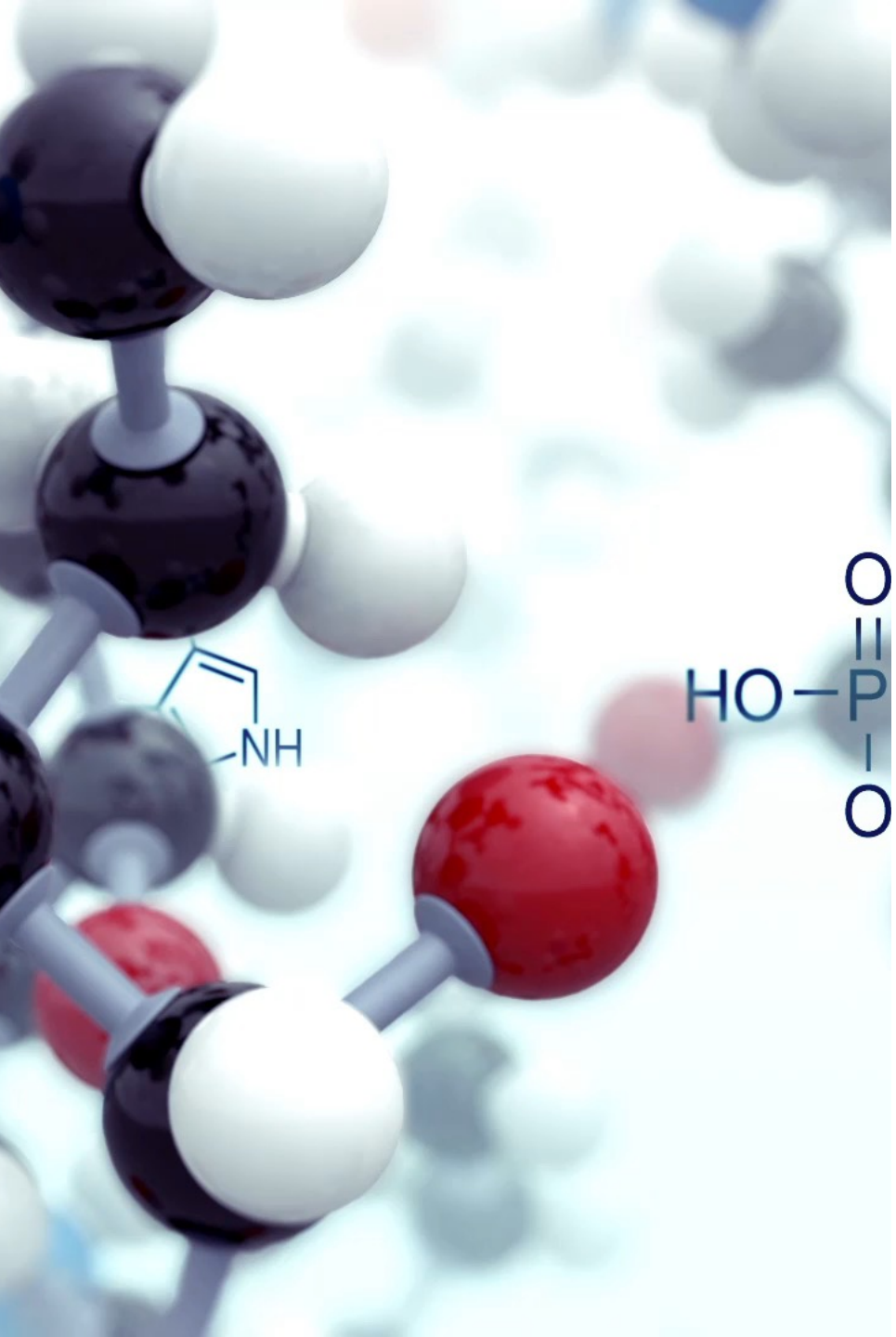
1. **Make certain** that students understand that they must NOT perform experiments with electrical current at home or at school “just for fun or to see what will happen.” Only supervised activities directed by the teacher should be done.
2. **Make certain** electrical cords are short and plugged into the nearest socket. Emphasize that students grasp the plug, rather than the cord, when unplugging electrical equipment. Cords also must be in good repair. Do not use extensions.
3. **Be sure** that students’ hands and surrounding surfaces are dry before plugging in electrical cords or turning on and off switches and appliances/tools. Water can be a good conductor of electricity.
4. **Make sure** all electrical outlets are Ground-Fault Interrupters (GFIs). Cover outlets when not in use.
5. **Use** only three-prong (grounded) plugs when small electrical tools such as heating elements for terraria and aquaria, hot plates, or small motors are used. Extension cords should not be used.
6. **Instruct** students never to grasp any electrical device that has just been turned off, since it may be hot after use and result in serious burns.
7. **Make certain** that students understand that connecting only a wire between the terminals of a battery will result in the wire getting hot and possibly causing serious burns.
8. **Remind** students that even non-electrical hand tools such as hammers, screwdrivers, or hand drills slip easily and can produce projectiles or inflict serious cuts. Appropriate safety equipment should always be worn.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It’s Elementary!

Common Safety Operating Procedures: RULES

1. **Know** district, local, and state statutes and regulations regarding animal care, storage of chemicals, and fire safety. Does your district have a written Chemical Hygiene Plan? A district Science Safety Policy? **A CHP is only required if working in a formal lab. Otherwise, as in most elementary schools, a Hazard Communication Standard Plan or Science safety plan is required**
2. **Maintain** Safety Data Sheets (SDS) for all chemical supplies with a second set in the main office; generic chemicals and/or store-bought substances should also be listed in the inventory.
3. **Require** the use of American National Standards Institute (ANSI) Z87.1 approved eye protective equipment (typically chemical splash safety goggles—type 'D3', gloves, and aprons during all activities, including demonstrations in which chemicals, glassware, potential projectiles, or heat are used.
4. **Dispose** of unwanted chemicals and materials according to state and local regulations.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!



Common Safety Operating Procedures: RULES

- **Know** the safety hazards before starting an activity; you should do a “dry run” without the students to identify unforeseen hazards.
- **Use** only equipment that is in good working order; inspect equipment before each use.
- **Maintain and have immediate access to** a first-aid kit for emergency treatment (if local and state policies allow), as well as biohazard and chemical spill kits/ materials.
- **Never use unfamiliar chemicals** unless the SDS sheets are consulted first. Consult SDS and the container label before using chemicals for the first time.
- **Never use** mercury thermometers in elementary classroms/labs.
- **Prevent** contamination by not returning unused chemicals to the original container.
- **Label and date** all storage containers of laboratory chemicals and preserved specimens upon receipt. Properly label all secondary chemical and specimen (set-out) containers.
- **Use** unbreakable plastic equipment whenever possible; **maintain** a separate waste container for broken glass; **sweep up** broken glass with dustpan and brush.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It’s Elementary!

Common Safety Operating Procedures: RULES

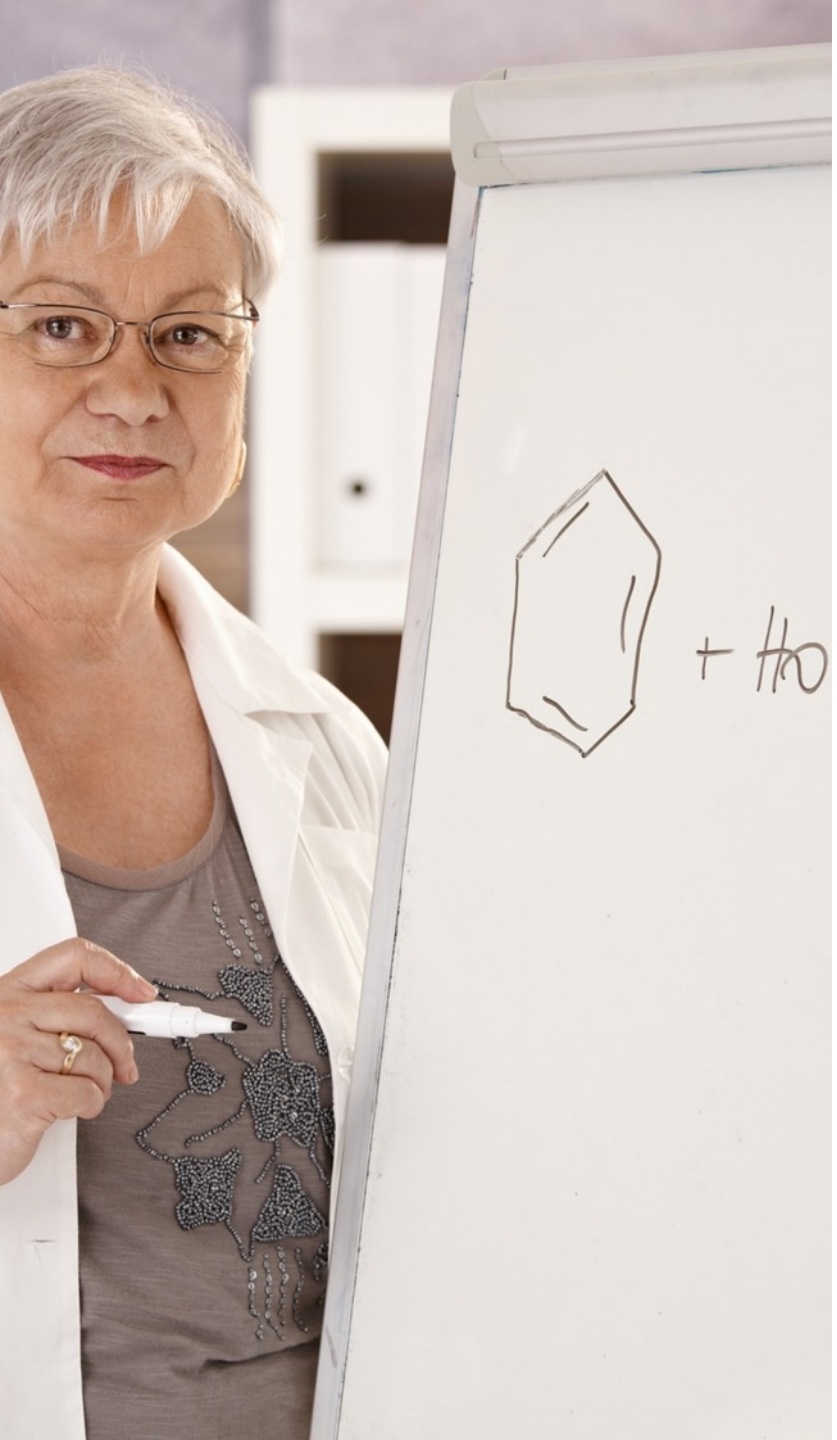
- **Check** with school medical personnel at the beginning of the school year to identify student medical conditions such as allergies, epilepsy, etc.,and be prepared to take appropriate actions.
- **Check** safety manuals for chemical and plant toxicity before use.
- **Tie back** long hair; **secure** loose clothing and dangling jewelry; **do not permit** open-toed shoes or sandals during lab activity. Clothing should cover upper and lower body.
- **Wear appropriate protective eyewear** for chemical and projectile hazards, as well as appropriate lab aprons and gloves.
- **Never permit** eating and drinking in the science classroom/laboratory.
- **Advise** students not to engage in a laboratory activity unless directed by you, and only after safety procedures are discussed and student “plans of action” (in inquiry) are reviewed and approved.
- Have students **wash hands and clean nail**s directly after coming into contact with animals, plants, soil and water samples, chemical substances, and laboratory/work surfaces. Hands should always be washed upon completion of an inquiry activity.
- **Teach** students to pick up and transport a microscope with one hand under the base and one hand on the arm.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It’s Elementary!

Common Safety Operating Procedures: Classroom Management legal safety standards and better professional safety practices

- **Supervise** students at all times. Do not permit students to conduct unauthorized experiments or work unsupervised. Do not make assignments that require students to perform hazardous experiments at home.
- **Maintain** a clear view of all students at all times. Set up science learning centers for single students or small groups that allow easy observation of students. Periodically update and evaluate safety concerns in the centers.
- **Do not block** access to exits, emergency equipment, and utilities with personal items.
- Have students **participate** in determining classroom rules, laboratory safety procedures, and emergency action plans.
- **Do not tolerate** boisterous conduct (horseplay). Enforce established rules and procedures immediately and appropriately.
- **Practice** the procedures and rules yourself before expecting students to follow them, so you can identify unforeseen consequences and avoid liability.
- **Discuss** safety concerns with students prior to each laboratory activity and monitor students for compliance. Write down in your lesson plan book that you did review safety concerns and the lab rules daily.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!



Common Safety Operating Procedures: Classroom Management Best Practices

- Ensure that sight-impaired students are made familiar with and always use the same area and equipment. These students should be “buddied” with a student who can read instructions (if Braille forms or a tape recorder are not available) and guide him/her to safety in case of emergency.
- Model safety procedures prior to an activity and have students practice the procedures before beginning work.
- Use student safety contracts/acknowledgment forms; have students and parents read and sign.
- Have an established procedure for student accident or injury: e.g., student runner, telephone/intercom, accident/injury report to the principal, etc.
- Lock science classrooms, cabinets, prep area doors, etc., when not in use; do not permit students in chemical/equipment storage rooms.
- Turn off gas and electrical equipment and close open containers during a fire drill. Gas, if available in the classroom, should always be turned off at the master valve when not in use.
- Have students report all accidents to the classroom teacher.
- Have students check the classroom daily for safety hazards.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It’s Elementary!

Common Safety Operating Procedures: Classroom Management Best Practices

- **Use** only age-appropriate activities with students.
- Have a designated “broken glass” container, if you use equipment made of glass (NOT recommended).
- **Limit** the size of student working groups to a number that can safely perform the activity without causing confusion and accidents.
- **Display** commercial and/or student-made safety posters and classroom safety rules in the classroom.
- **Do not permit** elementary students to dispense chemicals or handle containers of hot liquids. Discourage tasting and smelling. When smelling is required, students should waft vapors toward their nose using their hand. They should never inhale the vapors directly.
- **Dispose** of all waste chemicals properly. There should be separate containers for each solid. Non-hazardous liquids/solutions should be rinsed down the drain one at a time and flushed with plenty of water.
- **Clean up** spills or ice immediately on tables and floor; take appropriate precautions against contamination as needed.
- Have students **clean up** their work areas at the completion of each day’s activity, including sinks and floor.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It’s Elementary!

Schools including Science Classrooms and labs will look much different from the way we remember them…

Many new routines and protocols are in place already for schools . Most schools will have a variation of the following hygiene, safety disinfection and prevention protocols in place:

Health Check at Main Entrance potentially or home assessment prior to arrival at school / school bus

Hand Hygiene (washing and sanitizer use)

Directional arrows & messaging to encourage circulation and hygiene protocol reminders

Acrylic partition dividers in office and some teacher desks

Possibility of face masks (All Grades K-12 & Staff)

Possibility of nitrile gloves used

Possibility of isolation gowns used

Possibility of face shields for teachers / support workers

Possibility of REMOTE / DISTANCE learning for K12

1. https://www2.gov.bc.ca/gov/content/education-training/k-12/administration/program-management/safe-caring-and-orderly-schools

COVID-19 SCHOOL **SAFETY** GUIDE

Recommended PPE

SHARED RESOURCE ROOM

Concerns: Social Distancing, Shared Items, Cleanliness,

Recommended Products:

- Hand Sanitizing Station
- Disinfectant Wipes
- Multi-Surface Spray Sanitizer/Disinfectant
- Designated "Contamination" Area for Anything Touched that Needs to be Cleaned
- Acrylic Dividers where 6' Cannot be Maintained

LIBRARY MEDIA CENTER

Concerns: Social Distancing, Shared Items, Cleanliness,

Recommended Products:

- Hand Sanitizing Station
- Disinfectant Wipes
- Multi-Surface Spray Sanitizer/Disinfectant
- Designated "Contamination" Area for Anything Touched that Needs to be Cleaned
- Acrylic Dividers where 6' Cannot be Maintained

CAFETERIA

Concerns: Social Distancing, Shared Items, Cleanliness, Increased Spread of Saliva. Students should be encouraged to bring food from home, and disposable materials and pre-packaged food items used. Rigid cleaning protocols must be enforced.

Recommended Products:

- Masks
- Hand Sanitizing Station
- Disinfectant Wipes
- Multi-Surface Spray Sanitizer/Disinfectant
- Designated "Contamination" Area for Anything Touched that Needs to be Cleaned
- Acrylic Dividers where 6' Cannot be Maintained
- Staff: Full PPE including Aprons or Isolation Gowns, Shoe Coverings, Gloves,

CLASSROOMS

Concerns: Social Distancing, Shared Items, Cleanliness,

Recommended Products:

- Disinfectant Wipes
- Multi-Surface Spray Sanitizer/Disinfectant
- Designated "Contamination" Area for Anything Touched that Needs to be Cleaned
- Acrylic Dividers where 6' Cannot be Maintained

GYMNASIUM

Concerns: Social Distancing, Shared Items, Cleanliness.

Recommended Products:

- Sanitizing Stations at Each Entrance and Exit
- Designated Entrance and Exit Signage
- Limited Space and Social Distance Signage
- Disinfectant wipes
- Soapy water and rags

HALLWAYS

Concerns: Social Distancing, Shared Items, Cleanliness,

Recommended Products:

- Signage
- Hand Sanitizer Station at Points of Congruence

BATHROOMS

Concerns: Social Distancing, Cleanliness.

Recommended Products:

- Acrylic Dividers for Sinks
- Signage

CLASSROOMS

Concerns: Social Distancing, Shared Items, Cleanliness,

Recommended Products:

- Disinfectant Wipes
- Multi-Surface Spray Sanitizer/Disinfectant
- Designated "Contamination" Area for Anything Touched that Needs to be Cleaned
- Acrylic Dividers where 6' Cannot be Maintained

LOCKER ROOM

Concerns: Social Distancing, Increased Saliva, Cleanliness. Mark lockers to be closed every 4 lockers.

Recommended Products:

- Hand Sanitizing Station
- Multi-Surface Spray Sanitizer/Disinfectant
- Designated "Contamination" Area for Anything Touched that Needs to be Cleaned
- Acrylic Dividers for Sinks
- Signage

ART & MUSIC ROOMS

Concerns: Social Distancing, Increased Saliva, Cleanliness. All items must be 1-1 use—no shared equipment.

Recommended Products:

- Disinfectant Wipes
- Multi-Surface Spray Sanitizer/Disinfectant
- Designated "Contamination" Area for Anything Touched that Needs to be Cleaned
- Acrylic Dividers where 6' Cannot be Maintained

MAIN ENTRANCE

Concerns: Social Distancing, Shared Items, Cleanliness

Recommended Products:

- Hand Sanitizer Station
- Infrared Thermometer Station
- Signage for Designated Point of Entry
- Directional Arrows for 1-way Movement
- Social Distance Signage
- Masks

SCHOOL TRANSPORTATION

Concerns: Social Distancing, Shared Items, Cleanliness

Recommended Products:

- Masks
- Multi-surface Hand Sanitizer
- Disinfectant Wipes
- Infrared Thermometer
- Staff: Face Shield and Mask

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Increased Disinfection of Surfaces and Apparatus in the Science Lab

Make sure that ALL LAB EQUIPMENT such as microscopes, hot plates, digital balances, autoclaves, dissection tools and other apparatus are cleaned vigilantly before and after each use.

PPE including goggles should be cleaned appropriately after use with an approved liquid disinfectant solution and/or UV sanitation cabinet.

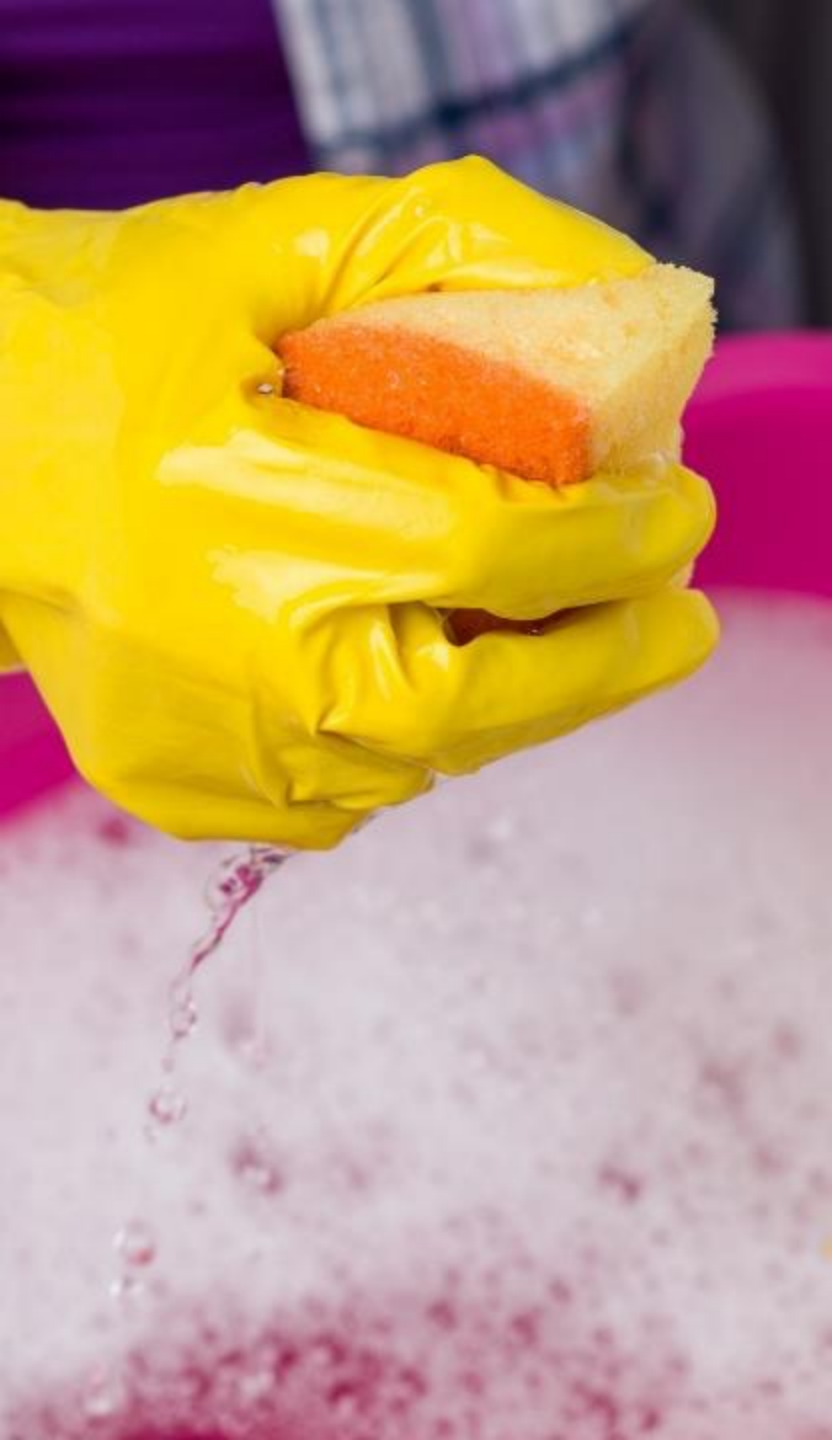
Disposable gloves are for one-time use only and follow procedures to remove them safely – and ensure they are discarded appropriately according to local protocols.

Make sure that hygiene protocols are followed from the CDC, WHO, UNESCO and the Federal, State/Provincial officers of health and safety.

EPA Disinfectants for Use Against SARS-CoV-2

CDC Considerations for Schools

https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html



Recommendations to Sanitize Science Equipment & Safety Items in the Lab

The WHO, CDC, OECD, Unicef and other large authorities are **recommending that high-use items be sanitized pre and post usage. Lab equipment would be considered a high-touch item.** Others in this category are art supplies, math manipulatives, toys, sports equipment and other tactile learning products.

The recommendation is to use warm soapy water when possible, and to use disinfectant or sanitizer when appropriate such as on electronic and delicate instrumentation.

The Lysol Dip method will be used based on adding an amount of disinfectant to warm water, and then using that to clean the lab instruments or apparatus and letting it air dry.

Safety glasses and goggles disinfect in the Lysol solution (1-1/4 ounces Lysol with one gallon of soft or DI water) for 15 minutes, rinsed with water, and allow to air dry. There is absolutely no damage or discoloration to any of the products. Water spots remaining on the lenses are easily removed using lens paper or a paper towel and leave no scratches or marks.

1. EPA Disinfectants for Use Against SARS-CoV-2
2. CDC Considerations for Schools
3. https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html

Cleaning and Disinfection – Continued

How should I clean?

- **Disinfect commonly used fixtures and equipment often, or when visibly soiled.**
- **Clean and disinfect other fixtures, furniture and equipment on a regular basis.**
- **Disinfect waste baskets as needed.**

An easy way to prepare a disinfectant solution is to mix 1 part bleach to 100 parts water (e.g., 10 ml bleach in 1 liter of water). It's better to prepare a solution with the disinfectant, dip your cloth or sponge into the solution, and then wipe it onto the surfaces you want to disinfect.

Spraying products may damage expensive furniture or expensive equipment, like computers. Some cleaning products will damage surfaces – when in doubt, check with a janitorial supply store. And always wear rubber gloves when handling disinfectants.

1. Public Health Authority of Canada Guidelines on Disinfection in the Workplace

Recommendations to Sanitize Science Equipment & Apparatus

The use of a disinfectant on a cloth which is then used to clean the surfaces is encouraged. Some people will prefer to use a disinfectant wipe and dispose of it accordingly after use.

Many recommendations are based on the use of a disinfectant wipe on science equipment both pre and post usage. Ensure that all products used for cleaning and disinfection are FDA / EPA approved. Only use 1 wipe per item – no cross-contamination from using it on multiple items.

Pump sprayer bottle tops allow for the alcohol-based sanitizer to be accurately aimed towards the surface being cleaned with minimal overspray or waste.

DO NOT spray alcohol-based sanitizer on any lab equipment that is hot or warm such as a hot plate, recently used Bunsen burner or soldering iron.

1. EPA Disinfectants for Use Against SARS-CoV-2
2. CDC Considerations for Schools
3. https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html

Recommendations to Sanitize Science Equipment & Apparatus Continued

USE LYSOL DIP METHOD FOR THESE ITEMS:

Glassware including beakers, test tubes, cylinders, flasks, stirring rods, dissection instruments, goggles, safety glasses, metric weights, funnels, burets, etc.

SPRAY OR WIPE THESE ITEMS:

Microscopes, balances, instrumentation, hot plates, data loggers and probes, electronic equipment, VDG, physics apparatus, etc.

Only use ONE DISINFECTANT WIPE PER OBJECT OR WORK SURFACE AREA. Then dispose of it accordingly to eliminate the potential for cross-contamination.

1. EPA Disinfectants for Use Against SARS-CoV-2
2. CDC Considerations for Schools
3. https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html

Accident Prevention and Mitigation Strategies

As the adult in the elementary classroom, you are expected to model safety practices at all times.

You are also expected to provide appropriate safety instruction before students perform science investigations and experiments. While students explore, you should continually monitor them and the classroom for unsafe practices and situations. Students need to know exactly which behaviors are safe and unsafe, as well as the rationale behind safety instruction appropriate to their intellectual and emotional development.

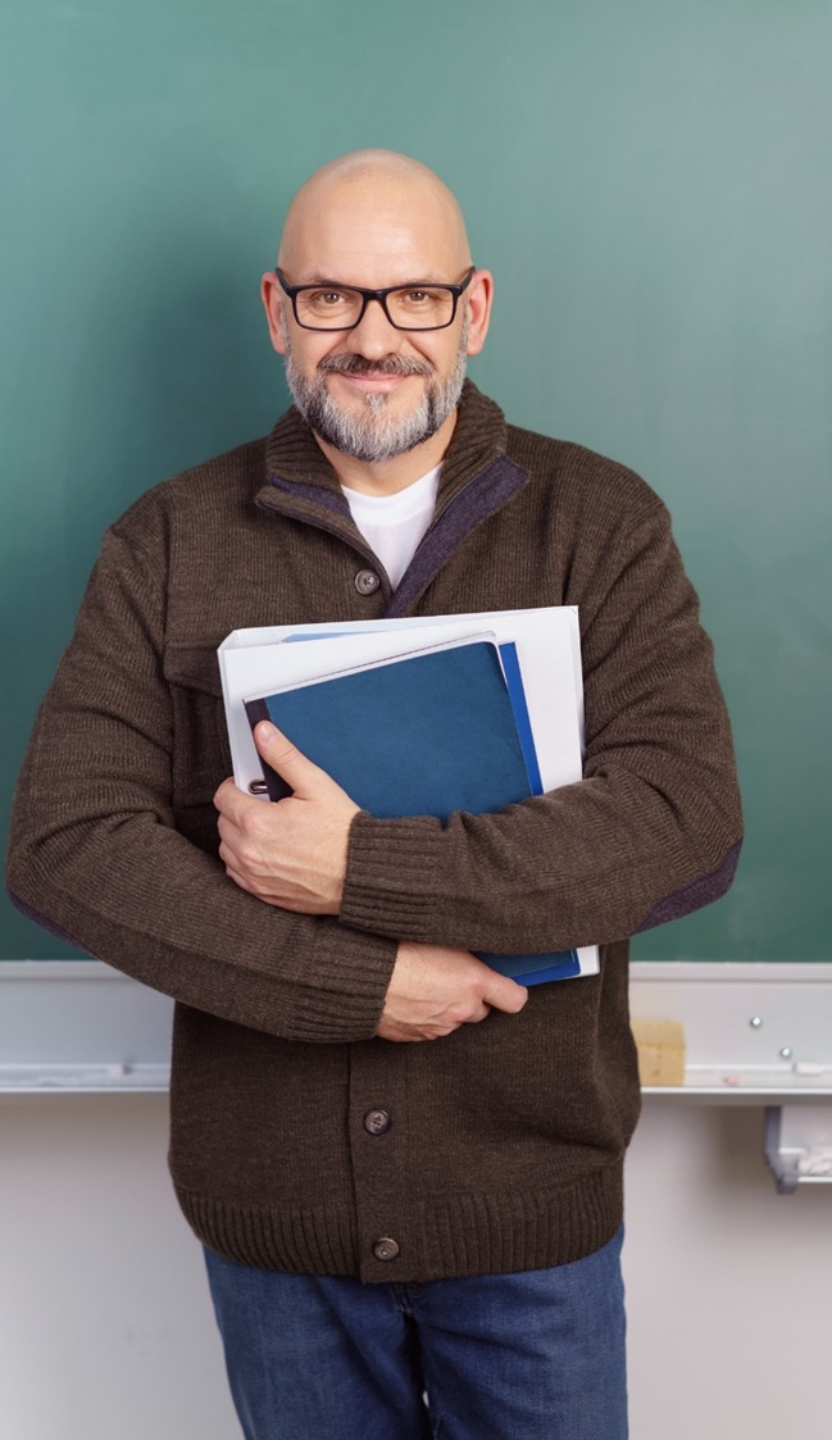
Safety instruction should be done at the beginning of the year and reinforced throughout the year. Pre-activity instruction should always include some general guidelines for safety and specific instructions and warnings for the current activity.
Listed below are some guidelines for your safety instruction to students. The safety instruction you provide should match the scope and intent of the safety/ emergency procedures developed for the school and the district.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Accident Prevention and Mitigation Strategies

1. **Post** a short, easy-to-read list of safety rules in the classroom and review it often with your students. Student-made safety posters help remind students of the rules!
2. **Conduct** an investigation/experiment to become familiar with needed safety procedures and any hazards before students are asked to perform it.
3. **Have** students wear appropriate eye protection.
4. **Identify** students' allergies, so that they are not accidentally exposed to allergens such as pet dander, pollen, or peanuts.
5. **Know** how to properly use and have readily accessible approved safety equipment, such as fire extinguishers, eyewashes, and retardant-treated wool fire blankets.
6. **Conduct** regular safety emergency drills that follow posted fire evacuation plans as required by law.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!



Accident Prevention and Mitigation Strategies

7. **Show** students how to obtain help (e.g., classroom telephone, intercom) should an emergency occur.
8. **Do not leave** students unattended in the classroom unless there is a serious, immediate emergency and a qualified substitute is first obtained.
9. **Keep** the classroom organized and orderly; provide ample space for student investigations/experiments.
10. **Tell** students to report any emergency/accident to you immediately.
11. **Contact** the school nurse (if there is one) and/or the principal immediately during any emergency.
12. **Provide** necessary emergency care (e.g., first aid, CPR) if you are properly trained and permitted to do so by local policy. NEVER dispense any form of medicine to a student.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Accident Prevention and Mitigation Strategies

If an accident occurs, you should act promptly, following approved procedures established by the local school and district. The procedures should list and describe specific actions to be taken for certain emergencies. Like the safety instruction mentioned above, the procedures must match the scope and intent of the safety/emergency procedures developed for the school and district. You should also become aware of all applicable state and local Good Samaritan laws.

Listed below are some general guidelines in the event an accident occurs in your classroom. For all accidents, you should immediately notify the school nurse (if present) and/or the building administrator. **The office** should notify parents and/or 911, depending on the seriousness of the injury.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

What to do in case of a chemical emergency?

Eyes: Flush the eye immediately with potable, aerated, 60-90 degree F water at a rate of 3-5 gallons/minute (the American National Safety Institute Standard Z-358.1 applies) for a minimum of 15 minutes. Hold eyelids apart as wide as possible and flush for at least 15 minutes or until emergency personnel arrive.

Skin: Flush the area as soon as possible with copious amounts of tepid water from a faucet or drench shower for at least 15 minutes. Do not apply ointments, baking soda, ice, or gauze.

Clothing: If the spill is on clothing, drench it with tepid water and cut/remove the clothing as soon as possible to prevent prolonged contact with the skin.

Ingestion: Consult the SDS for appropriate action and, if a poison or corrosive is involved, contact the local poison control center and 911 immediately. Begin appropriate action as directed—as soon as possible. If the student begins to vomit, turn the head so that the stomach contents are not aspirated into the lungs. If the chemical ingested is unknown, save all chemical containers and a small amount of vomitus for analysis by emergency medical personnel.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

What to do in case of a Fire emergency?

Clothing: If the student's clothes are on fire, smother flames properly with fire blanket, safety shower, and/or the stop-drop-roll method, whichever is/are most appropriate to the situation. Never use a fire extinguisher above the waist on a student.

Skin: If a burn occurs, do NOT apply ointments or ice to the wound. If the burn appears minor, flush with copious amounts of tepid water and apply a moist dressing, bandaging loosely. Anything more serious, do NOT flush with water. Apply a dry dressing and bandage loosely. Keep the student warm to avoid shock.

Materials: If materials are on fire, obtain the nearest ABC tri-class fire extinguisher (A is for paper, wood, cloth, rubber, or plastics fires; B is for burning liquids, gases, or greases; and C is for burning electrical equipment)

Fire Fighting: to combat the fire, using the PASS technique (Pull pin, Aim at base of fire, Squeeze handle, and Sweep side to side). Practice operating a fire extinguisher and using the PASS method before the time of need.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

How to deal with the accidental release of bodily fluids?

Wear disposable, non-allergenic gloves during cleanup. Clean up immediately with a pre-made disinfectant or 10% bleach solution.

Wipe up the fluids with paper towels or other absorbent material and dispose of the contaminated material used to clean up the fluids in a labeled biohazard container (or double-bag with plastic bags and label contents of bag as hazardous).

Flood the area after it has been wiped with a solution of 1 cup of liquid chlorine bleach to 1 gallon of fresh water, and allow it to stand for at least 20 minutes.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

How to deal with accidental injury: CUTS

If blood is present, wear disposable, non-allergenic gloves to control bleeding using approved procedures. *Follow your school district procedures regarding medical procedures including providing a bandage to the student.

If cut is minor, flush with tepid water to wash away any contaminants, sanitize with 3% hydrogen peroxide (drugstore variety), and cover with sterile bandage if no school nurse is available. Otherwise, refer student to the school nurse for proper care in all cases.

If blood is spilled, follow clean-up procedures given above (for body fluids).

If cut is more serious, send immediately for school nurse and notify the office so that parents and emergency services (911— if serious enough) can be called. Apply sterile gauze pads to the wound. If necessary, apply direct pressure to the covered wound to stop bleeding until school nurse or paramedics arrive. Try to keep yourself and your students calm.

Always follow local medical procedure protocols from your jurisdiction

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Chemical management in the elementary lab

Prior to conducting an experiment or investigation, you should carefully consider the safety of chemicals, materials, and equipment your students will use in the classroom. If you are unsure – ASK!

A high school chemistry teacher, the head of the science department, the district's chemical hygiene officer and the district science supervisor can provide you with important safety information regarding the use of chemicals, materials, and equipment in your classroom.

For example, they can help you determine whether the chemicals described in the activity should or should not be used or whether alternative chemicals can be used.

They can also provide assistance regarding the identification, procurement, handling, storage, and disposal of chemicals. Refer to your school district and state policies for specific requirements and mandates related to these matters.

Do NOT allow students access to chemical storage areas.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Chemical Identification and Management

The amount and types of chemicals used for science instruction in an elementary classroom should be small in quantity and number.

Many of the chemicals can be obtained from the local grocery or drugstore. Be careful to read and follow directions carefully and to use these chemicals only for their intended purpose.

Acquire the Safety Data Sheet (SDS) for each chemical. Listed below are some general guidelines for purchasing, labeling, storing, and disposing of chemicals. If you cannot find the sheet, look it up at http://www.flinnsci.com/SDS

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Purchasing Chemicals

1. Before purchasing chemicals from a commercial vendor, obtain and review the SDS for each chemical. These resources provide important information about the physical properties, toxicity, storage, and handling of the chemical. SDS are available online at http://www.flinnsci.com
2. SDS should be kept on file and easily accessible for all chemicals, whether purchased locally or from chemical supply houses.
3. Whenever possible, use generic chemicals that are commonly obtained from home, the grocery store, or the drugstore. These chemicals can serve as substitutes for lab-grade chemicals. Some examples include:

- *vinegar (acetic acid)*
- *aluminum foil (aluminum metal)*
- *vitamin C tablets (ascorbic acid)*
- *ammonia (ammonium hydroxide, base)*
- *chalk (calcium carbonate)*
- *lime (calcium oxide, basic)*
- *Plaster of Paris (calcium sulfate)*
- *rubbing alcohol (isopropyl alcohol)*
- *talc (magnesium silicate)*
- *baking soda (sodium bicarbonate)*
- *table salt (sodium chloride)*
- *table sugar (sucrose)*
- *Epsom salts (magnesium sulfate)*
- *starch (corn starch)*

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Purchasing Chemicals for Science & STEM labs

4. Limit the quantity of chemicals purchased to a supply that will last for a specific period of time (e.g., a one-year supply or the chemical shelf-life provided by the manufacturer).
5. Although experienced, upper-elementary teachers may make an exception at their own discretion, a general rule is that elementary students should not handle anything with a National Fire Protection Association (NFPA) rating in any category over 2. (NFPA ratings are from 0-4, with 0 indicating no hazard and 4 indicating the highest hazard level.

See http://www.nfpa.org for specific information about the rating system.)

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!
4. http://www.nfpa.org

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!

What do I need to know about GHS chemical labelling and SDS

A Safety Data Sheet (SDS) should be kept on file and be easily accessible for ALL chemicals. SDS sheets should be referenced for proper storage and for appropriate personal protective equipment (PPE). Refer to your school district and state policies for local storage requirements and mandates (print copy vs electronic copy)

These are available online in multiple locations for free as a searchable index or whole library download. Visit www.flinnsci.com/SDS and you can search through 2500+ current, valid, SDS files available for free.

You are required to maintain the records of the chemicals used in your school science departments for 30 years – so please do not discard the old binders with MSDS information as these are necessary for contact tracing and reference.

1. https://unece.org/about-ghs
2. https://www.ccohs.ca/oshanswers/chemicals/ghs.html
3. https://www.flinnsci.com/required-ghs-training---the-right-to-understand/vsc0678/

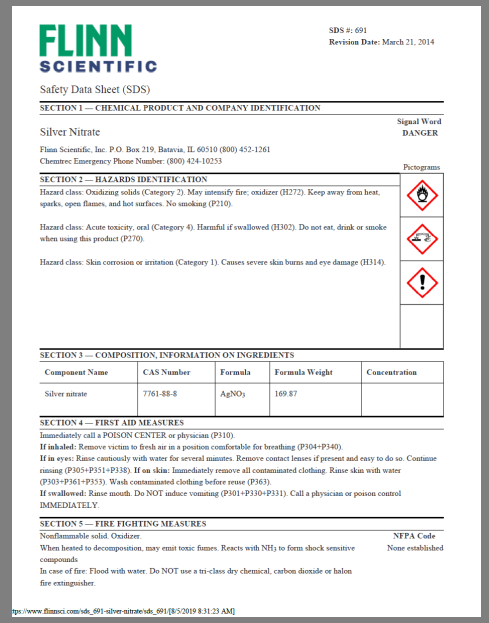
SDS

The Safety Data Sheet (SDS), formerly known as the Material Safety Data Sheet (MSDS), is provided by the manufacturer, distributor, or importer of a chemical to provide information about the substance and its use.

The SDS, unlike the MSDS, is required to present the information in a uniform manner. The information includes the properties of each chemical; the physical, health, and environmental health hazards; protective measures; and safety precautions for handling, storing, disposing of, and transporting the chemical. There are 16 sections on every SDS in the same sequence.

The GHS provides standard language or “building blocks” for communicating the hazards of chemicals in the SDS, just as on chemical labels. These “building blocks” include the use of specific signal words, pictograms, hazard statements, and precautionary statements.

1. How to Read a Safety Data Sheet



FLINN SCIENTIFIC

SDS #: 691
Revision Date: March 21, 2014

Safety Data Sheet (SDS)

SECTION 1 — CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Silver Nitrate

Signal Word
DANGER

Flinn Scientific, Inc. P.O. Box 219, Batavia, IL 60510 (800) 452-1261
Chemtrec Emergency Phone Number: (800) 424-10253

Pictograms

SECTION 2 — HAZARDS IDENTIFICATION

Hazard class: Oxidizing solids (Category 2). May intensify fire; oxidizer (H272). Keep away from heat, sparks, open flames, and hot surfaces. No smoking (P210).

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 1). Causes severe skin burns and eye damage (H314).

SECTION 3 — COMPOSITION, INFORMATION ON INGREDIENTS

Component Name	CAS Number	Formula	Formula Weight	Concentration
Silver nitrate	7761-88-8	$AgNO_3$	169.87	

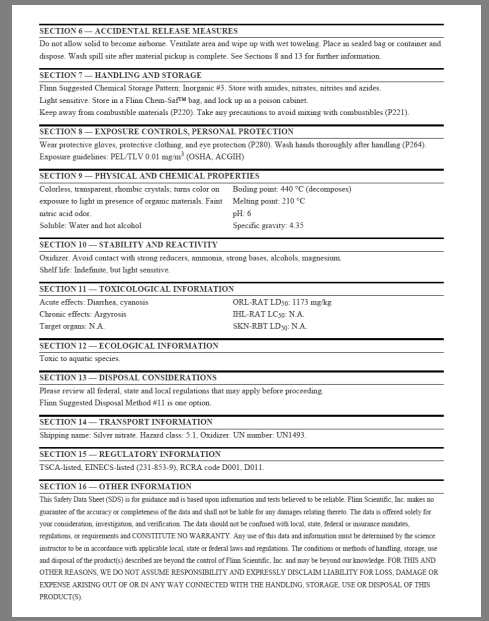
SECTION 4 — FIRST AID MEASURES

Immediately call a POISON CENTER or physician (P310).
If inhaled: Remove victim to fresh air 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 so. Continue rinsing (P305+P351+P338). **If on skin:** Immediately remove all contaminated clothing. Rinse skin with water (P303+P361+P353). Wash contaminated clothing before reuse (P363).
If swallowed: Rinse mouth. Do NOT induce vomiting (P301+P330+P331). Call a physician or poison control IMMEDIATELY.

SECTION 5 — FIRE FIGHTING MEASURES

Nonflammable solid. Oxidizer.
When heated to decomposition, may emit toxic fumes. Reacts with NH_3 to form shock sensitive compounds
In case of fire: Flood with water. Do NOT use a tri-class dry chemical, carbon dioxide or halon fire extinguisher.

NFPA Code
None established



SECTION 6 — ACCIDENTAL RELEASE MEASURES

Do not allow solid to become airborne. Ventilate area and wipe up with wet toweling. Place in sealed bag or container and dispose. Wash spill site after material pickup is complete. See Sections 8 and 13 for further information.

SECTION 7 — HANDLING AND STORAGE

Flinn Suggested Chemical Storage Pattern: Inorganic #3. Store with amides, nitrates, nitrites and azides.
Light sensitive. Store in a Flinn Chem-Saf™ bag, and lock up in a poison cabinet.
Keep away from combustible materials (P220). Take any precautions to avoid mixing with combustibles (P221).

SECTION 8 — EXPOSURE CONTROLS, PERSONAL PROTECTION

Wear protective gloves, protective clothing, and eye protection (P280). Wash hands thoroughly after handling (P264).
Exposure guidelines: PEL/TLV 0.01 mg/m^3 (OSHA, ACGIH)

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

Colorless, transparent, rhombic crystals; turns color on exposure to light in presence of organic materials. Faint nitric acid odor.
Soluble: Water and hot alcohol

Boiling point: 440 °C (decomposes)
Melting point: 210 °C
pH: 6
Specific gravity: 4.35

SECTION 10 — STABILITY AND REACTIVITY

Oxidizer. Avoid contact with strong reducers, ammonia, strong bases, alcohols, magnesium.
Shelf life: Indefinite, but light sensitive.

SECTION 11 — TOXICOLOGICAL INFORMATION

Acute effects: Diarrhea, cyanosis
Chronic effects: Argyrosis
Target organs: N.A.

ORL-RAT LD_{50}: 1173 mg/kg
IHL-RAT LC_{50}: N.A.
SKN-RBT LD_{50}: N.A.

SECTION 12 — ECOLOGICAL INFORMATION

Toxic to aquatic species.

SECTION 13 — DISPOSAL CONSIDERATIONS

Please review all federal, state and local regulations that may apply before proceeding.
Flinn Suggested Disposal Method #11 is one option.

SECTION 14 — TRANSPORT INFORMATION

Shipping name: Silver nitrate. Hazard class: 5.1, Oxidizer. UN number: UN1493.

SECTION 15 — REGULATORY INFORMATION

TSCA-listed, EINECS-listed (231-853-9), RCRA code D001, D011.

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).

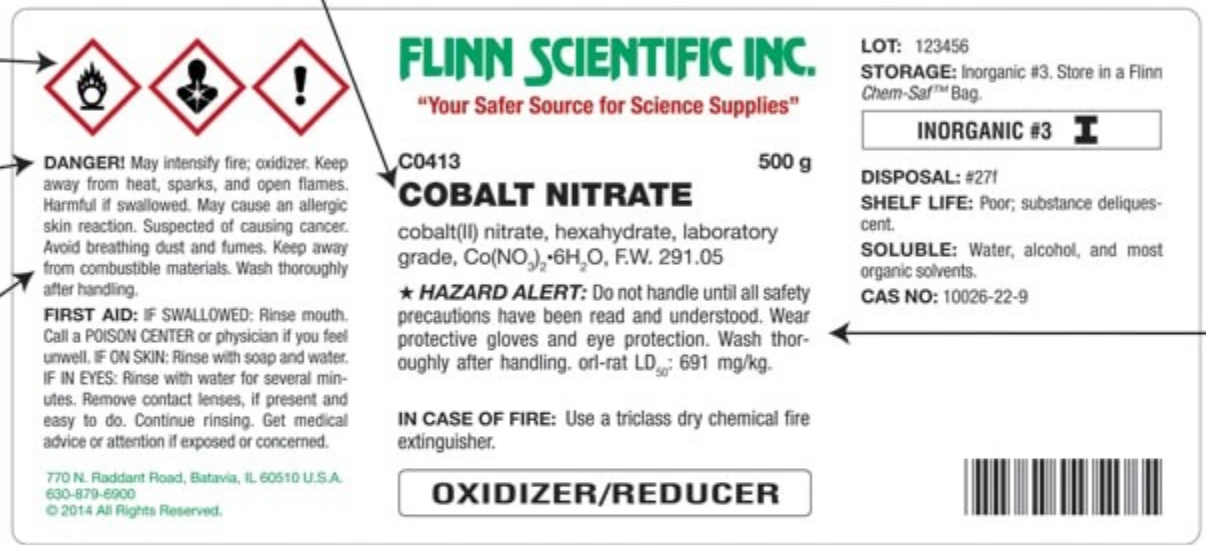
How To Read a Globally Harmonized System (GHS) Label

Product Name or Identifier identify the chemical formula. If a mixture or alloy, the label should include all chemical identities of all ingredients that contribute to the acute toxicity, skin corrosion, serious eye damage, germ cell mutagenicity, carcinogenicity, reproductive toxicity, skin or respiratory sensation, or Target Organ Systemic Toxicity (TOST) when these hazards appear on the label.

Hazard Pictograms are graphical compositions with characteristic symbols to convey specific hazard information.

Signal Word indicates the relative level of severity of the hazard and alerts the reader to potential risks. The GHS signal words are "Danger" (more severe hazards) and "Warning" (less severe hazards).

Hazard Statement
A phrase assigned to a hazard class and category that describes the nature of the hazards of a hazardous product, including, where appropriate, the degree of hazard. (These may also be found in the Hazard Alert section.)



DANGER! May intensify fire; oxidizer. Keep away from heat, sparks, and open flames. Harmful if swallowed. May cause an allergic skin reaction. Suspected of causing cancer. Avoid breathing dust and fumes. Keep away from combustible materials. Wash thoroughly after handling.

FIRST AID: IF SWALLOWED: Rinse mouth. Call a POISON CENTER or physician if you feel unwell. IF ON SKIN: Rinse with soap and water. IF IN EYES: Rinse with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice or attention if exposed or concerned.

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

FLINN SCIENTIFIC INC.
"Your Safer Source for Science Supplies"

C0413 500 g
COBALT NITRATE
cobalt(II) nitrate, hexahydrate, laboratory grade, $Co(NO_3)_2 \cdot 6H_2O$, F.W. 291.05

★ ***HAZARD ALERT:*** Do not handle until all safety precautions have been read and understood. Wear protective gloves and eye protection. Wash thoroughly after handling. orl-rat LD_{50}: 691 mg/kg.

IN CASE OF FIRE: Use a triclass dry chemical fire extinguisher.

OXIDIZER/REDUCER

LOT: 123456
STORAGE: Inorganic #3. Store in a Flinn *Chem-Saf*™ Bag.
INORGANIC #3 I
DISPOSAL: #27f
SHELF LIFE: Poor; substance deliquescent.
SOLUBLE: Water, alcohol, and most organic solvents.
CAS NO: 10026-22-9

Precautionary Statements describe recommended measures to minimize or prevent the adverse effects resulting from exposure to a hazardous product, or improper storage or handling of hazardous products. (These may also be found near the hazard statements.)

Flame Over Circle
Oxidizer

Skull and Crossbones
Acute Toxicity
(Fatal or Toxic)

Corrosion
Skin Corrosion/Burns
Eye Damage
Corrosive to Metals

Flame
Flammable
Pyrophoric
Self-Heating
Emits Flammable Gas
Self-Reactive
Organic Peroxide

Exclamation Mark
Irritant (Skin & Eye)
Skin Sensitizer
Acute Toxicity (harmful)
Narcotic Effects
Respiratory Tract Irritant

Health Hazard
Carcinogenicity
Mutagenicity
Reproductive Toxicity
Respiratory Sensitizer
Target Organ Toxicity
Aspiration Toxicity

Exploding Bomb
Explosives
Self-Reactive
Organic Peroxide

Environment
Aquatic Toxicity
(Non-Mandatory)

Gas Cylinder
Gas Under Pressure

FLINN SCIENTIFIC, INC
"Your Safer Source for Science Supplies"

AP7650

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)

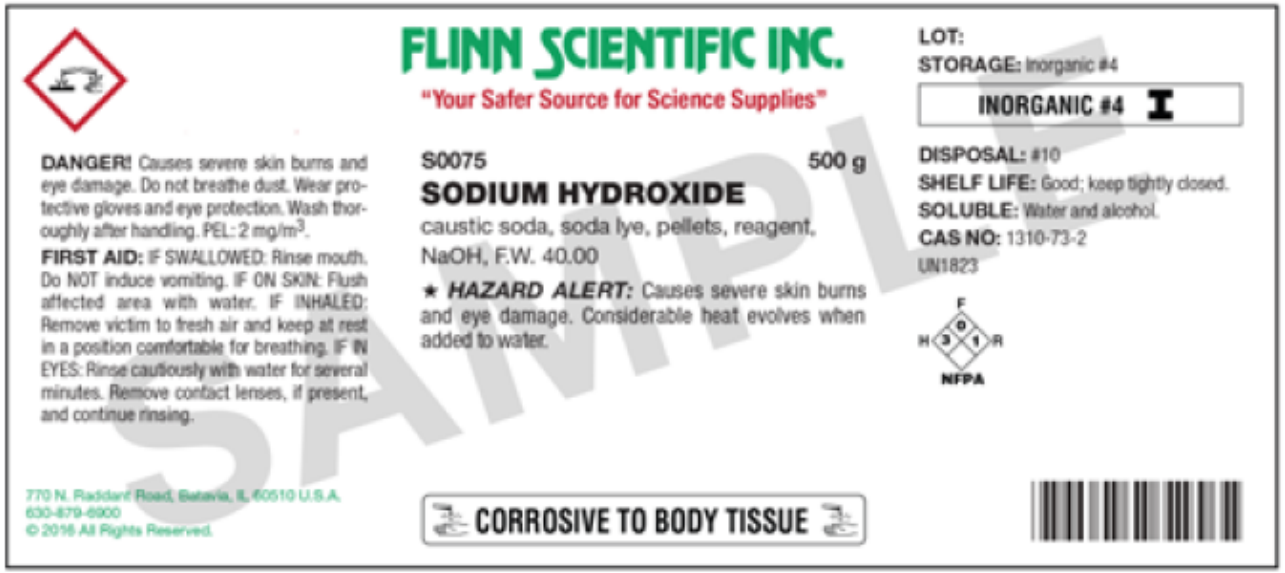
Biohazardous infectious material**
(for organism or toxins that can cause disease)

Labelling Requirements

- New bottles of chemicals ordered from trusted suppliers will already have compliant GHS labelling on the bottles.
- There is a prescribed format for labelling chemicals from the United Nations (GHS) and for updating existing older bottles in your lab.
- Different options exist to retrofit the labels on the bottles

Chemical Product Labels

Always read the label on a chemical bottle to obtain and review basic safety information concerning the properties of a chemical. It is the responsibility of teachers to be fully aware of the hazards and risks of all chemicals they are using.



https://unece.org/about-ghs

https://www.ccohs.ca/oshanswers/chemicals/ghs.html

https://www.flinnsci.com/required-ghs-training---the-right-to-understand/vsc0678/

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

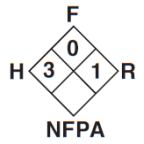
★ ***HAZARD ALERT:*** Causes severe skin burns and eye damage. Considerable heat evolves when added to water.

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

https://unece.org/about-ghs

https://www.ccohs.ca/oshanswers/chemicals/ghs.html

https://www.flinnsci.com/required-ghs-training---the-right-to-understand/vsc0678/

Labelling Requirements

- Existing bottles of chemicals require a GHS compliant label – 30mL dropper bottles or a 2.5L bottle. **No exemptions!**
- You can create an overlay label and adhere it over the existing supplier label. This is to standardize communication on the chemical labels.
- Solutions made in the lab require a label as well. *Ex Made a 0.1M HCl solution from a 3M stock bottle.* Both vessels require a current GHS label for compliance and adherence to the CHP & OSHA.

DANGER! Flammable liquid and vapor. Causes severe skin burns and eye damage.

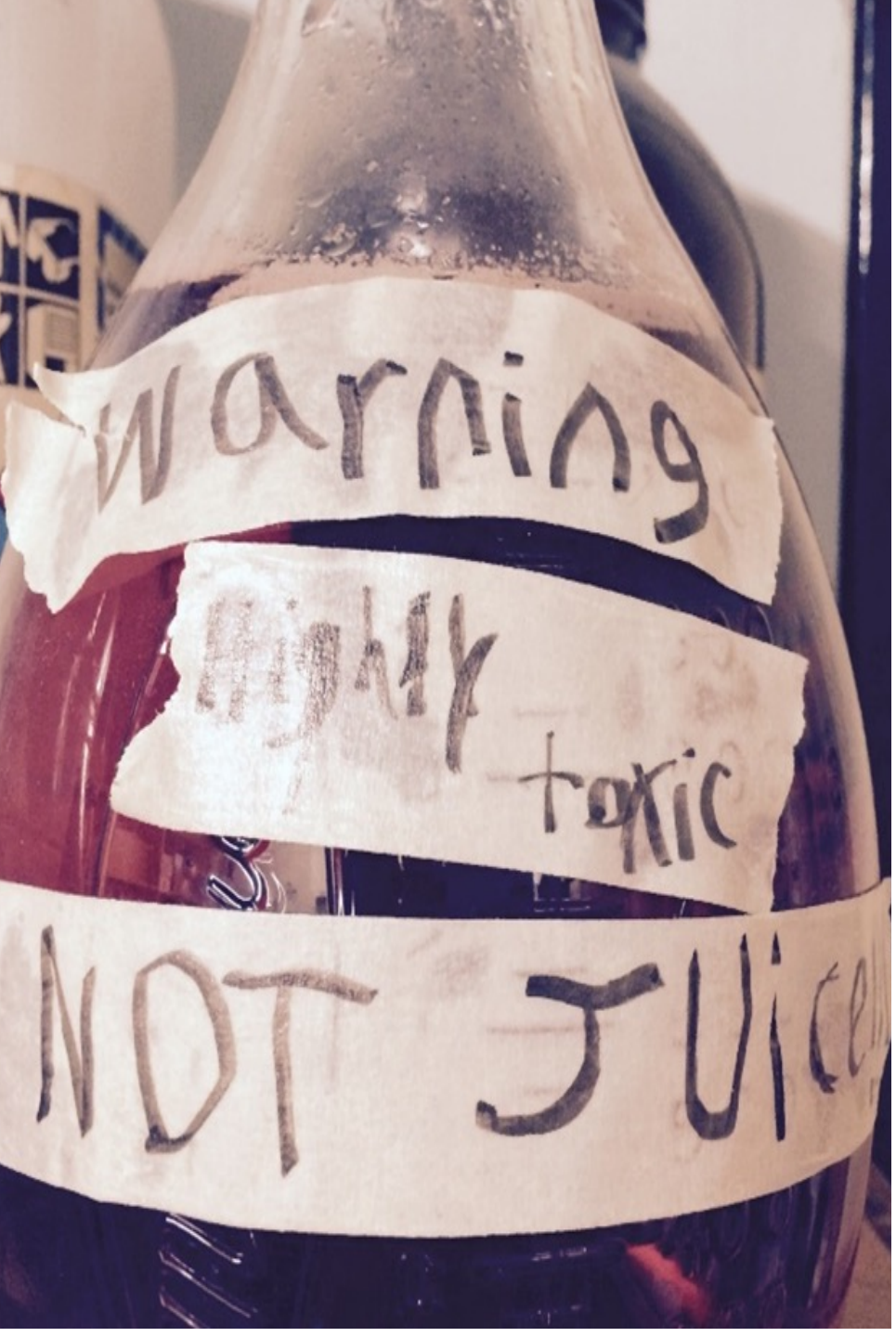
Acetic Acid, Glacial
Catalog #: **A0005**
Chemical Grade: **Reagent**
Amount: **250 mL**
Purchased: **03/11/2014**
Family: **O 1**
Disposal: **24a**

https://www.acs.org/content/acs/en/chemical-safety/basics/chemical-hygiene-plan.html
https://www.cpsc.gov/s3fs-public/NIOSH2007107.pdf
https://www.flinnsci.ca/api/library/Download/bece13a7fc1f4884a2b09ab28e63f6dc

Labelling Older Chemicals in the School Prep Area & Storage Cabinets

- You must have a current chemical inventory of the products in your lab. **Including OLD chemicals!!!**
- You need to have a GHS label on EVERY Chemical in the lab including dropper bottles and student learning kits. **Period.**
- There is no exemption for small bottles – even dropper bottles should have a proper label with the necessary information printed in color (Red diamond if needed)

1. https://unece.org/about-ghs
2. https://www.ccohs.ca/oshanswers/chemicals/ghs.html
3. https://www.flinnsci.com/required-ghs-training---the-right-to-understand/vsc0678/



Chemical Labelling Requirements

Labeling Chemicals

Include the following minimum essential information on chemical labels:

- Chemical manufacturer or supplier (including address and telephone number).
- Chemical name and/or trade name of the product (same as SDS when applicable).
- Date received or date placed in the container.
- Molarity or Concentration of the chemical.
- Precautions to be observed in the safe handling or mixing the chemical.
- Appropriate hazard symbol pictogram in a red diamond if applicable.

1. This is not an acceptable chemical label. This is a dangerous situation with no identifiers such as chemical name, concentration, date, lab activity or and hazard information present. Not from a Flinn certified school. This is a serious concern in prep rooms when you cannot identify these orphan chemicals on the shelf.
   James Palcik, Flinn Scientific Inc.

Chemical Labelling Best-Practices

- **Indicate the name of the chemical manufacturer or supplier** along with the address and telephone number.
- **Include the chemical name/trade name** of the product on the label.
- **Record the date** the chemical was received.
- **Include the appropriate hazard symbol** based on the NFPA rating. (Adhesive backed labels are available in most chemical supply catalogs.)
- **Indicate the strength** of the chemical, especially if it was prepared on-site.
- **Give and highlight** clear and concise emergency or first-aid directions on the label.
- **Use protective coating**, such as clear nail polish or adhesive tape, on labels to prevent stain or corrosion damage during use.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Chemical Storage Best Practices

- **Have a separate, locked storage area**—preferably away from the classroom.
- **Use appropriate NFPA warning symbols** to mark storage areas. On the front of the storage cabinet or doorway, you should place an NFPA diamond that shows the **highest** hazard rating in each category of any chemical stored in that cabinet area. This can quickly alert firefighters in an emergency.
- **Maintain a complete inventory** of every chemical in storage.
- **Keep copies of the chemical inventory and all MSDS** in the storage area, with additional copies to the building principal, the district science supervisor, and the local fire marshal.
- **Review and revise** the chemical inventory annually.
- **Use accepted guidelines** (e.g., Flinn at *http://www.flinnsci.com*) to properly separate and store chemicals. Wooden shelving with slide-proof front lips on each shelf are recommended. Uncoated metal supports or brackets should **NOT** be used.
- **Store acids, bases, and flammables** in separate and well-ventilated areas. These chemicals should only be stored in the original manufacturer's container or in an approved safety container.
- **Dispose properly** (see following text) of chemicals with no labels or unreadable labels.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Chemical Storage

Store chemicals according to the following minimum storage requirements:

- Separate chemical storage area from the classroom area. Use appropriate warning symbols to identify the chemical storage areas.
- Make certain that storage area is properlyventilated.
- Make certain that fire door or adequate exits
- extinguisher(s) orextinguishing systems.
- Make certain that storage shelves are securely attached to wall (each shelf with afront one-inch or 2.5 centimeters lip to pre-vent bottles from sliding off shelves).
- Separate inorganic chemicals from organicchemicals.
- Use a reputable guide, e.g., National Institute for Occupational Safety and Health/ Occupational Safety and Health Administration (NIOSH/OSHA), to help you properly separate incompatible chemical families.
- Do not store chemicals past the manufacturer suggested shelf life. Dispose of old chemicals in a timely manner.
- Make certain that chemicals are labeled andstored in appropriate containers.
- Store flammables and corrosives separately in appropriate cabinets

1. https://www.cdc.gov/niosh/npg/default.html
2. https://www.ors.od.nih.gov/sr/dohs/documents/chemicalsafetyguide.pdf
3. https://www.cpsc.gov/s3fs-public/NIOSH2007107.pdf
4. https://www.flinnsci.com/safe-storage-and-handling-of-lab-chemicals/sn033/

Best-in-Class Chemical Storage (NIOSH approved system)

FLINN SCIENTIFIC Chemical Storage Pattern

Organic Storage Codes

- Acids, Amino Acids, Anhydrides, Peracids
- Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides
- Hydrocarbons, Esters, Aldehydes, Oils
- Ethers, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide
- Epoxy Compounds, Isocyanates
- Peroxides, Hydroperoxides, Azides
- Sulfides, Polysulfides, Sulfoxides, Nitriles
- Phenols, Cresols
- Dyes, Stains, Indicators
- Organic Miscellaneous

Inorganic Storage Codes

I1 – Metals, Hydrides
I2 – Acetates, Halides, Iodides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens
I3 – Amides, Nitrates (except Ammonium Nitrate, store as I8), 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
I9 – Acids (except Nitric) (Nitric Acid is isolated and stored by itself.)
I10 – Sulfur, Phosphorus, Arsenic, Phosphorous Pentoxide
IM – Inorganic Miscellaneous

Chemical Families and Corresponding Storage Codes

tates — I2
ls, Inorganic (except Nitric) — I9
itric Acid is isolated and stored by itself.)
ls, Organic — O1
ohols — O2
ehydes — O3
ides (inorganic) — I3
ides (organic) — O2
ines — O2
ino Acids — O1
ydrides — O1
enates — I7
enic — I10
des (inorganic) — I3
des (organic) — O6
ates — I8
mates — I6

Carbides — I5
Carbon — I4
Carbonates — I4
Chlorates — I6
Chlorites — I6
Chromates — I8
Cresols — O8
Cyanates — I7
Cyanides — I7
Dyes — O9
Epoxy Compounds — O5
Esters — O3
Ethers — O4
Ethylene Oxide — O4
Glycols — O2
Halides — I2
Halogenated Hydrocarbons — O4

Halogens — I2
Hydrides — I1
Hydrocarbons — O3
Hydrogen Peroxide — I6
Hydroperoxides — O6
Hydroxides — I4
Hypochlorites — I6
Imides — O2
Imines — O2
Indicators — O9
Iodates — I6
Iodides — I2
Isocyanates — O5
Ketenes — O4
Ketones — O4
Manganates — I8
Metals — I1

Miscellaneous (inorganic) — IM
Miscellaneous (organic) — OM
Nitrates — I3
(except Ammonium Nitrate, store as I8)
Nitrides — I5
Nitriles — O7
Nitrites — I3
Oils — O3
Oxides — I4
Peracids — O1
Perchlorates — I6
Perchloric Acid — I6
Permanganates — I8
Peroxides (inorganic) — I6
Peroxides (organic) — O6
Phenols — O8
Phosphates — I2

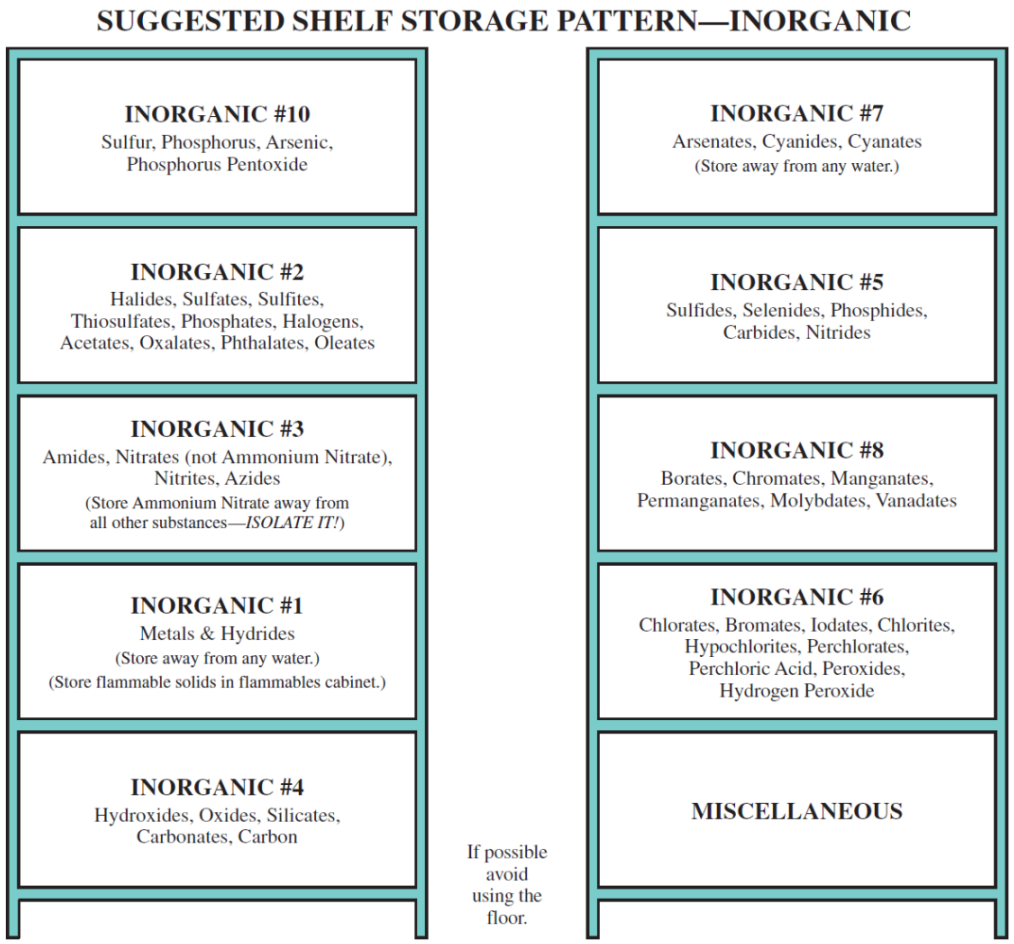
Phosphides — I5
Phosphorus — I10
Phosphorous Pentoxide — I10
Polysulfides — O7
Selenides — I5
Silicates — I4
Stains — O9
Sugars — O2
Sulfates — I2
Sulfides (inorganic) — I5
Sulfides (organic) — O7
Sulfites — I2
Sulfoxides — O7
Sulfur — I10
Thiosulfates — I2

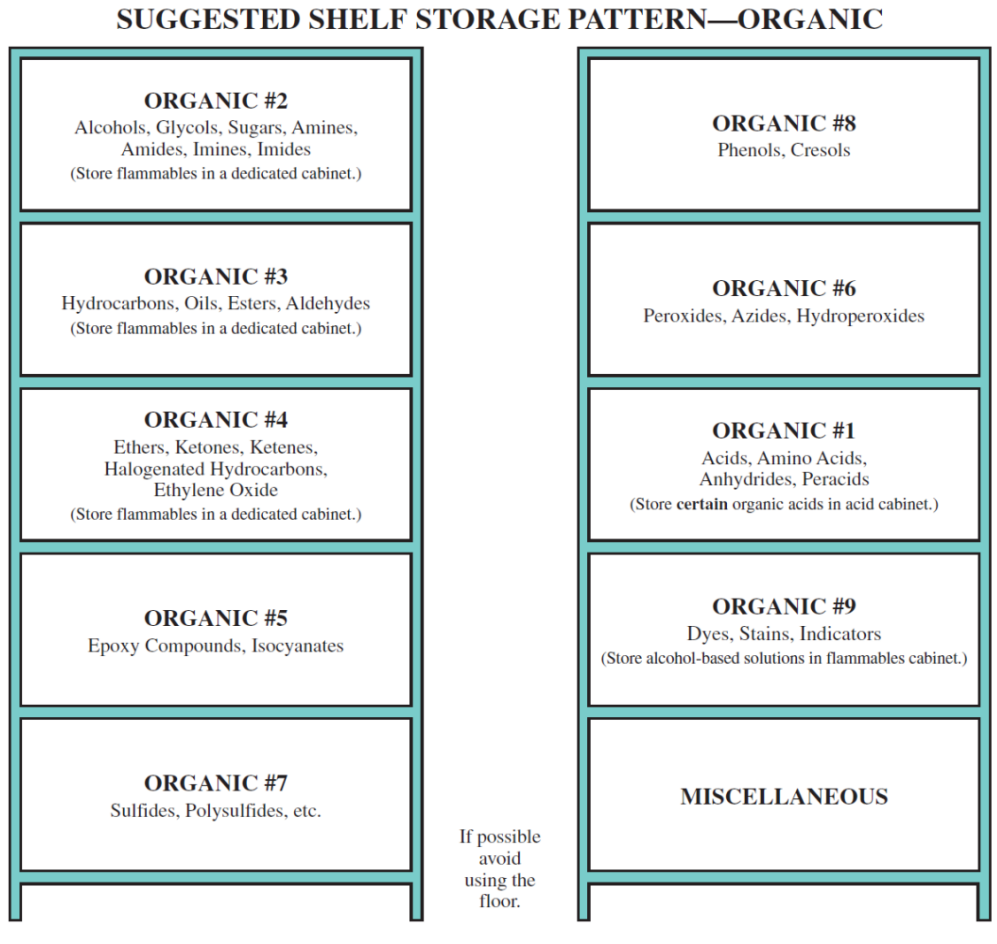
"Your Safer Source for Chemicals"

P.O. Box 219, Batavia, IL 60510 • 800-452-1261 • flinn@flinnsci.com • www.flinnsci.com
AP6196

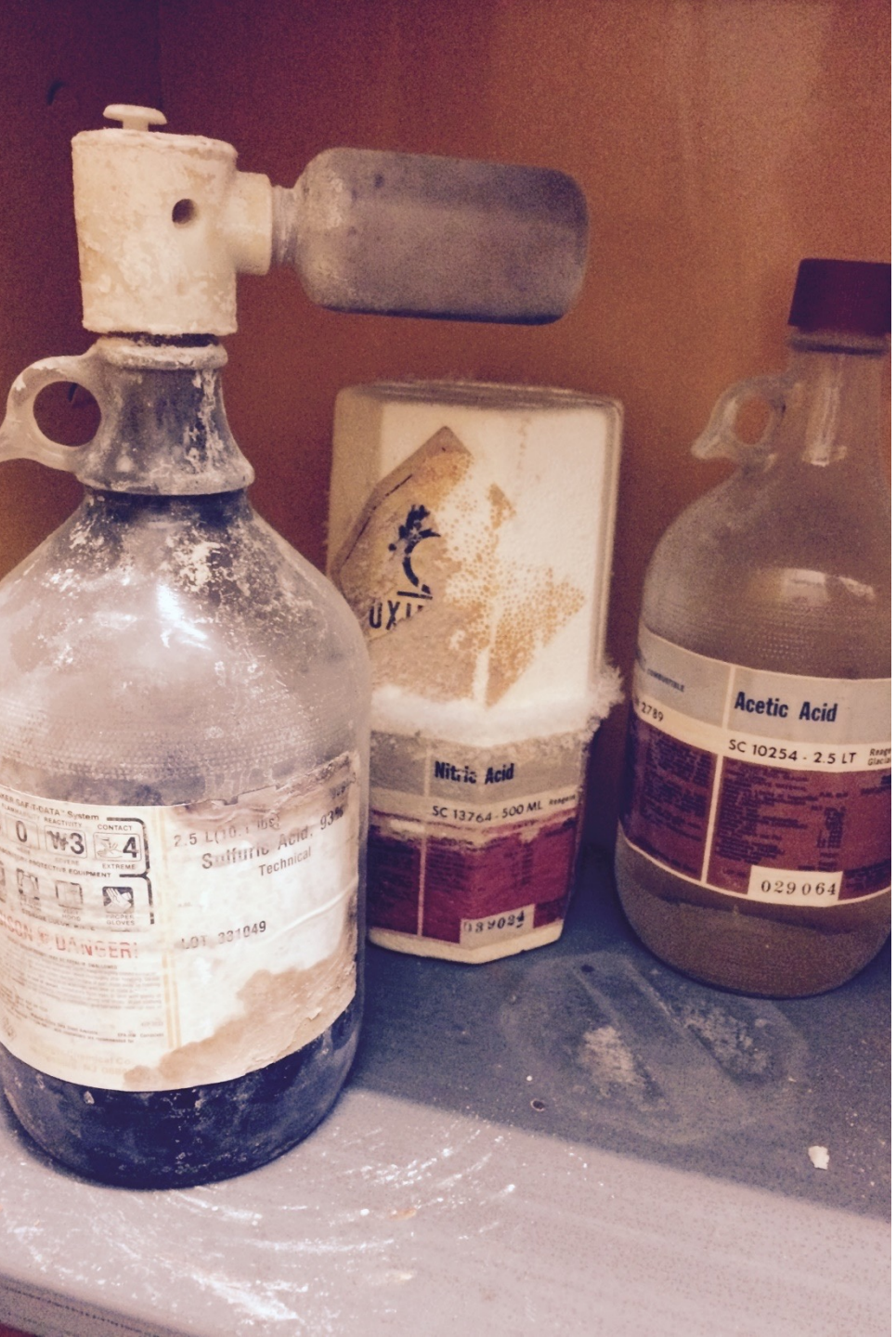
1. https://www.cdc.gov/niosh/npg/default.html
2. https://www.ors.od.nih.gov/sr/dohs/documents/chemicalsafetyguide.pdf
3. https://www.cpsc.gov/s3fs-public/NIOSH2007107.pdf
4. https://www.flinnsci.com/safe-storage-and-handling-of-lab-chemicals/sn033/

Inorganic and Organic Chemical Storage Guidance





1. https://www.cdc.gov/niosh/npg/default.html
2. https://www.ors.od.nih.gov/sr/dohs/documents/chemicalsafetyguide.pdf
3. https://www.cpsc.gov/s3fs-public/NIOSH2007107.pdf
4. https://www.flinnsci.com/safe-storage-and-handling-of-lab-chemicals/sn033/



Chemical Storage Concerns

End of semesters or prior to the summer vacation offer school science departments the perfect opportunity to do an audit of your chemical storage.

Here's what you need to do:

Yearly audits are recommended to ensure school labs and prep areas are safety compliant. Audits also offer the perfect opportunity for you to take stock of what your classroom will need and what you should dispose of before students arrive back in the classroom.

Incompatible chemical storage of chemicals typically results in odors, precipitates forming, or chemical bottle failures. Many chemicals when stored incorrectly will create tell-tale smells in the room and these are usually hydrocarbons from alcohols and solvents in the flammables cabinet; or corrosives that are mixing (vapors) creating a pungent smell.

The fine white precipitate that forms in a corrosive cabinet that is storing both acids and bases (improper storage method) is the chemical result of an acid + base = salt + water.

https://www.ors.od.nih.gov/sr/dohs/documents/chemicalsafetyguide.pdf
https://www.cpsc.gov/s3fs-public/NIOSH2007107.pdf
https://www.flinnsci.com/safe-storage-and-handling-of-lab-chemicals/sn033/

Chemical Disposal Concerns at the Elementary Level

- **Use information contained in the SDS** to properly dispose of chemicals.
- **Follow local and state mandates** for proper disposal of chemicals.
- **Contact** your local/state hazardous waste management agency, state environmental agency, regional Environmental Protection Agency (EPA) office, fire marshal's office, or state department of education to determine if a chemical requires special disposal methods.

If you feel uncomfortable with the chemical waste and disposal at any time, please notify your administration and the school district health & safety or facilities departments to remedy this situation for you.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Chemical Waste Concerns

Having too many chemicals in the prep room – even common inert substances such as sugars, starch, salts, sodium bicarbonates etc., will contribute to the smells in the room.

Here's what you need to know:

Having too many chemicals in the prep room – even common inert substances such as sugars, starch, salts, sodium bicarbonates etc., will contribute to the smells in the room. Going forward, teachers should be mindful of the volumes of the substances they procure and keep.

We suggest putting a small dot sticker (The kind from the Dollar Store that are red, blue, white, yellow….) which will allow you to visualize how often that particular bottle is used during the year. You will find that there about 15-20 chemicals that are very commonly used – and 40 more that are used periodically. You could offer a robust, comprehensive program with 60 -75 chemicals and meet the curricular expectations.

https://www.ors.od.nih.gov/sr/dohs/documents/chemicalsafetyguide.pdf
https://www.cpsc.gov/s3fs-public/NIOSH2007107.pdf
https://www.flinnsci.com/safe-storage-and-handling-of-lab-chemicals/sn033/

Chemical Waste Concerns

Chemical security is important all year round, but especially when you aren't there to monitor things daily. Long stretches of time where labs are unused require special precautions.

Here's what you need to know:

- Please make sure that the prep room and the chemical cabinets are all LOCKED properly and that there are extra keys for the locks with administration and maintenance.
- It is essential to have an updated inventory of chemicals in your school storage and prep rooms, and if often a requirement. Need help? The Flinn Online Chemventory™ is a cloud-based laboratory chemical inventory system that allows multiple users access to the database from multiple locations and devices! The program comes fully loaded with updated GHS pictograms, hazard codes, and signal word information for over 2,400 Flinn chemicals. Learn more at Chemventory.flinnsci.com.
- Keep a print copy of our catalog with disposal information handy and easily accessible.
- Are your locks broken or you don't have proper storage? We have cabinets especially designed for different school needs.

What PPE and Safety Infrastructure Equipment needs to be in the elementary science lab?

Although the materials used by elementary students may not be as harmful as those used at the secondary level, elementary science teachers should ensure that appropriate protective equipment is provided to prevent injury and clean up spills.

It is essential that you have properly working, certified, appropriate safety infrastructure and products in your science classroom or laboratory for EVERY PERSON in the room, and that you continue to demonstrate and model the proper behaviors at all times as the teacher.

Make sure that the following items are available and in good working order and that the students know how to use these products safely and the reasons why they need to use them. No science activity can be made safe – only safer. By using these safety items, you will help to mitigate potential risks and offer a truly inquiry-driven, experiential elementary science program with your students. - James Palcik

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Basic Safety Needs in the Elementary Lab

1. Safety goggles

- American National Standards Institute (ANSI) coded Z87 or Z87.1 approved chemical splash goggles (D3) should be provided for each student when chemical or projectile hazard is present. These goggles are available in sizes to fit elementary student-sized faces.

2. Sanitizing material for goggles

- Commercial alcohol wipes (not swabs) work well to kill bacteria and some lice (for new, more difficult strains, see your school nurse) that might adhere to goggle straps and rims. Wipe all surfaces that come into contact with the student. Be certain that they are completely dry before use.

3. Non-absorbent, chemical- resistant aprons

- Protective aprons should be provided for each student when there is a possibility of spillage or spattering of chemicals or hot water (teacher-dispensed). These aprons are available in sizes to fit elementary students.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Basic Safety Needs in the Elementary Lab

4. **Safety gloves**

- Elementary students should wear protective gloves when handling animals, plants, soil samples, or any other materials that might contain harmful micro-organisms or allergens. Wearing gloves may also be appropriate for some chemicals that can cause skin irritation or staining. You should be aware of any student allergy to latex. Most schools are using nitrile gloves for their hypo-allergenic and chemical resistant properties.

5. **Eyewash stations**

- A faucet-type portable eyewash unit (available from several scientific equipment vendors) should be placed on a goose-neck faucet in order to irrigate a student's eye if a chemical or particle (salt, sand) lands in it. Eyewash stations should be placed low enough for elementary students to use and should comply with ANSI Z358.1-1998. Generally, this means they should be within 20–30 steps and 10–15 seconds, relative to their location in the room. These should be activated for two minutes weekly and tested monthly for performance in case of an emergency.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Basic Safety Needs in the Elementary Lab

6. Fire extinguishers

- You should have adequate numbers of ABC tri- class fire extinguishers (A is for paper, wood, cloth, rubber, or plastics fires; B is for burning liquids, gases, or greases; and C is for burning electrical equipment) strategically placed to be within 20-30 steps distance or 10-15 seconds travel time of any location in the room. These should be checked and certified as fully charged and ready for use at least annually.
- Remember to use the PASS method (Pull pin, Aim at base of fire, Squeeze handle and Sweep the base of the fire from side to side) method. Be careful never to point the nozzle towards students.

7. Forearm or foot-operated face/ body sprayers

- These water sprayers with adequate-length flexible hose should be strategically placed to meet the same rule outlined above (20-30 steps or 10-15 seconds, etc.). They should be used to douse burning clothing or hair.

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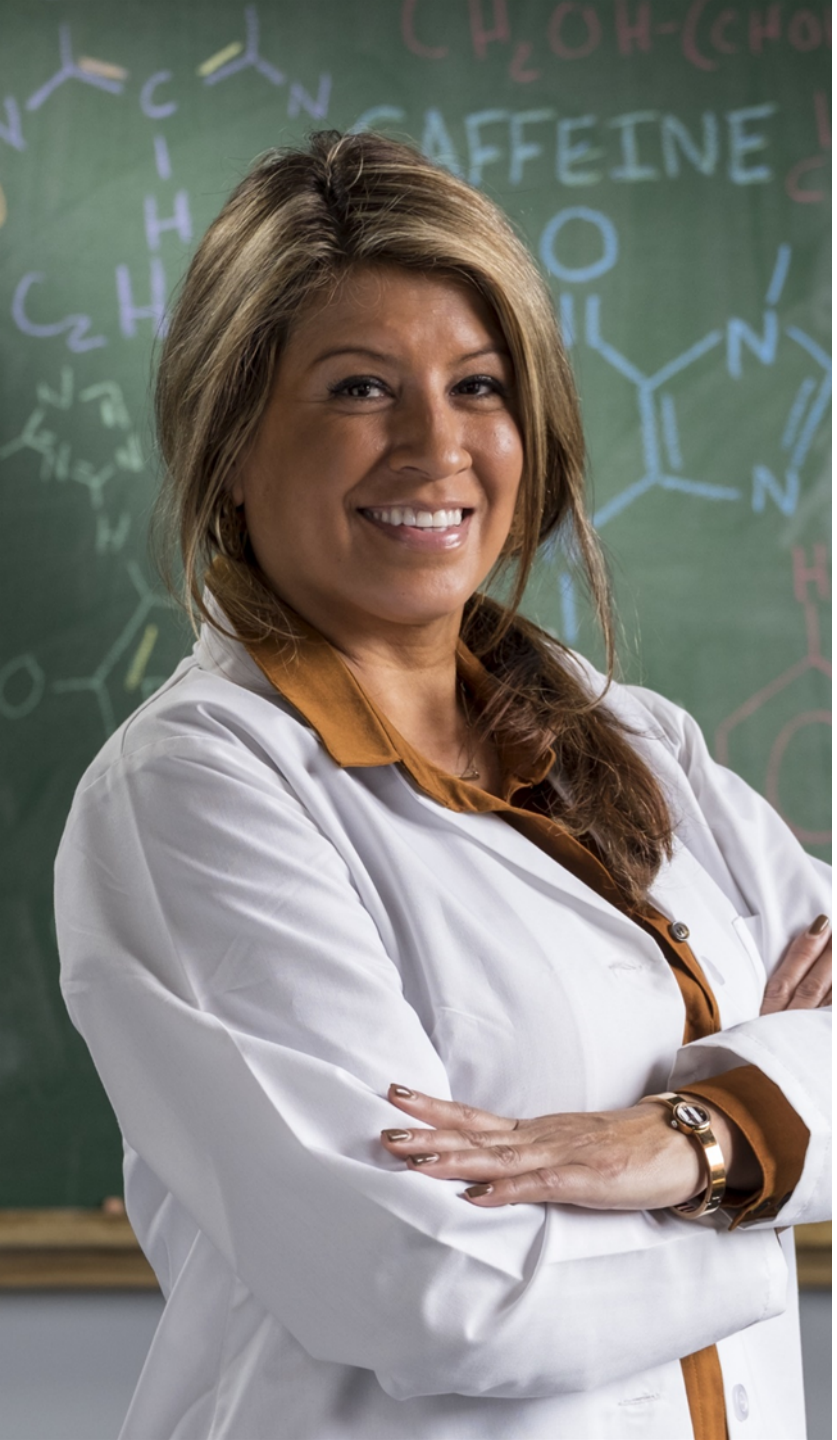
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!



Basic Safety Needs in the Elementary Lab

8. Ground-fault interrupters (GFI) and outlet covers

- These should be used on all electrical outlets in an elementary science classroom. The outlet cover guards against objects being “poked” into an outlet. The GFI breaks the circuit when an object or water shorts the circuit, or electricity attempts to ground through a student to a water pipe, preventing electrocution. Outlets should be placed along walls or counters at intervals of 6-8 feet and be capped when not in use.

9. First-aid kit

- Where local and state policies permit, have an adequately stocked first-aid kit easily accessible for your use in case of emergency. Check with the school nurse regarding safe contents of the kit. You should be aware of student allergies to first-aid materials.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
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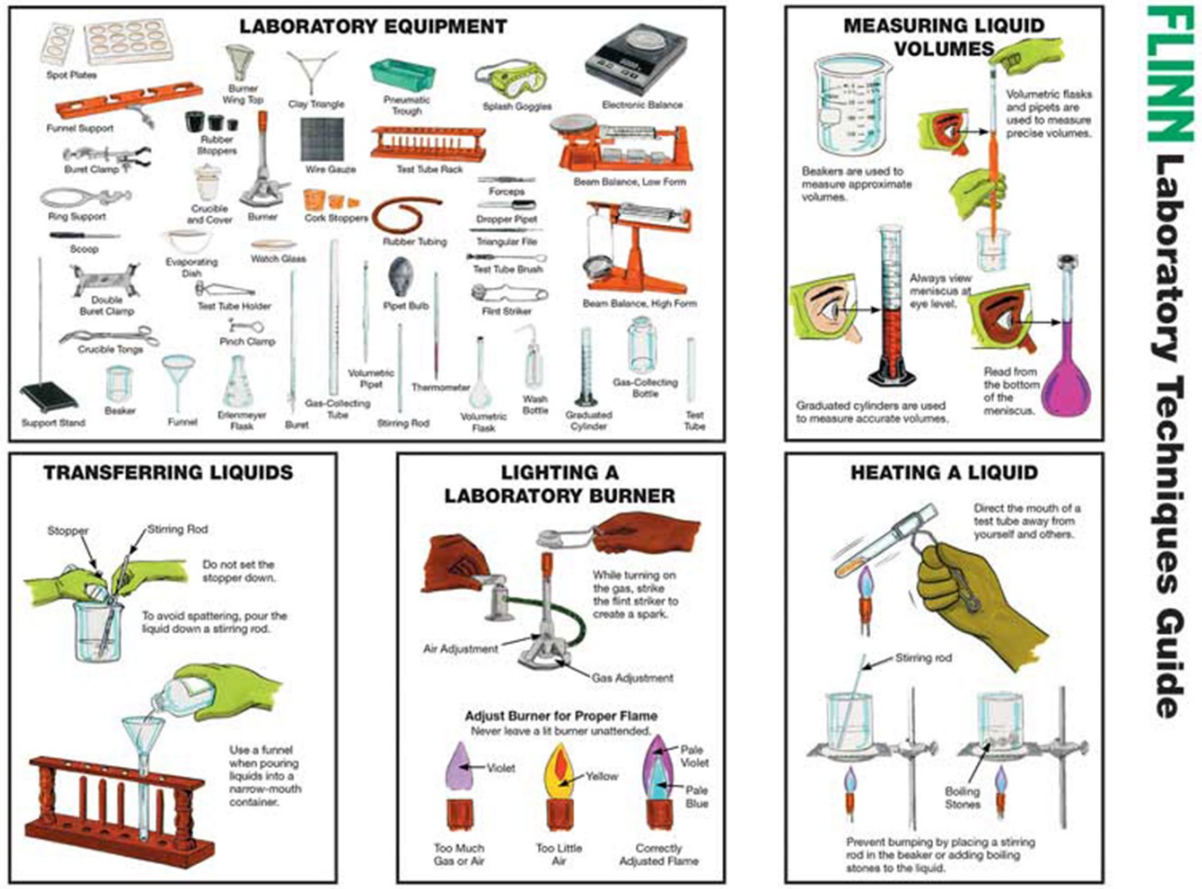
Basic Safety Needs in the Elementary Lab



FLINN Laboratory Techniques Guide

10. Safety Posters

- Posters appropriate for elementary students (student-made posters are even better) should be prominently displayed around the room.

- In addition to the equipment described above, emergency procedures and telephone numbers should be prominently displayed where they can be consulted quickly in case of accident or emergency. The same is true for proper disposal methods for the following: chemical waste, dead animals (checked by a veterinarian before disposal), animal wastes, dead plants, and spilled liquids.
- ***there should not be any bacterial cultures found in an elementary classroom according to the NSTA Safety Advisory Board as a 'Better Professional Safety Practice' for teachers**.

Goggles—One Pair for Each Person in the Room!

Ensure that you are using the correct goggles for the application. If you are not using any chemicals or liquids, and only observing phenomena, you can use certified impact goggles.

Once you do start using or looking at chemicals, liquids, or biologicals, please use ANSI Z87.1 certified indirect vent chemical splash goggles for safety. This is a requirement under OSHA.

Wearing goggles for any science activity naturally makes students consider some element of safety. The recommendation according to legal and professional best practice is that teachers and students wear goggles when performing any aspect of science inquiry including set-up, hands-on and take down segment of the of the activity.

Goggles for Everyone!!!

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Gloves

It is a best-practice to wear gloves for certain activities in the science program, just make sure that they are the correct ones for the application.

Vinyl gloves are typically fine for many investigations. Nitrile gloves are better than latex and do not have the associated allergy concerns.

Sometimes you need gloves to offer protection from cold / heat and you should use appropriate gloves for these activities. Ask if you're unsure.

When handling any plant or animal specimens, it is recommended to wear gloves to prevent any accidental exposure and as a best-practice against contamination etc.

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Aprons and Lab Coats

Flinn highly recommends using a lab coat or an apron and nitrile gloves when conducting activities that have any potential for spills or that involve the use of chemicals. In the workplace, these are non-negotiable!

The aprons should be age and grade level appropriate and not necessarily the same ones used in a high school or a college level laboratory. There are rolls of ‘re-useable’ aprons available from reliable suppliers that will work for most elementary applications or light-duty versions that can be purchased as well.

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Ear Protection & Common-Sense Safety

Ear protection is necessary as a safety item when there will be loud or noisy situations above 85 decibels. Most schools use ear plugs or purchase a few pairs of ear muff style protectors for these situations.

Have students with long hair keep their hair tied back to minimize the possibility of injury.

Have students with baggy or loose clothing be mindful around science equipment / tools and while doing STEM investigations.

Clear away clutter and school bags, textbooks, and miscellaneous items from working areas to minimize slips, trips and falls as well as providing a clean science investigation zone for observations etc.

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Common Science Equipment Used in Elementary Science & STEM Programs

Can you identify the most common pieces of science and laboratory equipment used?

Do you know how to safely use them? Store them?

Are you comfortable letting your students use this equipment?

Would you be comfortable teaching your colleagues about this equipment and its safe handling instructions?

Can you identify if a piece of equipment is damaged or dangerous to use with the class?

Are you familiar with doing a Safety or Hazard Analysis?

Can you prevent accidental injury or hazards from looking at the procedures provided by your students? (usually common sense prevails here)

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Typical Safety Concerns –Elementary Science and STEM Students

Students are naturally curious and are not always the most ‘safety-conscious’ in the classroom.

Many students will have never used some science equipment or hand tools prior to the STEM class.

Students try to be ‘funny’ by imitating dangerous behaviors (hammering improperly / pretending to do things which are unsafe) to make their classmates laugh.

Many do not follow directions (instructions) carefully or sequentially and that is the #1 cause for concerns and accidental injury.

1. http://cosss.org/
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Common Lab Equipment which can cause risks to students if used improperly:

- Hot plates
- Thermometers
- Scalpels / blades
- Glassware (broken)
- Scissors
- Accidental Spills

1. http://cosss.org/
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Hot Plates

These can cause serious burns to students if they do not follow safety directions. Never touch the surface to determine if it is ‘Hot’. Notice the light indicator on the surface that will alert you if it is ‘On’ and or ‘Warm’ Teach this to your class!

Always supervise students in the careful use of hotplates and do not leave the classroom unattended with these plugged in and hot.

Do not use the ‘ring’ element style hotplate – only use a ceramic top or sealed top unit to prevent spills and increased safety.

These need to be plugged into a GFCI protected receptacle so ensure that these are on a level surface with no possibility of being accidentally pulled or unplugged.

Safely store the hotplate once it is cooled and unplugged. Do not put these items away while they are still ‘warm’.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It’s Elementary!

Use of Heat in the Elementary Science/STEM lab

- Basic rules apply to the heating of solids and liquids in the STEM lab.
- Ensure the area where heating occurs is free from debris and combustible materials.
- Understand that alcohols and oils typically found in schools will burn from being heated improperly. Do NOT heat these substances.
- Students should not work with boiling water or open flames at these grades. Teachers may need to demonstrate certain chemical or physical changes but in a safer manner with PPE.
- Glassware is not created equally – only use heat resistant borosilicate glass such as Kimax or Pyrex for activities with heat. Regular glass will shatter under pressure and heat causing preventable accidental injuries. **NEVER USE FOOD JARS FOR EXPERIMENTS.**
- Never use alcohol burners. These are dangerous and should be disposed of.
- Only use tongs appropriate to handling the item(s) being heated. DO not use your hands or household cooking tongs or pliers. You can use oven mitts as a layer of heat safety.

Open Flame & Matches

Occasionally there are activities or investigations that require the use of open flames – typically a wooden splint, candle or a safety match. Do not use regular book style matches under any circumstances.

Do NOT allow this activity to occur unsupervised. Ensure you can use open flames in the school – many jurisdictions prohibit open flame use. MAKE SURE YOU ARE ALLOWED TO USE FLAMES FIRST.

Carefully demonstrate what you would like the students to do and enforce this rule. Label everything – including where to put waste materials.

Tea candles are great since these are wide and do not easily tip over – and use a drip tray to catch any stray wax should it overflow.

Ensure that the students are aware of the dangers of open flames, location of the fire alarm, and the school district policy on open flames in the classroom.

Do you have an ABC type fire extinguisher? Fire Blanket? Do you know how to use them in case of an emergency?

Thermometers

Use alcohol (spirit) filled thermometers only – DO NOT USE MERCURY style ones – and NEVER use the thermometer as a stirring rod!

Ideally at the Grades 1-6 level, use a plastic or metal backed thermometer for ease of use.

If you need to use the glass tube style traditional thermometer, please use the anti-roll triangle on the end or purchase impact resistant versions.

Broken thermometers need to be disposed of and cleaned up carefully with a small broom and dustpan. Broken glass is very sharp!

http://cosss.org/
Flinn Scientific Inc. Professional Learning Series 2021
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Glassware Concerns

Make sure that you use appropriate glassware for the activity. That means select the proper style & volume needed and be aware that glass will be accidentally broken. Test tubes, beakers, flasks and funnels are common glassware used.

Clean up broken glass immediately and dispose of it in a broken glass receptacle. Only use a small broom and dustpan to clean up the shards of glass – do NOT use paper towels or handouts!

Make sure that the glassware purchased or used is reputable – Pyrex, Kimax or borosilicate treated glass only! **Do not use soda bottles, jam jars, retail jars or containers for any reason.**

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
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Usage of Plasticware in the STEM Classroom

Whenever possible, you should use plastic versions with your students of the following products since they are safer alternatives for elementary applications: (ALL are readily available)

- **Beakers**
- **Graduated Cylinders**
- **Flasks**
- **Bottles**
- **Petri Dishes**

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Scissors, Blades and Sharp Instruments

Accidental cuts are the most common injury in the elementary STEM lab and among the most preventable.

Teachers should be modelling the proper safety procedures and behaviors when using scissors, blades, and sharp instruments.

Broken glass is another leading cause of accidental injury – follow safe clean up procedures.

Students performing lab investigations need to be shown the proper technique in using a scalpel or blade (Position of thumb and fingers) and the direction of the stroke.

Follow your CHP or SOP from the School District on these techniques and allowed activities

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Accidental Spills

Only make enough of the solution for the volume required in the class activity. There is no need to create stock solutions to keep on-hand for years in the elementary school.

When a spill occurs due to accidental knock-over or breakage, please clean it up immediately. The Teacher needs to know what the solution is (ideally it is inert such as salt water, sugar water, starch solution) but it may be more hazardous.

If you have flammables or corrosive chemicals in the school, you should have a comprehensive spill kit to use in case of accidental release. Consult the SDS for the chemical for clean up procedures.

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Chemicals in the Elementary Classroom

Ideally, there are no chemicals used in the elementary STEM program that cannot be purchased from a local store as a 'consumer commodity' which is readily available and safe to use. Remember that common products can cause toxic effects.

Baking soda (sodium bicarbonate), sugars, salts, starch, juice, ice, vinegar and such items can be obtained locally and used with care. **PLEASE READ AND UNDERSTAND THE LABEL FOR THE PRODUCT** as there are warnings and storage issues that need to be followed even though these are available locally in stores.

More concentrated or hazardous items such as alcohols (isopropyl, cleaners, acidic or basic substances) need to be stored properly in chemical cabinets and handled with caution. All chemicals must have the SDS with it for reference

Teachers should NOT handle, purchase or store chemicals that they are uncomfortable with. Contact FLINN for complimentary safety assistance when required.

Specialized Chemical Knowledge

Chemicals need to be handled and stored properly. Proper chemical cabinets are required for safe storage.

Do not store chemicals in non-chemical bottles (do NOT use soda bottles or food item containers) as these are not safe alternatives.

There are safety precautions for certain chemicals and other products such as Dry Ice which require special handling and PPE (special gloves) **Flinn suggests only having a trained person demonstrate dry-ice and to not allow students to handle it due to the risks involved **

Please refer to some online resources for safety procedures regarding chemical health & safety. Be safe and know what you are working with. www.flinnsci.com

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

Recommended guidelines covering the physical specifications for elementary classrooms, classrooms with labs, and science resource rooms

The guidelines given below are the ideal in a less- than-ideal world! You should view them as the recommended (some mandated by individual states within their individual building codes) standards that you can strive toward as renovations or new constructions are planned and completed.

- Provide access to students with disabilities (Americans with Disabilities Act of 1992).
- Maintain a storage area/room for materials and equipment, with locking cabinets and open shelving secured to wall or floor; equivalent to an area of 9.8 square feet per student.
- Provide floor space for any room where science investigations are conducted equal to 45 square feet/student or approximately 1100 square feet, as consistent with professional standards (NSTA: National Science Teaching Association and many state school municipal or county building codes).

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Recommended guidelines covering the physical specifications for elementary classrooms, classrooms with labs, and science resource rooms

- **Maintain** adequate natural light and/or diffused task lighting (538.2 to 1076.4 lumens per square meter) for all activities.
- **Provide** a telephone or intercom system to notify school medical personnel or school administrator of emergencies and accidents.
- **Provide** two classroom exits, both opening outward and at least 5 feet wide, to accommodate emergency exit for students with disabilities and for equipment carts.
- **Maintain** a tri-class ABC fire extinguisher (A is for paper, wood, cloth, rubber, or plastics fires; B is for burning liquids, gases, or greases; and C is for burning electrical equipment), fire blanket, and eyewash station at a height appropriate to the age and size of students within the classroom. Eyewash stations should be no more than 10 seconds or 20 steps away from any point in the room and should be activated weekly and tested monthly. Check local and state codes for variance from this. You should also provide a face/body sprayer nearby that meets the American National Standards Institute (ANSI) Z358.1-1998 standard.

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Recommended guidelines covering the physical specifications for elementary classrooms, classrooms with labs, and science resource rooms

- **Do not attach tables to the floor**; no more than four students should be at each table.
- **Give each student 6 feet** of horizontal work space, according to NSTA recommendations.
- **Maintain the professional safety ratio** of one teacher to 24 students in the science classroom (NSTA).
- **Maintain good ventilation** and adequate air exchanges to help facilitate student comfort.
- **Provide black laboratory tabletop surfaces** of plastic laminate (good) or epoxy resin (excellent) unaffected by chemicals and heat.
- **Provide floors with non-skid vinyl tile**.

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Recommended guidelines covering the physical specifications for elementary classrooms, classrooms with labs, and science resource rooms

- **Provide capped electrical outlets**. Ground-fault interrupters (GFIs) should be used near sinks and placed at intervals of 6-8 feet around perimeter counters; outlets should be capped when not in use.
- **Provide cut-off valves** for gas, electricity, and water near the teacher's desk, within a lockable cabinet in the demo table, or in an area that is not accessible to students.
- **Provide large sinks,** 16 by 20 inches with mats, and both hot (not scalding) and cold-water supply; provide gooseneck faucets on all sinks.
- **Provide space for computers** (one computer per student) tablets, data-logging equipment, monitors or TVs, and other electrical equipment on perimeter counters away from sinks and activity centers; outlets (see above) should have GFIs with surge protection.

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Precautions when using Animals in the lab

Animals play an important role in the elementary school classroom. The National Science Teachers Association has stated that studying animals

in the classroom enables students to develop skills of observation and comparison, a sense of stewardship, and an appreciation for the interrelationships and complexity of life.

As a teacher, however, you must be knowledgeable about the proper care of animals used for classroom study and the precautions necessary to ensure your students' safety. You should also have clearly defined learning objectives for using animals in the classroom.

Before introducing live animals into the classroom, you should check your school's, district's, or state's policy regarding live organisms including the safe handling, feeding and care guidance.

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Animal Care

- You as the teacher are responsible for ensuring that living animals receive proper care, which includes proper light, climate control, a correct diet, and sanitary living conditions. Care must be continuous and planned to include weekends and holidays.
- The comfort and humane treatment of animals should be of prime concern.
- Cages must be adequately sized, cleaned daily, and kept locked in safe, comfortable settings.
- Water bottles should be used for all mammals.
- Waste matter should be wrapped in newspaper, placed in a plastic bag, and deposited in the trash. Ordinarily, animal wastes are not harmful to the environment, but school staff—including the custodian—should be protected from exposure to these wastes.

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Animal Care

- Animals should be handled minimally and gently, only after proper directions and demonstrations have been given. Students should wear non-allergenic gloves while handling animals and should wash their hands thoroughly afterward. Sudden movements should be avoided, since they can make animals feel threatened.
- Allow animals new to the classroom a few days to adjust to the unaccustomed environment before students handle them. Take precautions when handling new animals for the first time. At first, restrict handling to yourself, or someone familiar with them, and wear heavy gloves until animals become acclimated to their surroundings and handling.
- Students should never be allowed to tease animals, throw things in their cages, or disturb them, especially while the animals are eating, sleeping, or birthing.

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Animal Precautions

- Always purchase healthy animals from reliable sources.
- Do not allow students to bring wild animals into the classroom. Wild animals, such as turtles, snakes, birds, arachnids (spiders, ticks, mites), and insects, may transmit serious diseases and behave unpredictably.
- Discourage students from bringing personal pets to school. If pets are allowed into the room, they should be handled only by their owners, and provisions should be made for proper care during the visit. Certification by a veterinarian declaring the animal disease-free should be required.
- Never use poisonous animals in the classroom. This includes some species of spiders, venomous insects, lizards, and poisonous snakes.
- Inquire beforehand about potential student allergies associated with animals. Some students are allergic to the dander produced by guinea pigs, hamsters, and other fur-bearing animals, as well as to mold found in animals' food and bedding. The school nurse should keep an "Epi-pen" handy in case of hyper-allergenic reactions.

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Animal Precautions

- **Pick up rabbits**, hamsters, mice, and lab rats by the scruff of the neck only, with a hand placed under the body for support. If the young are handled, you should remove the mother to another cage, since by nature the mother may be fiercely protective.
- **Do not allow students** to insert fingers into animal cages, since animals may protect themselves by biting, scratching, or kicking.
- **Report animal bites** and scratches immediately to the school's medical authority.
- **Do not allow** dead animals in the room, as the exact cause of death may not be determinable. You should have a veterinarian evaluate any classroom animal that dies unexpectedly.
- **Have a plan** for removal, care, and return of animals during holidays and at the end of the school year.

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Activities involving the use of Animals

- Animals used in the elementary classroom should most often be invertebrates. It is best practice to order live animals from a reputable science supplier. When you order live animals, be careful regarding date of delivery, since these specimens may be very sensitive to environmental conditions.
- No experimental procedure that causes pain or discomfort should be attempted on mammals, birds, reptiles, amphibians, or fish. Vertebrate studies should be restricted to observations of normal functions such as growth, feeding, or life cycles.
- Student-performed dissections are not recommended for most elementary students. If you decide to allow mature, advanced, upper- elementary students to perform dissections, only use preserved, lower-order animals (e.g., worms, insects, and crustaceans). In all cases, students must be completely instructed in procedures and safety precautions, and they must be carefully supervised. Students who do not wish to participate in dissections should be allowed alternative methods of instruction, such as the use of multimedia instructional programs.

1. http://cosss.org/
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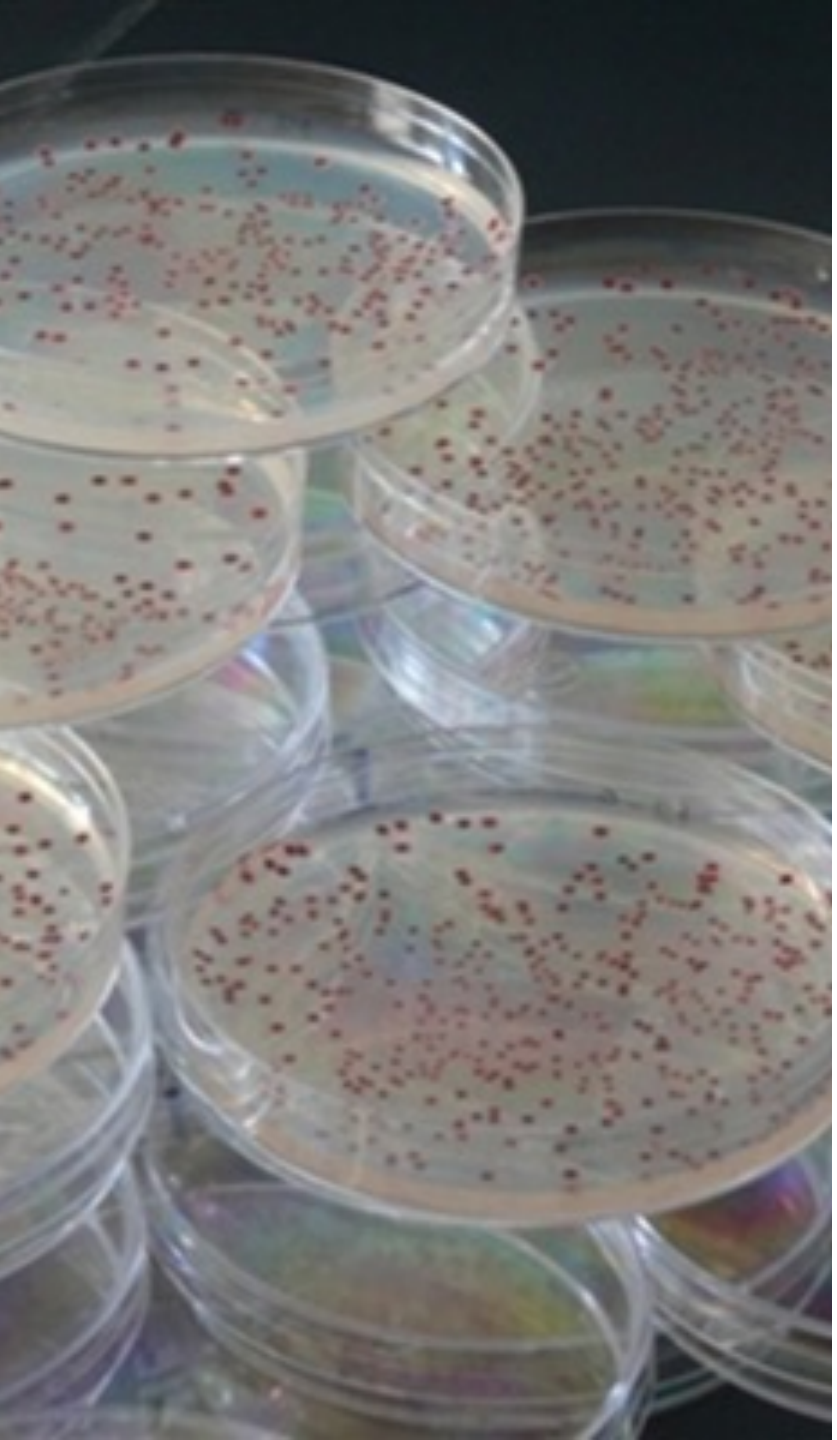

Activities involving the use of Animals

- **Live bacterial and fungal cultures should not be used in the elementary science program.** If bacterial cultures or molds are displayed, make sure that the container is completely sealed and cannot be opened by students. **There should be no culturing or active bacterial growth on petri plates at the elementary level. There is too high a hazards and resulting health risk to exposure. Use photos, etc.**
- **If pond water** is brought to class, never use contaminated or polluted sources. Be sure that students wash their hands immediately following the activity.
- **Watch for allergic reactions** when studying insects and be aware that some insects bite or sting.
- **Owl pellets** for classroom investigations should be previously sanitized. Check for student allergies to fur and feathers, since these are common contents of owl pellets.
- **If studying chicken bones,** thoroughly remove all traces of meat and soak the bones in a mild bleach solution for at least three days before allowing students to examine them.
- **Students should always** wash their hands carefully after animal investigations.

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Precautions when using plants in the lab

Most elementary classrooms have an assortment of plants for both decorative purposes and learning experiences. Classroom plants can help students understand the needs of living things and can reinforce process skills such as observation, measurement, and classification. Plants are relatively easy to care for, even during weekends or brief vacation times. Even so, there are precautions and safety considerations that you need to know.

You should be mindful of each plant that is in the science classroom, and while the use of plants is fundamentally important to the teaching and learning about botany, growth, life cycles, transportation systems and much more, also be aware of the potential risks associated with their usage. By following the precautions listed below, you should be safely able to use plants as a catalyst for understanding biotic processes in the classroom. Please note, that if there is a student allergy or sensitivity, that the plant will need to be removed from the room to provide student safety as the priority. James Palcik

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Precautions when using Plants in the lab

- **Be sure that students never eat** any part of an unknown plant, including seeds and berries, whether in the classroom or on a field trip. Help students understand the difference between edible and non- edible plants, vegetables, and fruits.
- **Plants that contain toxins** should not be present in classrooms.

  Examples of plants that are toxic when eaten include **azaleas, lantana, delphinium, iris, pokeweed, tansy, hemlock, foxglove, jimsonweed, dieffenbachia, philodendron, caladium, buckeye,** and **belladonna**.

  Examples of plants that have toxic sap include **oleander, poinsettia,** and **trumpet vine.**

  Examples of plants that are poisonous to the touch because of oils include **poison ivy, poison oak,** and **poison sumac**.

  Some plants with edible parts have parts that are inedible and quite toxic, such as **potato leaves** and **sprouts** and **rhubarb leaves**.

  Students should not touch unfamiliar plants.

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Precautions when using Plants in the lab

- **Teach children to avoid touching all mushrooms** they may find outdoors, since many varieties are poisonous.
- **Symptoms of plant poisoning** may include headache, nausea, dizziness, sweating, tightness in the chest, vomiting, skin eruption, itching, or dermatitis. Have the student obtain medical care immediately.
- **You should be able to identify** toxic or poisonous plants to prevent their introduction into the classroom and to ensure that students avoid these species, which are often common to school grounds.
- **Try to ascertain** whether students have allergies to certain plants. Many people are allergic to pollen or mold and exposure to these should be minimized or avoided.

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Precautions when using Plants in the lab

- **Fertilizers or plant chemicals** should be labeled and locked in cabinets and a Safety Data Sheet (SDS) filed for each. Wash hands and clean nails well after use of these chemicals. Goggles and gloves should be used when handling fertilizers and plant chemicals and precautions taken for dust hazard.
- **Be aware of what you burn** in a campfire, since some plants release toxins that can be inhaled into the respiratory system.
- **Always wash hands thoroughly** after handling plants, especially before eating food.
- **Identify the phone number** of your nearest poison control center and post it where it can be easily and quickly obtained.

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Experiments / Investigation / Observations involving plants in the lab

- **A common classroom activity** is seed sprouting or planting. Beans and seeds from a grocery store or specifically packaged for sprouting will be safer to handle and germinate. Do not use seeds used for garden or field planting, as they may be coated with chemicals. These seeds usually have a pink, blue, or green stain on their surface. These chemicals may irritate sensitive skin and could be poisonous if eaten.
- **Wash hands thoroughly,** or wear non-allergenic gloves, when working with plants. Plants with thorns or “stickers” should be avoided.
- **If studying soil,** it is safer to use sterilized potting soil. Soil that is dug up from the outside probably contains mold and fungi. If studying soil outdoors, have students use proper tools for digging up and examining the samples, not their bare hands.
- **Be careful if studying aquatic plants** from ponds or marshes. Pond or marsh water may contain contaminants that could cause illness. Try to avoid direct contact with water or mud unless wearing gloves; wash hands thoroughly afterward.
- **Wash all surfaces** thoroughly after plant activities.
- **Try to obtain** plant specimens from reputable scientific suppliers.

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Safety Considerations when Planning Field Trips and Experiences

There is strong consensus among science and environmental educators that field experiences for elementary- aged students are essential for effective learning. The experiential base provided by a broad range of outdoor investigations and activities can strengthen academic learning and reinforce citizenship skills and personal responsibility. Whether on school grounds or away from the school site, safer and successful field experiences require two major elements: thorough planning and careful implementation.

Planning Ahead

Become familiar with and follow the guidelines for field safety in effect in your school or district. These vary by jurisdiction.

Visit and survey the field site(s) prior to the actual event and instruct students in advance of any potential challenges (e.g., deep water, allergenic plants, slippery footing).

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Safety Considerations when Planning Field Trips and Experiences

- **Make sure parents or guardians are fully informed** about the nature of the field experience, appropriate student dress, and other essential information.
- **Be aware of any pertinent medical and physical issues** your students have, such as allergies.
- **Have parents/guardians and students sign a safety contract** outlining rules and expectations of student behavior.
- **Process and file** signed parent or guardian permission forms prior to the activity. These should include **contact information** in case of emergency and a copy of each student's **insurance card**. Make sure the permission form is preapproved by the appropriate authority in your school or district. Forms should be carried on the field trip in order to be given to a doctor/hospital in case emergency treatment is required.
- **Arrange for the use of school-sanctioned vehicles and drivers** if transportation is required. School medical and liability insurance is recommended for extended field trips involving students. **Discuss rules of behavior** beforehand and while enroute.

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Safety Considerations when Planning Field Trips and Experiences

- **Plan for additional adult supervision**. This includes, as a minimum, one (school-approved) adult per every 10 students. Consider assigning specific students to an adult in the group. Adult chaperones should be knowledgeable of all hazards, rules, and emergency procedures in advance.
- **Carry a mobile phone** in case of emergencies and a basic, approved **first-aid kit** for minor abrasions or scratches.
- **Make sure** that students fully understand the activities they will be conducting and any possible hazards to avoid.
- **Ensure that,** for water-related field experiences, at least one adult is trained in water safety techniques including CPR and lifesaving. If the student activity is planned in or on water, U.S. Coast Guard-approved life jackets must be worn.

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Field Trip and Experiences Implementation

- **Obtain the most current weather forecast** prior to the activity. Be especially aware of the chance for storms or other dangerous weather.
- **Make sure all students** are dressed appropriately for the field experience.
- **Review expectations** of student behavior and on-site precautions with students and chaperones.
- **Reinforce the learning objectives/goals** for the field experience and keep students focused on their purpose(s) or task(s).
- **Group students in pairs (buddies) or teams** to enhance mutual responsibility. Chaperones should assist in keeping students together and focused on the trip's purpose.
- **Keep on the move** at all times, monitoring student activities.
- **Use only plastic containers** when engaged in permitted collecting as part of the activity— avoid glass—and use non-allergenic gloves.
- **Get professional medical help** as soon as possible in the event of an accident.

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Legal Responsibility of an Elementary Teacher

These materials are targeted at teachers of science in grades K-8. They should help address safety concerns in self-contained as well as departmentalized science programs with a science lab room. The guidelines are not meant to be comprehensive, but rather representative. Consult the references at the back of this document for more complete science safety resources.

Negligence, as defined by the courts today, is conduct that falls below a standard of care established by law or profession to protect others from an unreasonable risk of harm, or the failure to exercise due care. *Recklessness involves conduct that is short of actual intent to cause harm, but greater than simple negligence.* Unlike negligence - recklessness means to knowingly take a risk. In the absence of specific laws or local policies, the standard of care expected is set by the profession; e.g., position statements adopted

by the National Science Teaching Association (NSTA), the National Association of Biology Teachers (NABT), the American Chemical Society (ACS), and the Council of State Science Supervisors (CSSS).

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Legal Responsibility of an Elementary Teacher

The elementary school teacher, just like all science teachers, has three basic duties relating to the modern concept of negligence:

- **duty of instruction;**
- **duty of supervision;** and
- **duty of maintenance**.

Teachers who are knowledgeable of their legal responsibilities, exercise good judgment, and take all appropriate precautions to avoid foreseeable hazards should not be apprehensive about guiding student inquiry. The law does not expect you to be clairvoyant. It does expect you to take all reasonable precautions to protect yourself and your students.

It is a good idea to document your instruction and precautions taken for each activity done; e.g., an entry labeled “Safety” should be part of all lesson plans where “lab” activities are involved. Failure to perform any duty may result in a teacher and/or school administrator being found liable for damages.

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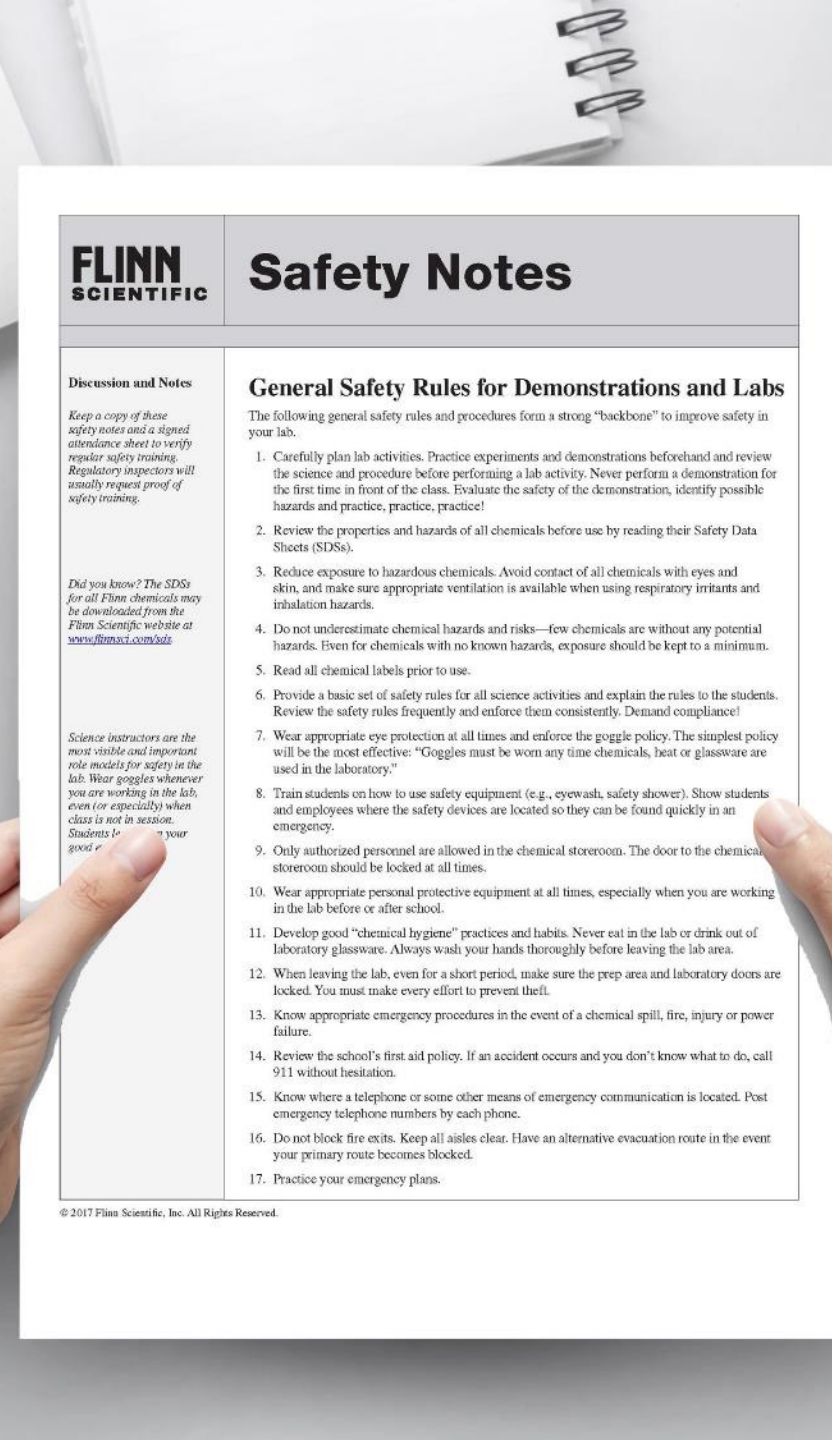

What are my legal responsibilities as a science teacher relating to negligence?

The legal definition of "negligence" is important for every teacher to know. **Negligence, as defined by the courts today, is conduct that falls below a standard of care established by law or profession to protect others from an unreasonable risk of harm, or the failure to exercise due care.** *Recklessness involves conduct that is short of actual intent to cause harm, but greater than simple negligence. Unlike negligence - recklessness means to knowingly take a risk.*

It should be noted that in the absence of specific laws or local policies, the standard of care expect- ed is set by the profession, e.g., position statements adopted by the National Science Teaching Association (NSTA), the National Association of Biology Teachers (NABT), the American Chemical Society (ACS), or the Council of State Science Supervisors (CSSS).

The science teacher has three basic duties relat-ing to the modern concept of negligence:

- **duty of instruction;**
- **duty of supervision;** and
- **duty to properly maintain facilities and equipment**

Failure to perform any duty may result in a finding that a teacher and/or administrator within a school system is/are liable for damages and a judgment and award against him/her/them.

1. http://cosss.org/
2. http://cosss.org/page-18148
3. https://static.nsta.org/pdfs/LegalImplicationsOfDutyOfCareForScienceInstruction.pdf
4. https://www.flinnsci.com/api/library/Download/a47ceee857f44684bf2bd43a5e5fb930

DUTY OF INSTRUCTION

DUTY OF INSTRUCTION includes adequate instruction before a laboratory activity (preferably in writing) that:

- ✓ Is accurate; is appropriate to the situation, setting, and maturity of the audience; and addresses reasonably foreseeable dangers.
- ✓ Identifies and clarifies any specific risk involved, explains proper procedures/techniques to be used, and presents comments concerning appropriate/inappropriate conduct in the lab.
- ✓ The use of a lab safety contract or safety acknowledgement form is a best-practice technique used to demonstrate safety rules for students in the laboratory

- ✓ Instruction must follow professional and district guidelines.
- ✓ Teachers who set bad examples by not following proper laboratory procedures may be sued if injury results from students following the teacher's bad examples.

1. http://cosss.org/
2. http://cosss.org/page-18148
3. https://static.nsta.org/pdfs/LegalImplicationsOfDutyOfCareForScienceInstruction.pdf
4. https://www.flinnsci.com/api/library/Download/a47ceee857f44684bf2bd43a5e5fb930

DUTY OF SUPERVISION

DUTY OF SUPERVISION includes adequate supervision as defined by professional, legal, and district guidelines to ensure students behave properly in light of any foreseeable dangers. Points to remember:

- **Misbehavior of any type must not be tolerated in the science department.**
- **Failure to act or improper action is grounds for liability.**
- **The greater the degree of danger, the higher the level of supervision should be.**
- **The younger the age of students or the greater the degree of inclusion of special population students, the greater the level of supervision should be.**
- **Students must never be left unattended, except in an emergency where the potential harm is greater than the perceived risk to students. Even then, risk should be minimized or responsibility transferred to another authorized person if the situation allows.**
- **Remote / Distance education involves safety concerns involving supervision and your duty of care obligations.**

1. http://cosss.org/
2. http://cosss.org/page-18148
3. https://static.nsta.org/pdfs/LegalImplicationsOfDutyOfCareForScienceInstruction.pdf
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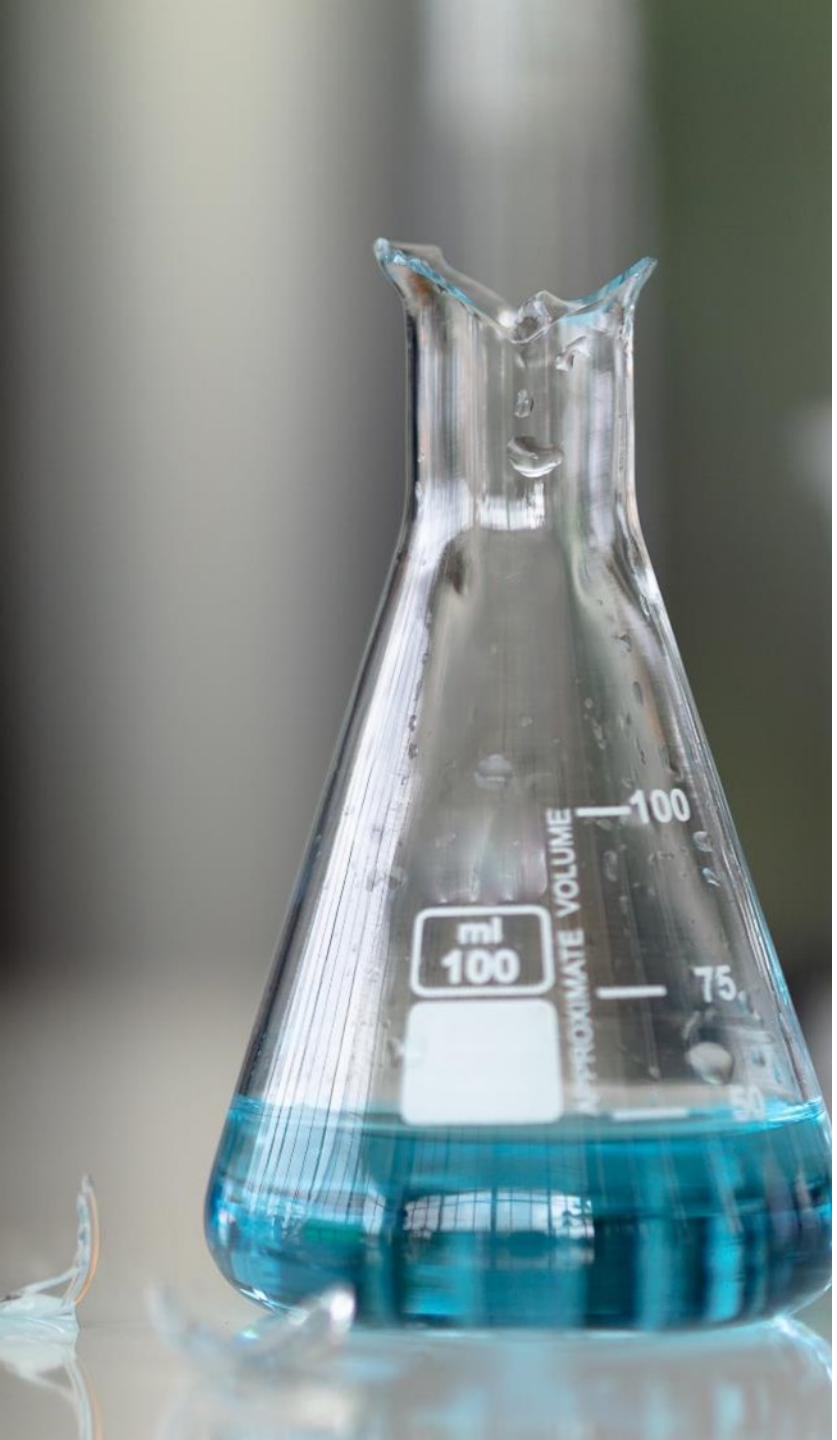

DUTY OF MAINTENANCE

DUTY OF MAINTENANCE includes ensuring a safe environment for students and teachers. This requires that the teacher:

- **Never use defective equipment for any reason.**
- **File written reports for maintenance/correction of hazardous conditions or defective equipment with responsible administrators.**
- **Establish regular inspection schedules and procedures for checking safety equipment and first-aid equipment.**
- **Follow all safety guidelines concerning prop-er labeling, storage, and disposal of chemicals according to your local, state or federal legislation and best-practices.**
- By keeping files of all hazard notifications and maintenance inspections, teacher liability in the event of an accident is minimized in cases where no corrective actions were subsequently made.

1. http://cosss.org/
2. http://cosss.org/page-18148
3. https://static.nsta.org/pdfs/LegalImplicationsOfDutyOfCareForScienceInstruction.pdf
4. https://www.flinnsci.com/api/library/Download/a47ceee857f44684bf2bd43a5e5fb930

Risk or Hazard Analysis for Activities

Are you aware of what to look for when students bring you an outline of their inquiry-based activity?

Looking at the procedures, there are a handful of red flag items or processes that you should recognize and prevent students from continuing onwards in their planned pursuit of knowledge.

Students often develop a plan or sequence of procedures that do not always align with the safety protocols in place on their quest to solve an inquiry or design problem. Reminders are a good way to start this conversation without dampening their innate curiosity as a student into studying the world around them. Once you establish benchmarks, it gets easier.

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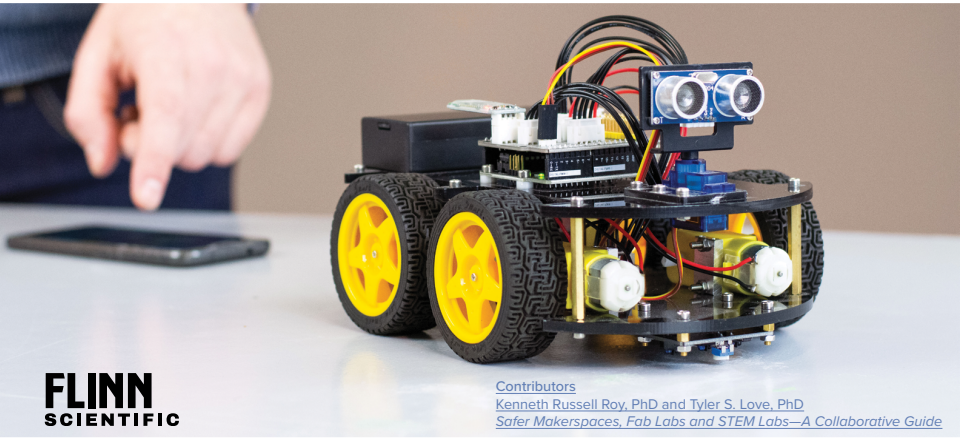
Things That Should Not Be Found in Your Stem/Science Classroom:

- Aerosols with organic propellant
- Alcohol burners
- Bacterial cultures
- Body fluids - blood/saliva/urine etc.
- Common allergens—pollens, animal furs, treenut/peanut products, mold, etc.
- Flammable liquids—methyl alcohol, acetone, carbon disulfide, ether, etc.
- Formaldehyde-preserved animal specimens & homemade jars
- Glues—“instant,” epoxy, airplane, Superglue, etc.
- Mercury thermometers—replace with alcohol-filled thermometers
- Nail polish remover solutions
- Oil-based paint thinners and turpentine
- Organic-based craft dyes & paint strippers (harsh solvents)
- Poisonous plants—poison ivy, mistletoe, poinsettia, azalea, invasive species etc.
- Poisonous animals—spiders, stinging insects, centipedes, millipedes, some snakes and lizards
- White-out type solutions—Liquid Paper
- Strong acids—undiluted hydrochloric, nitric, sulfuric; boric acid powder
- Strong bases—undiluted ammonia, sodium hydroxide (lye), chlorine bleach

8 Tips for a Safer STEM Lab



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Contributors
Kenneth Russell Roy, PhD and Tyler S. Love, PhD
Safer Makerspaces, Fab Labs and STEM Labs—A Collaborative Guide

Entry and Exit
Labs over 1,000 sq. ft. need two outward-opening doors in the event an emergency exit is needed. Avoid blocking doors.

Lighting
Include a mixture of natural and atrificial light for safer lab operation.

Sound
Place noise-producing equipment in a dedicated lab space and provide acoustical treatment on ceilings and walls within the lab.

Temperature
Keep chemical storerooms within your lab between 60—80 °F along with continuous airflow to prevent or reduce rate of decomposition of chemicals.

Ventilation
Ventilation that is directly at the source (e.g. a dust collector hose hooked directly to a belt sander) protects against hazardous particulates, gases or vapors.

Electrical Power Sources
Keep outlets at least three feet away from any water source and unplug any cords when the lab is not in use to avoid a fire hazard.

Showers and Eyewashes
A must in any STEM Lab, Makerspace or Fab Lab to minimize effects of accidental exposure to chemicals, specimens, particles and other airborne objects.

Safety Zones
Safer operator zone markings, the appropriate Personal Protective Equipment, machine guards and instructor supervision reduce accidents and injuries.

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Checklist for STEM Classroom Safety

Flinn has created a poster with 8 Tips for STEM Safety and we encourage you to use this resource for your classroom activities.

Take the time to consider to the safety & risk assessments for the activities and investigations involved with your curricular framework in your local jurisdiction.

Planning your STEM program and activities will take some thought and time, but the results will be much richer learning and deeper understanding (safely) for your students.

1. Flinn 8 Tips for a Safer STEM Lab

How to incorporate STEM into your Lessons/Student Activity Remotely?

This can be as simple as using on the provided “Flinn At Home” activities to your students (ensuring that it is age and subject appropriate) as part of the weekly assigned tasks. There doesn’t need to be an activity each day. Strive for balance and progression in your program.

STEM activities are also great ‘critical thinking or inquiry’ models that many students enjoy participating in. See our **STEM Activities for Intro Courses** video for ideas.

Be careful to not provide too many activities and also to provide too few. There is a balance that happens when you collectively work to achieve common goals and apply these to your own students.

Note - need to make sure safety contract or safety acknowledgment form along with disclaimer form (available from NSTA:

https://static.nsta.org/pdfs/SafetyAcknowledgmentForm-ElementarySchool.pdf) are signed by parents/guardians and students before any activities are undertaken.

Call FLINN for support on how to use STEM activities remotely and safely.

1. http://cosss.org/
2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It’s Elementary!

References Used in the Publication

The following is a list of general references. It should be obvious that it is not exhaustive. The references provided are for those interested in obtaining additional information from primary sources. A much more exhaustive listing of references and resources can be found in two excellent state documents: Guidebook for Science Safety in Illinois, available from the Illinois State Center for Educational Innovation and Reform (contact Illinois State Board of Education) and Maryland Science Safety Manual, K-12, available from the Maryland Science Supervisors Association (con- tact the Maryland State Department of Education). No implication of endorsement or lack of endorsement should be read into inclusion or omission of any referenced material within this document.

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2. Flinn Scientific Inc. Professional Learning Series 2021
3. COSS: Science Safety: It's Elementary!

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Trusted Online Sources for Safety, Regulatory and Compliance Content

American Association of Law Librarians: http://www.aallnet.org/aallnetweb.html American Chemical Society: http://www.acs.org

Centers for Disease Control: http://www.cdc.gov Council of State Science Supervisors: http://csss.enc.org Eisenhower National Clearinghouse: http://www.enc.org Environmental Protection Agency: http://www.epa.gov Flinn Scientific: http://www.flinnsci.com/

Flinn Scientific Inc. https://www.flinnsci.com

Howard Hughes Medical Institute. Online Information Site: http://www.practicingsafescience.org and http://www.hhmi.org/science/labsafe/lcss/

Humane Society of the United States: http://www.hsus.org/programs/research/animals_education.html JaKel, Inc. Online Information Site: http://www.netins.net/showcase/jakel

Kansas City Hazardous Waste Program: http://www.metrokc.gov/hazwaste/rehab/ Laboratory Safety Institute. Online Information Site: http://www.labsafety.org MSDS Online: http://www.msdsonline.com

National Association of Biology Teachers: http://www.nabt.org National Fire Protection Association: http://www.nfpa.org National Institutes of Health: http://www.nih.gov/od/ors/

OSHA Laboratory Standard - 29 CFR 1910.1450: http://www.osha.gov

University of Virginia: http://keats.admin.virginia.edu/

Wellesley College: http://www.wellesley.edu/ScienceCenter/lab-safe-home.html

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