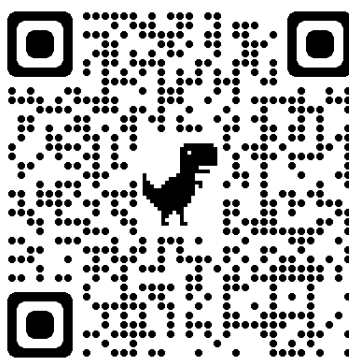


# Loudoun County Public Schools **Science Safety Manual**

**Secondary Schools**



<b>Emergency</b>	<b>911</b>
<b>LCPS Security Operations Center (SOC)</b> (24/7 Dispatch)	<b>703-779-8833</b>
<b>National Capital Poison Center</b>	<b>1-800-222-1222</b>
<b>LCPS Safety &amp; Security Office</b>	<b>571-252-1740</b>
<b>LCPS Risk Management</b>	<b>571-252-1270</b>
<b>LCPS Science Supervisor</b> Darielle Timothy	<b>571-252-1360</b>
<b>LCPS Secondary Science Specialist</b> Tracy Matthews	<b>571-252-1360</b>
<b>LCPS Environmental Health &amp; Safety Office</b> Cristina Windover, Supervisor Erin Rush, Specialist Chad Nicolardi, Specialist Beth Demith, Specialist	<b>571-252-2960</b>

# Introduction

It is the policy of Loudoun County Public Schools to provide a safe and healthy workplace in compliance with the Occupational Safety and Health Act (OSHA) of 1970 and regulations of the Department of Labor including 29CFR1910.1450 "Occupational Exposure to Hazardous Chemicals in Laboratories".

The purpose of the *Loudoun County Public Schools Science Safety Manual* is to strengthen safety practices in the science classroom, to describe proper practices, procedures, equipment and facilities for faculty and students in order to protect them from potential health hazards present in the Science Classroom.

Safety is, and must be, a primary consideration in every science activity. LCPS is committed to reducing or eliminating risks to the health and safety of its students and employees. Loudoun's commitment to health and safety can be successful only if individual members of the school community do their part by accepting responsibility for developing and practicing safety awareness.

Safety is preventing an accident that might result in injury, not merely dealing with the accident after it has occurred. Safety is a change in attitude, not just for the immediate benefit, but for a future lifestyle. Safety is the high level of mental alertness, which anticipates problems which might arise as a result of classroom activities.

## LCPS Science Safety Timeline

Date	Science Safety Action	Staff Involved
August	Science Safety Training	New Secondary Science Teachers, Science Chairs and Science SALTs
Staff Development Days	Science Safety Training	Science Teachers
August – June	On-going Safety Training at Science Department Monthly Meetings Overview of revisions and additions to Safety Manual and Guidelines	Science Chair or Science SALT and Science Teachers
November 15	<i>LCPS Science Department Chair or SALT Science Safety Checklist due</i>	Science Chair Science SALT
November 15	<i>Chemical Hygiene Plan complete</i>	All Science Teachers
November 15	Annual Chemical Inventory updated in Chemventory	All Science Teachers Science Chair Science SALT
November 15	<i>LCPS Science Room Safety Inspection Checklist Due</i>	All Science Teachers
December 1	Review chemical inventory; Resolve issues raised in review	Science Supervisor/Specialist in conjunction with Environmental Health & Safety Office
February	Check inventory for outdated chemicals	All Science Teachers
March	Check status on outstanding items from <i>LCPS Science Room Safety Inspection Checklist</i>	All Science Teachers
April	Submit list of chemical wastes that need to be removed	Science Chair Science SALT All Science Teachers
June	Chemical Waste Pick-Up	Coordinated by the Environmental Health & Safety Office in conjunction with Science Supervisor/Specialist

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# Legal Aspects of Laboratory Safety

The classroom teacher can be placed in the unenviable position of being the only party amenable to suit among all potentially liable parties – the state, the school district, the school board, the school administration, and the classroom teacher. Teachers can incur legal liability in a number of ways; however, only one is of interest here, and that is negligent behavior.

The legal definition of “Negligence” is defined as conduct that falls below a standard of care established by law or profession to protect others against an unreasonable risk of harm, or the failure to exercise due care. If the standard of care has not been specifically established by laws or local policies, the standard of care expected is set by the profession. These include position statements adopted by the [National Science Teachers Association](#) (NSTA), the National Association of Biology Teachers (NABT), the American Chemical Society (ACS), or the Council of State Science Supervisors (CSSS).

The classroom teacher has three basic duties which are related to negligence. These are

- Duty of instruction
- Duty of supervision
- 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.

## **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.

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

## **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.
- 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.

### **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.
- Conduct regular inspections of safety equipment according to the annual timeline set by the Science Office.
- and procedures for checking safety and first aid equipment per the annual timeline set by the Science Office.
- Follow all safety guidelines concerning proper labeling, storage and disposal of chemicals.

By keeping files of all hazard notifications and maintenance inspections, teacher liability, in the event of an accident, is minimized.

LCPS purchases liability insurance coverage to provide protection for employees' general and professional liability risk exposures. Science teachers are covered for their unintentional actions within the scope of their official duties on behalf of LCPS in accordance with the insurance policy terms, conditions, and exclusions. All questions pertaining to legal liability or insurance should be directed to the LCPS Risk Management Office at (571) 252-1270.



# Managing the Safety Program

Safety in the science classroom is a shared responsibility among administrators, teachers and students. The following outlines general responsibilities of involved parties.

## **Responsibilities**

### **Loudoun County Public Schools (LCPS), Science Supervisor, Environmental/Safety Coordinator**

Loudoun County Public Schools and the Science Supervisor have the responsibility and the authority to see that the Loudoun County Public Schools Science Safety Plan is written, updated and implemented. These responsibilities include working with Environmental/Safety Coordinator, Science Faculty and School Administration to insure safe science facilities and science equipment and to monitor safe procurement, use and disposal of chemicals.

In conjunction with the Science Chair or Science Subject Area Lead Teacher (SALT), the Science Supervisor and Environmental/Safety Coordinator will also:

- Monitor the procurement of hazardous materials.
- Maintain the *List of Prohibited Chemicals*.
- Inspect laboratories and chemical storage facilities.
- Arrange for proper disposal of unwanted materials.

### **School Administrator**

- Provide a laboratory that is functional and safe.
- In conjunction with the Science Supervisor, provide for safety items and ensure that they are in good condition.
- Provide for regular inspection of the laboratory and document inspection and maintenance of safety equipment.
- Comply with Federal Right-to-Know laws (Hazard Communication Standards, MSDS/SDS collection).
- Assist in implementing the *Chemical Hygiene Plan* as developed by the school's Science Department.

### **High School Science Department Chair or Middle School Science Subject Area Lead Teacher (SALT)**

The Science Department Chair or Science SALT should appoint a *Safety Contact Teacher* at their school. This teacher should have a chemistry background or appropriate safety training. The Science Chair or SALT in conjunction with the *Safety Contact Teacher* is responsible for coordinating and implementing the safety program in their school. These shared responsibilities include:

- Provide each teacher with a *LCPS Science Safety Manual*.
- Provide each teacher with *Science Curriculum Guides*.
- Provide each teacher with supplemental *Resource Guides*.
- Inservice department members on Right to Know Laws, MSDS/SDS, etc.
- Facilitate regular safety meetings with science staff.
- Provide new teacher orientation and training related to chemical safety and storage.
- Assure that the written student safety guidelines are modified to be site specific.
- Assist teachers to develop a chemical emergency plan or chemical response procedure.

- Provide training to coworkers on emergency or spill procedures and proper use of emergency equipment.
- Assure that all emergency equipment is in place, functional, and tested periodically. Keep a written record of testing in accordance with LCPS Science Safety guidelines.
- Assist teachers in enforcing safety procedures and the proper use of appropriate personal protective equipment (goggles, gloves, aprons) by students and teachers.
- Update Chemventory yearly, at a minimum.
- Update chemical inventories as supplies are received and used, monitor usage to determine reasonable purchase amounts.
- Assume joint responsibility with the principal's designee for ordering science materials to ensure that only authorized and reasonable quantities are purchased.
- Organize chemical storage according to compatible families, clearly labeled, dated and in proper containers.
- Update and maintain the MSDS/SDS notebook.
- Coordinate the onsite waste processing and disposal to reduce accumulation, to assure safe procedures are followed in compliance with state and local hazardous materials disposal regulations.
- Arrange with the Science Supervisor for the pick-up and legal disposal of materials requiring special handling.
- Submit a *LCPS Science Room Safety Inspection Checklist* for each teacher to complete.
- Work with school administrators to correct any deficiencies found in the *LCPS Science Room Safety Inspection Checklist*.

The Department of Instruction, Science Supervisor, and Science Specialist will provide any necessary training and support to the High School Science Department Chairs, Middle School Science SALTs, and Elementary Science Contacts.

In an effort to organize the safety needs and concerns within each school, several checklists are included in the *Appendix* at the end of this Safety Manual. Copies of completed checklists should be kept on file for reference by the school administration, Science Chairs/SALTs and the science supervisor. Checklists should be completed as early in the school year as possible, but before **November 15<sup>th</sup>**. A copy of each school's checklist is to be sent to the Science Supervisor by this date.

### **School Science Department**

The Science Department should develop, update and enforce a *Chemical Hygiene Plan* customized to the school's facilities. (See *Sample Chemical Hygiene Plan* in the Appendix.) The science department should also meet monthly to discuss and resolve specific chemical safety and storage concerns identified within their building as well as any other safety issues.

### **Science Teachers**

Each teacher should assume the responsibility for assuring that the teaching space is as free of safety and health hazards as possible. This means that teachers must be continuously vigilant in recognizing unsafe conditions and eliminating or reporting such conditions to the school administration. Other responsibilities include:

- Informing themselves about the health and safety risks associated with any exercises involving chemicals, living materials, live animals and science equipment.
- Identify the safety procedures required for each process, and integrate this information in the instructional program.

- Supervising students as they work to ensure that students are wearing appropriate personal protective equipment, that safe procedures are being followed, and that the areas in which the students work are safe.
- Ensure through signs and labels that the disposal of chemical waste and broken glassware does not create a health or safety hazard for the custodians who clean the classroom at the end of the school day.
- Complete the *LCPS Science Room Safety Inspection Checklist*.
- Inventory all chemicals and potential hazardous materials in the classroom.
- Assist in acquiring, updating and maintaining the Safety Data Sheet (MSDS/SDS) records at their school.
- Maintain proper hazard communication by labeling science materials properly, including waste substances produced by experiments (e.g. solid lead (II) chloride produced from a precipitation reaction).

### **Students**

Students have a responsibility to follow all safety instructions presented by the teacher and to abide by classroom/laboratory rules of conduct. The older the students the greater is their responsibility for contributing to the safe facilitation of classroom activities. Students should conduct themselves in such a manner as to reduce the probability of being involved in accidents or incidents. In addition students should:

- Understand the experimental procedure before starting work in the laboratory.
- Obey all safety rules and regulations.
- Sign Safety Rules and Regulations Acknowledgement Form.
- Know the location and use of all safety equipment in the laboratory.
- Clean their work area immediately after use.
- Obey good housekeeping practices.
- Report all accidents and injuries.

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# Classroom Safety Overview for Teachers

Correct and safe techniques, as well as wise selection of experiments, resources, materials, and field experiences appropriate to age levels, must be carefully considered with regard to safety precautions for every instructional activity. Safe science classrooms require thorough planning, careful management, and constant monitoring of student activities.

Teachers must be knowledgeable of the properties, use and proper disposal of all chemicals that may be judged as hazardous prior to their use in an instructional activity. Such information is referenced through Safety Data Sheets (MSDS/SDS). The identified precautions involving the use of Personal Protective Equipment, PPE, (e.g. goggles, gloves, aprons) fume hoods, and Biosafety Cabinets, BSC, must be followed.

## Strategies for Teachers

- Have a set of safety rules spelled out in an agreement that is signed by the students and parents. (Student Science Safety Rules and Regulations are in the *Appendix* and in *Permission Click*. See statement wording on page 11.)
- Keep signed copies of the Safety Rules and Regulations on file.
- Display posters and signs highlighting safety rules and techniques.
- Give a “Safety Quiz”.
- Document science safety discussions with students.
- Insist on proper lab clean up and maintenance. (Lab areas, sinks, equipment, etc. are clean, neat and orderly.)
- Establish a procedure for ‘checking’ students out of the lab at the end of an experiment. Make clean up and safety part of the lab practice and protocol.
- Know the established emergency response procedure at your school.
- Model safety in your science class/lab everyday.

## Safety Equipment

- Enforce a firm goggle policy – **“Any time chemicals, glassware, or heat is used, you must wear your lab goggles.”**
- Demonstrate proper use of PPE and have ready access to:
  - Goggles, aprons, gloves, etc.
  - Eyewash station
  - Safety Shower
  - Fume hood (only if appropriate to your laboratory)
  - Biosafety Cabinet (only if appropriate to your laboratory)
  - Basic first-aid supplies (i.e. bandages, gauze)
- Carefully inspect all PPE before using. Do not use defective PPE.
- Practice fire evacuation drills as well as what students must do if a fire occurs or if they come in contact with a hazardous chemical.
- Complete *LCPS Science Room Safety Inspection Checklist*.
- Use heat-safety items such as safety tongs, mittens, aprons, and rubber gloves for both cryogenic and very hot materials.
- Use safety shields or screens whenever there is potential danger that an explosion or implosion of an apparatus might occur.

- When working with flammable chemicals, be certain that there are no sources of ignition near enough to cause a fire or explosion in the event of a vapor release or liquid spill.
- Never block access to or alter emergency equipment, showers, eyewashes, and exits.
- Test and inspect emergency equipment on a regular basis to ensure proper working order. Eyewashes should be run at least weekly in order to flush the apparatus of dust and debris. Check the condition of the eyewash filters **monthly**.
- Provide in a readily accessible location appropriate materials and procedures for clean-up of hazardous spills and accidents.
  - Aspirator or spill kit for mercury spills
  - Vermiculite and baking soda for acid spills
  - Autoclave or 10% bleach (sodium hypochlorite) solution for clean-up of microorganisms. **[Note: Bleach is only permitted for laboratory use, NOT for classroom cleaning/disinfecting.]** Consult the [Science Equipment Cleaning/Disinfecting Guidelines](#) in the appendix (page 83) for instructions on making the 10% bleach solution.
  - Follow Blood Borne Pathogen procedures for body fluids. (Note that use of human body fluids in classroom activities is strictly prohibited.)

### Biological Hazards

- Prohibit the use of pathogens or any procedures or materials in any school laboratory above Biosafety Level 1 as outlined by Centers for Disease Control protocols. (Biosafety Level 1 is defined as “agents not known to cause disease in healthy adult humans and present a minimum potential hazard to laboratory personnel and the environment”.)
- Schools with Biological Safety Cabinets and trained teachers/students are permitted to conduct limited BSL-2 research. All BSL-2 research must be reviewed and approved by the LCPS Scientific Review Board (SRC).
- Teachers and students conducting research that requires the use of a BSC must complete the CDC [Recognizing the Biosafety Levels](#) Quick Learn Lesson available at <https://www.cdc.gov/training/quicklearns/biosafety/>
- Teachers who use BSC must also complete the CDC [Fundamentals of Working Safely in a Biological Safety Cabinet Course](#) at <https://www.cdc.gov/labtraining/training-courses/biological-safety-cabinets.html>
- Do not use human tissues and/or any body fluids. They are prohibited from use in LCPS science classrooms.
- Know [Virginia Wildlife](#) laws in regards to collecting and using wild animals for educational purposes. You cannot legally release any animal into the wild, it should be clear that any animal you buy or legally collect live must remain in captivity for the rest of its life. Therefore, you should not acquire any animal unless you are prepared to care for it the rest of its life or to make future arrangements for its care.
- Keep live animals and students adequately protected from one another.
- Protect and treat all animals humanely.
- Alert students that many plants, both domestic and wild, have poisonous parts and should be handled with care.

## Lab Procedures

- A positive student attitude toward safety is imperative. Students should not fear doing experiments, using reagents, or equipment, but should respect them for potential hazards. Students should read the lab materials in advance noting all cautions (written and oral).
- Always perform an experiment or demonstration prior to allowing students to replicate the activity. Look for possible hazards. Alert students to potential dangers.
- Never assume that an experiment is free from safety hazards.
- Reduce students' exposure to harmful materials by selecting those that pose a minimum risk.
- Set good safety examples when conducting demonstrations and experiments, including selection and use of appropriate PPE (e.g. aprons and goggles).
- Written lab instructions must be clear and safety rules emphasized in these instructions.
- Safety instructions should be given orally and reinforced each time an experiment is conducted.
- Train students in the proper handling of materials, chemicals, and equipment.
- Constant surveillance and supervision of student activities are essential.
- During lab periods;
  - Circulate among students to monitor work.
  - Stay in the lab at all times when students are working.
  - Make sure that students understand instructions before they begin work.
  - Inform students about hazards and precautions associated with specific activities.
  - Allow sufficient time for student completion and clean-up of the lab activity.
- Make sure that you are aware of students who wear contact lenses. See the following references:  
American Optometric Association Guidelines for [Use of Contacts in Industrial Environments](#).

NIOSH Publication No. 2005-139: *Current Intelligence Bulletin 59* [Contact Lens Use in a Chemical Environment](#)

- Make it clear to students that rough play or mischief is not permitted in science classrooms or labs.
- Make certain all hot plates and burners are turned off and unplugged when leaving the laboratory.
- Do not heat a closed system. Explosive pressures and high temperatures could be generated.
- **Use of alcohol burners is prohibited.**
- Visitors to the science classroom/lab must be informed of and follow all safety rules.



## Housekeeping

- Keep the laboratory uncluttered and locked when not in use or when the teacher is not present.
- Suggest that students leave large coats, book bags, and backpacks in lockers before coming to class.
- Never eat or drink in the laboratory or from laboratory equipment.
- Do not bring or store food or beverages in laboratory areas including refrigerators. Laboratory refrigerators are not to be used for personal food storage
- Keep personal items off the lab surfaces.
- All work surfaces and equipment in the chemical or biological laboratory should be thoroughly cleaned after each use.
- Wash promptly and thoroughly whenever a chemical has contacted the skin.
- Wash well with soap and water before leaving the laboratory.
- Students should properly note odors or fumes with a wafting motion of the hand. Avoid inhalation of chemicals; do not "SNIFF" to test chemicals.
- Do not mouth pipette; use pipetting bulbs or pipette fillers.
- Maintain a strict control of student access to chemicals.
- When transferring chemicals to unmarked containers, label the container with the name, chemical formula, date and the hazards the contents present to users. Do not remove or deface labels of bottles in use.
- Keep all work areas, especially laboratory benches, free of clutter.
- Do not store chemicals in aisles, hallways, or stairwells.
- Return all chemicals to their assigned storage areas at the end of each workday.
- Properly label and keep wastes in their appropriate containers. **There should never be unknowns in the science laboratory (teachers may use "unknown" as an instructional term during a lab, but the chemical formula of all substances used or created in the lab must be known and recorded on the label of the waste).**
- Promptly clean up all spills; properly dispose of chemical and cleanup materials.
- The gas line should be shut off in classrooms unless being used for instructional activities.
- Do not store materials or chemicals on top of cabinets or on the top shelf in the storage area.

## Use of Candles in School Buildings

The Fire Marshall has agreed to the use of candles in school buildings under very specific and restricted instances. Specifically, candles can be used during ceremonies such as National Honor Society Induction and other such events. Lit candles cannot be left unattended or placed near combustible materials. Scented candles are prohibited, and candles may not be used for decoration.

## Student Science Safety Rules and Regulations

LCPS Science teachers must have each student and the student's parents/guardians sign the *Student Science Safety Rules and Regulations*. The student should return a signed copy to the classroom teacher and retain a copy for his/her notes. There are examples of Safety Rules and Regulations in the *Appendix* and in *Permission Click*. Teachers may revise the samples to align with safety guidelines and procedures specific for their grade/subject.



Regardless of which format is used the Science Safety Rules and Regulations must contain the following statement for students to sign:

I, \_\_\_\_\_ (student's printed name) have received, read and agree to follow the science safety rules and procedures listed above. I further agree to abide by all written and verbal instructions given in class. I understand that I may ask my instructor at any time about rules and regulations that are not clear to me. I am aware that my failure to follow these science laboratory rules and regulations will subject me to possible disciplinary action.

## **Student Science Safety Guidelines**

The following is a comprehensive list of Student Science Safety Guidelines.

Science is a hands-on laboratory class. You will be doing many laboratory activities, which require the use of potentially hazardous materials and equipment. A positive attitude toward safety is imperative. Students should not fear doing experiments, using reagents, or equipment, but should respect them for potential hazards.

Safety in the science classroom is the highest priority for students, teachers, and parents. To ensure a safe science classroom, the following set of rules should be followed at all times.

### **General Guidelines**

1. Conduct yourself in a responsible manner at all times in the laboratory.
2. Follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ask your teacher for help before proceeding.
3. Never work alone. No student may work in the laboratory without a teacher present.
4. Do not touch any equipment, chemicals, or other materials in the laboratory area until you are instructed to do so.
5. Do not eat food, drink beverages, or chew gum in the laboratory. Do not use laboratory glassware as containers for food or beverages.
6. Perform only those experiments authorized by your teacher. Never do anything in the laboratory that is not specified in the laboratory procedures or by your teacher. Carefully follow all instructions, both written and oral. Unauthorized experiments are prohibited.
7. Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory. Never fool around in the laboratory. Horseplay, practical jokes, and pranks are dangerous and prohibited.
8. Observe good housekeeping practices. Work areas should be kept clean and tidy at all times. Bring only your laboratory instructions, worksheets, and/or reports to the work area. Other materials (books, purses, backpacks, etc.) should be stored in the classroom area.
9. Keep aisles clear. Push your chair under the desk when not in use.

10. Know the locations and operating procedures of all safety equipment including the eyewash station, safety shower, fire extinguisher, and fire blanket. Know where the fire alarm and the exits are located.
11. Always work in a well-ventilated area. Use the fume hood when working with volatile substances or poisonous vapors. Never place your head into the fume hood.
12. Be alert and proceed with caution at all times in the laboratory. Notify the teacher immediately of any unsafe conditions you observe.
13. Dispose of all chemical waste properly. Never mix chemicals in sink drains. Sinks are to be used only for water and those solutions designated by the teacher. Solid chemicals, metals, matches, filter paper, and all other insoluble materials are to be disposed of in the proper waste containers, not in the sink. Check the label of all waste containers twice before adding your chemical waste to the container.
14. Labels and equipment instructions must be read carefully before use. Set up and use the prescribed apparatus as directed in the laboratory instructions or by your teacher.
15. Keep hands away from face, eyes, mouth and body while using chemicals or ,. Wash your hands with soap and water after performing all experiments. Clean (with detergent), rinse, and wipe dry all work surfaces (including the sink) and apparatus at the end of the experiment. Return all equipment clean and in working order to the proper storage area.
16. Experiments must be personally monitored at all times. You will be assigned a laboratory station at which to work. Do not wander around the room, distract other students, or interfere with the laboratory experiments of others.
17. Students are never permitted in the science storage rooms or preparation areas unless given specific permission by their teacher.
18. Know what to do if there is a fire drill during a laboratory period; containers must be closed, gas valves turned off, fume hoods turned off, and any electrical equipment turned off.
19. Handle all living organisms used in a laboratory activity in a humane manner. Preserved biological materials are to be treated with respect and disposed of properly.
20. When using sharp instruments, always carry with tips and points pointing down and away. Always cut away from your body. Never try to catch falling sharp instruments. Grasp sharp instruments only by the handles.

### **Clothing**

21. Any time chemicals, heat, or glassware are used, students will wear laboratory goggles.
22. Notify your teacher if you wear contact lenses.
23. Dress properly during a laboratory activity. Long hair, dangling jewelry, and loose or baggy clothing are a hazard in the laboratory. Long hair must be tied back and dangling jewelry and loose or baggy clothing must be secured. Shoes must completely cover the foot.

### **Accidents and Injuries**

24. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the teacher immediately, no matter how trivial it may appear.
25. If you or your lab partner is hurt, immediately alert your teacher.
26. If a chemical should splash in your eye(s) or on your skin, immediately flush with running water from the eyewash station or safety shower for at least 15 minutes. Notify the teacher immediately.
27. Report any broken laboratory equipment to the teacher immediately.

### **Handling Chemicals**

28. All chemicals in the laboratory are to be considered dangerous. Do not touch, taste, or smell any chemicals unless specifically instructed to do so. The proper technique for smelling chemical fumes will be demonstrated to you.
29. Check the label on chemical bottles twice before removing any of the contents. Take only as much chemical as you need.
30. Never return unused chemicals to their original containers.
31. Never use mouth suction to fill a pipet. Use a rubber bulb or pipet pump.
32. When transferring reagents from one container to another, hold the containers away from your body.
33. Acids must be handled with extreme care. You will be shown the proper method for diluting acids. Always add acid to water, swirl or stir the solution and be careful of the heat produced, particularly with sulfuric acid.
34. Handle flammable hazardous liquids over a pan to contain spills. Never dispense flammable liquids anywhere near an open flame or source of heat.
35. Never remove chemicals or other materials from the laboratory area.
36. Take great care when transferring acids and other chemicals from one part of the laboratory to another. Hold them securely and walk carefully.

### **Handling Glassware and Equipment**

37. Carry glass tubing, especially long pieces, in a vertical position to minimize the likelihood of breakage and injury.
38. Never handle broken glass with your bare hands. Use a brush and dustpan to clean up broken glass. Place broken or waste glassware in the designated glass disposal container.
39. Inserting and removing glass tubing from rubber stoppers can be dangerous. Always lubricate glassware (tubing, thistle tubes, thermometers, etc.) before attempting to insert it in a stopper. Always protect your hands with towels or cotton gloves when inserting glass tubing into, or removing it from, a rubber stopper. If a piece of glassware becomes "frozen" in a stopper, take it to your teacher for removal.
40. When removing an electrical plug from its socket, grasp the plug, not the electrical cord. Hands must be completely dry before touching an electrical switch, plug, or outlet.

41. Examine glassware before each use. Never use chipped or cracked glassware. Never use dirty glassware.
42. Report damaged electrical equipment immediately. Look for things such as frayed cords, exposed wires, and loose connections. Do not use damaged electrical equipment.
43. If you do not understand how to use a piece of equipment, ask the teacher for help.
44. Do not immerse hot glassware in cold water; it may shatter.

### **Heating Substances**

45. Exercise extreme caution when using a gas burner. Take care that hair, clothing and hands are a safe distance from the flame at all times. Do not put any substance into the flame unless specifically instructed to do so. Never reach over an exposed flame. Light burners only as instructed by the teacher.
46. Never leave a lit burner unattended. Never leave anything that is being heated or is visibly reacting unattended. Always turn the burner or hot plate off when not in use.
47. You will be instructed in the proper method of heating and boiling liquids in test tubes. Do not point the open end of a test tube being heated at yourself or anyone else.
48. Heated metals and glass remain very hot for a long time. They should be set aside to cool and picked up with caution. Use tongs or heat-protective gloves if necessary.
49. Never look into a container that is being heated.
50. Do not place hot apparatus directly on the laboratory desk. Always use an insulating pad. Allow plenty of time for the hot apparatus to cool before touching it. Determine if an object is hot by bringing the back of your hand close to it prior to grasping it.

## **Field Trips and Field Studies**

Any teacher planning a field trip should consult and follow the [Loudoun County School Board Field Trip Regulation 5070](#). More information can be obtained from the Support Services-Transportation website at <https://www.lcps.org/Page/217558>

In addition to the LCPS School Board regulations governing student field trips, certain safety precautions must be taken to preclude accidents or injuries. It should be kept in mind that field trips as a school activity are under school sponsorship and the school's responsibility for student safety is not abrogated.

Prior to departure on a field trip, the teacher should issue *Field Trip Permission Forms*. These forms must be signed by the parent or guardian and returned prior to the field trip. Copies of the signed permission forms shall accompany the responsible field study teacher as an immediate resource for student emergency medical information. These permission slips give parental approval for the student to make the trip, but in no way diminish the teacher's responsibility for safeguarding the students in his/her care. During the field trip or field study the teacher should ensure all students have adequate supervision.

Field studies done with students on school grounds do not require a *Field Trip Permission Form*, but the same safety guidelines listed below apply. Teachers should follow their school's procedures for taking students outside.

During a field study there are several hazards to be aware of that may result in injury, such as cuts, punctures, poisoning and allergic reactions.

**The teacher should survey the area and include a list of all hazards, such as:**

- Conditions that may cause students to fall (steep terrain, slippery or unstable rocks)
- Unstable overhead objects, which may fall on students
- Animal burrows or holes into which students could step
- Footbridges or other elevated crossings that may collapse under student weight
- Deep water or streams with currents strong enough to sweep a student off balance
- Animals capable of attacking and injuring students
- Poisonous, venomous, and infected animals
- Insects and arachnids
- Allergenic and poisonous plants
- Vehicle traffic

**The teacher should take precautionary measures such as:**

- Map the safest passage through the study area.
- Confirm that all students are physically capable of participating in the field study (heart condition, severe allergic reactions, and ambulation difficulties must be considered). Be aware of students with Individualized Health Plans.
- Avoid areas that have been sprayed with herbicides or pesticides.
- Use the school board approved means of transportation.

**The teacher should instruct students in:**

- Safe methods of walking or climbing on marshy terrain, or rock or shale strewn slopes
- Appropriate shoes and clothing appropriate for the terrain and weather  
If the field trip is taken during tick season, the clothing should be tick-proof as much as possible (buttoned collar, wrist and ankle bindings). Head covering should also be worn.
- Recognition of poison ivy, poison sumac and poison oak  
(After field trips where exposure to poison ivy, etc. is probable, immediately on return the students should lather the exposed parts of the body with strong soap. The lather should be allowed to dry, then washed off, and the treatment repeated several times.)
- Recognition and avoidance of poisonous snakes of the types indigenous to this area (e.g. rattlesnakes, copperheads)
- Safe methods of working in deep or turbulent bodies of water, including wearing life jackets
- Familiarize students with the general area. Prior arrangements should be made for rendezvous in case students are separated from the group.

**Emergency Procedures**

Follow the established emergency procedures for field trips.

# STARLAB Portable Planetarium

STARLAB portable planetaria may be used under the following conditions.

1. A **yearly** site inspection of the location used to set up the STARLAB must be conducted. Each high school should contact the Fire Marshal's office at 703-737-8600 to schedule the inspection. The STARLAB should be set up and inflated for the Fire Marshal's inspection.
2. A Dry Chemical **Fire Extinguisher**, with a rating of 2A:B, must be inside the STARLAB adjacent to the lamp assembly during use.
3. The STARLAB must be set up in a large area that provides clearance about the planetarium.
4. Students must have a safety drill of evacuation procedures the first time they use the STARLAB.
5. Questions about STARLAB use should be directed to the Science Office at 571-252-1360.

## STARLAB Safety Features

- The STARLAB dome has two means of egress: through the entrance tube and, as there is no floor, occupants can exit in seconds by lifting the side of the dome.
- It requires 8 lbs of force to lift the side of the Standard Dome.
- The STARLAB dome and components are Latex™ free.
- Air circulates through the dome continuously, with a complete fresh air exchange rate of every 6 minutes.
- The Standard Projector (halogen) and blower are UL Listed and CE compliant.

## Required STARLAB Set-up

- The STARLAB should always be set up in an open space such as a cafeteria, gym, multipurpose room, or large classroom. Do not set up on a stage. Do not set up where exit doors are blocked or ceiling height is low.
- Allow at least 18 inches above the dome for a ceiling with sprinkles; allow at least 12 inches above the dome for a ceiling with incandescent lighting; allow at least 6 inches above the dome for a ceiling with fluorescent lighting.
- When setting up the dome, be sure to avoid blocking the exit paths out of the room.
- Always bring a working flashlight into the STARLAB.

## Safety Rules

- Never set up the STARLAB dome near an open flame, incandescent lighting, radiators, space heaters or other heat source.
- Students should never be left alone in the STARLAB. The instructor should always be the first one in and last one out of the dome.
- When leaving the STARLAB dome, the instructor should check to make sure there is no one remaining in the entrance or inflation tubes.
- Always make sure there is a clear path out of the STARLAB in the event of an emergency.
- Safety rules and evacuation procedures should be reviewed with the students before the start of each STARLAB lesson.



# Biological Materials

LCPS Risk Management Office maintains the most recent [Live Animals in the Classroom Guidelines](#). Teachers must complete the “LCPS Animals in the Classroom Request Form” and obtain written approval from the School Principal prior to bringing animals to school.

## Wildlife

Before any wild animals are used in any science activity, teachers must know [Virginia’s Wildlife Laws](#). Unless a particular wildlife activity, purpose, or use is specifically authorized by law, you can assume it is illegal. Virginia law specifies how many and what type of wild animals you can legally collect and/or have in your possession at any given time. As an educator, if you choose to bring live animals into your school or classroom for educational purposes, as an individual you can only have the limit specified by law. A prudent educator understands that the intent of Wildlife laws is to protect wildlife populations by controlling widespread collection and will teach students to leave wildlife in its natural setting. For more information see the DWR [Wildlife in the Classroom](#) document or contact

### Virginia Department of Wildlife Resources

Richmond Headquarters:  
P.O. Box 90778  
Henrico, VA 23228-0778  
(804) 367-1000

In addition to a limit on the numbers of wildlife species there is a concern of releasing animals. Once an animal has been kept in captivity for any length of time its chances of survival when released into the wild are very nominal. Also, because of the nature of captivity (close quarters, or inadequate hygiene), captive animals are more likely to contract diseases that their wild counterparts may have not been exposed to. Virginia law states that it is **unlawful to liberate any animal unless specifically permitted by law or regulation**. It should be clear that any animal you buy or legally collect live must remain in captivity for the rest of its life. Therefore, you should not acquire any animal unless you are prepared to care for it the rest of its life or to make arrangements for its care.

## Live Animals

Teachers should follow the [LCPS Live Animals in the Classroom Guidelines](#) for information about the LCPS approval process for using or keeping live animals in the classroom. Using or keeping live animals in the day-to-day operations of LCPS **non-science classroom activities** requires the completion of the *Animals in the Classroom Request Form*. Teachers enrolled in the 4H embryology program, Trout in the Classroom, or raising monarch butterflies do not require the completion of the *Animals in the Classroom Request Form*.

Animals should only be used in science classes for appreciation and understanding of life processes. **Before using animals, teachers must obtain permission from their principal.** Teachers should establish guidelines to avoid any intentional or unintentional abuse, mistreatment, or neglect of animals and to promote humane care and proper animal husbandry practices. Whenever animals are to be used in science activities with

students, it is imperative that care be exercised to protect both the animals and the students.

If animals are to be kept for anytime in the room in cages, be certain that adequately sized and clean cages are provided to all animals. Keep cages locked and in safe, comfortable settings. If heaters are used to keep animals warm, animals should be in a non-combustible container (no cardboard boxes). Only heaters that are specifically designed for incubators, aquariums and terrariums should be used to maintain the temperature in the habitat. Clip lamps are PROHIBITED as a heat source for animals, as they represent a significant fire hazard.

Animals can stimulate and enhance learning and should be used safely in the laboratory/classroom. Should a teacher elect to keep classroom animals, they must take responsibility for the wellbeing of the animal and students. All safety precautions must be followed and all student contact with animals must be highly organized and supervised.

Teachers should be aware of the following hazards:

- Numerous diseases can be transmitted to humans from animals.
- Animals may contract and serve as carriers for human disease.
- Scratches and bites are hazards when handling animals.
- Animals can be a source of potentially severe allergies.
- Animals may adversely impact classroom air quality.

Teachers should use the following guidelines to ensure a safe experience for students:

- Inquire beforehand about student allergies associated with animals.
- Allow students to handle/touch animals only after proper directions and demonstrations have been given. (No kissing or close personal contact.)
- Have students use leather or rubber gloves while handling vertebrates and appropriate invertebrates and wash hands thoroughly with soap and water afterward.
- Report to the school administration and the school nurse immediately any animal bites or scratches.
- Have a veterinarian evaluate all animals that die unexpectedly.
- Never dispose of fecal matter in sinks or with commonly used equipment. Flush into toilets or seal in a plastic bag and place in a dumpster for removal to a sanitary landfill.
- Obtain classroom animals from reputable pet suppliers. Only certified disease free animals should be allowed in the classroom.
- Never use poisonous or venomous animals in the classroom.
- Never allow students to tease animals or touch animals to their mouths.
- Students should not be permitted to take animals home for week-ends, holidays or vacations.
- Use rubber, latex, or vinyl gloves when cleaning the cage.
- Clean and disinfect the cage in a well ventilated area or outside. Once solid material has been removed clean the cage with a school approved household disinfectant.

Pet Rodents such as hamsters and guinea pigs, can transmit a rare disease to humans – *lymphocytic choriomeningitis* virus (LCM). More information about LCM is available on the CDC website at <https://www.cdc.gov/vhf/lcm/index.html>



### **Chicken Egg (and other bird) Hatching**

LCPS Science Office in partnership with Loudoun Cooperative Extension Office 4H offers an embryology program available to all schools. **Schools wishing to incubate fertilized chicken (or other bird eggs) can only do so by participating in the 4H embryology program.** Each school participating in the program must send at least one teacher to a yearly training. Participating teachers are responsible for making sure that needed equipment (incubator and brooder) is available and is working properly. After hatching, the chicks must be returned to 4H. Chicks are not available for adoption by students or school staff. Schools participating in the 4H embryology program are not required to complete the Animals in the Classroom Request Form or the Parental Notice and Permission Form, since it is part of a science instructional program. However, teachers should notify their students' families of their participation in the program.

### **Trout in the Classroom**

[Trout in the Classroom](#) is a program supported by the LCPS Science Office and is offered to schools in conjunction with Trout Unlimited and the Virginia Department of Wildlife Resources to conserve and restore cold water fisheries in Virginia. Only participating schools can raise and release trout. Contact the LCPS Science Office for additional information.

### **Preserved Materials**

- Materials used in dissection activities must be preserved in **non-formaldehyde** solutions.
- Only commercially prepared specimens can be used for dissection.
- When disposing of preserved materials, rinse the preservative away from the specimens. Allow items to drain for an hour and then double bag in non-transparent bags. Personally carry the trash bags to the school's regular garbage disposal bin.
- Schools and teachers are prohibited from preserving any biological specimens that have been collected in the field or are part of a personal collection.
- All biological specimens that are **preserved in liquid are prohibited**. Biological specimens that are encased in acrylic are acceptable.

### ***Note About Dissection***

*Students enrolled in life science courses may participate in animal dissection. Students who decline to participate will be offered alternatives to dissection (See Virginia Board of Education [Alternatives to Animal Dissection Guidelines](#)). A student's objection to participating in an animal dissection should be substantiated by a signed note from his or her parent or legal guardian.*

### **Plants**

Some plants produce very toxic substances. Teachers should familiarize themselves thoroughly with any plants they plan to use in the classroom.

- Inquire beforehand about student allergies associated with plants.
- Never use poisonous or allergy-causing plants in the classroom.
- Never burn plants that might contain allergy-causing oils, e.g. poison ivy.
- Make a clear distinction between edible and non-edible plants.
- Never allow plants to be tasted.
- Have students wash hands after handling plants and plant material.

## **Microorganisms and Biotechnology**

Prohibit the use of pathogens or any procedures or materials in any school laboratory above Biosafety Level 1 as outlined by Centers for Disease Control protocols (Biosafety Level 1 is defined as “agents not known to cause disease in healthy adult humans and present a minimum potential hazard to laboratory personnel and the environment”).)

The potential hazards associated with microbes are the contraction of an infectious disease or the infection of an open wound. To minimize these risks only non-pathogenic organisms can be used in LCPS Science classrooms and laboratories.

Schools with Biological Safety Cabinets and trained teachers/students are permitted to conduct limited BSL-2 research. All BSL-2 research must be reviewed and approved by the LCPS Scientific Review Board (SRC).

Teachers and students conducting research that requires the use of a BSC must complete the CDC [Recognizing the Biosafety Levels](https://www.cdc.gov/training/quicklearns/biosafety/) Quick Learn Lesson available at <https://www.cdc.gov/training/quicklearns/biosafety/>

Teachers who use BSC must also complete the CDC [Fundamentals of Working Safely in a Biological Safety Cabinet Course](https://www.cdc.gov/labtraining/training-courses/biological-safety-cabinets.html) at <https://www.cdc.gov/labtraining/training-courses/biological-safety-cabinets.html>

Additional information about Biosafety in the laboratory can be found in the [WHO Laboratory Biosafety Manual, Fourth Edition](#).

Teachers must have students and parents sign the *Student Science Safety Acknowledgement Form for Working with Microorganisms*. See page 89, also available in Permission Click.

Teachers should be aware of the following guidelines related to microorganisms.

- Proper aseptic techniques must be used at all times when working with bacterial, viral, or microbial cultures. Use only sterile equipment.
- All cultures must be treated as if they were pathogenic.
- Remember that microorganisms cultured directly from the environment can contain unintentionally cultured pathogens in a concentrated form. Only use cultures that are obtained through an established biological supply company.
- Cultures obtained from soil, mouth, plants, or other local environmental sources should not be used.
- Use appropriate handling procedures to ensure that microorganisms are not released into the environment as aerosols.
- Instruct students in appropriate procedures and supervise them to ensure proper control of cultures.
- Prohibit mouth pipetting.
- Students and teachers should never have anything in their mouth while working with bacterial and viral cultures.
- Students and teachers should wash their hands thoroughly before and after conducting laboratory work.
- Unsealed but covered containers should be disinfected by autoclave for 0.5 hour at 15 lbs. of pressure or soaked in bleach by flooding with 10 percent bleach solution for 0.5 hour.
- All equipment and work surfaces should be properly cleaned and disinfected after use.

### **Recombinant DNA (rDNA) Technologies**

Classroom, extra-curricular, and research project activities involving rDNA technologies in which microorganisms, plants and/or animals are genetically modified are **prohibited** unless specific approval for the activity is obtained from the LCPS Science Office.

### **Human Body Tissues, Blood, and Other Body Fluids**

The use of human body fluids or tissues is generally **prohibited** for classroom laboratory activities. See [OSHA Standard 1910.1030](#) for detailed explanation of the dangers and precautions involving body fluids.

### **Human Cheek Cell Slide Preparation**

Students may prepare slides of their own cheek cells under conditions where the teacher has appropriate risk management, risk assessment and disposal procedures in place. The teacher must also have expert understanding of the handling of potentially infectious material using aseptic techniques. Students may only handle their own sample. Soft cotton buds, as opposed to sharp implements such as toothpicks, must be used to obtain cheek cells. All used cotton buds, slides and any other contaminated items must be decontaminated using either bleach solution (freshly prepared 0.5–1% v/v (5000–10000 ppm) and items left for a minimum of 10 minutes before discarding into the trash), or autoclave (121° C, 15 psi for 15–20 minutes).

### **Autoclave Safety**

Teachers must be thoroughly familiar with the operation of the autoclave before using and should adhere to the following guidelines.

- Examine the safety valve and check that it works.
- Tighten wing nuts evenly by tightening down two opposite wing nuts simultaneously.
- Keep the pressure (gauge reading) below twenty pounds.
- Allow the pressure to return to zero before trying to remove the cover.
- Open the test stopcock before releasing the wing nuts.
- Use eye protection when working with autoclave under pressure.
- Sterilization requires 30 minutes at 15 pounds of pressure (psi).

### **Biosafety Cabinets**

A biosafety cabinet (BSC) is an enclosed, ventilated laboratory workspace for safely working with materials contaminated with (or potentially contaminated with) pathogens requiring a defined biosafety level. Several LCPS high school science departments have a biological safety cabinet. The cabinets should only be used by teachers who have training and/or expertise in their use. Student use is allowed only when they are being directly supervised by a teacher with training in use of the biosafety cabinet.

Teachers and students conducting research that requires the use of a BSC must complete the CDC [Recognizing the Biosafety Levels](#) Quick Learn Lesson available at <https://www.cdc.gov/training/quicklearns/biosafety/>

Teachers who use BSC must also complete the CDC [Fundamentals of Working Safely in a Biological Safety Cabinet Course](#) at <https://www.cdc.gov/labtraining/training-courses/biological-safety-cabinets.html>

Additional information about Biosafety in the laboratory can be found in the [WHO Laboratory Biosafety Manual, Fourth Edition](#).

Teachers and students using BSC must understand how to work safely in the BSC which reduces the likelihood of laboratory-acquired infections, accidents, and incidents.

Understanding BSC safety includes information on:

- The way biological safety cabinets function to help protect personnel, products, and the environment.
- How to prepare for working in a BSC.
- How to work safely in a BSC, and how to clean up when work has been completed.

### Prohibited Sink Disposal

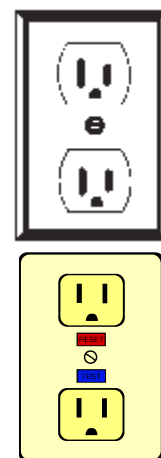
Science classroom sinks must not be used to dispose of plant matter, food scraps, or any solid materials. Do NOT dispose of such materials in any science classroom or prep room sink drain.

## Electrical Safety

Electrically powered equipment has routine use in LCPS Science Labs and classrooms. All items must be “UL Listed”. Balances, fume hoods, microscopes, hot plates, goggle sanitizer cabinets, light fixtures, heat lamps, spectrometers, centrifuges, refrigerators, autoclaves, computers, vacuum pumps, etc. are just a few of the electrical devices found in a typical science lab. Attention must be paid to the hazards inherent in these devices.

Electric shock is the major electrical hazard. Improperly used electrical equipment can also serve as an ignition source for flammable or explosive materials. The following guidelines along with regular, proper maintenance and a clear understanding of the correct use of electrical devices can minimize these risks.

- Know the location of the master electrical cut-off switch.
- All 110-volt (V) outlet receptacles in the science labs should be of the standard design that accepts a three-prong plug and provides a ground connection. These receptacles should have directional current with one slot larger than the other.
- Ground fault interrupters (GFI) or ground fault circuit interrupters (GFCI) are required for lab receptacles located less than 6 feet (1.83 m) from sinks.
- Inspect all electric cords prior to use to insure proper insulation. Frayed, damaged, abraded cords or those that arc, sizzle, heat up, or blow a circuit cannot be used and must be replaced.
- Keep water and flammable liquids (vapors) away from electrical devices.
- Make sure electric outlets are not broken and plugs fit well into them.
- Do not overload a circuit. (More places to plug do not equal more capacity.) If a circuit breaker is tripped, there is not enough capacity.
- Extension cords are **prohibited** in schools.
- Never use multiple surge protectors on the same circuit. Surge protectors may be used, but do not use multiple connected together in a series. Never cover surge protectors with floor coverings.
- Plugs should always be plugged in and pulled out using the plug, not the wire.
- Always turn off and unplug electrical devices before leaving the room for the day.
- Use low voltage direct current (DC) from batteries or a DC generator for study of simple circuits.
- Check all student created circuits before power is turned on.
- Never touch electrical components while power is on.



- Switches to all electrical equipment should be clearly labeled ON and OFF.
- Follow all safety precautions related to special electrical equipment.
- The sparks from a Van de Graaff generator (VDGG) are not dangerous, but they are startling, and they sometimes hurt. Ground the machine (touch a ground wire or the grounding ball to the dome) right after each use. The VDGG is harmless to most people, but could possibly cause problems to someone with a heart condition or pacemaker.
- Spectroscope high voltage supplies must be checked prior to classroom use. Students must be cautioned never to touch the ends of the spectrum tube while the voltage supply is connected.

## **Battery Safety**

- Use caution with linking dry cell batteries. Doing so increases voltage when linked in series and amperage increases when linked in parallel circuits.
- Use caution when working with rechargeable batteries. They can get very hot if they short circuit or are recharged with an incompatible charger.
- Keep car batteries out of the science lab.
- Never mix different brands of batteries.
- Never mix new and old batteries. The newer batteries can charge the older batteries and effect a voltage reversal with violent action.
- Never mutilate (crush or puncture) batteries. Hazardous chemical leakage can occur.
- Never store batteries in equipment for a long period of time. Doing so can cause chemical leakage.
- Never get batteries wet or use them wet. Discard batteries that are swelling or leaking – these are signs of corrosion and other potential safety issues.
- When using batteries, always inspect them first for cracks, leaks and other issues. Discard the battery if any of these conditions occur.
- When storing batteries, never allow the terminals to touch the terminal of other batteries.

Battery disposal information is listed on page 58; disposal form is on page 81 in the Appendix.

## **Radioactive Materials**

Recognizing the importance of teaching students about radioactive materials and ionizing radiation, certain radioactive materials are allowed in LCPS secondary schools with the following constraints:

- Teachers may use radioactive materials in the classroom provided that they are used for demonstration purposes only. Materials that are allowed must be purchased from a science supply company. This includes isotope disk sources with radioactive material sealed in the plastic/epoxy, needle sources for use in cloud chambers, and Cs-137/Ba-137m Isotope Generators.
- Materials must be appropriately labeled as radioactive and stored in locked cabinets, not with the general storage chemicals. They should especially be maintained away from flammable and corrosive materials.

- Teachers may have the common items in their personal collections that include glassware and ceramic items, luminous clock/watch dials, smoke alarm, gas mantles, etc. These items were not designed for educational use and will not be purchased using LCPS funds. Teachers may, however; use these personally owned items for classroom demonstrations, provided that all labeling and storage guidelines are followed.

For more information about storage, labeling and disposal of radioactive sources please refer to the publication, [Managing Ionising Radiations and Radioactive Substances in Schools, etc L 93](#).

## Prohibited Demonstrations

Demonstrations that use methanol (or other volatile combustible liquids) as an accelerant are prohibited in all Loudoun County Public Schools. These include, but **are not limited to**:

Rainbow flame - methanol-based flame tests

Whoosh bottle

Burning hands

Flaming bubbles

Igniting hand sanitizer

For more information, please review this statement from the U.S. Chemical Safety Board:

[Preventing Accidents in High School Chemistry Labs](#)

Please also review statement from the National Science Teachers Association:

[Safety Alert: Methanol Based Flame Tests](#)

# Chemical Inventory

The High School Science Department Chair or the Middle School Science SALT will initiate and oversee the Chemical Inventory process, but every science teacher must participate. A determination shall be made as a department regarding how the inventory will be accomplished.

Set a **date** for completion. All schools must submit a completed inventory to the Science Supervisor by **November 15th**.

Be sure to note any containers that are corroding, rusting, or cracked. Be aware of chemicals that are hygroscopic, deliquescent, or that have a short shelf life. Plan to dispose of any materials that are no longer pure.

Required Information for all materials in the Chemical Inventory:

**Name of the chemical**

**Chemical formula**

**Company**

**CAS #**

**Flinn Disposal #**

**Room**

**Shelf / location**

**Approximate amount of chemical in the container**

**Date purchased**

LCPS Science uses a commercial product, Flinn Chemventory, to manage the chemical inventories. Please refer to a template in the Appendix.

The screenshot shows the 'Add a Chemical' page in the Flinn Chemventory system. The page has a green header with the Flinn Scientific, Inc. logo and navigation links: Home, Inventory, Purchase Lists, and Label Print Queue. Below the header is a search bar with the text 'Search by Keyword or Flinn Catalog Number, Add Manually, or From a List' and a 'Search' button. The main form is titled 'Chemical Information' and contains several input fields and checkboxes. On the left, there are fields for Chemical Name, Chemical Formula, Synonyms, Company, Catalog #, Grade, Disposal #, CAS #, Class, Compatible Family, and Comments/Notes. On the right, there is a GHS Signal Word dropdown menu (set to 'Danger'), a large text area for GHS Pictograms, and a section for GHS Information Link with a 'Find an SDS' button. The GHS Pictograms section includes checkboxes for various hazard categories: Corrosive, Flammable, Irritant, Oxidizer, Gas, Explosive, Harmful, and Carcinogen.



# Purchasing Chemicals

The High School Science Department Chair or the Middle School Science SALT with assistance from the Safety Contact Teacher is responsible for monitoring chemical procurement at each high school or middle school.

**Do not stockpile chemicals; buy only what you need for the upcoming school year! While the cost per unit is generally cheaper in larger purchases, the cost of disposal of the unused portion must be considered and included in the overall cost of the material. Very often the cost of disposal exceeds the original purchase price. Remember unused portions will deteriorate with age and contents of large containers are more likely to become contaminated through frequent dispensing.**

## Purchasing Procedures

- Review and update the chemical inventory. Know what supplies are on hand before placing an order. Be sure to check all storerooms and storage areas.
- Consult the *List of Prohibited Chemicals* on pages 29-34.
- Consulted the list of *Materials Allowed in Limited Quantities* on page 35.
- **Chemicals in a form that have been classified as human carcinogens or a potential explosion risk are prohibited from being purchased, stored or used in any Loudoun County Public School.**
- Materials with an extremely **short shelf life** (less than 6 months) must be carefully considered and are only allowed under specific conditions. The purchase, use and disposal must take place within the shelf life window.
- Purchase only those chemicals that will directly support science instruction.
- Obtain and review the Safety Data Sheet (SDS/MSDS) for each product and answer the following questions:
  - Will the amounts purchased be used within 1-2 years?
  - Can the chemical be stored properly?
  - Is the classroom properly designed to use the material safely?
  - Can the chemical be disposed of and will it be disposed of as a hazardous waste?
  - Does the classroom have the proper personal protective equipment required?
  - Are science teachers at your school aware of any hazards associated with this product?
  - Are science teachers at your school trained in the use and handling of the material?
- Consider safer alternatives and substitute materials. Select those materials that meet program objectives while presenting the least hazard. Do not allow the cost of the product to influence the choice of a safer alternative.
- Reduce the potential for overexposure to more hazardous materials by purchasing ready-to-use products that do not require mixing or dilution of concentrated ingredients.
- Avoid bulk purchases unless large quantities of the product are required. Smaller containers, though generally more expensive, promote freshness, maintain quality, and reduce the likelihood of contamination.
- Order chemicals from approved vendors, such as Sargent Welch, Carolina Biological, or Flinn Scientific. While convenient, third-party sellers, such as Amazon, should be avoided.
- Submit the order to your Science Department Chair or SALT for review.
- **All chemical orders must be approved by the LCPS Science Office before purchase.** The Science Department Chair or SALT will email the list of chemicals to be ordered to the Science Supervisor and Secondary Science Specialist. The Science Office will reply in one of three ways: “Approved”, “Approved with caution”, or “Not Approved”.
- Date products as they are received. Many chemicals arrive at school from the supplier without a date. Use a permanent marker to date and initial the container.

- When purchasing kits, chemicals that require special storage (e.g. hydrochloric acid) must be removed from the kit upon delivery and stored properly (e.g. in the acid cabinet).
- Use the oldest materials first. Use dating to determine the rate of consumption.

# List of Prohibited Chemicals

## Substances with Greater Hazardous Nature Than Educational Utility

Chemicals used in the laboratory may be hazardous because of the following:

- Safety risks (i.e., highly flammable or explosive material)
- Acute and chronic health hazards
- Environmental harm
- Impairment of indoor air quality

Assessment of the chemicals in this list indicates that their hazardous nature is greater than their potential usefulness. Evaluation included physical hazards (i.e., flammability, explosive propensity, reactivity, corrosivity) and health hazards (i.e., toxicity, carcinogenicity).

This following list of prohibited chemicals was generated from [School Chemistry Laboratory Safety Guide \[2006\]](#) and *Manual of Safety and Health Hazards in the School Science Laboratory* [1984] published by the U.S. Consumer Product Safety Commission, Department of Health and Human Services, Centers for Disease Control and Prevention, and the National Institute for Occupational Safety and Health

Carcinogenic substances were identified from the [Report on Carcinogens \(15th Edition\) generated by the National Toxicology Program \[2021\]](#).

**This list is not comprehensive and does not include all materials that fall into the above categories or could pose a hazard to students and/or staff.** Consult MSDS/SDS of all materials for hazards.

Chemical	CAS Number	Hazard
Acetamide	60-35-5	Health Rating: 3 - severe (cancer causing)
Acrylonitrile	107-13-1	Flammable (NFPA = 3), reasonably anticipated human carcinogen
Ammonium chromate	7788-98-9	Oxidizer, known human carcinogen
Ammonium dichromate	7789-09-5	Oxidizer, known human carcinogen
Aniline	62-53-3	Combustible, may be fatal if inhaled, ingested, or absorbed through the skin
Aniline hydrochloride	142-04-1	May be fatal if inhaled, ingested, or absorbed through the skin
Anthracene	102-12-7	Irritant, may cause an allergic skin reaction
Antimony trichloride	10025-91-9	Corrosive
Antimony trioxide	1309-64-4	Reasonably anticipated human carcinogen

<b>Chemical</b>	<b>CAS Number</b>	<b>Hazard</b>
Arsenic and its compounds	N/A	Known human carcinogen
Asbestos	1332-21-4	Known human carcinogen
Ascarite II	N/A	Corrosive, may be fatal if ingested
Benzene	71-43-2	Flammable (NFPA = 3), known human carcinogen, mutagen
Benzidine	92-87-5	Known human carcinogen
Benzoyl peroxide	94-36-0	Flammable (NFPA = 3), explosive, oxidizer
Beryllium carbonate	66104-24-3	Known human carcinogen
Bromochloroacetic acid	5589-96-8	Reasonably anticipated human carcinogen
Bromodichloroacetic acid	71133-14-7	Reasonably anticipated human carcinogen
Cadmium compounds	N/A	Known human carcinogen
Calcium cyanide	592-01-8	May be fatal if inhaled or ingested
Carbon disulfide	75-15-0	Flammable (NFPA = 4), acute CNS toxicity and peripheral neurotoxicity
Carbon tetrachloride	56-23-5	May be fatal if inhaled or ingested, reasonably anticipated human carcinogen
Chloral hydrate	302-17-0	Controlled barbiturate
Chlorine	7782-50-5	Oxidizer, corrosive, may be fatal if inhaled
Chlorodibromoacetic acid	5278-95-5	Reasonably anticipated human carcinogen
Chloroform	67-66-3	Reasonably anticipated human carcinogen
Chlorpromazine	50-53-3	Controlled substance
Chromium hexavalent compounds	N/A	Known human carcinogen
Chromium trioxide	1333-82-0	Oxidizer, corrosive, known human carcinogen
Colchicine	64-86-8	May be fatal if ingested, mutagen

Chemical	CAS Number	Hazard
Dibromoacetic acid	631-64-1	Reasonably anticipated human carcinogen
Dichloroacetic acid	79-43-6	Reasonably anticipated human carcinogen
Diisopropyl ether	108-20-3	Flammable (NFPA = 3), explosive
Dimethylaniline	121-69-7	May be fatal if inhaled, ingested, or absorbed through the skin
<i>p</i> -Dioxane	123-91-1	Flammable (NFPA = 3), forms peroxides (Group 2), reasonably anticipated human carcinogen
Ethyl ether	60-29-7	Flammable (NFPA = 3), explosive
Ethylene dichloride (1,2 Dichloroethane)	07-06-2	Flammable (NFPA = 3), reasonably anticipated human carcinogen, mutagen
Ethylene oxide	75-21-8	Flammable (NFPA = 4), explosive (NFPA = 3), may be fatal if inhaled or absorbed through the skin, known human carcinogen
Formaldehyde (Formalin)	50-00-0	Known human carcinogen
Gunpowder	N/A	Explosive
<i>Helicobacter pylori</i>	N/A	Known human carcinogen
Hexachlorophene	70-30-4	May be fatal if inhaled, ingested, or absorbed through the skin, possible teratogen
Hydrobromic acid	10035-10-6	Corrosive, may be fatal if inhaled or ingested
Hydrofluoric acid	7664-39-3	Corrosive, may be fatal if inhaled or ingested (liquid and vapor can cause severe burns not always immediately painful or visible but possibly fatal)
Hydrogen	1333-74-0	Flammable (NFPA = 4)
Hydriodic acid	10034-85-2	Corrosive, may be fatal if inhaled or ingested
Lead arsenate	7784-40-9	Known human carcinogen, teratogen
Lead carbonate	1319-46-6	May be fatal if inhaled or ingested, neurotoxic
Lead (VI) chromate	7758-97-6	May be fatal if inhaled or ingested, known human carcinogen
Lithium, metal	7439-93-2	Combustible, water reactive
Lithium nitrate	7790-69-4	Oxidizer

Chemical	CAS Number	Hazard
Mercury	7439-97-6	Corrosive, may be fatal if inhaled or ingested
Mercuric chloride	7487-94-7	May be fatal if inhaled, teratogen
Methyl iodide (iodomethane)	74-88-4	May be fatal if inhaled, ingested or absorbed through the skin, potential carcinogen (NIOSH)
Methyl methacrylate	80-62-6	Flammable (NFPA = 3), explosive (vapor)
Methyl orange	547-58-0	Possible mutagen
Methyl red	493-52-7	Possible mutagen
Nickel, metal	7440-02-0	Reasonably anticipated human carcinogen, mutagen
Nickel oxide	1314-06-3	Reasonably anticipated human carcinogen, mutagen
*Nickel (II) chloride	7791-20-0	Carcinogen by inhalation of dust
*Nickel (II) nitrate	13478-00-7	Carcinogen by inhalation of dust
*Nickel (II) sulfate	54-11-5	Carcinogen by inhalation of dust
Nicotine	45-11-5	May be fatal if inhaled, ingested, or absorbed through the skin
Osmium tetroxide	20816-12-0	May be fatal if inhaled or ingested
Picric acid	88-89-1	Explosive
Perchloric acid	7601-90-3	Corrosive, explosive in contact with common organic materials such as wood or cloth
Paris green	12002-03-8	May be fatal if inhaled, ingested, or absorbed through the skin, known human carcinogen
Phenol	108-95-2	Combustible (liquid and vapor), corrosive, may be fatal if inhaled, ingested, or absorbed through the skin
Phosphorus pentoxide	1314-56-3	Water reactive, corrosive
Phosphorous, red, white	7723-14-0	May ignite spontaneously in air
Phthalic anhydride	85-44-9	Combustible/finely dispersed particles form explosive mixtures in air, corrosive
Potassium, metal	7440-09-7	Flammable (NFPA = 3), water reactive, forms peroxides

<b>Chemical</b>	<b>CAS Number</b>	<b>Hazard</b>
Potassium chromate	7789-00-6	Known carcinogen, highly toxic
Potassium dichromate	77778-50-9	Known carcinogen, highly toxic
Potassium oxalate	583-52-8	Corrosive, may be fatal if ingested
Potassium sulfide	1312-73-8	Spontaneously combustible, explosive in dust or powder form, corrosive
Pyridine	110-86-1	Flammable (NFPA = 3), possible mutagen
Selenium	7782-49-2	Severe irritant
Silver cyanide	506-64-9	May be fatal if inhaled, ingested, or absorbed through the skin
Silver oxide	20667-12-3	Oxidizer
Sodium arsenate	7778-43-0	May be fatal if inhaled or ingested, known human carcinogen
Sodium arsenite	7784-46-5	Known human carcinogen, teratogen
Sodium azide	26628-22-8	Explosive, may be fatal if ingested or absorbed through the skin
Sodium chromate	7775-11-3	Oxidizer, corrosive, known human carcinogen
Sodium cyanide	143-33-9	May be fatal if inhaled, ingested or absorbed through the skin
Sodium dichromate	10588-01-9	Oxidizer, corrosive, may be fatal if ingested, known human carcinogen
Sodium nitrite	7632-00-0	Oxidizer
Sodium sulfide	1313-82-2	Corrosive, may be fatal if inhaled or ingested
Sodium thiocyanate	540-72-7	Contact with acid liberates very toxic gas
Stearic acid	57-11-4	May form combustible dust concentration in the air
Strontium	7440-24-6	Water reactive
Strontium nitrate	10042-76-9	Oxidizer
Sudan IV	85-83-6	Irritant, toxic properties have not been thoroughly evaluated

Chemical	CAS Number	Hazard
Tannic acid	1401-55-4	Irritant
Tetrabromoethane	79-27-6	May be fatal if inhaled, ingested, or absorbed through the skin
Thioacetamide	62-55-5	Reasonably anticipated human carcinogen
Thiourea	62-56-6	Reasonably anticipated human carcinogen
Tin (IV) chloride	7646-78-8	Corrosive, hydrochloric acid liberated upon contact with moisture and heat
Titanium trichloride	7705-07-9	Water reactive, corrosive
Titanium tetrachloride	7550-45-0	Water reactive, corrosive, may be fatal if inhaled
<i>o</i> -Toluidine	95-53-4	Reasonably anticipated human carcinogen, mutagen
Tribromoacetic acid	75-96-7	Reasonably anticipated human carcinogen
Uranium	7440-61-1	Radioactive material
Uranyl acetate	541-09-3	Radioactive material
Urethane	51-79-6	Combustible, reasonably anticipated human carcinogen
Wood's metal	8049-22-7	May be fatal if inhaled or ingested, known human carcinogen (cadmium), neurotoxic

\*These nickel compounds are known carcinogens by inhalation of dust. Purchase *Gramolpaks* (from Flinn) or prepared solutions. Aqueous solutions of these compounds can be used with proper safety precautions. Storage of these compounds as solids is prohibited.

[Chemical Abstract Service](#) (CAS) – provides a comprehensive summary of all published chemical information

The following **miscellaneous items** are also prohibited in any Loudoun County Public School.

- Compressed gas cylinders containing toxic gases. (Cl<sub>2</sub>, NH<sub>3</sub>, H<sub>2</sub>S, CH<sub>3</sub>Cl, SO<sub>2</sub>).
- Any mercury containing apparatus.



## Materials Allowed in LCPS in Limited Quantities

The following list indicates the **maximum quantity** allowed in any school.

These items are allowed **only if appropriate storage, handling and disposal protocols are in place and are strictly followed**. The specified personal protective equipment from the MSDS/SDS must be used.

Substance	Maximum quantity
<b>Oxidizers</b>	
Ammonium nitrate	500 g
Potassium chlorate	500 g
Potassium nitrate	500 g
Potassium permanganate	500 g
Sodium nitrate	500 g
Other nitrates, permanganates, dichromates	500 g
<b>Other</b>	
Acetic acid (glacial)	1 L
Charcoal (powdered or granular)	500 g
Ethidium bromide	250 mL of concentration 1 µg / mL (1 microgram per milliliter)
Glycerin	500 mL
Hydrochloric acid (concentrated 12M, 35-37%)	2.5 L
Magnesium ribbon	500 g
Magnesium, metal (powder)	25 g
Nitric acid, (concentrated 15.8M; 69-71%)	500 mL
Sodium metal (small demonstration pieces)	100g
Sulfur	1 kg
Sulfuric acid, (concentrated 18M, 95-98%)	500 mL
Zinc powder (dust)	500 g

## Cautious Materials

The following list of chemicals **should only be in a school if the appropriate safety controls are in place to handle them**. These materials must be stored safely in corrosive cabinets, flammable cabinets, or bagged, canned and stored separately.

- Acetic acid (glacial) – flammable liquid, corrosive (Do not store with nitric acid.)
- Acetyl chloride – dangerous fire risk; violent with water
- Adipoyl chloride – corrosive
- Aluminum chloride, anhydrous – violent reaction with water
- Ammonium hydroxide – respiratory hazard; severely corrosive
- Antimony pentachloride – corrosive; reacts with organics
- Benzoyl chloride – heating releases phosgenes; reacts violently with water, alcohol, oxides
- Benzyl alcohol – reacts violently with oxidants
- Bromine – toxic by inhalation and ingestion; oxidizer; reacts violently with organics
- Butyric acid – stench agent; lachrymator
- Calcium carbide – evolves acetylene with water; fire risk
- Hydrochloric acid- severely corrosive
- Hydrogen peroxide (30%) – readily decomposes with almost anything
- Magnesium perchlorate – oxidizer; dangerous in combination with organic material
- Nitric acid – strong oxidizer (Do not store with acetic acid.)
- Potassium permanganate – oxidizer; explodes on sudden heat
- Sebacyl chloride – corrosive; eye irritant
- \*Sodium metal – flammable solid, 100g maximum in small demonstration pieces, sodium metal must be stored under mineral oil in original plastic bottle, and metal *Saf-Stor* can
- Sodium peroxide – explosion/fire risk in combination with powdered metals and organics; oxidizer
- Sulfuric acid – severely corrosive

\*Sodium metal is only allowed in high school chemistry labs and middle school physical science labs where teachers have received appropriate training in safe handling.

# Chemical Storage Guidelines

## Store Minimum Quantities

- Store minimum quantities. The less you have—the smaller your risk.
- Refer to *Materials Allowed in LCPS in Limited Quantities* on page 35 for a list of potentially hazardous materials that you should limit.
- Store only a two-year supply (or less) of chemicals.

## Separate and Isolate the Most Serious Hazards

- Isolate the greatest chemical hazards.
- Acids should be stored in a **dedicated acid cabinet**.
- Corrosives should be stored in a **dedicated corrosive cabinet**.
- Flammables should be stored in a **dedicated flammable cabinet**.
- Corrosives and flammables should never be stored together.
- If you are not sure if a material is designated as Acid, Corrosive or Flammable refer to the material's MSDS/SDS or to a chemical supply catalog (Flinn or Sargent-Welch).

## General Guidelines

- Chemicals shall be stored in separate, identified locked rooms or cabinets.
- Breakdown kits. Chemicals that require special storage (e.g. hydrochloric acid) must be removed from the kit upon delivery and stored properly (e.g. in the acid cabinet).
- Access to storage areas is restricted to authorized persons.
- Chemicals are stored by hazard class (flammable, corrosive, oxidizer, etc.).
- Chemicals shall be properly labeled and dated.
- All containers must be labeled as to contents. Liquids must be labeled by name and percent of each constituent.
- Incompatible chemicals should be physically segregated (by distance or barrier) from each other during storage. (See list of *Incompatible Chemicals* on page 39.)
- When segregating chemicals, acids should not be stored with bases.
- Oxidizers should not be stored with organic materials or reducing agents.
- Whenever possible, keep large chemical containers in their original protective shipping package. Chemicals that are highly toxic or have other extremely hazardous characteristics shall be stored in unbreakable secondary containers.
- Containers of corrosives (acids and bases) should be stored in trays large enough to contain spillage or leakage.
- Stored chemicals shall be examined for deterioration, crystallization and container integrity during the annual chemical inventory and routinely throughout the school year.
- Store larger containers on lower shelves.
- Caustics and corrosives should not be stored above shoulder height of the shortest person working in the lab.
- Shelves should be painted or covered with chemical resistant paint or other chemical resistant coating.
- Shelves should be strong enough to hold chemicals stored on them. Do not overload shelves. Keep all containers back from the edge.
- All solids should be kept separated from liquids.
- Chemicals should not be exposed to direct sunlight or localized heat.

- Chemicals should not be stored under sinks or in fume hoods.
- Ordinary domestic refrigerators and walk-in coolers must not be used for the storage of flammable liquids because they contain certain built-in ignition sources such as electrical contacts.
- Refrigerators used for storage of chemicals and/or specimens shall not be used for food or beverage storage.
- Cylinders of compressed gases shall be handled as high-energy sources and considered potentially explosive. Gas cylinders must be securely strapped to a permanent structure (wall, lab bench, etc.). Large cylinders (CO<sub>2</sub> canisters) shall be anchored to prevent toppling.
- Appropriate spill control materials shall be readily available.

### **Storage of Acids**

- Large bottles of acids should be stored on lower shelves in acid cabinets.
- Oxidizing acids (nitric acid) should be segregated from organic acids (such as acetic acid), flammables, and combustible materials.
- Acids should be segregated from bases and active metals such as sodium, magnesium and potassium.
- Acids should be segregated from chemicals that can generate toxic gases on contact, such as ferrous/iron (II) sulfide.
- Acids should be stored in chemical resistant trays that are capable of containing any spillage or leakage from their container.
- Make sure that all acids are stored by compatibility. Nitric acid should be isolated from acetic acid. Store nitric acid in a [separate liquid tight compartment](#) within the acid cabinet. The separate compartment should be stored upright with the lip on the bottom to prevent spills.
- Concentrated hydrochloric acid fumes continuously and cannot be stored without releasing hydrochloric acid fumes. (How much concentrated acid do you really need?) Purchase diluted solutions or ampules to dilute instead of large containers of concentrated acid.

### **Storage of Bases**

- Bases should be stored separately from acids.
- Large bottles of bases should be stored on lower shelves of a corrosive cabinet.
- Bases should be stored in chemical resistant trays that are capable of containing any spillage or leakage from their container.
- Make sure that bases are stored by compatibility.

### **Storage of Flammables**

- National Fire Prevention Association (NFPA) specified safety flammable cabinets should be used for storage of flammable liquids.
- **Do not purchase flammables requiring refrigeration.**
- Do not store flammables in domestic grade refrigerators, only explosion proof or intrinsically safe refrigerators and freezers can be used for storing flammable liquids. This type of refrigerator is normally not provided in LCPS.
- Storage cabinets for flammable materials are designed to protect contents from heat and flames of an external fire rather than to confine burning liquids within. Vents on opposite sides of the cabinet will be plugged unless ducting to an exhaust connects to the cabinet.
- Store only compatible materials inside the cabinet.

- Do not store paper or cardboard inside the cabinets with the chemicals.
- Do not overload the cabinet.

### Storage of Oxidizers

- Oxidizers should be stored away from flammables, combustibles, and reducing agents (e.g. zinc, alkaline metals, etc.).
- Make sure that all oxidizers are stored by compatibility.

### Storage of Toxic Compounds

- Toxic compounds should be stored according to the nature of the chemical, with appropriate security employed when necessary.
- A *Poison Control Network* telephone number should be posted in the laboratory.  
**National Capital Poison Center 1-800-222-1222**
- Make sure that all potentially toxic compounds are stored by compatibility.

### Storage of Water Reactive Chemicals

- Water-reactive chemicals should be stored in a cool, dry place.
- In case of a fire, a Class ABC (all-purpose) fire extinguisher, or Class D fire extinguisher for the specific water reactive chemical should be used.
- Make sure that all water reactive chemicals are stored by compatibility.

## Incompatible Chemicals

Certain chemicals cannot be safely mixed or stored with each other because severe reactions can take place or toxic products can result. Chemicals should be stored by the hazard class and not alphabetically. The label and the MSDS/SDS of a chemical will contain information on incompatibilities. The following are examples of incompatible chemicals. It is not a comprehensive list, but covers most materials that may be in LCPS.

Compound	Incompatible Materials
Acetic Acid (glacial)	nitric acid, hydroxyl compounds, peroxides, permanganates
Acetylene	chlorine, bromine, copper, silver, mercury
Alkaline earth metals (including powdered aluminum, magnesium, or calcium)	water, chlorinated hydrocarbons, carbon dioxide, halogens, alcohols, aldehydes, ketones, acids
Ammonia	chlorine, calcium hypochlorite, iodine, bromine
Ammonium nitrate	acids, metal powders, flammable liquids, chlorates, nitrites, sulfur, finely divided organic or combustible materials
Bromine	activated carbon, ammonia, acetylene, butane, calcium hypochlorite, methane, propane (or other petroleum gases), hydrogen, turpentine, finely divided metals, all oxidizing agents

<b>Compound</b>	<b>Incompatible Materials</b>
Chlorates	ammonium salts, acids, metal powders, sulfur, finely divided organic or combustible materials
Chlorine	ammonia, acetylene, butane, methane, propane (or other petroleum gases), hydrogen, turpentine, finely divided metals
Copper	acetylene, hydrogen peroxide
Hydrocarbons	chlorine, bromine, sodium peroxide
Hydrogen peroxide	copper, iron, most metals or their salts, alcohols, acetone, organic materials, flammable liquids, oxidizing agents
Hypochlorites	acids, activated carbon
Iodine	acetylene, ammonia (aqueous or anhydrous), hydrogen
Nitrates	sulfuric acids
Nitric acid	acetic acid, flammable liquids, flammable gases
Nitrites	acids
Oxalic Acid	silver
Oxygen	oils, grease, flammable liquids, solids or gases
Potassium chlorate	sulfuric and other acids
Potassium permanganate	glycerin, ethylene glycol, sulfuric acid
Silver	acetylene, oxalic acid, tartaric acid, ammonium compounds
Sodium nitrate	ammonium nitrate and other ammonium salts
Sodium peroxide	ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, glycerin, ethylene glycol, ethyl acetate
Sulfides	acids
Sulfuric acid	potassium chlorate, potassium perchlorate, potassium permanganate (or compounds with similar light metals, such as lithium, sodium, etc.)

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## High School Chemical Storage Pattern

A solution to chemical incompatibility problems is to separate chemicals into their organic and inorganic families and then to further divide the materials into related and compatible chemical families. Below is a list of compatible families following the Flinn© pattern.

### Compatible Family Codes

Code	INORGANIC	Code	ORGANIC
I 1	Metals, Hydrides	O 1	Acids, Amino acids, Anhydrides, Peracids
I 2	Acetates, Halides, Iodides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens	O 2	Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides
I 3	Amides, Nitrates (except ammonium nitrate), Nitrites, Azides	O 3	Hydrocarbons, Esters, Aldehydes, Oils
I 4	Hydroxides, Oxides, Silicates, Carbonates, Carbon	O 4	Ethers, Ketones, Ketenes, Halogenated hydrocarbons, Ethylene Oxide
I 5	Sulfides, Selenides, Phosphides, Carbides, Nitrides	O 5	Epoxy Compounds, Isocyanates
I 6	Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide	O 6	Peroxides, Hydroperoxides, Azides
I 7	Arsenates, Cyanides, Cyanates	O 7	Sulfides, Polysulfides, Sulfoxides, Nitriles
I 8	Borates, Chromates, Manganates, Permanganates	O 8	Phenols, Cresols
I 9	Acids (except Nitric, Nitric Acid is isolated and stored by itself)	O 9	Dyes, Stains, Indicators
I 10	Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide	O M	Organic Miscellaneous
I M	Miscellaneous		



## High School Shelf Storage Pattern

If shelf space is a problem, you are permitted to place more than one compatible chemical family on a shelf. Make sure that you either have a physical divider or leave a 3” space between each family.

### INORGANIC

<b>Inorganic # 10</b> Sulfur, Phosphorus	<b>Inorganic # 7</b> Cyanates (Store away from any water)
<b>Inorganic # 2</b> Acetates, Halides, Iodides, Sulfates, Sulfites, Thiosulfates, Phosphates, Halogens	<b>Inorganic # 5</b> Sulfides, Selenides, Phosphides, Carbides, Nitrides
<b>Inorganic # 3</b> Amides, Nitrates (except ammonium nitrate), Nitrites, Azides	<b>Inorganic # 8</b> Borates, Manganates, Permanganates, Ammonium Nitrate
<b>Inorganic # 1</b> Metals, Hydrides (Store away from any water) (Store flammable solids in a flammable cabinet.)	<b>Inorganic # 6</b> Chlorates, Bromates, Iodates, Chlorites, Perchlorates, Peroxides, Hydrogen Peroxide
<b>Inorganic # 4</b> Oxides, Silicates, Carbonates, Carbon	<b>Miscellaneous</b>

### ORGANIC

<b>Organic # 2</b> Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides (Store flammables in a dedicated cabinet.)	<b>Organic # 8</b> Phenols, Cresols
<b>Organic # 3</b> Hydrocarbons, Esters, Aldehydes, Oils (Store flammables in a dedicated cabinet.)	<b>Organic # 6</b> Peroxides, Hydroperoxides, Azides
<b>Organic # 4</b> Ketones, Ketenes, Halogenated hydrocarbons	<b>Organic # 1</b> Acids, Amino acids, Anhydrides, Peracids (Store <b>certain</b> organic acids in acid cabinet.)
<b>Organic # 5</b> Epoxy Compounds, Isocyanates	<b>Organic # 9</b> Dyes, Stains, Indicators (Store alcohol-based solutions in a flammable cabinet.)
<b>Organic #7</b> Sulfides, Polysulfides, Sulfoxides, Nitriles	<b>Miscellaneous</b>

## High School Storage Pattern (continued)

## Acid Cabinet

### Inorganic # 9

Acids

Except Nitric Acid

Nitric Acid is isolated and stored by itself unless it can be stored in a separate liquid tight compartment within the acid cabinet.

## Flammables Cabinet

Glacial Acetic Acid

### Organic # 2

Alcohols, glycols, etc.

### Organic # 3

Hydrocarbons, etc.

### Organic # 4

Ethers, Ketones, etc.

### Organic # 9

Alcohol-based Indicators

## Corrosives Cabinet

Hydroxides

Ammonia

Hypochlorites

## Middle School Chemical Storage Pattern

A solution to chemical incompatibility problems is to separate chemicals by color codes. Below is a list of codes following the Sargent Welch© pattern. Chemicals ordered from Sargent Welch have a color code on the bottle. Be sure to cross check the code with the listing in the Sargent Welch Catalog.



Red - Flammable

Examples: Acetone, Ethanol

Store in a **dedicated flammables cabinet**.



White - Corrosive

Store away from chemicals coded red, yellow or blue.

**Store acids** (Hydrochloric acid, Sulfuric acid, Nitric acid and Acetic acid) in a **dedicated acid cabinet**.

Keep Nitric acid separated from Acetic acid by using a separate sealed storage container within the Acid Cabinet.

**Store other corrosives** (Ammonium Hydroxide, Sodium Hypochlorite aka Bleach, Sodium Hydroxide) in a **dedicated corrosives cabinet**.



Yellow – Reactive or Oxidizing

Examples: lead (II) nitrate, potassium bromate

Store away from red-coded materials in a **locked chemical storage area**.



Blue - Health Hazard

Examples: copper (II) carbonate, lead (II) acetate

Store in a secure **locked chemical storage area**.



Green – No specific hazard specified

Examples: sand, sodium chloride

Store in **general storage**.

## Middle School Shelf Storage Pattern

### Locked Shelves

#### Reactive or Oxidizing (Yellow)

Lead (II) nitrate Potassium bromate

#### Health Hazards (Blue)

Lead (II) acetate Copper (II) carbonate

### General Chemical Storage (Green)

Sand Sodium Chlorite (Salt)
Sodium Bicarbonate (Baking Soda) Copper
Soap

Corn Oil Food Coloring

### Acid Cabinet (White)

Acids Except Nitric Acid Nitric Acid is isolated and stored by itself unless it can be stored in a separate liquid tight compartment within the acid cabinet.
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### Flammables Cabinet (Red)

Acetone Ethanol Charcoal Flammable Solvents
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### Corrosives Cabinet (White)

Ammonium Hydroxide Sodium Hypochlorite (Bleach) Sodium Hydroxide
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# Storage, Maintenance, and Handling of Compressed Gas Cylinders

Compressed gases can be hazardous because each cylinder contains large amounts of energy and may also have high flammability and toxicity potential.

The following is a list of recommendations for storage, maintenance, and handling of compressed gas cylinders:

- Make sure the contents of the compressed gas cylinder are clearly stenciled or stamped on the cylinder or on a durable label.
- Do not identify a gas cylinder by the manufacturer's color code.
- Never use cylinders with missing or unreadable labels.
- Check all cylinders for damage before use.
- Be familiar with the properties and hazards of the gas in the cylinder before using.
- Wear appropriate protective eyewear when handling or using compressed gases.
- Use the proper regulator for each gas cylinder.
- Do not tamper with or attempt to repair a gas cylinder regulator.
- Never lubricate, modify, or force cylinder valves.
- Open valves slowly using only wrenches or tools provided by the cylinder supplier directing the cylinder opening away from people.
- Check for leaks around the valve and handle using a soap solution, "snoop" liquid, or an electronic leak detector.
- Close valves and relieve pressure on cylinder regulators when cylinders are not in use.
- Label empty cylinders "EMPTY" or "MT" and date the tag; treat in the same manner that you would if it were full.
- Always attach valve safety caps when storing or moving cylinders.
- Transport cylinders with an approved cart with a safety chain; never move or roll gas cylinders by hand.
- Securely attach all gas cylinders (empty or full) to a wall or laboratory bench with a clamp or chain, or secure in a metal base in an upright position.
- Store gas cylinders in cool, dry, well-ventilated areas away from incompatible materials and ignition sources.
- Do not subject any part of a cylinder to an ambient temperature higher than 125°F or below 50°F.
- Store empty cylinders separately from full cylinders.

# **Hazard Communication**

## **Global Harmonized System for the Classification and Labeling of Chemicals (GHS)**

In March 2012 the Occupational Safety and Health Administration (OSHA) revised the Hazard Communication Standard to align it with the United Nations Globally Harmonized System (GHS) for the classification and identification of chemical hazards. (GHS has been in use internationally since 2002.)

The goal of the updated OSHA standard is to eliminate possible confusion about the risk associated with chemical hazards and thus provide better protection for employees and emergency responders. By improving the understanding of the nature of chemical hazards, and requiring specific safety training, the GHS standard seeks to transform the “Right to Know” law into the “Right to Understand.”

### **GHS Label Requirements**

The GHS provides a set of objective criteria for classifying the physical and health hazards of chemicals. To remove ambiguity about the degree of risk inherent in using a chemical, GHS further specifies the use of standard symbols and language elements to convey the hazard information on chemical labels. Labels for hazardous chemicals will be required to include pictograms, a signal word, as well as specific hazard and precautionary statements. The pictograms, signal words, and hazard statements will help you quickly identify and understand the nature of the hazard(s). Precautionary statements provide guidance to prevent accidents and avoid exposure to chemicals.

**Pictograms and the Signal Word** According to the GHS scheme, eight pictograms are associated with 16 different physical hazards and 10 health hazard categories.

Examples of physical hazards include: explosive, flammable, oxidizing, and self-reactive.

Health hazard categories include acute toxicity, corrosive to skin and eyes, respiratory irritants, allergens and skin sensitizers, and carcinogens, mutagens or reproductive toxins.

In addition to the pictograms, GHS requires the use of signal words, either Danger or Warning, to heighten awareness of the relative risk when using certain chemicals. (Danger is a more severe signal word than Warning.) Depending on their hazard signal word rankings, not all chemicals will have a pictogram or signal word.

**Hazard and Precautionary Statements** Pictograms and signal words convey the general physical and health hazards of chemicals. To understand the relative hazards, GHS assigns specific hazard statements to chemicals. For example, the hazard statement “Toxic if swallowed” is assigned to chemicals with acute oral toxicity (LD50 values) between 50 and 300 mg/kg, while “Harmful if swallowed” is used for chemicals with acute toxicity between 300 and 2000 mg/kg. GHS has codified 82 specific, unique hazard statements.

Understanding physical and health hazards is one aspect of chemical safety. Taking precautions to prevent accidents and minimize exposure is the rationale behind more than 300 different precautionary statements in the GHS labeling requirements.

To illustrate how the hazard and precautionary statements work together to protect you when using a chemical, consider the following label elements for a flammable liquid such as ethyl alcohol. With a flash point of 14 °C, ethyl alcohol is classified as a Category 2 flammable liquid in the GHS scheme, and the assigned hazard statement is “Highly flammable liquid and vapor.” Five precautionary statements associated with this hazard describe the safe use of the chemical and appropriate response measures in the event of exposure or fire: • Keep away from heat, sparks, and open flames. • Keep the container tightly closed. • Wash protective gloves and clothing after handling. • IF ON SKIN (or hair): Immediately remove all contaminated clothing. Rinse skin with water. • In case of fire: Use a tri-class dry chemical fire extinguisher.

**Training Requirements** OSHA has set a December 2013 deadline for all employers, including schools, to provide training to ensure that teachers and staff understand how to read GHS labels.

Chemical providers have until June 2015 to reclassify and produce GHS-formatted labels. At that time Material Safety Data Sheets (MSDS) will become Safety Data Sheets (SDS).

For more information go to:

<https://www.osha.gov/dsg/hazcom/global.html>

<http://www.flinnsci.com/teacher-resources/teacher-resource-videos/globally-harmonized-system/required-ghs-training-the-right-to-understand/>



## Hazard Communication Safety Data Sheets (SDS/MSDS)

Safety data sheets are sent from the manufacturer with chemicals when they are ordered. They are important sources of information. Right-to-know laws require schools to maintain a collection of SDS/MSDS for every chemical in the school.

The High School Department Chairs and the Middle School Science SALTs with the assistance of science teachers have the responsibility to **acquire, update and maintain** the science safety data sheets for their school.

A copy of the SDS/MSDS for each chemical in the school should be on file in the science department and in the main office. A school administrator keeps the SDS/MSDS collection for the main office.

In the science department the collection should be in a central location so that every teacher has access to it.

### Finding Safety Data Sheets

Each Middle and High School Science Department has a SDS/MSDS computer database. Missing SDS/MSDS also can be located in [Flinn Chemventory](https://www.flinnsci.com/resources/safety-reference/) and from the following websites:

- <https://www.flinnsci.com/resources/safety-reference/>
- <https://www.avantorsciences.com/site/>

### Updating and Maintaining SDS/MSDS

Update and maintain the SDS/MSDS collection, by adding new SDS/MSDS when new chemicals are purchased. This is an on-going and continuous process.

When a new chemical arrives in the building

- 1) Initial and Date the SDS/MSDS
- 2) Make a copy of the SDS/MSDS
- 3) File one SDS in the Science SDS binder and place the other one in the main office SDS binder.
- 4) Keep old SDS in the binder. If materials are no longer used in the building, make a note with an “archive” stamp provided by the science office.

Sheets should be **alphabetized by the most common name of the substance**.

The school nurse should be made aware of the SDS/MSDS collection locations.



# Understanding the Safety Data Sheets (SDS/MSDS)

The following information must be listed on the SDS. It is required by law. Be aware that different manufacturers present this information in different formats.

## 1. Chemical Product and Company Identification

- Manufacturers' name, address, phone number
- Emergency number in case of accident

## 2. Hazards Identification

- Poison information
- Potential health effects
- Signal words and pictograms

## 3. Composition/ Information on Ingredients

- CAS number
- Percent of each component
- Molecular weight and chemical formula

## 4. First Aid Measures

- Measures to take if inhaled, ingested, contact with skin, or eye contact

## 5. Fire Fighting Measures

- Stability of substance
- Explosive hazards
- Fire extinguishing media

## 6. Accidental Release Measures

## 7. Handling and Storage

- Proper storage
- Proper handling

## 8. Exposure Controls/Personal Protection

- Safety goggles/ face shields
- Laboratory aprons
- Protective gloves
- Respirators

## 9. Physical and Chemical Properties

- Appearance, color
- Odor
- Solubility
- Boiling point, melting point
- Evaporation rate

## 10. Stability and Reactivity

- Stability
- Incompatible materials

## 11. Toxicological Information

- Lethal dose LD<sub>50</sub>
- Threshold limit values TLV

## 12. Ecological Information

- Environmental Fate
- Environmental Toxicity

## 13. Disposal Considerations

## 14. Transport Information

## 15. Regulatory Information

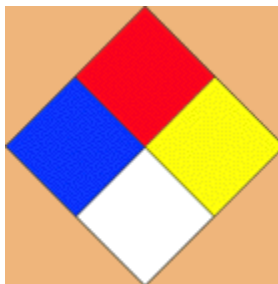
- International, state and federal information

## 16. Other information

**PLEASE NOTE:** On SDS hazards identification (listed in section 2, the scale for hazards are numbered 1-4. One is severe, 4 is mild. This is just the reverse of the scales on the NFPA code (listed in section 5). Note the difference in the example shown below:

SECTION 1 — CHEMICAL PRODUCT AND COMPANY IDENTIFICATION				
<b>Nitric Acid, 9M - 15.8M (Concentrated)</b>				
Flinn Scientific, Inc. P.O. Box 219, Batavia, IL 60510 (800) 452-1261				
CHEMTREC Emergency Phone Number: (800) 424-9300				
Signal Word		DANGER		
SECTION 2 — HAZARDS IDENTIFICATION				
Hazard class: Oxidizing liquids (Category 3). May intensify fire; oxidizer (H272). Keep away from heat, sparks, open flames, and hot surfaces. No smoking (P210).				
Hazard class: <b>Skin corrosion or irritation (Category 1)</b> . Causes severe skin burns and eye damage (H314). Do not breathe mist, vapors or spray (P260).				
Hazard class: Acute toxicity, inhalation (Category 3). Toxic if inhaled (H331).				
Avoid contact with acetic acid and readily oxidized substances.				
Industrial exposure to nitric acid vapors and mists is listed as a known human carcinogen by IARC (IARC-1).				
SECTION 3 — COMPOSITION, INFORMATION ON INGREDIENTS				
Component Name	CAS Number	Formula	Formula Weight	Concentration
Nitric acid	7697-37-2	HNO <sub>3</sub>	63.01	40-70%
Water	7732-18-5	H <sub>2</sub> O	18.00	30-60%
Concentrate is 70% (15.8 M)				
SECTION 4 — FIRST AID MEASURES				
Call a POISON CENTER or physician if you feel unwell.				
<b>If inhaled:</b> Remove victim to fresh air and keep at rest in a position comfortable for breathing (P304+P340).				
<b>If in eyes:</b> Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do so. Continue rinsing (P305+P351+P338).				
<b>If on skin (or hair):</b> Immediately remove all contaminated clothing. Rinse skin with water (P303+P361+P353).				
<b>If swallowed:</b> Rinse mouth. Do NOT induce vomiting (P301+P330+P331).				
SECTION 5 — FIRE FIGHTING MEASURES				
Nonflammable, noncombustible solution, but a strong oxidizer.			NFPA CODE	
Dangerous fire risk in contact with acetic acid, combustible or organic materials.			H-4	
When heated to decomposition, may emit toxic fumes.			F-0	
<b>In case of fire:</b> Use a tri-class dry chemical fire extinguisher. Take any precautions to avoid mixing with combustibles (P221+P370+P378).			R-0	
			OX	

## Understanding the NFPA Fire Diamond



<b>FIRE HAZARD - Red</b> <b>4</b> Flash Point below 73 F (Boiling Point below 100 F) <b>3</b> Flash Point below 73 F (Boiling point at/above 100 f) and/or at/above 73 F- not exceeding 100 F <b>2</b> Flash Point above 100 F, not exceeding 200 F <b>1</b> Flash Point above 200 F <b>0</b> Will not burn	<b>REACTIVITY (Instability) - Yellow</b> <b>4</b> May detonate <b>3</b> Shock and heat may detonate <b>2</b> Violent chemical change <b>1</b> Unstable if heated <b>0</b> Stable
<b>HEALTH HAZARD - Blue</b> <b>4</b> Deadly <b>3</b> Extreme Danger <b>2</b> Hazardous <b>1</b> Slightly Hazardous <b>0</b> Normal Material	<b>SPECIFIC HAZARD - White</b> OX or OXY Oxidizer W (W with line through it) Use no water

### FIRE DIAMOND

Fire diamonds located on storage tanks and buildings indicate the level of chemical hazard located there. The four colors are blue, red, yellow, and white.

The numbers superimposed over the colors rank the severity or danger, ranging from one to four with four being the highest rating.

The **blue** diamond indicates potential health effects. A four in the blue means severe and immediate health effects, including death and a one time exposure can cause lasting health problems.

The **red** diamond indicates explosiveness or readiness to ignite. A four in the red indicates an extremely high ability to ignite and combust.

The **yellow** diamond concerns Reactivity, or the chemical's ability to react with other chemicals in the environment.

The **white** diamond indicates special precautions, usually used for oxy, or oxidizing agent or materials that should not be mixed with water.

# Chemical Labeling

## Original Containers

Certain information should be shown on all chemical bottle labels in their original containers.

Chemical Name  
Chemical Formula (if applicable)  
Grade, Purity, and/or Concentration  
Hazard Alert or Warning Information  
Compatible Chemical Storage Family  
C.A.S. Number  
Date Purchased – **If the original bottle from the manufacturer does not list the date purchased, initial and date the bottle when it arrives in the school.**

## Dispensing Containers or Solutions

When chemicals are subdivided into smaller dispensing jars or solutions are made, the following information should be included on the label:

Chemical Name  
Chemical Formula (if applicable)  
Grade, Purity, and/or Concentration  
Hazard Alert or Warning Information  
Compatible Chemical Storage Family  
Name or initials of person who prepared the container  
Date prepared

## Sample Chemical Label:

The image shows a sample chemical label for Acetic Acid. At the top left are three hazard diamonds: a flame (F+), a skull and crossbones (T+), and a hand being corroded (C+). The text 'DANGER!' is followed by a description of the hazards. Below this is the 'FIRST AID' section. The top right of the label features the 'FLINN SCIENTIFIC INC.' logo and the tagline 'Your Safer Source for Science Supplies'. The center of the label identifies the chemical as 'ACETIC ACID' (A0177) with a volume of '100 mL'. It provides details about the reagent's purity and molecular weight. A 'HAZARD ALERT' section describes the corrosive and toxic properties. The bottom right includes 'LOT' and 'CAS NO.' information, a disposal instruction, and a shelf life note. A barcode is located at the bottom right. A 'CORROSIVE TO BODY TISSUE' warning is prominently displayed at the bottom center. The bottom left corner contains the company's address and copyright information.

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

**A0177** **100 mL**  
**ACETIC ACID**  
glacial, ACS reagent, 17.4 M, assay 99.7%,  $\text{CH}_3\text{CO}_2\text{H}$ , F.W. 60.05

**DANGER!** Flammable liquid and vapor. May be harmful if swallowed. Harmful in contact with skin. Causes severe skin burns and eye damage. May cause an allergic skin reaction. Avoid breathing fumes. Toxic if inhaled. Use only in a fume hood. TLV: 10 mg/m<sup>3</sup>, Ori-rat LD<sub>50</sub>: 3310 mg/kg.

**FIRST AID:** External: Flush affected area with water. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Internal: Immediately call a POISON CENTER or physician.

**★ HAZARD ALERT:** Corrosive to skin and tissue; moderate fire risk (flash point 103 °F); moderately toxic by ingestion, inhalation, and skin absorption. Avoid all body contact. Wear protective gloves, protective clothing, eye and face protection. Avoid contact with oxidizing agents.

**LOT:**  
**STORAGE:** Organic #1 inside a dedicated acid cabinet. Store away from nitric acid. If acid cabinet is not available store in a Flinn Saf-Cube.

**ORGANIC #1**

**DISPOSAL:** #24a  
**SHELF LIFE:** Good if stored properly.  
**SOLUBLE:** Miscible with water, alcohol, glycerine and ether.  
**CAS NO:** 64-19-7  
UN2789

**770 N. Raddant Road, Batavia, IL 60510 U.S.A.**  
630-879-6900  
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**CORROSIVE TO BODY TISSUE**

**NFPA**

**There should never be unknowns in the science laboratory (teachers may use “unknown” as an instructional term during a lab, but the chemical formula of all substances used or created in the lab must be known and recorded on the label of the waste).**

# Disposal of Chemical Waste

## Reduction of Waste

It is the intent of LCPS to reduce the amount of waste produced and to eliminate, to the extent practical, any environmental pollution. To this end use the following guidelines to reduce the amount of waste produced.

- Inventory chemicals at least once a year. (Inventory must be completed and submitted to the Science Supervisor by November 15th.)
- Purchase chemicals in the smallest quantities needed; plan for only one or two years.
- Date chemical containers when received. Use the older ones first.
- Establish an area for storing chemical waste in the chemical storage area.
- Consider the quantity and type of waste produced when purchasing new materials.
- **Label all chemical containers and waste containers as to their contents. There should never be unknowns in the science laboratory (teachers may use “unknown” as an instructional term during a lab, but the chemical formula of all substances used or created in the lab must be known and recorded on the label of the waste).**
- Prepare only enough solution for immediate use.
- Never allow students to place chemicals back into a chemical reagent bottle. Do not dispense chemicals to students from the original reagent bottle.
- Never accept donations of chemicals.
- Use microscale lab procedures.
- Evaluate laboratory procedures to see if less-hazardous or non-hazardous reagents could be used.
- Avoid the use of reagents containing barium, chromium, lead, selenium, and silver.

## Chemical Waste Disposal Guidelines

**Any teacher who uses a chemical in a Loudoun County Public School is responsible for the proper disposal of the chemical.** Before using a material know how it will be safely disposed. Use the waste disposal procedures described in the **Flinn Catalog** if you are able to process waste prior to on-site disposal. If you have any questions about the proper disposal methods please contact the LCPS Science Office at 571-252-1360.

### General Guidelines

- Waste that cannot be processed on-site should be properly labeled and stored until the annual countywide chemical waste pick-up.
- Directions on how to label chemical wastes and where to leave them for the commercial company to collect must be strictly followed.
- Include any used and/or expired mercury spill kits as part of the chemical waste list. Keep them stored in a locked chemical storage cabinet until the waste pick-up day.
- Keep information about disposal procedures for chemical waste in your lab on file.
- Log chemical waste as soon as it is generated.
- Dispose of waste chemicals using the Flinn Catalog procedures immediately after they are generated.

- Keep waste types separate unless they have identical disposal methods. **Do not mix wastes.**
- Keep halogenated solvents separate from non-halogenated solvents.
- Keep organic wastes separate from metal-containing or inorganic wastes.
- Keep chemical wastes separate from normal trash (paper, wood, etc).
- Include waste management as part of the pre and post laboratory written student experience.

### **Disposal of Nonhazardous Waste Chemicals as Trash (Disposal Method #26a in Flinn)**

The following partial list, adapted from *Prudent Practices* and the *Flinn Catalog*, lists **solid** chemicals which are not considered hazardous and are therefore suitable for disposal with regular trash. Packaging of such waste for disposal must be secure.

#### **A. Organic Chemicals**

Enzymes  
Sugars and sugar alcohols  
Starch  
Naturally occurring amino acids and salts  
Citric acid and its Na,K,Mg,Ca,NH<sub>4</sub> salts  
Lactic acid and its Na,K,Mg,Ca,NH<sub>4</sub> salts

#### **B. Inorganic Chemicals**

Silica  
Sulfates: Na,K,Mg,Ca,Sr,NH<sub>4</sub>  
Sulfites: Na,K,Mg,Ca,Sr,NH<sub>4</sub>  
Phosphates: Na,K,Mg,Ca,Sr,NH<sub>4</sub>  
Carbonates: Na,K,Mg,Ca,Sr,NH<sub>4</sub>  
Oxides: B,Mg,Ca,Sr,Al,Si,Ti,Mn,Fe,Co,Cu  
Chlorides: Ca,Na,K,Mg,NH<sub>4</sub>  
Bromide: Ca,Na,K,Mg,NH<sub>4</sub>  
Iodide: Ca,Na,K,Mg,NH<sub>4</sub>  
Borates: Na,K,Mg,Ca

#### **C. Laboratory Materials Not Contaminated with Hazardous Chemicals**

Chromatographic adsorbent  
Glassware  
Filter papers  
Filter aids  
Rubber and plastic protective clothing  
Other examples of nonhazardous biochemicals include polysaccharides, nucleic acids and naturally occurring precursors, and dry biological media.

## **Disposal of Nonhazardous Waste Chemicals by Drain Disposal (Disposal Method #26b in Flinn)**

Laboratory sinks should be used for disposal of chemicals on the safe for drain disposal list. Drain disposal must only be used when the drain flows to a sanitary sewer system which eventually goes to the wastewater treatment plant. Storm drain systems that flow directly into surface water should **NEVER** be used for chemical disposal. Find out what type of system you have at your school.

Quantities of chemical waste for drain disposal should be limited generally to a few hundred grams or milliliters or less per day. Disposal should be followed by flushing with at least 100-fold excess of water at the sink. (That means for 100 ml of chemical, run the water for about two minutes at maximum flow.)

Note: Sulfuric, hydrochloric, acetic and phosphoric acids may be discharged in larger quantities since they must be neutralized to a pH of between 5.5 and 9.0 before they can be discharged to the sanitary sewer.

### **Safe for Drain Disposal**

#### **A. Inorganic Chemicals**

Dilute solutions of inorganic salts where both cation and anion are listed below are suitable for drain disposal. Materials listed are considered to be relatively low in toxicity. Compounds of any of these ions that are strongly acidic or basic should be neutralized before drain disposal.

**Cation:**  $\text{Al}^{+3}$ ,  $\text{Ca}^{+2}$ ,  $\text{Fe}^{+2, +3}$ ,  $\text{H}^+$ ,  $\text{K}^+$ ,  $\text{Li}^+$ ,  $\text{Mg}^{+2}$ ,  $\text{Na}^+$ ,  $\text{NH}_4^+$ ,  $\text{Sn}^{+2}$ ,  $\text{Sr}^{+2}$ ,  $\text{Ti}^{+3, +4}$ ,  $\text{Zr}^{+2}$

**Anion:**  $\text{BO}_3^{-3}$ ,  $\text{B}_4\text{O}_7^{-2}$ ,  $\text{Br}^-$ ,  $\text{CO}_3^{-2}$ ,  $\text{Cl}^-$ ,  $\text{OCN}^-$ ,  $\text{OH}^-$ ,  $\text{I}^-$ ,  $\text{NO}_3^-$ ,  $\text{PO}_4^{-3}$ ,  $\text{SO}_4^{-2}$ ,  $\text{SCN}^-$

Mineral acids and bases should be neutralized to pH 5.5 to 9 range before disposal.

#### **Neutralization Procedures**

1. Do neutralizations in a fume hood behind a safety shield, as fumes and heat may be generated. Wear a lab coat or apron, gloves and goggles.
2. Keep containers cool during the process.
3. Work slowly.
4. After neutralization is complete, dispose of the solution in the sewer with 20 parts water.

#### **Acid Neutralization**

1. While stirring, add acids to large amounts of an ice water solution of base such as sodium carbonate, calcium hydroxide, or sodium hydroxide for concentrated acids.
2. When a pH of at least 5.5 is achieved, dispose of the solution into the sewer, followed by 20 parts water.

#### **Base Neutralization**

1. Add the base to a large vessel containing water. Slowly add a 1M solution of HCl.
2. When a pH of 9 or less is achieved, dispose of the solution into the sewer system followed by 20 parts water.



## B. Organic Chemicals

Materials designated as Disposal Method #26b in the Flinn Catalog (quantities up to about 100 g or 100 ml at a time) are suitable for disposal down the drain while flushing with excess water. These materials are soluble to at least 3 percent, present low toxicity and are readily biodegradable.

## Chemical Waste Pickup

Chemical waste that cannot be processed on-site should be stored in **separate, individually labeled** bottles until the annual chemical waste pick-up.

**Each school** requesting pick-up should follow the process provided by the LCPS Science Office.

Chemical waste will be picked up in early June by a waste disposal vendor, or as required. Chemical waste should be stored properly according to type of material (see storage guidelines) until the pick up day. Chemical waste bottles should be placed in the designated temporary waste storage container ([large yellow drum](#)) just prior to the waste pick up day.

**There should never be unknowns in the science laboratory (teachers may use “unknown” as an instructional term during a lab, but the chemical formula of all substances used or created in the lab must be known and recorded on the label of the waste).**

**Never mix waste chemicals.** Keep them in separate, labeled containers.

If you have any questions about the appropriate safe disposal and/or storage methods please contact the LCPS Science Office at 571-252-1360.

## Disposal of Biological Wastes

Biological wastes must be properly disposed. For more information consult the Flinn Catalog’s section on Biological Waste Disposal.

**No food, solid plant or animal products or non-aqueous solutions can be flushed down the drains in laboratory sinks.** The lab sinks drain into limestone filters that are intended to neutralize only aqueous solutions. Solid or oily materials get caught in the drain and degrade and create an unpleasant odor in the classroom.

- **Potentially harmful wastes due to microorganism contamination** - All lab wastes that may harbor any microorganisms must be assumed to be pathogenic and need to be treated before they are thrown in the trash. These items must be sterilized either by autoclaving or by 10% bleach solution for 24 hours.
- **Potentially harmful wastes due to dangerous chemical hazards** - Solutions from electrophoresis, staining procedures, or other chemical solutions or solids must be considered chemical waste and the chemical waste procedures apply.
- **Preserved Materials** - Preserved materials used in dissection activities should be preserved in non-formaldehyde solutions. When the materials are ready to be disposed of – rinse and wash away the preservative away from the specimens. Allow them to drain for an hour and then double bag in non-transparent bags. Personally carry the trash bags to the school’s regular garbage disposal bin.



- **Living Materials** - Carcasses of dead animals should only be handled with gloves and disposed of as quickly as possible. Wrap the deceased animal in newspaper, place it in a non-transparent plastic bag and throw it in the school's main trash container.
- **Broken glass and sharp objects** - Broken glass, dissecting blades, glass tubing, glass pipette, etc. must be placed inside a hard plastic or metal container to prevent possible injury. Purchase a broken glass container or use a narrow necked hard plastic metal container and label it as *broken glass*. Dispose of container by closing the container (close box, do not simply remove plastic liner). Dispose of in the school's main trash container. If the broken glass objects have the possibility of containing pathogenic microorganisms, they must be sterilized before disposal.

## Disposal of Batteries

Batteries contain various metals and chemical compounds that can contaminate groundwater if improperly disposed. Each type of battery has its own unique use, its own makeup and composition, and each must be disposed of properly. The most common types of batteries found in LCPS are alkaline batteries, (e.g., flashlight batteries). They do not contain leachable metals and could be disposed of in the regular trash. Always read the labels of batteries to ensure the type and proper disposal. Refer to the chart below.

Battery Type	Common Name	Sizes Available	Examples of Use	Proper Disposal
Alkaline Manganese	Coppertop, Alkaline	AAA, AA, C, D, 6V, 9V	Flashlights, calculators, toys, clocks, smoke alarms, remote controls	Dispose in regular school trash.
Button	Mercuric Oxide, Silver Oxide, Lithium, Alkaline, Zinc-Air	Sizes vary	Watches, hearing aids, toys, greeting cards, remote controls	*Send to LCPS Facilities Services for disposal.
Carbon Zinc	"Classic", Heavy Duty, General Purpose, All Purpose, Power Cell	AAA, AA, C, D, 6V, 9V	Flashlights, calculators, toys, clocks, smoke alarms, remote controls, transistor radios, garage door openers	*Send to LCPS Facilities Services for disposal.
Lithium	Usually has "lithium" label on the battery	3V, 6V, 3V button	Cameras, calculators, computer memory back-up, tennis shoes	*Send to LCPS Facilities Services for recycling
Nickel-Cadmium ( <i>Rechargeable</i> )	Either unlabeled or labeled "Ni-Cd"	AAA, AA, C, D, 6V, 9V	Flashlights, toys, cellular phones, power tools, computer packs	*Send to LCPS Facilities Services for disposal.
Reusable Alkaline Manganese ( <i>Rechargeable</i> )	Renewal	AAA, AA, C, D	Flashlights, calculators, toys, clocks, radios, remote controls	*Send to LCPS Facilities Services for recycling
Sealed Lead Acid ( <i>Rechargeable</i> )	"Gel," VRB, AGM, Cyclone, El Power, Dynasty, Gates, Lithonia, Saft, Panasonic, Yuasa	Multiples of 2 Volts: 2V, 6V, 12V	Video cameras, power tools, wheelchairs, ATV's, metal detectors, clocks, cameras	Save for Waste Pick-up

\*Department Chairs/SALTS will collect batteries until the end of the year and complete a *LCPS Battery Disposal Pick-up* form (see page 82 in the Appendix).

Do not send damaged or corroded batteries to Facilities Services through the LCPS pony. Arrange for a pick-up from your site.

# Emergency Response and Spill Response

For any incident that cannot be handled by the individual in the laboratory,  
evacuate the area and call **911**, then the 24-hour  
**LCPS Security Operations Center (SOC) at 703-779-8833**

## **In case of a FIRE**

Rescue anyone in immediate danger  
Pull the fire alarm  
Close the windows and doors  
Evacuate the area

## **In case of an ACCIDENT**

In the event of an accident or injury, take the following steps immediately.

### **In a life threatening situation**

- Call 911 (most school phones require you to dial 9 before getting an outside line.)
- Call the LCPS Dispatcher **703-779-8833**
- Send someone to notify the school principal.
- Send someone to notify the school nurse.
- Have a properly trained person administer first aid if necessary.
- Notify parents or guardians.

### **For less serious accidents (minor burns, cuts, etc.)**

- Send someone to notify the school principal.
- Send someone to notify the school nurse.
- Have a properly trained person administer first aid if necessary.
- Notify parents or guardians.

## **In case of CHEMICAL EXPOSURE**

Follow accident procedures above and the following:

### **Chemical Splash (eye)**

If materials enter the eyes, rush to the eye/face wash station and flush eyes with a continuous stream of water holding the eyelids open. Contact the school office/nurse and call 911 if needed. Continue to flush eyes for 15 minutes or until medical assistance arrives.

### **Chemical Splash (body)**

If the chemical is capable of causing chemical burns, wash immediately in a safety shower for at least 15 minutes. Contact the school office/nurse and call 911 if needed.

**EXCEPTION:** Water reactive chemicals require special precautions. Do not expose students to the hazard of water reactive chemicals unless preparations have been made to specifically address this hazard.

Make sure that the nurse or person administering first aid receives a copy of the SDS/MSDS as soon as possible.

## **In case of a CHEMICAL SPILL (NOT on a person)**

If the spill constitutes a **fire hazard**

Immediately extinguish all flames.

Shut down all experiments and vacate the room until the situation has been corrected.

If there is **no fire hazard**

- Evacuate if necessary.
- Notify other personnel.
- Tend to the injured.
- Contain and limit the spill.

**The following procedures are NOT used to treat a spill on a person. These are for spills on counters, floors, shelves, etc.**

Use **sand** to contain the spill and prevent rapid spreading.

Use an **absorbent** to contain and absorb the spill so that it is easier to clean up, transport and dispose. Finally use a **neutralizer** to neutralize the spill.

- Powdered sodium bicarbonate (baking soda), sodium carbonate or calcium hydroxide is used to neutralize inorganic acid spills.
- Solid citric acid is used to neutralize base spills.
- Sodium thiosulfate solution (5-10%) or limewater is used for bromine spills.
- Slaked lime and soda ash are used for organic acids, halides, or nonmetallic compounds.

While cleaning up the material, wear rubber gloves and use a dustpan and brush. Clean the area thoroughly with soap and water and mop dry.

## **In the case of a MERCURY SPILL**

Mercury is prohibited from use or storage in any LCPS science classroom. All mercury, mercury compounds, and apparatus containing mercury have been removed from schools.

However, it is possible that mercury could inadvertently enter a school by accident or intent. The following page lists the proper response.

### **Is it really mercury?**

There are many different types of materials that are used in thermometers that are not mercury. Mercury is a heavy, silvery-white liquid metal. Mineral spirit thermometers have a red, green or other colored liquid. Some commercial home thermometers have a metallic like material that can be confused as mercury. Carefully read information on the thermometer.

If you have any doubt if a material is actually mercury, treat it as if it is mercury and contact the LCPS Security Operations Center (SOC) at 703-779-8833.

The mercury spill kit must be replaced every 3 years.

## **Mercury Spill Clean-Up**

Mercury is a heavy, silvery-white liquid metal. Mercury is sometimes called quicksilver.

Mercury is a poison and can cause serious illness, however the effects of mercury toxicity are

cumulative after long repeated exposure to mercury vapor. **There is no immediate danger**, but it is important that the spill be cleaned up promptly, properly and completely.

#### Important Reminders

- Mercury should **not** be touched with the hands.
- **Do not** sweep with a broom.
- Be careful not to contaminate shoes.

#### Response to a mercury spill

1. Block off spill site (at least 6 feet) from foot traffic. Open windows and shut off the HVAC system. Check clothing and footwear for mercury and remove contaminated items.
2. Call the LCPS Security Operations Center (SOC) 703-779-8833.
3. Do not attempt a clean up until trained personnel arrive.

#### Mercury Spill Kit Instructions for Trained Personnel

1. Wearing protective clothing, eyewear, and gloves spray **MERCON** spray (from Mercury Spill Kit) into the ambient air starting at eye level and work down towards the floor including the visible spill.
2. Use **MERCONvap** (from Mercury Spill Kit) to cover visible mercury beads. CAUTION: After applying **MERCON** spray or **MERCONvap**, the floor may be slippery.
3. Use the Mercury Aspirator (black syringe-like apparatus in spill kit) to pick up mercury beads. (Press spring down, hold tip close to mercury beads and release spring to suction up the spill.) Deposit the mercury into **MERCONtainer** (small white bottle in the spill kit). Ensure the tip of the aspirator is below the rim of the **MERCONtainer** and press the spring down to release the mercury.
4. Wipe contaminated surfaces with **MERCONwipes** (in the spill kit).
5. Wipe shoes, gloves and other contaminated items with **MERCONwipes**.
6. Label contaminated items as “Caution Mercury Waste”. Store securely until hazardous waste pick-up can be arranged.

**24 hour LCPS Security Operations Center (SOC)** **703-779-8833**

**LCPS Safety & Security Office** **571-252-1740**

**LCPS Science Supervisor** **571-252-1360**

## Safety Equipment

**The personal protective equipment specified in any experiment, activity or demonstration must be used.**

**If the personal protective equipment is not available, the activity must be postponed until such equipment is available.**

### Personal Protective Equipment

#### Eye protection

Protective eyewear is required to be worn in any situation where there is a potential for damage to the eye. These situations include protection from flying debris, protection from chemical splashes, and protection from hazardous radiation such as lasers or ultraviolet light, etc. It is critical that the proper protective eyewear be selected for use.

Goggles that form a liquid proof seal around the eyes are absolutely necessary when working with liquid chemicals or solutions.

#### Goggle Sanitizer Cabinets

The purpose of the goggle sanitizer cabinet is to allow several classes of students to safely share goggles. Sanitizer cabinets are designed to kill infectious organisms through a timed exposure to ultraviolet light. To correctly use, the goggles must be placed face down with the surfaces that touch skin facing the upper UV light in the cabinet. The inner surfaces of the goggles must be exposed and not facing downward. Schools should contact LCPS Facilities Services for replacement bulbs when needed.

In order for the goggle sanitizer cabinet to be effective, the goggles must be cleaned periodically. A dirty surface cannot be effectively sanitized. Using Lysol© solution will effectively remove dirt, grime and also sanitize goggles. When worn by students, goggles are required to be cleaned via the Lysol© dip method at least once a month. Add 1.25 ounces of Lysol© to one gallon of soft water (distilled or deionized). Dip the goggles in the Lysol© Solution, rinse and let air dry. Use Optical Lens Paper (non-abrasive, soft, and dust free) to clean the lenses.

#### Gloves

Protection of hands from the exposure to solvents, detergents, or any hazardous material is essential in preventing absorption through the skin. Exposure of the hands to hazardous chemicals can also result in burns, chafing of the skin, contact dermatitis and sensitization. Gloves must be of a material compatible with the chemicals used. **Gloves should only be worn by students if the laboratory activity specifically requires the use of gloves.**

Special types of gloves to protect against extreme heat or cold should be used if needed to handle those materials safely.

## Fire Prevention and Control

### Fire Extinguishers

A fire extinguisher should be in every science classroom and chemical storage area. It should be located in a clear area where it can easily be seen. The fire extinguisher must be inspected on a regular basis and only used if classroom exit is blocked. Do not use a fire extinguisher on a person.

Fires are commonly classified as **A**, **B** or **C**.

**A** – Common combustibles (paper, wood, rubber, plastic, textiles)

**B** – Flammable Liquids (solvents, gasoline, oil)

**C** – Energized Circuits (electrical equipment and computers)

The fire extinguisher will be labeled as **type** (water, dry chemical or CO<sub>2</sub>) and **classification** (A, B, C). Fire extinguishers in LCPS Science Labs should be dry chemical, ABC and are suitable for use on all classification of fires. Double-check those in your building. Use only the appropriate type for the appropriate fire.

Use a fire extinguisher only if the exit is blocked.

Fire Extinguisher General use directions (**PASS**):

- Pull the ring or lock pin.
- Aim at the base of the fire standing back 8-10 feet.
- Squeeze the discharge lever.
- Sweep side to side.

### Fire Blankets

Fire Blankets are made of specially treated fire resistant fabric. They are used to cover a fire to cut its supply of oxygen or to wrap a person whose clothes are on fire. Fire blankets are also a good means to keep shock victims warm or to cover large chemical spills.

Fire Blankets should be located in an accessible area in all science laboratories, be easy to get to in an emergency, and should never be put away in a cupboard.

A person whose clothes catch on fire should STOP, DROP and ROLL. Lying down prevents flames from spreading up the body. To use a fire blanket, drop and roll the person on fire, wrapping the victim in the blanket to extinguish the fire. Get medical attention immediately.

## Protection from Chemicals

### Fume Hoods

Fume hoods are **not** designed for room ventilation. Fume hoods are designed to ventilate the activity taking place in the fume hood itself and to prevent the release of hazardous chemicals into the general laboratory environment. Fume hoods should capture, dilute (with air), and exhaust hazardous substances. Use the fume hood when working with volatile substances or poisonous vapors.

- Fume hoods are not storage cabinets.
- Know that other room ventilation factors may interfere with fume hood operation, such as open doors to labs, open windows, blocked exhaust ports or heating and air conditioning vents.

- Use the sash as a safety shield when boiling materials or conducting an experiment with reactive chemicals.
- Never place your head into the fume hood.

A properly functioning fume hood should provide a face velocity of 80 to 120 linear feet per minute of airflow. Fume hood operation should be checked **annually**.

- Airflow must be checked to determine proper fume hood operation. (The fan motor noise or the switch indicator light is not an indication of proper operation.)
- Before testing with a smoke generator, test with a strip of Kim Wipe or tissue taped to the lower edge of the sash. This will indicate the presence of airflow.
- The smoke generator should be placed at or near the center of the internal working space of the hood.
- With the hood operating and the smoke generator ignited, the smoke should move from the front of the sash directly up and out to the hood chamber, not allowing spots of turbulence or dead space.
- The sash should be placed at the position where it provides the most efficient draft, and labeled.
- Do not begin an exercise requiring the use of a fume hood if it is suspected to be malfunctioning. Immediately put in a repair request.

### **Eye/Face Wash Stations**

Whenever chemicals have the possibility of damaging the eyes, an emergency supply of water from suitable fixtures must be available. Every science laboratory should have an eye wash station.

- An eye wash station that can wash both eyes simultaneously is required in every science laboratory or classroom where hazardous materials are used.
- Squeeze-bottle eyewashes are NOT sufficient and should NOT be used in any science laboratory.
- Eye/Face Washes should be clearly marked and unobstructed for immediate use.
- Eye/Face Washes should be flushed **once a week** for **five minutes** to remove any harmful contaminants that may form or grow in the eyewash. The dust covers must be replaced on eyewash heads after testing.
- Periodically check the condition of the eyewash filter and change when needed.
- Prior to conducting an experiment where there is the possibility of damaging the eyes, do a quick test of the eyewash.

### **Emergency Use of the Eyewash**

- Hold open eyelids and flush with water for **15 minutes**.
- During the wash time the eyeballs should be rolled around to allow water to reach all areas.

### **Chemical Spill Safety Showers**

A safety shower is required in chemistry, physical science lab rooms and in any laboratory where hazardous chemicals are used.

- Safety showers must have a control valve that can remain on without requiring the use of the operator's hands.
- Handles must remain on the safety shower at all times.



- Should be marked with a highly visible sign and unobstructed for immediate use.
- Should be tested every **three months** to ensure adequate flow. Make sure that the water runs until it is clear to clean out the pipes. (This is particularly important for new schools. Plan your test carefully as the shower can create a huge mess.)

#### **Safety Shower Testing**

1. Notify custodial staff prior to testing and request use of a 'cafeteria' trash can.
2. Since the lever will stay on until it is pushed back up into the off position, have a chair or ladder available to reach the lever.
3. Attach the Safety Shower Tester around the head of the shower. Place the bottom of the tester into a large trash can.
4. One person should be positioned at the top of the shower to turn it off once the test is complete. Another person should hold up the shower tester and pull the lever to start the test.

#### **Emergency Use of Safety Shower**

Use a safety shower in the event of a chemical spill. The first response is to rinse the affected area with fresh water for at least **15 minutes**.

- Guide the exposed person to the Safety Shower.
- Pull the overhead handle and remove clothing, jewelry, shoes, etc. that may be contaminated. Allow the skin to be rinsed, and continue for **15 minutes**.

#### **Utility Carts**

Chemicals should be transported from the prep room or chemical storage area using heavy-duty utility carts with raised sides to contain spills. Carts made of noncorrosive materials such as plastic and stainless steel are recommended with heavy-duty wheels or casters approximately five inches in diameter to ensure smooth transportation of chemicals.

Chemicals should only be transported between classrooms when students are not in the halls.



## References and Resources

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# Appendix

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# LCPS Science Department Chair or SALT Science Safety Checklist

School \_\_\_\_\_ Department Chair or SALT \_\_\_\_\_ Date \_\_\_\_\_

This list and the required attachments are due to the Science Supervisor by **November 15**.

	Date(s)	
		Provide each teacher with a LCPS Science Safety Manual (electronic or print)
		Provide each teacher with Science Curriculum Guides
		Moderate regular safety meetings with science staff
		Provide new teacher orientation and training related to chemical safety and storage specific to your site
		Oversee the development of a Chemical Hygiene Plan specific for your school <b>(Send an electronic copy to the Science Supervisor.)</b>
		Replace <i>Science Safety Equipment Testing Logs</i> in each Science Classroom at the start of each school year.
		Keep a written or scanned electronic record of testing of emergency equipment for <b>3 years</b> .
		Oversee the organization of chemical storage according to compatible families, clearly labeled, dated and in proper containers
		Oversee the update and maintenance of the SDS/MSDS notebook
		Updated Chemical Inventory yearly in Flinn Chemventory
		Check inventory for prohibited chemicals
		Arrange to have chemical waste and prohibited chemicals removed from your school
		Submit a Room Evaluation Checklist for each teacher to complete <b>(Send an electronic copy to the Science Supervisor.)</b>
		Submit a list of safety equipment that requires corrective action <b>(Send an electronic copy to the Science Supervisor.)</b>

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# LCPS Science Room Safety Inspection Checklist

School \_\_\_\_\_ Room: \_\_\_\_\_ Inspector: \_\_\_\_\_ Date: \_\_\_\_\_

Proper Operation of:	Good	Poor	Date Remedied	Notes
Eyewash				
Safety Shower				
Fume Hood				
Ventilation				
Central Gas Cutoff				

Condition of:	Good	Poor	Date Remedied	Notes
Eyewash filters				
Fire Extinguishers				
Fire Blanket				
Spill Clean-up kit				
Safety Goggles				
Lab Aprons				
Protective Gloves:				
Hot hand holders				
Acid resistant gloves				
Disposable gloves				
Safety Information posted				

Hazards	Yes	No	Date Remedied	Notes
Exits are clear (not blocked)				
Aisles are clear (not cluttered)				
Chemicals are stored properly away from students				
Glassware is in good condition (not cracked or broken)				
Proper waste containers for broken glass and other sharps				
Chemicals are properly labeled				

Housekeeping	Yes	No	Date Remedied	Notes
Sinks and sink traps are clean, unblocked				
Fume hood is clean, clear of clutter				
Work counter tops are clean, free of clutter				
Table tops are clean				
No food or drink in lab areas				
Waste containers for chemicals are available				
*Waste chemicals should be separated based on type, properly labeled and stored				

Chemical Store room	Yes	No	Date Remedied	Notes
Storeroom or area is locked; has restricted student access				
Chemical Inventory is up-to-date				
MSDS/SDS sheets updated and accessible				
Chemicals are properly labeled, dated				
Chemicals stored according to compatibilities				
Chemical containers checked for rust, corrosion, leaks				
Prohibited chemicals removed				
Acid Storage Cabinet				
Flammable Storage Cabinet				
Corrosive Storage Cabinet				
Utility Cart (raised edges)				
Aisles, countertops are not cluttered				

If some of these items do not apply to your subject/lab/room please indicate "N/A" in the notes column.

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# Science Safety Equipment Testing Log

Year: \_\_\_\_\_

Name \_\_\_\_\_

School \_\_\_\_\_

Room \_\_\_\_\_

**Eyewash** (Flushed once a week for 5 minutes, Filters checked monthly) – list dates tested below


**Safety Shower** (tested once a month) – list dates tested below


**Floor Drain** (pour in bucket of water every month to flush) – list dates tested below


**Sink Drains** (flush drains every month, including teacher demo desk and fume hood) – list dates tested below


**Fume Hood** (test operation with a smoke generator or airflow detection powder yearly) – list date tested below

--

**Demonstrate that you are a Safe Science Teacher**

Prepare, Plan, Prevent and Protect

Document all safety lessons and meetings

Keep current records of safety equipment testing


**This record must be kept with permanent ink. Do not laminate and complete with dry erase or washable marker.**


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# LCPS Science Chemical Inventory

## Flinn Chemventory

The Science Department Chair or SALT has access information for each school. There are multiple modes of entering information. Please note the product details required. For more information on how to use Chemventory, see the [Flinn Chemventory Overview](#).

"Your Safer Source for Science Supplies"



[Home](#) [Inventory](#) [Purchase Lists](#) [Label Print Queue](#)

[Need Help?](#)

### Add a Chemical

Search by Keyword or Flinn Catalog Number, [Add Manually](#), or [From a List](#)

Chemical Name

Chemical Formula

Synonyms

Company

Catalog #

Grade

Disposal #

CAS #

Class

Compatible Family

Comments/Notes

GHS Signal Word

Danger

GHS Pictograms

☐  Acute

☐  Carcinogen

☐  Corrosive

☐  Environmental

☐  Explosive

☐  Flammable

☐  Gas

☐  Irritant

☐  Oxidizer

SDS Information Link

[Find an SDS](#)

Inventory Information

Amount (Numeric Values Only)

Unit of Measure

bt

Minimum Reorder Amount (Numeric Values Only)

School

Store Room

Shelf Location

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## LCPS Chemical Waste Pick-up

**Directions:** All sections of this form must be completed by the last week in April. Once this list is turned in, no other items can be added or picked-up this spring.

<b>School:</b>	<b>Contact Person:</b>	<b>Location that waste is stored (Room Number):</b>
----------------	------------------------	---

All materials designated for pick-up should be properly stored using the chemical storage guidance contained in the LCPS Science Safety Manual.

Materials designated for pick-up should be stored in their original containers. If the original container is not available, they should be stored in separate, sealed containers. Do not mix different wastes together.

On the pick-up day, materials may be moved [into Flinn's yellow chemical storage bins](#).

<b>Teacher Submitting Form (if different than Contact Person):</b>	<b>Date:</b>
--	--------------

Substance (chemical name; include concentration if applicable) There should be nothing labeled as "unknown"	Flinn Waste Disposal Number	Condition (i.e. Description of substance) Examples: Clear, colorless liquid, white powder, etc	Packaging Volume Ex: 500 mL half-full; 500 g bottle 1/4 full	Notes



# LCPS Battery Disposal

School \_\_\_\_\_  
Teacher \_\_\_\_\_

Depleted batteries should be sent along with this completed form to LCPS Facilities Services for recycling.  
If batteries are damaged or corroded, do not send in the LCPS pony; contact Facilities Services for pick-up.

Battery Type	Common Name	Size	Number of Batteries
Alkaline Manganese	Coppertop, Alkaline	AAA	Dispose at school in regular trash.
		AA	
		C	
		D	
		6V	
		9V	
Button	Mercuric Oxide, Silver Oxide, Lithium, Alkaline, Zinc-Air	List size	
Carbon Zinc	"Classic", Heavy Duty, General Purpose, All Purpose, Power Cell	AAA	
		AA	
		C	
		D	
		6V	
		9V	
Lithium	Usually has "lithium" label on the battery	3V	
		6V	
		3V button	
Nickel-Cadmium (Rechargeable)	Either unlabeled or labeled "Ni-Cd"	AAA	
		AA	
		C	
		D	
		6V	
		9V	
Reusable Alkaline Manganese (Rechargeable)	Renewal	AAA	
		AA	
		C	
		D	
Sealed Lead Acid (Rechargeable)	"Gel," VRB, AGM, Cyclone, El Power, Dynasty, Gates, Lithonia, Saft, Panasonic, Yuasa	2V	Hold for waste pick-up
		6V	
		12V	

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## [Science Equipment Cleaning/Disinfecting Guidelines](#)

Teachers should only use the cleaning and [disinfecting supplies](#) that are provided through Facilities Services or that are approved by the Science Office as listed and described below.

Questions about cleaning and disinfecting science equipment not listed below should be sent to [odette.scovel@lcps.org](mailto:odette.scovel@lcps.org) or [tracy.matthews@lcps.org](mailto:tracy.matthews@lcps.org).

**Note:** Isopropyl alcohol and other cleaning/disinfecting products should **not be used in spray bottles** because they become aerosolized and should **never be used on or around heat sources or open flames**.

All electrical equipment should be **unplugged and at room temperature** before cleaning or disinfecting.

All equipment should be **free of chemicals and spills**. Any residue from experimentation should be cleaned (using a solution of Alconox, then wiping down with paper towels saturated with distilled water) off of the equipment before disinfecting or sanitizing.

**Acid Cabinets:** Acid and Corrosive cabinets may become covered in precipitate overtime and need to be cleaned occasionally. Follow the instructions from [Flinn Scientific](#) for cleaning the cabinets.

**Biological Incubators:** After use, incubators should be wiped down using paper towels saturated with Isopropyl Alcohol (70%). Biological materials should not be stored in the incubator. **Incubators should only be cleaned and disinfected when they are unplugged, turned off, and returned to room temperature.**

**Biological Materials:** Follow the guidance in the [LCPS Science Safety Manual](#) for disposal of biological wastes. Biological lab wastes that are potentially hazardous biological agents (PBHA) must be sterilized using the autoclave or by soaking in a freshly made 10% bleach solution (10mL household bleach in 100 mL water) for 2 hours. If items are soaking in bleach, there should be appropriate [signage identifying that a bleach solution is in use](#).

**BioSafety Cabinets:** After use, BSC and all equipment in the BSC should be wiped down using paper towels saturated with Isopropyl Alcohol (70%). Biological materials should not be stored in the BSC.

**Dissection Tools:** Should be treated as PBHA. Must be sterilized using the autoclave or by soaking in a freshly made 10% bleach solution (10mL household bleach in 100 mL water) for 2 hours. If items are soaking in bleach, there should be appropriate [signage identifying that a bleach solution is in use](#).

**Electronic Balances:** Balances can be wiped down using paper towels saturated with Isopropyl Alcohol (70%).

**Environmental Science Equipment:** Boots and waders can be wiped down with LCPS approved disinfectant. Tools should be cleaned with soap and water, then wiped down with LCPS approved disinfectant.

**Fume Hoods:** Fume Hoods should be cleared of any equipment and chemicals and wiped down with distilled water before cleaning. Teachers need to be aware of the chemicals that were used in the fume hood and ensure that there is no residue from incompatible chemicals before disinfection. The fume hood should be cleaned with mild soap and water. Painted and glass surfaces can be disinfected with Isopropyl Alcohol (70%).

**Glassware:** Hand washing - use [Alconox](#) for cleaning glass, porcelain, metal, plastic and rubber. ([Alconox SDS](#)).  
Dishwasher - use [Alcojet](#)

**Goggles: Additional cleaning and disinfecting ([Lysol Dip Method](#), pg 4) is required monthly.** (Lysol has been approved by Facilities Services for use in Science Classrooms for goggle sanitizing only.) Goggles should be sanitized using the [Lysol Dip Method](#) first, then sanitized by using the goggle cabinets. Goggles should be placed in the cabinet appropriately (do not stack goggles on each other) and sanitized for a minimum of 10 minutes. Goggles must be sanitized using the goggle cabinet before each use and must be sanitized using the Lysol Dip Method on a monthly basis.

**Hot Plates-Note: Hot Plates should only be cleaned and disinfected when they are unplugged, turned off, and returned to room temperature.** Hot plates and Stirring Hot plates can be wiped down using paper towels saturated with Isopropyl Alcohol (70%).

**Lab Aprons:** Wipe down with LCPS approved disinfectant.

**Lab Benches/Countertop/Table Surfaces:** Lab benches, countertops, and surfaces can be cleaned using LCPS approved cleaning supplies if teachers have completed the training on the proper use of the LCPS provided cleaning chemicals.

**Microscopes:** Isopropyl Alcohol (70%) can be used to disinfect microscope body parts and non [abrasive wipes](#). Eyepieces and lenses should only be cleaned using [lens paper](#).

**Spectrophotometers:** Can be wiped down using paper towels saturated with Isopropyl Alcohol (70%).

**Triple Beam Balances:** Balances can be wiped down using paper towels saturated with Isopropyl Alcohol (70%).

**Vernier LabQuests/Probeware:** LabQuests can be wiped down using paper towels saturated with Isopropyl Alcohol (70%). Note: **Kimwipes** should be used to clean the **device screens**. Care should also be taken not to get alcohol into any of the data ports or into the membranes on any of the probes. **Probes** should be rinsed with **distilled water** after wiping down with Isopropyl Alcohol.

## Resources

[Guidance from NSTA](#)

[NSTA Safety and School Science Instruction](#)

[Flinn Scientific-Safety](#)

[Flinn Lab Safety Guides](#)

[ASM Biosafety Guidelines](#)

[ASM Biosafety Guidelines Appendix](#)

## Science Department Monthly Safety Meeting Agendas

### August/September

- Discuss how to teach safety to students
- Review the LCPS Science Safety Manual
- Resolve any school specific concerns
- Replace *Science Safety Equipment Testing Logs* in each Science Classroom

### October (begin the following)

- Write School Specific Chemical Hygiene Plan
- Conduct Science Chemical Inventory
- Conduct Room Safety Inspection

### November (complete the following and send to the LCPS Science Office by Nov 15)

- School Specific Chemical Hygiene Plan
- Science Chemical Inventory
- Room Safety Inspection Checklists
- LCPS Science Department Chair or SALT Science Safety Checklist (as cover page to above documents)

### December

- Review Biological Materials
- Review BSC training Materials (if applicable)
- Discuss VA Wildlife Laws
- Resolve any school specific concerns

### January

- Review Electrical Safety
- Resolve any school specific concerns
- Develop plan to complete science department equipment inventory

### February

- Review Field Trip Safety
- Resolve any school specific concerns
- Work on science department equipment inventory

### March

- Review Chemical Storage Guidelines
- Resolve any school specific concerns
- Work on science department equipment inventory

### April

- Review Waste Disposal
- Complete Waste Disposal Form, forward to LCPS Science Office
- Update science department equipment inventory

### May/June

- Discuss how to leave rooms for the summer (Safe, uncluttered, secure, storage of materials)
- Complete science department equipment inventory

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## Student Science Safety Rules and Regulations

Science is a hands-on laboratory class. You will be doing many laboratory activities, which require the use of potentially hazardous materials and equipment. Maintain a positive attitude toward safety. Students should not fear doing experiments, using reagents, or equipment, but should respect them for potential hazards.

In my science class I will:

- Read written directions carefully before starting an activity.
- Follow all instructions given by the teacher.
- Properly protect my eyes, hands, body and clothing while participating in class activities.
- Know the location and use of all safety equipment in the classroom.
- Carry out good housekeeping practices.
- Conduct myself in a responsible manner at all times in the laboratory.
- Follow all other classroom rules and safety rules.

I, \_\_\_\_\_ (student's printed name) have received, read and agree to follow the science safety rules and procedures listed above. I further agree to abide by all written and verbal instructions given in class. I understand that I may ask my instructor at any time about rules and regulations that are not clear to me. I am aware that my failure to follow these science laboratory rules and regulations will subject me to possible disciplinary action.

\_\_\_\_\_  
**Student Signature**

\_\_\_\_\_  
**Date**

Dear Parent or Guardian:

Please read the list of safety rules above. Your signature on this form indicates that you have read this Student Science Safety Rules and Regulations, are aware of the measures taken to make the science laboratory safer, and will instruct your son/daughter to uphold his/her agreement to follow these rules and procedures in the laboratory.

\_\_\_\_\_  
**Parent Signature**

\_\_\_\_\_  
**Date**

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## Student Science Safety Rules and Regulations

Science is a hands-on laboratory class. You will be doing many laboratory activities, which require the use of potentially hazardous materials and equipment. Maintain a positive attitude toward safety. Students should not fear doing experiments, using reagents, or equipment, but should respect them for potential hazards.

1. Know the location of safety and first aid equipment.
2. Wear safety goggles whenever you use heat, chemicals, solutions, glassware or other dangerous materials.
3. Do not touch materials or equipment until instructed to do so by your teacher.
4. Do not engage in horseplay or other acts of carelessness.
5. Dispose of wastes properly  
Do not put matches in the sink  
Put broken glassware in proper containers
6. Never eat, drink or chew gum in the laboratory.
7. Never drink from the laboratory glassware.
8. Notify the teacher when you observe hazardous conditions in the classroom
9. Examine equipment for malfunction, cracks, or other defects before beginning.
10. Report all accidents to your teacher immediately.
11. Know the possible hazards of a lab experiment before conducting it.
12. Never reach over a flame or a heat source.  
Keep hair and clothing away from flames.
13. Use flammable chemicals only after ensuring that there are no flames anywhere in the lab.
14. Perform only authorized and approved experiments.
15. Follow instructions both verbal and written from your teacher.
16. If you do not understand a procedure, ask your teacher to explain.
17. Prepare for an experiment by reading the directions before coming to the lab.
18. Set up equipment away from table edges to avoid dropping it on the floor.
19. Read all labels twice before using.
20. Never return reagents to the stock bottle.
21. Never mix chemicals together unless the instructions indicate for you to do so.
22. Never taste chemicals.
23. Always add acid to water when diluting acids.
24. Always clean your lab equipment and workspace after you finish a lab experiment or activity.
25. Wash hands after spills and at the end of each laboratory period.

I, \_\_\_\_\_ (student's printed name) have received, read and agree to follow the science safety rules and procedures listed above. I further agree to abide by all written and verbal instructions given in class. I understand that I may ask my instructor at any time about rules and regulations that are not clear to me. I am aware that my failure to follow these science laboratory rules and regulations will subject me to possible disciplinary action.

\_\_\_\_\_  
Student Signature

\_\_\_\_\_  
Date

Dear Parent or Guardian:

Please read the list of safety rules above. Your signature on this form indicates that you have read this Student Science Safety Rules and Regulations, are aware of the measures taken to make the science laboratory safer, and will instruct your son/daughter to uphold his/her agreement to follow these rules and procedures in the laboratory.

\_\_\_\_\_  
Parent Signature

\_\_\_\_\_  
Date

**Contrato de Seguridad en la Clase de Ciencias**

***Ciencias es una clase activa. Los alumnos estarán haciendo actividades de laboratorio, que requieren el uso de algunos tipos de materiales y equipos delicados. Se debe mantener una actitud alerta y positiva orientada a la seguridad. Los alumnos no deben tener temor de hacer los experimentos, de usar reactivos químicos, o equipos, pero deben respetarlos por los daños que estos puedan causar.***

1. Conozcan el lugar de los equipos de primeros auxilios.
2. Usen los lentes de seguridad cuando estén cerca de objetos calientes, usando productos químicos, solventes, vidrios y cualquier otro material peligroso.
3. No toquen material o equipo hasta que no reciban las instrucciones del/ la profesor/a.
4. No se involucren en juegos o cualquier otro tipo de acto que genere descuido.
5. Desechen la basura apropiadamente. No boten los fósforos en el lavadero. Pongan los vidrios rotos en el lugar adecuado designado por el profesor/a.
6. No coman, beban ni mastiquen chicle en el laboratorio.
7. Nunca beban líquidos contenidos en los recipientes del laboratorio.
8. Avisen a los profesores cuando observen algún tipo de peligro en el salón de clase.
9. Examinen el equipo antes de usarlo para constatar que funciona adecuadamente. Vean si están rotos, rasgados, o si tienen algún otro defecto antes de empezar.
10. Reporten cualquier accidente a los/las profesores/as inmediatamente cuando estos ocurren.
11. Infórmense de los posibles daños que pudieran ocurrir en el laboratorio antes de que empiece.
12. Nunca se recuesten o apoyen sobre una llama o una superficie caliente. Mantengan el cabello y la ropa lejos de las llamas.
13. Usen los químicos inflamables solamente después que se aseguren que no hay llamas en ningún lugar del laboratorio.
14. Realicen solamente laboratorios aprobados y autorizados por el/la profesor/a.
15. Sigan las instrucciones de los profesores/as tanto verbales como escritas.
16. Si no entienden el procedimiento hagan las preguntas necesarias a los profesores/as para que les expliquen mejor.
17. Prepárense para el experimento de mejor manera leyendo las indicaciones antes de venir al laboratorio.
18. Mantengan el equipo lejos de los bordes de las mesas para evitar que estos caigan al suelo.
19. Lean las etiquetas de los productos dos veces antes de usarlos.
20. Nunca viertan los reactivos químicos ya utilizados a los envases originales.
21. Nunca mezclen sustancias químicas a menos que las indicaciones del experimento lo indiquen.
22. Nunca prueben las sustancias químicas.
23. Agreguen siempre el ácido al agua cuando diluyan ácidos.
24. Siempre limpien su equipo del laboratorio y el lugar donde trabajan o realizan la actividad.
25. Lávense las manos después del experimento o actividad y al final de cada período en el laboratorio.

**Yo,**

**( nombre del alumno en esta línea)**

**He recibido y leído estas reglas y estoy dispuesto a seguir los procedimientos aquí establecidos en la lista anterior. Me comprometo a seguir todas las indicaciones escritas y verbales que sean impartidas en la clase. Estoy alerta/a de que en caso de violar las reglas de este contrato seré sujeto a una acción disciplinaria.**

**Firma del alumno**

**Fecha**

**Estimado padre o tutor:**

**Por favor lea las reglas establecidas en este contrato. Con su firma usted nos esta asegurando que las ha leído y que está al corriente de las medidas tomadas para que su hijo/a trabaje en un entorno seguro en los laboratorios de ciencias. Estamos seguros que usted aconsejará a su hijo/a a mantener fielmente las reglas y a seguirlas durante los procedimientos en los laboratorios.**

**Firma del alumno**

**Fecha**



## Student Science Safety Rules and Regulations

Science is a hands-on laboratory class. You will be doing many laboratory activities, which require the use of potentially hazardous materials and equipment. A positive attitude toward safety is imperative. Students should not fear doing experiments, using reagents, or equipment, but should respect them for potential hazards.

Safety in the science classroom is the highest priority for students, teachers, and parents. To ensure a safe science classroom, the following set of rules has been determined for LCPS Science Classrooms. These rules must be followed at all times.

### General Guidelines

1. Conduct yourself in a responsible manner at all times in the laboratory.
2. Follow all written and verbal instructions. If you do not understand a direction or part of a procedure, ask your teacher for help before proceeding.
3. Never work alone. No student may work in the laboratory without a teacher present.
4. Do not touch any equipment, chemicals, or other materials in the laboratory area until you are instructed to do so.
5. Do not eat food, drink beverages, or chew gum in the laboratory. Do not use laboratory glassware as containers for food or beverages.
6. Perform only those experiments authorized by your teacher. Never do anything in the laboratory that is not in the laboratory procedure or is authorized by your teacher. Carefully follow all instructions.
7. Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory. Horseplay, practical jokes, and pranks are dangerous and prohibited.
8. Observe good housekeeping practices. Work areas should be kept clean and tidy at all times. Bring only your laboratory instructions, worksheets, and/or reports to the work area. Other materials (books, purses, backpacks, etc.) should be stored in the classroom area.
9. Keep aisles clear. Push your chair under the desk when not in use.
10. Know the locations and operating procedures of all safety equipment including the first aid kit, eyewash station, safety shower, fire extinguisher, and fire blanket. Know where the fire alarm and the exits are located.
11. Always work in a well-ventilated area. Use the fume hood when working with volatile substances or poisonous vapors. Never place your head into the fume hood.
12. Be alert and proceed with caution at all times in the laboratory. Notify the teacher immediately of any unsafe conditions you observe.
13. Dispose of all chemical waste properly. Never mix chemicals in sink drains. Sinks are to be used only for water and those solutions designated by the teacher. Solid chemicals, metals, matches, filter paper, and all other insoluble materials are to be disposed of in the proper waste containers, not in the sink. Check the label of all waste containers twice before adding your chemical waste to the container.

14. Labels and equipment instructions must be read carefully before use. Set up and use the apparatus as directed in the lab instructions or by your teacher.

15. Keep hands away from face, eyes, mouth and body while using chemicals or preserved specimens. Wash your hands with soap and water after performing all experiments. Clean (with soap), rinse, and wipe dry all work surfaces (including the sink) and apparatus at the end of the experiment. Return all equipment clean and in working order to the proper storage area.

16. Experiments must be personally monitored at all times. You will be assigned a laboratory station at which to work. Do not wander around the room, distract other students, or interfere with the laboratory experiments of others.

17. Students are never permitted in the science storage rooms or preparation areas unless given specific permission by their teacher.

18. Know what to do if there is a fire drill during a laboratory period; containers must be closed, gas valves turned off, fume hoods turned off, and any electrical equipment turned off.

19. Handle all living organisms used in a laboratory activity in a humane manner. Preserved biological materials are to be treated with respect and disposed of properly.

20. When using knives and other sharp instruments, always carry with tips and points pointing down and away. Always cut away from your body. Never try to catch falling sharp instruments. Grasp sharp instruments only by the handles.

### Clothing

21. Any time chemicals, heat, or glassware are used, students will wear laboratory goggles.

22. Notify your teacher if you wear contact lenses.

23. Dress properly during a laboratory activity. Long hair must be tied back and dangling jewelry and loose or baggy clothing must be secured. Shoes must completely cover the foot.

### Accidents and Injuries

24. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the teacher immediately, no matter how trivial it may appear.

25. If you or your lab partner is hurt, immediately alert your teacher.

26. If a chemical should splash in your eye(s) or on your skin, immediately flush with running water from the

eyewash station or safety shower for at least 15 minutes. Notify the teacher immediately.

27. Report any broken laboratory equipment to the teacher immediately.

### Handling Chemicals

28. All chemicals in the laboratory are to be considered dangerous. Do not touch, taste, or smell any chemicals unless specifically instructed to do so.

29. Check the label on chemical bottles twice before removing any of the contents. Take only as much chemical as you need.

30. Never return unused chemicals to their original containers.

31. Never use mouth suction to fill a pipet. Use a rubber bulb or pipet pump.

32. When transferring reagents from one container to another, hold the containers away from your body.

33. Acids must be handled with extreme care. You will be shown the proper method for diluting acids. Always add acid to water, swirl or stir the solution and be careful of the heat produced, particularly with sulfuric acid.

34. Handle flammable hazardous liquids over a pan to contain spills. Never dispense flammable liquids anywhere near an open flame or source of heat.

35. Never remove chemicals or other materials from the laboratory area.

36. Take great care when transferring acids and other chemicals from one part of the laboratory to another. Hold them securely and walk carefully.

### Handling Glassware and Equipment

37. Carry glass tubing, especially long pieces, in a vertical position to minimize the likelihood of breakage and injury.

38. Never handle broken glass with your bare hands. Use a brush and dustpan to clean up broken glass. Place broken or waste glassware in the designated glass disposal container.

39. Inserting and removing glass tubing from rubber stoppers can be dangerous. Always lubricate glassware (tubing, thistle tubes, thermometers, etc.) before attempting to insert it in a stopper.

40. When removing an electrical plug from its socket, grasp the plug, not the electrical cord. Hands must be completely dry before touching an electrical switch, plug, or outlet.

41. Examine glassware before each use. Never use chipped or cracked glassware. Never use dirty glassware.

42. Report damaged electrical equipment immediately. Look for things such as frayed cords, exposed wires, and

loose connections. Do not use damaged electrical equipment.

43. If you do not understand how to use a piece of equipment, ask the teacher for help.

44. Do not immerse hot glassware in cold water; it may shatter.

### Heating Substances

45. Exercise extreme caution when using a gas burner. Take care that hair, clothing and hands are a safe distance from the flame at all times. Do not put any substance into the flame unless specifically instructed to do so. Never reach over an exposed flame. Light burners only as instructed by the teacher.

46. Never leave a lit burner unattended. Never leave anything that is being heated or is visibly reacting unattended. Always turn the burner or hot plate off when not in use.

47. You will be instructed in the proper method of heating and boiling liquids in test tubes. Do not point the open end of a test tube being heated at yourself or anyone else.

48. Heated metals and glass remain very hot for a long time. They should be set aside to cool and picked up with caution. Use tongs or heat-protective gloves if necessary.

49. Never look into a container that is being heated.

50. Do not place hot apparatus directly on the laboratory desk. Always use an insulating pad. Allow plenty of time for the hot apparatus to cool before touching it. Determine if an object is hot by bringing the back of your hand close to it prior to grasping it.

I, \_\_\_\_\_ (student's printed name) have received, read and agree to follow the science safety rules and procedures listed above. I further agree to abide by all written and verbal instructions given in class. I understand that I may ask my instructor at any time about rules and regulations that are not clear to me. I am aware that my failure to follow these science laboratory rules and regulations will subject me to possible disciplinary action.

Student Signature \_\_\_\_\_ Date \_\_\_\_\_

Dear Parent or Guardian:

Please read the list of safety rules above. Your signature on this form indicates that you have read this Student Science Safety Rules and Regulations, are aware of the measures taken to make the science laboratory safer, and will instruct your son/daughter to uphold his/her agreement to follow these rules and procedures in the laboratory.

Parent/Guardian Signature \_\_\_\_\_ Date \_\_\_\_\_

## Student Science Safety Acknowledgement Form for Working with Microorganisms

The laboratory can be a hazardous place. It is therefore critical and an expectation that students adhere to the following specific protocols and standards to help make it a safer place to work and learn. Students who are immune compromised or pregnant are advised to let the teacher know in confidentiality, should alternative activities be required to insure health and safety. Culturing and use of live bacteria is not recommended at the elementary/middle schools and introductory level high school science courses.

1. Eating, drinking, and the application of cosmetics are strictly prohibited in the laboratory. Food must not be stored in a refrigerator with microorganisms.
1. Open toed shoes are not permitted; e.g. sandals, flip-flops.
2. All personal belongings (books, purses, backpacks) must be removed from the work surface.
3. Tie back long hair.
4. Keep hands away from the face at all times.
5. Cover all cuts, broken skin, or wounds to reduce or prevent exposure.
6. Gloves and indirectly vented chemical splash goggles must be worn whenever students are working with microorganisms.
7. If gloves become soiled, change immediately, following the proper protocol.
8. Always wash hands with soap and water after removing gloves.
9. DO NOT put pencils or pens in the mouth while working with microorganisms.
10. Cover and protect exposed wounds.
11. Laboratory coats or aprons must be worn.
12. Locate all fire extinguishers in the microbiology laboratory and know how to use them if allowed.
13. Know the location of the eyewash station and how to operate it.
14. Disinfect the work space before and after each investigation. First apply a green cleaner and the use 70% alcohol or 10% bleach solution to disinfect. Leave on the surface for appropriate contact time of approximately 10-15 minutes (check recommended manufacturer's contact time).
15. Handle all bacterial cultures with CAUTION!!
16. Use a pipetting device, never pipette by mouth.
17. Notify the instructor immediately if a culture has been spilled.
18. Place all materials in the appropriately labeled disposal containers upon completion of the laboratory investigation.
19. Cultures must never leave the laboratory workspace.
20. If there is a fire drill, turn off all flames and electrical equipment, if possible, and exit in an orderly fashion.

Parents and students should sign as indicated below before starting the activity. I have read and agree to follow the above safety guidelines. I agree to report any accident or injury to the instructor immediately. I will never use any equipment or supplies without obtaining permission from the instructor.

\_\_\_\_\_  
Print Student Name                      Student Signature                      Date

I have read and reviewed the above guidelines with my child.

\_\_\_\_\_  
Print Parent Name                      Parent Signature                      Date

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Loudoun County Public Schools

# Chemical Hygiene Plan

Secondary School  
Science Laboratories and Classrooms

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(School Name)

# **Loudoun County Public Schools**

## **Chemical Hygiene Plan**

### **Secondary School Science Laboratories and Classrooms**

#### **Overview**

As a companion to *Loudoun County Public Schools Science Safety Manual for Secondary Schools* and to ensure compliance with OSHA Laboratory Standard, each secondary school will develop a site specific Chemical Hygiene Plan. The objective of the plan is to protect employees and students from being overexposed to hazardous laboratory chemicals or conditions.

In compliance with the Federal Laboratory Standard \_\_\_\_\_ **(School Name)** realizes our responsibility for the protection of our employees. We hereby institute the enclosed Chemical Hygiene Plan to assist us in our safety program.

We realize that the success or lack of success of our Chemical Hygiene Plan rests with all of our employees.

\_\_\_\_\_  
**(Name of Science SALT/Chair)**

\_\_\_\_\_  
**(Name of Safety Contact Teacher)**

\_\_\_\_\_  
**(Name of the School Principal)**

\_\_\_\_\_  
**(Principal Signature)**

\_\_\_\_\_  
**(Date)**

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## I. Standard Operating Procedures

### A) General Employee Rules and Procedures

1. Never work alone in a laboratory, chemical storage or prep area.
2. Wear appropriate eye protection in the laboratory at all times. Chemical splash goggles must be worn any time chemicals, glassware or heat are used in the laboratory.
3. When working with flammable chemicals, be certain that there are no sources of ignition nearby to cause a fire or explosion in the event of a vapor release or liquid spill.
4. For the chemicals they are working with, all employees should know and constantly be aware of:
  - The chemical hazards as determined from the MSDS/SDS and other appropriate references.
  - The location and proper use of emergency equipment.
  - Appropriate safeguards for using a chemical, including personal protective equipment.
  - How and where to properly store the chemical when it is not in use.
  - Proper personal hygiene practices.
  - The proper methods of transporting chemicals within the facility.
  - Appropriate procedures for emergencies, including evacuation routes, spill cleanup procedures and proper waste disposal.
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## B) General Laboratory Rules and Procedures

1. Create a written first aid policy; whether it says to treat, contact the school nurse or call a physician.  

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2. Post emergency telephone numbers in the chemical storage areas. Have a telephone or some means of emergency communication in the laboratory, chemical storage area and/or prep area.
3. In the event of an accident, respond to email as requested through the LCPS Incident Management System (IMS). Describe the event in detail.
4. Conduct an inventory of all chemicals being used and/or stored in each laboratory by November 15. The inventory will be kept on file in the department. (Where?)  

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5. A file of Safety Data Sheets (SDS/MSDS) for each hazardous chemical in the department should be assembled. When a new chemical arrives in the building, the SDS/MSDS should be copied. One copy is kept in the science department and the other copy is kept on file in the main office. The file is available at all times for employees to review.  
(Where is the SDS/MSDS in the Science Department?)  

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(Where is the SDS/MSDS in the Main Office?)  

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6. The *LCPS Science Safety Manual* and the school specific *Chemical Hygiene Plan* must be available to all employees.
7. Do not block fire exits.
8. Have an alternative evacuation route in the event your primary route becomes blocked.
9. Practice the emergency plan.
10. Written records are kept of the training outline and format and a list of employees receiving the training is on file in the department. These sessions will be conducted during monthly department meetings.
11. 

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### **C) Personal Hygiene Guidelines**

17. Wash promptly whenever a chemical has come in contact with the skin.
18. Avoid inhalation of chemicals; do not "sniff" to test chemicals.
19. Do not use mouth suction to pipet anything; use suction bulbs.
20. Wash hands well with soap and water before leaving the laboratory; do not wash with solvents.
21. Do not drink, eat, or apply cosmetics in the laboratory.
22. Do not bring food, beverages, or cosmetic products into chemical storage or use areas.
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### **D) Protective Clothing Requirements**

1. Eye protection must be worn. Chemical splash goggles must meet the requirements of the American National Standards Institute (ANSI) Z87.1 standard. Also wear a face shield, large enough to protect the chin, neck, and ears, as well as the face, in situations where large quantities of chemicals may cause splashing, or where reactions may splash.

2. When working with corrosive liquids, wear gloves made of a material known to be resistant to permeation by the corrosive chemical.
3. Laboratory coats or ankle-length rubberized aprons over normal clothing will offer protection against spills. Shorts should be discouraged.
4. Always wear low-heeled shoes with fully covering uppers; shoes with open toes are not recommended.
5. Whenever exposure by inhalation is likely to exceed the threshold limits described in an MSDS/SDS, use a fume hood.
6. Carefully inspect all protective equipment before using. Do not use defective protective equipment.
7. Never block access to emergency exits or equipment.
8. Clean up spills properly and promptly.
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### **E) Housekeeping Rules**

1. Access to emergency equipment, showers, eyewashes, and exits should never be blocked by anything, not even a temporarily parked chemical cart.
2. All chemical containers must be labeled with the identity of the contents and any known hazards those contents present to users.

3. Keep all work areas, especially laboratory benches, clear of clutter.
4. Keep all aisles, hallways, and stairs clear of all chemicals.
5. All chemicals should be placed in their assigned storage areas at the end of each workday. At the end of each workday, the contents of all unlabeled containers should be labeled.
6. Waste should be properly labeled and kept in the proper containers.
7. Promptly clean up all spills; properly dispose of the spilled chemical and cleanup materials.
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#### **F) Spill and Accident Procedures**

1. Notify – Call for help. Evacuate – Get everyone to a safe location. Assemble – Organize students and staff. Report – Fill out a detailed accident report after the emergency is over.
2. Clean up spills immediately and thoroughly. Follow approved spill cleanup procedures. Spills should only be cleaned by trained personnel.
3. Neutralizer for both acid and base spills should be available in the event of a chemical spill.
4. Powdered sodium bicarbonate (baking soda) should be on hand for acid spills.

5. Commercial absorbents or spill kits, small particles of clay absorbents (kitty litter or vermiculite) should be available to contain spills.
6. Mercury spills kits are available in each middle and high school. (Mercury and mercury containing apparatus are prohibited in all LCPS science labs. The spill kit is available in the event that mercury is brought into the school by a student.)  
Record the **expiration date** of the mercury spill kit. Check the date of the mercury spill kit materials. The Mercury Spill Kit must be replaced every 3 years.  
**Where is the mercury spill kit stored?**

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### **G) Chemical Storage Rules and Procedures**

1. Keep an updated inventory of all chemicals, amounts, locations and date received in the building. When the annual inventory is conducted stored chemicals should be examined for deterioration, corrosion, etc.
2. Label all chemical solutions you make with the identity of the contents, date, concentration, hazard information and your name.
3. The storage area for chemicals should be separate and secure from students.
4. Do not store or use any chemicals on the *List of Prohibited Chemicals* (page 29-34 of *LCPS Science Safety Manual*).
5. Store only the minimum amount of chemicals needed. Refer to limitations listed in Materials Allowed in LCPS in Limited Quantities (page 35 of *LCPS Science Safety Manual*).

6. Store acids in a dedicated acid cabinet. Store nitric acid in that same cabinet only if isolated from the other acids. Store both inorganic and some organic acids in the acid cabinet.
7. Store flammables in a dedicated flammables cabinet.
8. Store corrosives in a dedicated corrosives cabinet.
9. Store severe poisons in a locked poisons cabinet.
10. Avoid chemical storage (even temporary) on the floor.
11. Avoid storage of chemicals on top shelves.
12. Avoid storage of chemicals above eye level.
13. Make sure shelf assemblies are firmly secured to walls. Avoid island shelf assemblies. Ideally, shelving assemblies would be of wood construction. Avoid metal adjustable shelf supports and clips.
14. High Schools should follow the Flinn© Storage Plan outlined on pages 42-44 of *LCPS Science Safety Manual*.
15. Middle Schools should follow the Sargent Welch© Storage Plan outlined on page 45-46 of *LCPS Science Safety Manual*.
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### **1) Compressed Gas Handling Instructions**

1. Gas cylinders must be secured in place. They must be protected to prevent damage, which may be caused by falling.

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### **2) Flammable Chemical Handling Instructions**

1. Store all flammables in a dedicated flammables cabinet
2. Store away from sources of ignition.
3. Store away from oxidizers.

4. Never store flammables in commercial refrigerators.
5. Avoid storing any chemicals, especially flammable materials in direct sunlight.
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### **3) Corrosive Material Handling Instructions**

1. Store corrosives in a dedicated corrosives cabinet. Store acids in a dedicated acid cabinet.
2. If possible, keep acids and bases in the original shipping package, e.g. in the special Styrofoam cubes.
3. Always wear appropriate eyewear. Wear a chemical splash face shield when handling corrosive materials.
4. Every three months inspect the shelf clips in your acid cabinet for possible corrosion.
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### **H) Procedure – Specific Safety Rules and Guidelines (for extremely hazardous chemicals)**

The MSDS/SDS for many of the chemicals used in the laboratory will state recommended limits or OSHA mandated limits, or both as guidelines for exposure. Typically limits are Threshold Limit Values (TLV), Permissible Exposure Limits (PEL), and action levels. When such limits are stated, they will be used to assist the staff in determining the safety precautions, control measures and safety apparel that apply when working with toxic chemicals.

1. Use a fume hood when the permissible exposure limit for a chemical is less than 50 ppm as indicated on the MSDS/SDS.
2. Handle toxic, corrosive, flammable and noxious chemicals under a fume hood.



3. Do not expose flammable liquids to open flame, sparks, heat or any source of ignition.
4. Water reactive solids (sodium metal) should be stored under dry oil. **Sodium is prohibited in middle schools.**
5. Use extreme caution when handling finely divided (dust-like) material. Finely divided materials may form explosive mixtures with air.
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#### **I) Prior Approval Required Procedures**

There may be some procedures which require prior approval before an instructor attempts to perform them. Such as when an unfamiliar laboratory procedure or test is to be carried out. These procedures must be determined by cooperation and communication between the Science Department and the Science Chair or SALT.

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#### **J) Safety Equipment Inspections**

1. All safety equipment must always be in good operating condition.
2. Each instructor must complete the *LCPS Science Room Safety Inspection Checklist* before November 15 of each school year.

3. Goggles always must be clean and functional.
4. Fire extinguishers must be of the right type, Tri-Class ABC, and they must always be properly inspected.
5. Eyewashes must be functional and flushed at least once a week and filters checked monthly.
6. Fume hoods must be operational at the level of 70 – 120 linear feet per minute.
7. The Safety Shower and all other safety equipment should be inspected every three months. Defective equipment must be reported and repaired immediately. Records of testing should be kept.
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## II. Employee Training

Loudoun County Public Schools and \_\_\_\_\_ (**School Name**) provides ongoing training sessions for our instructors. The Science Office provides Science Safety professional development for all LCPS science teachers in August. The Science Department of \_\_\_\_\_ (**School Name**) has monthly staff meetings, part of which is dedicated to discussion of safety related issues. Training for staff includes:

1. Content and location of this Chemical Hygiene Plan.
2. Potential hazards involved in using chemicals.
3. Location and availability of chemical Material Safety Data Sheets (MSDS/SDS).
4. The proper use and location of all safety equipment.
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### **III. Exposure Evaluations**

It is the policy of \_\_\_\_\_ (School Name) to investigate all suspected overexposures to chemicals in a prompt and timely fashion.

In the event of an overexposure, after the immediate event, we must document all chemicals and circumstances involved in the overexposure. This information should be reported to the Science Chair or SALT and used to change safety practices to further improve lab safety. It is our obligation to maintain these files and make them accessible to the employees.

Signs of overexposure may include:

1. Accidental breakage of a hazardous material container.
2. A skin rash or irritation occurring because of contact with a chemical.
3. Caustic splash to eyes, face or body.
4. Symptoms such as nausea, dizziness and others.

### **IV. Medical Evaluations**

It is the policy of LCPS and \_\_\_\_\_ (School Name) to make medical consultation and examinations available to our employees when:

- Any sign or symptom of an overexposure to a chemical is present.
- Monitoring has indicated an overexposure to a chemical has occurred.
- There has been a spill or uncontrolled release of chemical fumes.

All incidents of overexposure shall be reported immediately to the teacher's supervisor and to the LCPS Risk Management Division. A Workers' Compensation First Report of Accident report shall be filed with the Risk Management Division as soon as possible.

We will provide the physician with the names of the chemicals used, circumstances of exposure and the signs and symptoms of the exposure.

The medical examinations dealing with the overexposure must be documented and other employees working under the same conditions must be notified. All documentation must be kept on file and accessible by other employees working in this area.

All medical examinations and consultations shall be performed by or under the direct supervision of a licensed LCPS Preferred Panel Physician and shall be provided without cost to the employee, without loss of pay per LCPS workers' compensation and personnel policies.

### **V. Monitoring**

Monitoring will be necessary for substances regulated by a standard only if there is reason to believe that exposure levels for that substance routinely exceed the Permissible Exposure Limits (PEL) for that substance. If you have no cause to suspect a hazard or an exposure, no monitoring is necessary.

If monitoring is performed and this initial monitoring shows no evidence of exposure, the monitoring may be discontinued. If initial monitoring indicated an exposure, steps must be taken to immediately reduce the exposure to permissible limits. Monitoring must be performed periodically to verify that the steps to reduce the exposure have been effective. Monitoring may be terminated after complying with the applicable standard for the hazardous material.

All monitoring results and activities shall be fully accessible and in full knowledge of the employee(s).

## **VI. Emergency Evacuation Plan**

Every LCPS school has a specific Emergency Response Plan. Once it has been determined evacuation is necessary, proceed in an orderly fashion as you would in a fire drill evacuation. Send everyone to a pre-designated area and then count heads to make sure that everyone is out of the building.

Attach a copy of your school's floor plan indicating evacuation routes. Make sure that all teachers, staff and students are aware of evacuation procedures and routes.