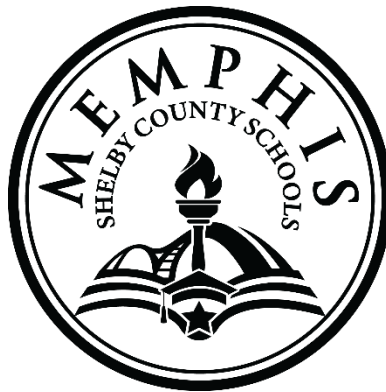


School Laboratory Safety Program



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Responsibility

The laboratory safety program is the responsibility of school system administrators. The [Tennessee Code § 49-50-501 \(2021\)](#) along with OSHA's 29 CFR [1910.1450 - Occupational exposure to hazardous chemicals in laboratories](#) standard set forth requirements to protect students and teachers in a laboratory setting at schools.

It is the responsibility of each science lab teacher/instructor must submit a curriculum or plan to their principle for each school year detailing what experiments and chemicals will be used for the school year.

(TN Code Annotated) TCA § 49-50-501 - All students, teachers and others in attendance at the following courses or laboratories in schools, colleges or universities, and exposed to the risks incident to working with the materials, equipment or performing the acts described in subdivisions (a)(1) and (2), shall wear eye protective devices of industrial quality:

Career and technical education courses or laboratories using or concerned with:

Hot molten metals; Milling, sawing, turning, shaping, cutting, grinding or stamping of any solid materials; Heat treatment, tempering or kiln firing of any metal or other materials; Gas or electric arc welding; Repair or servicing of any vehicle; or Caustic or explosive materials; and

Chemical or combined chemical-physical laboratories using caustic or explosive chemicals or hot liquids or solids.

Eye protective devices shall be considered of industrial quality when they meet the standards of the American Standards Association Safety Code for Head, Eye, and Respiratory Protection promulgated by the American Standards Association, Inc., or other standards generally recognized by industry.

I. Upkeep of Laboratory and Equipment

Conduct regular (**weekly**) inspections of safety and first aid equipment as often as requested by the administration. Record the inspection date and the inspector's initials on the attached equipment inspection tag or affixed label. Notify the administration in writing if a hazardous or possibly hazardous condition (e.g., malfunctioning safety equipment or chemical hazard) is identified in the laboratory and follow through on the status. Never use defective equipment.

Chemical Inventory List:

The school district maintains a Chemical Inventory Master List for all schools with science lab programs. A separate list for each of the following schools will be maintained due to the complexities of the inventory list. These schools are as follows:

- Overton High School
- Bolton High School
- Cordova High School

All chemicals inventoried at the associated schools are required to be easily identified with a label.

Safety Data Sheets:

All associated schools will keep an accurate Safety Data Sheet (SDS) list of chemicals inventoried at their school.

II. Personal Protective Equipment (PPE)

The following PPE is required for all teachers, staff, students, and anyone using the Science Lab.

- Chemical splash goggles
- Face shields
- Lab coats or Lab apron
- Gloves (selected based on the material being handled and the particular hazard involved)

Safety and Emergency Equipment:

- Fire Extinguisher (dry chem and carbon dioxide extinguishers only)
- First Aid kits
- Spill control kits

- Laboratory chemical hood (60-100 ft/minute capture velocity, vented to the outside)
- Safety Data Sheets
- Container for broken glass or sharps
- Fire detection or alarm system with pull stations
- Hands free Eyewash Station (must conform to ANSI Z358.1-2004 (see below)
- Decon/Safety Shower (must conform to ANSI Z358.1-2004 (see below)

III. Safety and Emergency Procedures

Educate students on the location and use of all safety and emergency equipment prior to laboratory activity. Identify safety procedures to follow in the event of an emergency/accident. Provide students with verbal and written safety procedures to follow in the event of an emergency/accident.

Know the location of and how to use the cut-off switches and valves for the water, gas, and electricity in the laboratory.

Know the location of and how to use the following:

- decon/safety shower
- eyewash station
- first-aid kit
- fire extinguishers
- mercury spill kits

Keep a list of emergency phone numbers near the phone.

Conduct appropriate safety and evacuation drills on a monthly basis. Explain in detail to students the consequences of violating safety rules and procedures.

See [Appendix C](#) for spill cleanup procedures.

Eyewash Station Requirements:

Eyewash stations are essential safety devices in workplaces where eye injuries may occur. All schools with science labs within the district **must** have an eyewash station for immediate use. They must meet specific requirements to ensure proper function and effectiveness.

ANSI/ISEA Z358.1-2014 Standard:

The American National Standards Institute (ANSI) and the International Safety Equipment Association (ISEA) have established the standard for eyewash stations, ANSI/ISEA Z358.1-2014. This standard outlines the following requirements:

Location:

- Within 10 seconds of walking distance from the potential eye injury site.
- Easily accessible and free of obstructions.

Design and Construction:

- Two separate, adjustable spray heads delivering a steady stream of water.
- Water flow rate of at least 0.4 gallons per minute (GPM) at 30 pounds per square inch (PSI) for 15 minutes.
- Water temperature between 60- and 100-degrees Fahrenheit (16 and 38 degrees Celsius).
- Non-corrosive materials resistant to freezing.

Operation:

- Easy-to-use activation mechanism that requires no tools or special knowledge.
- Automatic shut-off after 15 minutes of use.

Maintenance:

- Regular inspection and maintenance according to manufacturer's instructions.
- Testing of water flow and pressure at least weekly.
- Replacement of parts as needed.

Additional Requirements:

- Signage clearly indicating the purpose and instructions for using the eyewash station.
- Emergency eyewash kits containing sterile eyewash solutions and first aid supplies may be provided.
- If the workplace is in a cold climate, the eyewash station must be protected from freezing.

Compliance:

Schools must ensure that their eyewash stations meet all applicable requirements. Failure to comply may result in fines, legal liability, and potential injuries.

IV. Maintenance of Chemicals

Perform regular inventory inspections of chemicals.

Update the chemical inventory list at least annually, or as requested by the administration. Provide a copy of the chemical inventory to the local emergency responders (i.e., fire department).

Do not store food and drink with any chemicals.

If possible, keep all chemicals in their original containers. Make sure all chemicals and reagents are labeled. Do not store chemicals on the lab bench, on the floor, or in the laboratory chemical hood. Ensure chemicals not in use are stored in a locked facility with limited access. Know the storage, handling, and disposal requirements for each chemical used. Make certain that chemicals are disposed of properly.

Consult the label and the Safety Data Sheet for disposal information and always follow appropriate chemical disposal regulations.

V. Preparing for Laboratory Activities

Before each activity in the laboratory, weigh the potential risk factors against the educational value. Understand all the potential hazards of the materials, the process, and the equipment involved in every laboratory activity. Inspect all equipment/apparatus in the laboratory before use. Before entering the laboratory, instruct students on all laboratory procedures that will be conducted. Discuss all safety concerns and potential hazards related to the laboratory work that students will be performing before starting the work. Document in lesson plan book or handouts.

VI. Laboratory Conduct

Be a model for good safety conduct for students to follow.

Make sure students wear the appropriate personal protective equipment (i.e., chemical splash goggles, laboratory aprons or coats, and gloves). See [Appendix B](#) for student safety procedures.

Enforce all safety rules and procedures at all times.

Never leave students unsupervised in the laboratory.

Never allow unauthorized visitors to enter the laboratory.

Never allow students to take chemicals out of the laboratory.

Never permit smoking, food, beverages, or gum in the laboratory.

VII. General Rules for Chemical Storage

Store chemicals inside a closeable cabinet or on a sturdy shelf with a front-edge lip to prevent accidents and chemical spills; a ¾-inch front edge lip is recommended.

Secure shelving to the wall or floor.

Ensure that all storage areas have doors with locks.

Keep chemical storage areas off limits to all students.

Ventilate storage areas adequately.

Organize chemicals first by COMPATIBILITY—not alphabetic succession (see the Inorganic/Organic table on the following page).

Store alphabetically within compatible groups.

Store acids in a dedicated acid cabinet.

Nitric acid should be stored alone unless the cabinet provides a separate compartment for nitric acid storage.

Store highly toxic chemicals in a dedicated, lockable poison cabinet that has been labeled with a highly visible sign. [See Appendix A](#) for restricted chemicals.

Store volatile and odoriferous chemicals in a ventilated cabinet.

Store flammables in an approved flammable liquid storage cabinet.

Store water sensitive chemicals in a water-tight cabinet in a cool and dry location segregated from all other chemicals in the laboratory.

See the following table for storage pairings:

Inorganics	Organics
1. Metals, Hydrides	1. Acids, Anhydrides, Peracids
2. Halides, Halogens, Phosphates, Sulfates, Sulfites, Thiosulfates	2. Alcohols, Amides, Amines, Glycols, Imides, Imines
3. Amides, Azides*, Nitrates* (except Ammonium nitrate), Nitrites*, Nitric acid	3. Aldehydes, Esters, Hydrocarbons
4. Carbon, Carbonates, Hydroxides, Oxides, Silicates	4. Ethers*, Ethylene oxide, Halogenated hydrocarbons, Ketenes, Ketones
5. Carbides, Nitrides, Phosphides, Selenides, Sulfides	5. Epoxy compounds, Isocyanates
6. Chlorates, Chlorites, Hydrogen Peroxide*, Hypochlorites, Perchlorates*, Perchloric acid*, Peroxides	6. Azides*, Hydroperoxides, Peroxides
7. Arsenates, Cyanates, Cyanides	7. Nitriles, Polysulfides, Sulfides, Sulfoxides
8. Borates, Chromates, Manganates, Permanganates	8. Cresols, Phenols
9. Acids (except Nitric acid)	
10. Arsenic, Phosphorous*, Phosphorous Pentoxide*, Sulfur	

*Chemicals deserving special attention because of their potential instability.

Do not place heavy materials, liquid chemicals, and large containers on high shelves.

Do not store chemicals on tops of cabinets.

Do not store chemicals on the floor, even temporarily.

Do not store items on bench tops and in laboratory chemical hoods, except when in use.

Do not store chemicals on shelves above eye level.

Do not store chemicals with food and drink.

Do not store chemicals in personal staff refrigerators, even temporarily.

Do not expose stored chemicals to direct heat or sunlight, or highly variable temperatures.

Never use food containers for chemical storage. Make sure all containers are properly closed. After each use, carefully wipe down the outside of the container with a paper towel before returning it to the storage area. Properly dispose of the paper towel after use.

Compressed Gas Cylinder Storage:

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.

Identify a cylinder by its descriptor words NOT 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 cylinders by gas type, separating oxidizing gases from flammable gases by either 20 feet or a 30-minute firewall that is 5 feet high.

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 a temperature higher than 125 °F or below 50 °F.

Store empty cylinders separately from full cylinders.

VIII. Recordkeeping

All science lab teachers and building engineers are required to have ***initial*** training on Laboratory Safety. Organized records on this safety training of staff must be maintained for a minimum of 10 years. Records of all laboratory incidents must be turned into the school's principal as well as Risk Management.

Inspections of the eyewash station, decon/safety shower, first aid supplies, science lab, and chemicals must be completed ***monthly*** and ***documented***.

IX. Chemical Disposal Procedures

Any chemical discarded or intended to be discarded is chemical waste.

HAZARDOUS chemical waste as designated by the Environmental Protection Agency (EPA) or OSHA is waste that presents a danger to human health and/or the environment.

According to EPA regulations, there are four characteristics that define a waste as hazardous:

- Ignitability
- Corrosivity
- Reactivity
- Toxicity

Store all waste in containers that are in good condition and are compatible with their contents.

Clearly and permanently label each container as to its contents and label as hazardous waste.

Store waste in a designated area away from normal laboratory operations and to prevent unauthorized access. Document date of hazardous accumulations and contact EHS.

Store waste bottles away from sinks and floor drains.

Do not completely fill waste bottles; leave several inches of space at the top of each waste container. Cap all waste bottles.

Do not pour chemicals down the drain (unless authorized by local sewer authority).

Do not treat hazardous waste on-site.

Contact the Environmental Health & Safety (EHS) dept to ensure appropriate disposal.

APPENDIX A

Hazardous Substances

Per the CDC, these chemicals should be removed from the schools if alternatives can be used. For those that must be retained, amounts should be kept to a minimum. These are appropriate for advanced-level High School classes only.

Chemical	CAS Number	Hazard
Acetamide	60-35-5	Combustible solid
Aluminum chloride	7446-70-0	Water reactive, corrosive
Ammonium bichromate	7789-09-5	Oxidizer, corrosive, known human carcinogen
Ammonium oxalate	1113-38-8	May be fatal if inhaled or ingested
Ammonium vanadate	7803-55-6	May be fatal if inhaled or ingested
Antimony	7440-36-0	May be fatal if inhaled, irritant
Antimony oxide	1309-64-4	Irritant
Antimony potassium tartrate	11071-15-1	Irritant
Barium chloride	10361-37-2	May be fatal if ingested, irritant
Benzene (phenylbutazone)	50-33-9	Irritant
Beryllium carbonate	66104-24-3	Irritant
Bromine	7726-95-6	Oxidizer, corrosive, may be fatal if inhaled or ingested
Cadmium and cadmium compounds	N/A	Known human carcinogen
Carmine	860-22-0	Irritant, burning may produce carbon monoxide, carbon dioxide, sulfur oxides, and nitrogen oxides.
Catechol	120-80-9	Corrosive
Chromic acid	7738-94-5	Oxidizer, known human carcinogen
Chromium acetate	1066-30-4	Irritant
Cobalt, metal	7440-48-4	Possible human carcinogen (IARC, Group 2B)
Cobalt nitrate	10141-05-6	Oxidizer, irritant
Cyclohexane	110-82-7	Flammable (NFPA 3) corrosive, forms peroxides
Dichloroindophenol (sodium salt)	620-45-1	Irritant
2,4-Dinitrophenol	51-28-5	Irritant

Chemical	CAS Number	Hazard
Ferrous Sulfate	7720-78-7	Irritant
Formaldehyde (formalin)	50-00-0	Flammable (NFPA = 3), reasonably anticipated human carcinogen
Fuchsin (acid/basic)	3244-88-0/ 632- 99-5	Irritant
Gasoline	8006-61-9	Flammable (NFPA 3)
Hematoxylin	517-28-2	Irritant
Hydrogen sulfide	7783-06-4	Corrosive
Hydroquinone	123-31-9	May be fatal if ingested
Isoamyl alcohol (isopentyl alcohol)	123-51-3	Irritant, combustible liquid and vapor
Isobutyl alcohol	78-83-1	Flammable (NFPA 3)
Magnesium chlorate	10326-21-3	Irritant
Methyl ethyl ketone	78-93-3	Irritant, flammable (NFPA 3)
Methyl oleate	112-62-9	Toxic properties not investigated
Nickel carbonate	3333-67-3	Reasonably anticipated human carcinogen
Nickelous acetate	373-02-4	Reasonably anticipated human carcinogen
Paradichlorobenzene	106-46-7	Irritant
Pentane	109-66-0	Irritant, flammable (NFPA 4)
Petroleum ether	8032-32-4	Flammable (NFPA 4)
1-Phenyl-2-Thiourea (Phenylthiocarbamide)	103-85-5	May be fatal if inhaled or ingested
Potassium chlorate	3811-04-9	Oxidizer
Potassium chromate	7789-00-6	Oxidizer, known human carcinogen
Potassium periodate	7790-21-8	Oxidizer
Potassium permanganate	7722-64-7	Oxidizer, corrosive
Salol (phenyl salicylate)	118-55-8	Irritant
Sodium bromate	7789-38-0	Oxidizer
Sodium chlorate	7775-09-9	Oxidizer
Sodium fluoride	7681-49-4	May be fatal if inhaled or ingested
Sodium oxalate	62-76-0	Corrosive, may be fatal if ingested
Sodium nitrate	7631-99-4	Oxidizer, irritant
Sodium silicofluoride	16893-85-9	Toxic
Sudan III	85-86-9	Decomposes to oxides of nitrogen
Sulfamethazine	57-68-1	Irritant

Chemical	CAS Number	Hazard
Toluene	108-88-3	Flammable (NFPA = 3), irritant, may be fatal if ingested
Trichloroethylene	79-01-6	Reasonably anticipated human carcinogen
Urethane	51-79-6	Combustible, reasonably anticipated human carcinogen
Xylenes	1330-20-7	Flammable (NFPA = 3), irritant, may be fatal if ingested

APPENDIX B

Student Safety Procedures & Conduct

All students should follow these procedures while conducting exercises and experiments in the science lab.

- Do not engage in practical jokes or animated conduct in the laboratory.
- Never run in the laboratory.
- The use of personal audio or video equipment is prohibited in the laboratory.
- The performance of unauthorized experiments is strictly forbidden.
- Do not sit on laboratory benches.

General Procedures

- Know emergency procedures.
- Never work in the laboratory without the supervision of a teacher.
- Always perform the experiments or work precisely as directed by the teacher.
- Immediately report any spills, accidents, or injuries to a teacher.
- Never leave experiments while in progress.
- Never attempt to catch a falling object.
- Be careful when handling hot glassware and apparatus in the laboratory. Hot glassware looks just like cold glassware.
- Never point the open end of a test tube containing a substance at yourself or others.
- Never fill a pipette using mouth suction. Always use a pipetting device.
- Make sure no flammable solvents are in the surrounding area when lighting a flame.
- Do not leave lit Bunsen burners unattended.
- Turn off all heating apparatus, gas valves, and water faucets when not in use.
- Do not remove any equipment or chemicals from the laboratory.
- Coats, bags, and other personal items must be stored in designated areas, not on the bench tops or in the aisle ways.
- Notify your teacher of any sensitivities that you may have to particular chemicals if known.
- Keep the floor clear of all objects (e.g., ice, small objects, spilled liquids).

Housekeeping

- Keep work area neat and free of any unnecessary objects.
- Thoroughly clean your laboratory workspace at the end of the laboratory session.
- Do not block the sink drains with debris.
- Never block access to exits or emergency equipment.

- Inspect all equipment for damage (cracks, defects, etc.) prior to use; do not use damaged equipment and label as damaged.
- Never pour chemical waste into the sink drains or wastebaskets.
- Place chemical waste in appropriately labeled waste containers.
- Properly dispose of broken glassware and other sharp objects (e.g., syringe needles) immediately in designated containers.
- Properly dispose of weight boats, gloves, filter paper, and paper towels in the laboratory.

Apparel & PPE

- Always wear appropriate eye protection (i.e., chemical splash goggles) in the laboratory.
- Wear disposable gloves, as provided in the laboratory, when handling hazardous materials. Remove the gloves before exiting the laboratory.
- Wear a full-length, long-sleeved laboratory coat or chemical-resistant apron.
- Wear shoes that adequately cover the whole foot; low-heeled shoes with non-slip soles are preferable. Do not wear sandals, open-toed shoes, open-backed shoes, or high-heeled shoes in the laboratory.
- Avoid wearing shirts exposing the torso, shorts, or short skirts; long pants that completely cover the legs are preferable.
- Secure long hair and loose clothing (especially loose long sleeves, neck ties, or scarves).
- Remove jewelry (especially dangling jewelry).
- Synthetic fingernails are not recommended in the laboratory; they are made of extremely flammable polymers which can burn to completion and are not easily extinguished.

Hygiene Practices for Students

- Keep your hands away from your face, eyes, mouth, and body while using chemicals.
- Food and drink, open or closed, should never be brought into the laboratory or chemical storage area.
- Never use laboratory glassware for eating or drinking purposes.
- Do not apply cosmetics while in the laboratory or storage area.
- Wash hands after removing gloves, and before leaving the laboratory.
- Remove any protective equipment (i.e., gloves, lab coat or apron, chemical splash goggles) before leaving the laboratory.

Emergency Procedures for Students

- Know the location of all the exits in the laboratory and building.
- Know the location of the emergency phone.
- Know the location of and know how to operate the following:
 - Fire extinguishers
 - Alarm systems with pull stations
 - Eye washes
 - First aid kits
 - Decon safety showers
- In case of an emergency or accident, follow the established emergency plan as explained by the teacher and evacuate the building via the nearest exit.

Chemical Handling

- Check the label to verify if it is the correct substance before using it.
- Wear appropriate chemical resistant gloves before handling chemicals. Gloves are not universally protective against all chemicals.
- If you transfer chemicals from their original containers, label chemical containers as to the contents, concentration, hazard, date, and your initials.
- Always use a spatula or scoopula to remove a solid reagent from a container.
- Do not directly touch any chemical with your hands.
- Never use a metal spatula when working with peroxides. Metals will decompose explosively with peroxides.
- Hold containers away from the body when transferring a chemical or solution from one container to another.
- Use a hot water bath to heat flammable liquids. Never heat directly with a flame.
- Add concentrated acid to water slowly. Never add water to a concentrated acid.
- Weigh out or remove only the amount of chemical you will need. Do not return the excess to its original container but properly dispose of it in the appropriate waste container.
- Never touch, taste, or smell any reagents.
- Never place the container directly under your nose and inhale the vapor.
- Never mix or use chemicals not called for in the laboratory exercise.
- Use the laboratory chemical hood, if available, when there is a possibility of release of toxic chemical vapors, dust, or gases. When using a hood, the sash opening should be kept at a minimum to protect the user and to ensure efficient operation of the hood. Keep your head and body outside of the hood face. Chemicals and equipment should be placed at least six inches within the hood to ensure proper air flow.
- Clean up all spills properly and promptly as instructed by the teacher.
- Dispose of chemicals as instructed by the teacher.

- When transporting chemicals (especially 250 mL or more), place the immediate container in a secondary container or bucket (rubber, metal or plastic) designed to be carried and large enough to hold the entire contents of the chemical.
- Never handle bottles that are wet or too heavy for you.
- Use equipment (glassware, Bunsen burner, etc.) in the correct way, as indicated by the teacher.

APPENDIX C

Accidents or Spill Procedures

Follow these approved spill procedures as mandated by OSHA and the CDC.

1. Assess the overall situation.
2. Determine the appropriate action to resolve the situation.
3. Follow the pre-existing, approved local emergency plan.
4. Always wear approved PPE (goggles, face shield, gloves, etc.)

Chemicals in the Eye

- Flush the eye immediately with water while holding the eye open with fingers.
- If you are wearing contact lens, remove and continue to rinse the eye with water.
- Continue to flush the eye and seek immediate medical attention.

Acid/Base Spill

For a spill not directly on human skin, do the following:

- Neutralize acids with powdered sodium hydrogen carbonate (sodium bi-carbonate/baking soda), or bases with vinegar (5% acetic acid solution).
- Avoid inhaling vapors.
- Spread diatomaceous earth to absorb the neutralized chemical.
- Sweep up and dispose of as hazardous waste.

For spills directly on human skin, do the following:

- Flush area with copious amounts of cold water from the faucet or drench shower for at least 5 minutes.
- If spill is on clothing, first remove clothing from the skin and soak the area with water as soon as possible.
- Arrange treatment by medical personnel.

Mercury Spill

- Evacuate the affected area.
- Close off interior doors and windows, and heating and air conditioning vents in the incident room.
- Open exterior doors and windows to move the inside air outside.
- Contact the EHS dept for specific cleanup procedures.