School District Chemical Hygiene Plan (CHP)

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In accordance with the Occupational Safety and Health Administration (OSHA) Occupational Exposure to Hazardous Chemicals In Laboratories Standard, 29 CFR 1910.1450, the following chemical hygiene plan (CHP) has been developed. Pursuant to Section 101.055, Stats., the Wisconsin Department of Safety and Professional Services (DSPS) is required to adopt and enforce health and safety standards equal to those offered private employees as administered by OSHA. Definitions relating to the exposure control plan are found in this plan.

Additional specific School District program information that is included as part of this plan can be found on the Health & Safety page of the School District safety website under Science Laboratory Chemical Hygiene.

I. Scope/Application

The purpose of this CHP is to describe practices, procedures, equipment and facilities to be used by employees, and other personnel working with hazardous chemicals in a laboratory setting throughout the School District in order to protect them from potential health hazards presented by chemicals, and to keep hazardous exposures below specified limits. The non-mandatory appendices provide guidance to meet the intent of the standard.

Each individual doing work in the laboratory has the potential to be exposed to hazards associated with that laboratory and the specific work being conducted. These persons must be informed about the potential hazards and risks involved as well as trained how to avoid potential hazards.

II. Responsibilities

A. Employer

1. Provide laboratory facilities in compliance with Laboratory Standard.

2. Designate an employee as the Chemical Hygiene Officer (CHO) who is qualified by training or experience to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan (CHP).

3. Ensure annual testing and documentation of proper operation of laboratory fume hoods.

4. Ensure availability of adequate chemical storage room with dedicated exhaust ventilation.

5. Annually inspect science laboratory safety showers and eyewash fountains in compliance with ANSI Z358.1.

B. Chemical Hygiene Officer (CHO)

1. Administrative

    a. Have background knowledge and training in chemicals/chemistry, their potential hazards and applicable safety requirements and be qualified by training or experience to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan (CHP).

    b. Act as the School District representative in matters relating to laboratory chemical hygiene.

    c. Appoint a Chemical Hygiene Committee (CHC), if appropriate, and hold meetings as appropriate.

    d. Ensure that appropriate training has been provided to all employees/students in the laboratory facilities and that they know and follow the chemical hygiene rules. Update training as site conditions and/or procedures change.

    e. Make sure the Chemical Hygiene Plan (CHP) is available for review upon request to science employees.

    f. Ensure MSDS Sheets are readily accessible to all employees who use chemicals.

    g. Report deficiencies and/or safety concerns to the CHC, if appointed, and District Administration as appropriate.

    h. Maintain records of all accidents, employee exposure monitoring, medical records, etc.

2. Written Plans and Procedures

    a. Work with School District Administrators and the CHC, if appointed, in the development and maintenance of a District specific CHP.

    b. Ensure the CHP is maintained and reviewed annually with any significant changes documented.

    c. Ensure lesson plans and instruction in the laboratory facilities are conducted according to the CHP and includes an evaluation of potential hazards, preventative measures and emergency procedures for hazards identified.

    d. Verify completion of lab science safety contracts.

    e. Develop safety policies and procedures for the School District laboratory facilities specific to each operation involving the use of chemicals.

    f. For chemicals used on the “not recommended for use in schools list”, develop detailed written procedures for the proper use, storage, handling, disposal and exposure monitoring of these chemicals may be required.

3. Personal Protective Equipment

    a. Oversee laboratory facilities and procedures; determining that laboratory facilities, personal protective equipment (PPE) and training levels are adequate for chemicals in use.

    b. Determine the proper level of personal protective equipment (PPE), and coordinate procurement of PPE as well as training specific to the PPE used.

4. Safety Equipment and Inspections

    a. Ensure that weekly activation of eyewash stations is conducted and documented.

    b. Ensure that weekly activation of safety showers is conducted and documented.

    c. Ensure that safety inspections of the laboratory facilities, lab equipment, fire extinguishers and lab glassware are conducted on a regular basis

    d. Inspect for proper operation of ventilation equipment (hoods and storage room ventilation) and report any equipment deficiencies to the maintenance department.

    e. Ensure that proper chemical spill kits are available and accessible.

    f. Recommend safety improvements for the School District laboratory facilities.

5. Emergency Plan

    a. Annually review emergency evacuation procedures

    b. Annually review emergency medical plan

6. Warning signs and Labels

    a. Ensure adequate signage to proper identify locations and types of safety equipment (eye wash, shower, fire extinguisher)

    b. Ensure Chemical storage room is labeled.

    c. Ensure all hazardous chemical containers are properly labeled with hazard information.

    d. Ensure emergency contacts are posted directly outside chemical storage room.

7. Science Chemical Procurement and Storage

    a. Develop and maintain a list of chemicals acceptable for use in the laboratory facilities.

    b. Be directly involved in all purchasing of science chemicals.

    c. Coordinate delivery, receipt and storage of purchased science chemicals

d. Maintain a complete inventory of all hazardous chemicals in the laboratory facilities. If, upon investigation, chemicals not recommended for use in schools are found, a disposal of these chemicals shall be immediately coordinated.

e. Ensure all chemicals are stored in a recognized storage pattern

f. Ensure proper storage of hazardous chemicals in approved storage cabinets (acid, corrosive, flammable, etc…) and/or chemical storage room with dedicated exhaust ventilation.

g. Ensure material safety data sheets (MSDS's) are obtained and maintained for all chemicals purchased and utilized in the laboratory facilities.

h. Oversee the disposal of all hazardous chemicals from the laboratory facilities.

C. Laboratory Supervisor (Teaching Staff in Charge of the Laboratory/Classroom)

1. Supervise laboratory activities.

2. Report incidents and/or safety concerns to the CHO.

3. Conduct all laboratory activities in compliance with the CHP.

4. Provide instruction in safe laboratory procedures, personal protective equipment and emergency response to all personnel (students and employees) in laboratories. Execute the Student Safety Agreements, a sample of which can be found in Appendix F.

5. Document all accidents and forward this documentation to the Administration.

6. Document all student safety training conducted.

7. Report broken/damaged equipment to Administration.

8. Maintain classroom area in a clean and orderly manner.

9. If the laboratory supervisor is responsible for their own chemical procurement, they shall coordinate their inventory with the CHO.

10. Ensure lesson plans and instruction in the laboratory facilities is conducted according to the CHP and includes an evaluation of chemical hazards, preventative measures and emergency procedures for hazards identified.

D. Students in Laboratory/Classroom

1. Read, understand and follow the Student Safety Agreement.

2. Conduct each operation in accordance with instructions provided by the Laboratory Supervisor.

III. Information and Training

Each employee of the School District covered by the Laboratory Standard will be provided with information and training prior to working with hazardous chemicals in a laboratory setting. This information provided and training conducted will be documented and kept by the CHO and will include the following items:

A. Information

1. The contents of this standard and its appendices which shall be made available to employees

2. The location and availability of the employer's Chemical Hygiene Plan

3. The permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard

4. Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory

5. The location and availability of known reference material on the hazards, safe handling, storage and disposal of hazardous chemicals found in the laboratory including, but not limited to, Material Safety Data Sheets received from the chemical supplier.

B. Training

1. Methods and observations that may be used to detect the presence or release of a hazardous chemical (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc…)

2. The physical and health hazards of chemicals in the work area

3. The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used

4. The applicable details of the employer's written Chemical Hygiene Plan.

Employees shall be re-trained as needed when any changes to methods, procedures, chemicals usage, etc… occur in the science laboratory.

In addition to full-time employee of the School District covered by the Laboratory Standard, part-time or substitute teachers working with hazardous chemicals in science laboratories will be provided with the same information and training previously noted above. If this training cannot be provided, the part-time of substitute teacher shall not be permitted to work with hazardous chemicals in a laboratory setting. Information provided and training conducted will be documented and kept by the CHO.

In addition to full-time and part-time employees of the School District covered the by Laboratory Standard, students working with hazardous chemicals in the science laboratories will be provided with basic information and training by the CHO or Laboratory Supervisor to include safety in the laboratory, equipment use and personal protective equipment (PPE) use. Training conducted will be documented on the Student Safety Agreement form and kept by the Laboratory Supervisor.

IV. Material Safety Data Sheets (MSDS's)

The CHO shall insure that a MSDS will be available for each hazardous chemical found within all School District laboratory facilities.

If a MSDS is not currently available, the CHO will contact the product manufacturer, vender, and/or distributor to obtain a copy.

If the CHO is not successful in obtaining a MSDS, the School District will either use up, or dispose of the product and subsequently utilize a different product with a MSDS.

All MSDS's will be kept readily accessible to employees at each building laboratory and/or on electronic version accessible to all staff.

V. Chemical Labeling

All hazardous chemicals within the School District laboratory facilities will be labeled. This includes chemical containers and waste containers. The labels shall be informative and durable.

The labels utilized for meeting this requirement will contain the following information:

1. Identity of the chemical/product.

2. Appropriate hazard warning.

3. Name and address of the manufacturer.

Additional labeling requirements may be required for Particularly Hazardous Chemicals. Further information is found in Section XI.

Materials already labeled by the manufacturer meeting the above requirements are acceptable and do not need to be relabeled.

Labels on incoming containers of hazardous chemicals are not to be removed or defaced.

Any materials not appropriately labeled by the manufacturer, or materials placed in any unmarked container, must be labeled as previously stated.

Improperly labeled containers, including the contents, will be disposed of in accordance with all applicable regulations.

Containers utilizing the National Fire Protection Association (NFPA) labeling system, or the Hazardous Materials Information System (HMIS), or systems with similar hazard information markings will be acceptable.

Portable containers shall be labeled by the individual using the container with a grease pencil.

Exemptions for labeling requirements shall be made for chemical transfers from a labeled container into a container which is intended only for the immediate use of the employee who performed the transfer.

VI. Standard Operating Procedures (SOP) for Laboratory Chemicals

A. Chemical Procurement

The decision to procure a chemical shall be completed by the CHC or, if no such committee exists, the decision will be approved by the CHO. A commitment of safe handling and use of the chemicals from initial receipt to ultimate disposal will always be practiced. School District policy is to aggressively and continually evaluate current inventory and properly dispose of unnecessary materials. A list of acceptable chemicals shall be generated.

Requests for procurement of new chemicals shall be submitted to the CHO for approval.

Information on proper handling, storage and disposal shall be identified by the CHO prior to procurement of a chemical. If, upon investigation, the chemical is either extremely hazardous (e.g. mutagenic, carcinogenic, teratogenic, etc.), extremely flammable and/or explosive, or difficult to dispose of, the CHC or CHO shall not approve procurement.

In addition, chemicals used in the laboratory shall be those which are appropriate for the ventilation system.

Administrative personnel who receive chemical shipments shall be knowledgeable of the proper procedures for receipt.

When science laboratory chemicals are received in the School District, the pertinent laboratory supervisor will be notified for pick-up.

Laboratory supervisors or a designated, trained person will transport the materials to the Chemical Storage area.

B. Chemical Storage

Received chemicals shall be immediately moved to the designated Chemical Storage area by one of the Laboratory supervisors. Large glass containers shall either remain in their original shipping container or be placed in carrying containers during transportation.

The storage area shall be well-illuminated, with storage maintained at or below eye level. Large bottles (e.g. Gallon) shall be stored no more than two feet from ground level. Flammables will be stowed in the designated flammable storage cabinet in the Chemical Storage area.

Toxic substances should be segregated in a well-identified area with local exhaust ventilation at 6-12 air exchanges per hour. Chemicals which are highly toxic or other chemicals whose containers have been opened should be in unbreakable secondary containers. Stored chemicals should be examined periodically (at least annually) for replacement, deterioration, and container integrity.

Stockrooms/storerooms should not be used as preparation or repackaging areas, should be open during normal working hours, and should be controlled by the Science Department and Laboratory supervisors.

Chemicals shall be stored in a recognized storage pattern, a sample of which can be found in Appendix D, to insure safety. The list of Incompatible Chemicals, found in Appendix C, should also be consulted if questions arise.

Chemicals shall be maintained in good condition with proper labeling. Lips measuring ¼" or larger shall be present on all shelves to prevent spillage.

Nitric acid will be stored in a separate acid cabinet.

Acid resistant trays shall be placed under bottles of:

1. Mineral acids.

2. Acid sensitive materials, such as cyanides and sulfides shall be separated from acids or protected from contact with acids and water.

Laboratory storage: Amounts permitted should be as small as practical. Storage on bench tops and in hoods is not allowed. Exposure to heat or direct sunlight should be avoided. Storage areas shall be labeled as "Chemical Storage Area". Emergency contact information shall be posted at the entrance to the room.

C. Chemical Handling and Use

Each laboratory employee/student (with the training, education, and resources provided by supervision), shall develop work habits consistent with requirements of CHP to minimize potential personal and co-worker exposure to chemicals. Based on the realization that all chemicals inherently present hazards in certain conditions, exposure to all chemicals shall be minimized.

Prior to use of any hazardous chemical, a specific chemical hazard evaluation should be conducted. This hazard evaluation should include the hazard category, personal protective equipment (PPE), engineering controls and waste disposal. A Chemical Hazard Evaluation form to assist in this hazard evaluation can be found in Appendix G.

In addition, the following general precautions shall be followed for the handling and use of all chemicals:

1. Avoid eating, drinking, smoking, gum chewing, or application of cosmetics in areas where laboratory chemicals are present, wash hands before conducting these activities.

2. Storage, handling, or consumption of food or beverages is not allowed in chemical storage areas.

3. Avoidance of "routine" exposure: Develop and encourage safe habits, avoid unnecessary exposure to chemicals by any route. Do not smell, touch, or taste chemicals. Vent apparatus which may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) into local exhaust devices.

4. Choice of chemicals: Use only those chemicals for which the quality of the available ventilation system is appropriate.

5. Mouth suction: Do not use mouth suction for pipetting or starting a siphon.

6. Exiting: Wash areas of exposed skin well before leaving the laboratory.

7. Unattended operations: Leave lights on, place an appropriate sign on the door, and provide for containment of toxic substances in the event of failure of a utility service (such as cooling water) to an unattended operation.

8. Distribution. When chemicals are hand carried, the container should be placed in an outside container, bucket or cart.

9. Laboratory employees/students shall be familiar with the symptoms of exposure for the chemicals which they work with and the precautions necessary to prevent exposure.

10. In all cases of chemical exposure, neither the Permissible Exposure Limits (PEL's) of OSHA or the Threshold Limit Values (TLV's) of the American Conference of Governmental Industrial Hygienists (ACGIH) shall be exceeded.

11. Specific precautions based on the toxicological characteristics of individual chemicals shall be implemented as deemed necessary by the CHO. In addition the list of Incompatible Chemicals, found in Appendix C, should be consulted prior to chemical usage if the CHO or Laboratory Supervisor has any uncertainty regarding a chemical.

12. The following provisions shall apply to chemicals developed in the laboratory:

    a. If the composition of the chemical substance which is produced exclusively for the laboratory's use is known, the employer shall determine if it is a hazardous chemical as defined in OSHA 29 CFR 1910.1450(b). If the chemical is determined to be hazardous, the employer shall provide the appropriate training.

    b. If the chemical produced is a byproduct whose composition is not known, the employer shall assume that the substance is hazardous and take the appropriate measures.

D. Laboratory Equipment and Glassware

Each employee/student shall keep the work area clean and uncluttered. At the completion of each work day or operation, the work area shall be thoroughly cleaned and all equipment properly cleaned and stowed.

In addition, the following procedures shall apply to the use of the laboratory equipment:

1. All laboratory equipment shall be used only for its intended purpose.

2. Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware. All broken glassware will be immediately disposed of in the broken glass container.

3. All evacuated glass apparatus shall be shielded to contain chemicals and glass fragments should implosion occur.

4. Waste receptacles shall be labeled as such.

5. All laboratory equipment shall be inspected on a periodic basis and replaced or repaired as necessary.

E. Personal Protective Equipment

Appropriate personal protective equipment (PPE) shall be worn by all employees and other persons working with chemicals based on the hazard evaluation.

1. Eye Protection

   a. Eye protection should be used for all personnel in locations where chemicals are stored or handled or a significant splash hazards exists.

   b. Goggles and face shields prevent chemicals and/or particles from getting into eyes.

   c. Goggles provide good protection for the eyes, while face shields protect the eyes, face and neck.

   d. Contacts should not be worn in laboratories as gases and vapors can be concentrated under lenses and cause permanent damage, soft lenses can absorb solvents and adhere to the eye and they can be very hard to remove contact after chemical exposure, due to involuntary spasm.

2. Hand Protection

   a. Gloves

      i. Protective gloves should be worn when the potential for contact with corrosive or toxic materials exists.

      ii. Gloves should be selected on the basis of the material.

      iii. Single use gloves should never be used more than once.

      iv. Gloves should be inspected before use to ensure integrity.

      v. Types of gloves include:
      - Leather (When exposed to broken glass, sharp objects, where chemical exposure is not an issue).
      - Rubber, neoprene, nitrile, polyvinyl chloride, latex (all which differ in their resistance to substances).

Following is a partial listing of some chemicals and their resistance to different glove materials. This list is not a comprehensive list.

Resistance to Chemicals of Common Glove Materials
(E=Excellent, G=Good, F=Fair, P=Poor)

Chemical	Natural Rubber	Neoprene	Nitrile	Vinyl
Acetaldehyde	G	G	E	G
Acetic Acid	E	E	E	E
Acetone	G	G	G	G
Acrylonitrile	P	G	--	F
Ammonium hydroxide (sat)	H	E	E	E
Aniline	F	G	E	G
Benzaldehyde	F	F	E	G
Benzene[a]	P	F	G	F
Benzyl Chloride[a]	F	P	G	P
Bromine	G	G	--	G
Butane	P	E	--	P
Butyraldehyde	P	G	--	G
Calcium hypochlorite	P	G	G	G
Carbon disulfide	P	P	G	F
Carbon tetrachloride[a]	P	F	G	F
Chlorine	G	G	--	G
Chloroacetone	F	E	--	P
Chloroform[a]	P	F	G	P
Chromic acid	P	F	F	E
Cyclohexane	F	E	--	P
Dibenzyl ether	F	G	--	P
Dibutyl phthalate	F	G	--	P
Diethanolamine	F	E	--	E
Diethyl ether	F	G	E	P
Dimethyl sulfoxide[b]	--	--	--	--
Ethyl acetate	F	G	G	F
Ethylene dichloride[a]	P	F	G	P
Ethylene glycol	G	G	E	E
Ethylene trichloride[a]	P	P	--	P
Fluorine	G	G	--	G
Formaldehyde	G	E	E	E
Formic Acid	G	E	E	E
Glycerol	G	G	E	E
Hexane	P	E	--	P
Hydrobromic acid (40%)	G	E	--	E
Hydrochloric acid (conc)	G	G	G	E
Hydrofluoric acid (30%)	G	G	G	E
Hydrogen peroxide	G	G	G	E
Iodine	G	G	--	G
Methylamine	G	G	E	E
Methyl cellosolve	F	E	--	P
Methyl chloride[a]	P	E	--	P
Methyl ethyl ketone	F	G	G	P
Methylene chloride[a]	F	F	G	F
Monoethanolamine	F	E	--	E
Morpholine	F	E	--	E
Naphthalene[a]	G	G	E	G
Nitric acid (conc)	P	P	P	G
Perchloric acid	F	G	F	E

Chemical	Natural Rubber	Neoprene	Nitrile	Vinyl
Phenol	G	E	--	E
Phosphoric acid	G	E	--	E
Potassium hydroxide (sat)	G	G	G	E
Propylene dichloride[a]	P	F	--	P
Sodium hydroxide	G	G	G	E
Sodium hypochlorite	G	P	F	G
Sulfuric acid (conc)	G	G	F	G
Toluene[a]	P	F	G	F
Trichloroethylene	P	F	G	F
Tricresyl phosphate	P	F	--	F
Triethanolamine	F	E	E	E
Trinitrotoluene	P	E	--	P

A. Aromatic and halogenated hydrocarbons will attack all types of natural and synthetic glove materials. Should swelling occur, the user should change to fresh gloves and allow the swollen gloves to dry and return to normal.

B. No data on the resistance to dimethyl sulfoxide of natural rubber, neoprene, and nitrile rubber of vinyl materials are available; the manufacturer of the substance recommends the use of butyl rubber gloves.

3. Protective Apparel

a. Laboratory Coats/Coveralls

Shall be provided to prevent contact with dirt and minor chemical splashes or spills. Cloth coats are primarily a protection for clothing.

b. Plastic/Rubber Aprons

Shall be provided to protect against corrosive and irritating liquids. Plastic aprons can accumulate static electricity which is a hazard when working with flammable liquids. Note that they can increase the risk of static charge.

c. Foot Covers

Plastic and/or rubber shoe covers provide protection against corrosive chemicals or large quantities of solvents. Note that they can increase the risk of static charge.

F. Personal Work Practices

Laboratory supervisors must ensure that each student knows and follows laboratory-specific rules and procedures established by this plan. For example, safety rules in Biology may differ from those in Chemistry.

All employees/students shall remain vigilant to unsafe practices and conditions in the laboratory and shall immediately report such practices and/or conditions to the laboratory supervisor. The supervisor must promptly correct unsafe practices or conditions.

Horseplay is strictly forbidden. Avoid practical jokes or other behavior which might confuse, startle or distract another worker.

Long hair and loose clothing shall be confined close to the body to avoid contact with chemicals or being caught in moving machine/equipment parts.

Shoes will be worn at all times in the laboratory. Shoes worn in the laboratory must be close-toed; sandals or perforated shoes are not allowed.

Inspect personal protective equipment prior to use, and wear appropriate protective equipment as procedures dictate and when necessary to avoid exposure.

Seek information and advice from knowledgeable persons, standards and codes about the hazards present in the laboratory. Plan operations, equipment and protective measures accordingly.

Avoid working alone in a building; do not work alone in a laboratory if the procedures being conducted are hazardous.

Use engineering controls in accordance with CHP procedures.

Keep the work area clean and uncluttered, with chemicals and equipment being properly labeled and stored; clean up the work area on completion of an operation or at the end of each day.

VII. Criteria for Implementation of Control Measures

A. When to use fume hoods:

1. Operations which might result in release of toxic, offensive, or flammable chemical vapors or dust.

2. Rule of thumb; use a hood or other local ventilation device when working with any appreciably volatile substance with a TLV of less than 50 ppm.

B. When to use safety shields or other containment devices:

1. Where the possibility exists for laboratory scale detonation. Protective devices, such as long and short-handled tongs for holding or manipulating hazardous items should be used whenever possible.

C. When to use personal protective equipment:

1. Eye protection – Safety goggles or laboratory splash glasses must be worn by all personnel in the laboratory whenever hazardous chemicals are in use. No exceptions

2. Gloves – Gloves should be worn to protect the skin from chemical and physical (e.g. heat, cold, etc.) exposures. Soiled or damaged gloves should be decontaminated and disposed of properly.

3. Respirators – Respiratory protection may be necessary to maintain chemical exposure below OSHA's PEL. Respirators will be provided, if necessary.

D. When to institute special work practices:

Special work practices must be approved by the laboratory supervisor and the CHO. If particularly hazardous chemicals are to be used (e.g. carcinogens, reproductive toxins, teratogens, or acutely toxic chemicals), specific work practices and work locations must be designated.

VIII. Safety Equipment

A. Fume Hood Management and Use

1. Fume Hood Management

a. Frequency and type of monitoring – All local exhaust hoods used for primary containment control will be monitored for adequate airflow on an annual basis. The survey will be completed with a calibrated velometer.

b. Acceptable operating range – Minimum average face velocities of at least 100 linear feet per minute (fpm) must be maintained for each hood. If the face velocity does not meet the minimum of 100 linear fpm, maintenance personnel must be contacted to repair or upgrade the hood. A minimum 18" of work space height must be provided at the sash opening.

c. Results will be documented.

d. Hoods shall be operated as per manufacturer recommendations. All alarms, baffles, sash stops and other equipment shall be maintained as per the manufacturer recommendation.

e. Hoods failing to meet any required criteria shall not be used.

f. Maintenance schedule – Maintenance of local exhausts or fume hoods will be completed on an "as needed" basis, or as recommended by the manufacturer.

2. Fume Hood Use

a. The laboratory instructor shall confirm adequate hood performance before use.

b. The hood will be kept closed at all times except when adjustments within the hood are being made.

c. A minimum of 2.5 linear feet of hood space per person for every two (2) workers should be provided when working with chemicals.

d. Materials shall be stored in hood to a minimum and do not allow them to block vents or air flow.

e. The hood shall be left "on" when:

i. It is not in active use if toxic substances are being stored

ii. It is uncertain whether adequate general laboratory ventilation will be maintained when the hood is turned "off".

B. Safety Showers and Eyewash Fountains in Science Laboratories

1. Safety Showers

a. Safety showers shall be provided in areas where chemicals are handled for immediate treatment of chemical splashes and extinguishing clothing fires and comply with ANSI Z358.1.

b. Safety showers shall have adequate signage to be easily identified in case of emergency.

c. Safety showers shall not be obstructed in any manner.

d. Safety showers should be activated and documented weekly by laboratory supervisor for proper operation and to remove any debris from the system.

e. Safety showers should provide continuous flow for a 15 minute period with a quick opening valve.

f. Safety showers shall be inspected annually by the maintenance department.

2. Eye Wash Fountains

a. Eye wash fountains shall be provided in areas where a substance presents an eye hazard. Hazards may include chemical, fume, particulate, dust or other hazard.

b. Eye wash fountains shall have adequate signage to be easily identified in case of emergency.

c. Eye wash fountains shall comply with ANSI Z358.1.

d. Eye wash fountains shall be accessible in locations that take no more than 10 seconds to reach. The unit shall be on the same level as the hazard and path of travel shall be free of obstructions.

e. Eye wash fountains shall be immediately adjacent to hazard.

f. Eye wash fountains shall deliver tepid water (between 60 degrees and 100 degrees F) and be capable of delivering flushing fluid for 15 minutes.

g. Eye wash fountains shall deliver continuous flow without requiring use of operator’s hands.

h. Eye wash fountains should be activated and documented weekly by the laboratory supervisors for proper operation and to remove any debris from the system.

i. Eye wash fountains should be inspected annually by the maintenance department.

j. Personal eye wash equipment that does not meet the criteria of plumbed units and shall only be used to support plumbed units, not replace them.

C. Fire Extinguishers and Fire Blankets

Fire extinguishers shall be inspected monthly by the maintenance department and serviced annually by a qualified firm.

Science staff shall only use fire extinguishers in emergencies only unless properly trained.

1. Fire Extinguishers – Types

a. Class A - Ordinary combustibles or fibrous material, such as wood, paper, cloth, rubber and some plastics.

b. Class B - Flammable or combustible liquids such as gasoline, kerosene, paint, paint thinners and propane.

c. Class C - Energized electrical equipment, such as appliances, switches, panel boxes and power tools.

d. Class D - Certain combustible metals, such as magnesium, titanium, potassium and sodium. These metals burn at high temperatures and give off sufficient oxygen to support combustion. They may react violently with water or other chemicals and must be handled with care.

2. Using a Fire Extinguisher

P Pull the pin.
A Aim extinguisher nozzle at the base of the flames.
S Squeeze trigger while holding the extinguisher upright.
S Sweep the extinguisher from side to side, covering the area of the fire with the extinguishing agent.

Remember to leave the area immediately if:

a. Your path of escape is threatened

b. The extinguisher runs out of agent.

c. The extinguisher proves to be ineffective

d. Should you no longer be able to safely fight the fire.

Never fight a fire, but call for help, if:

a. The fire is spreading beyond the spot where it started.

b. You can't fight the fire with your back to an escape exit.

c. The fire can block your only escape.

d. You don't have adequate firefighting equipment.

3. Fire Blankets

a. Used primarily as a first aid measure to prevent shock.

b. Should be used as a last resort, as blankets can hold heat in and increase burn severity.

IX. Housekeeping, Maintenance and Inspections

A. Passageways – Stairways and hallways should not be used as storage areas. Access to exits, emergency equipment, and utility controls should never be blocked.

B. Maintenance personnel will conduct inspections and maintenance of equipment in the science laboratories as detailed within this CHP.

C. Inspections – Formal housekeeping and chemical hygiene inspections should be held at least annually as directed by the CHO. Informal inspections should be continual by laboratory supervisors. A sample Laboratory Inspection Checklist can be found in Appendix E.

X. Required Approvals

Certain laboratory procedures which present serious health hazards or are found on the list Chemicals Not Recommended for Use in Schools, require prior approval by the CHO before work may commence. The list of Chemicals Not Recommended for Use in Schools and the list of Chemicals Appropriate for Advanced Level Classes Only can be found in Appendix A and Appendix B, respectively.

XI. Additional Protection for Work with Particularly Hazardous Substances

Work with selected carcinogens, reproductive toxins and substances which have a high degree of acute toxicity may require additional employee protection. Specific consideration will be given to:

A. Establishment of a designated area.

B. Use of containment devices such as fume hoods or glove boxes.

C. Procedures for safe removal of contaminated waste and decontamination procedures.

D. Additional labeling of containers to include the target organ and health effects may be required.

E. Additional OSHA personal exposure monitoring for exposure to these chemicals may be required. This determination shall be made after a proper hazard evaluation has been conducted.

F. Operating procedures that are at least as protective as those described on pp. 30-56 of Prudent Practices, (Procedures for Working with Substances that Pose Hazards Because of Acute Toxicity, Chronic Toxicity, or Corrosiveness), will be employed for work with particularly hazardous substances. The specific listed work practices should be followed when handling, storing and disposing of the following chemicals:

1. Corrosive Solids - corrosive means a chemical that causes visible destruction of or irreversible alterations in living tissue by chemical action at the site of contact. Corrosive solids, such as sodium hydroxide and phenol, can cause burns to the skin and eyes. Dust from corrosive solids can be inhaled and cause irritation or burns to the respiratory tract. Many corrosive solids, such as potassium hydroxide and sodium hydroxide, can produce considerable heat when dissolved in water.

    a. Always read MSDS for hazards and proper handling and disposal practices. The procedures and risks involved should be thoroughly reviewed before working with solid corrosives.

    b. Work should be performed with the smallest possible amount of the chemical or determine if a less hazardous chemical or process could be used as a replacement.

    c. Wear gloves and eye protection when handling corrosive solids. Refer to the MSDS and glove chart for proper glove choice.

    d. When mixing with water, always slowly add the corrosive solid to water, stirring continuously. Cooling may be necessary.

    e. If there is a possibility of generating a significant amount of dust, conduct work in a fume hood.

    f. Waste disposal method: As written in lesson plans and to be performed in compliance with the CHP and all current local, state and federal regulations.

2. Corrosive Liquids - corrosive liquids (e.g. mineral acids, alkali solutions and some oxidizers) represent a very significant hazard because skin or eye contact can readily occur from splashes and their effect on human tissue generally takes place very rapidly. Bromine, sodium hydroxide, sulfuric acid and hydrogen peroxide are examples of highly corrosive liquids.

    a. Always read MSDS for hazards and proper handling and disposal practices. The procedures and risks involved should be thoroughly reviewed before working with liquid corrosives.

    b. Work should be performed with the smallest possible amount of the chemical or determine if a less hazardous chemical or process could be used as a replacement.

    c. The eyes are particularly vulnerable. It is therefore essential that approved eye and face protection be worn in all laboratories where corrosive chemicals are handled.

    d. Gloves and other chemically resistant protective clothing should be worn to protect against skin contact. Refer to the glove chart for proper glove choice.

    e. To avoid a flash steam explosion due to the large amount of heat evolved, always add acids or bases to water (and not the reverse). These mixtures should be performed in the fume hood.

    f. Acids and bases should be segregated for storage.

g. Liquid corrosives should be stored below eye level.

h. Adequate quantities of spill control materials should be readily available.

i. Waste disposal method: To be performed in compliance with the CHP and all current local, state and federal regulations.

3. Reactives – reactive chemicals are substances that can explode or enter into violent reactions releasing large amounts of light, heat, and gases. A number of reactive chemicals are recognized explosives, requiring only a mild initiating force for detonation. Other reactive chemicals are capable of detonation but require a stronger initiating force. Some reactive chemicals will not detonate but can enter violent reactions producing large quantities of heat and explosive gases. Reactive chemicals must be handled with extreme care, even milligram quantities of some chemicals can result in violent explosions.

Classes of Reactives: Reactive chemicals are classified as explosives, strong oxidizing agents, acid sensitives, water reactives, air reactives, and special organic compounds.

- *Solid Reactive* examples include sodium, potassium and lithium metals; acid anhydrides, acid chlorides and salt hydrides.

- *Liquid Reactive* are chemicals that react vigorously with moisture, oxygen or other substances. Examples include organic halides, phosphorous trichloride, titanium tetrachloride, butyl lithium, and hydrazine.

a. Always read MSDS for hazards and proper handling and disposal practices. The procedures and risks involved should be thoroughly reviewed before working with reactive chemicals.

b. Work should be performed with the smallest possible amount of the chemical or determine if a less hazardous chemical or process could be used as a replacement.

c. Quantities should be limited to the amount necessary for the work in progress.

d. No more than 10 gallons of flammable and combustible liquids, combined, should be stored outside of a flammable storage cabinet unless safety cans are used. When safety cans are used, up to 25 gallons may be stored without using a flammable storage cabinet.

e. Safety glasses, face shield, gloves, and a laboratory coat should be worn at all times when handling, transporting, or manipulating reactive chemicals.

f. Adequate portable fire extinguishers should be immediately available in the laboratory.

g. Approved eye-wash stations and emergency showers must be in working order. Safety shields should be used as necessary.

h. Explosives should be protected from heat and shock.

i. Clean up spills immediately. The safest method is to absorb the material onto vermiculite or a similar loose absorbent.

j. Waste disposal method: As written in lesson plans and to be performed in compliance with the CHP and all current local, state and federal regulations.

4. Volatile Chemicals – Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. (examples: hexanes, *acetone*, methylene chloride, diethyl ether)

a. Always read MSDS for hazards and proper handling and disposal practices. The procedures and risks involved should be thoroughly reviewed before working with volatile chemicals.

b. Work should be performed with the smallest possible amount of the chemical or determine if a less hazardous chemical or process could be used as a replacement.

c. Safety glasses, face shield, gloves, and a laboratory coat should be worn at all times when handling, transporting, or manipulating reactive chemicals.

d. Prior to working with volatiles be sure fume hood is in working order.

e. Work in the fume hood to ensure proper ventilation when working with volatile chemicals.

f. When carrying volatile chemicals through the lab, carry them in a covered container.

g. Work with smallest amounts to minimize the amount of volatile gases into the room.

h. Waste disposal method: As written in lessons plan and to be performed in compliance with the CHP and all current local, state and federal regulations.

XII. Emergency Response/Chemical Spills

The CHO shall communicate this emergency response plan to all personnel, which includes:

1. Ventilation Failure – if ventilation systems in the general science laboratory or chemical storage area fail, the laboratory supervisor shall contact the CHO to evaluate potential hazards. If a hazard is determined to be present, all affected areas shall be evacuated according to the School District Crisis Response Plan. No work will be conducted with chemicals until the ventilation systems are repaired and operational.

2. Evacuation – shall be conducted according to the School District Crisis Response Plan. If the evacuation could create a chemical hazard for occupants, the laboratory supervisor shall notify the CHO, who shall intern notify the building maintenance personnel.

3. Medical Care – shall be implemented according to the School District Crisis Response Plan.

4. Reporting – shall be conducted by the laboratory supervisor to the CHO. The CHO shall make the determination if any additional reporting (Fire Department, Haz. Mat., etc…) is necessary.

5. Drills – shall be conducted according to the School District Crisis Response Plan.

6. Alarm System – is the fire alarm for the building to effectively alert people in all parts of the facility. The CHO shall determine the need to use the fire alarm.

A spill control policy should be developed and should include consideration of prevention, containment, cleanup and reporting.

A. General Spill Procedures:

1. Provide any first aid (if necessary) to affected personnel. Liberally use eyewash station and/or safety shower to flush affected areas. Flushing shall continue for at least 15 minutes.

2. Notify supervision of spill. If spill is large or extremely hazardous, the Principal and Maintenance Supervisor will be notified. First Aid personnel may require notification.

3. Evacuate students from the area.

4. If spilled materials exhibit flammability, eliminate ignition sources, such as hot plates, Bunsen burners, etc.

5. Avoid all contact with spilled material. If necessary, don protective gloves, gown, goggles, and/or respirator.

6. Obtain supplies from Chemical Spill Clean-Up Kit.

7. Neutralize acids and bases.

8. Contain collected materials and label container with name of contents and also as Hazardous Waste.

9. Always refer to MSDS for special precautions or spill cleanup requirements.

B. Liquid Spills

1. Confine spill to small area as practical.

2. For small quantities of acids or bases, use the neutralizing agent from the chemical spill clean-up kit. An absorbent material specially prepared for acid/base spills may also be used.

3. For small quantities of other materials, such as organic solvents, utilize an absorbent material to clean-up spill. Examples of absorbent materials are vermiculite, dray sand, paper towels, etc.

4. For large quantities of inorganic acids and bases, flush with large amounts of water, preferably toward a containment area or drain. Caution must be taken not to add too much water to create a flood which may react with water-reactive materials and cause spattering and additional personnel exposure.

5. If possible, utilize a mop to pick up as much of the spilled material. An excellent clean-up device is the mop bucket and wringer to collect the liquid.

6. Carefully pick up and decontaminate and bottles, broken glass, and/or other containers. Decontaminate over the bucket or pail to collect contaminated wash.

7. Avoid using any shop vacuum which is not rated for chemical clean-up. A potential exists for atomizing hazardous wastes and creating a potential human inhalation exposure.

8. If the spill is extremely volatile (high vapor pressure), allow the spill to evaporate and exhaust out the laboratory exhaust (e.g. fume hood).

9. Properly containerize, label, store and/or dispose of collected hazardous waste (See waste disposal section for methods).

C. Solid Spills

If possible, sweep solid spills of low toxicity into a designated, easily decontaminated, bust pan and place in a labeled container for storage and/or disposal.

D. Additional Spills

Mercury (Hg) – Clean-up with pre-purchased spill clean-up kit. Collect Hg in a sealed container to prevent exposure to Hg vapors. Large spills or spills that render some Hg unavailable for clean-up (e.g. Hg in floor cracks or beneath lab benches); an airborne evaluation of Hg vapor content may be required.

E. Compressed Gas Cylinders

Any compressed gas cylinders used in science laboratories must be transported, handled, and stored as described in this School District's Compressed Gas Compliance Plan.

F. Incident Report

An incident investigation should take place after the spill and/or accident. The incident report should be completed by the Laboratory Supervisor and forwarded to the CHO.

G. Chemical Spill Limitations

The laboratory supervisor responsible for the work area shall have adequate knowledge and training to safely and effectively clean up all spills. If any doubt exists, the area shall be isolated and the CHO shall be contacted immediately.

H. Spill Kits

Every laboratory in which hazardous substances are used should have spill control kits tailored to deal with the potential risk associated with the materials being used in the laboratory. These kits are used to confine and limit the spill if such actions can be taken without risk of injury or contamination. A specific individual should be assigned to maintain the kit. Spill control kits should be located near laboratory exits for ready access. Typical spill control kits might include these items:

1. Spill control pillows. These commercially available pillows generally can be used for absorbing solvents, acids, and caustic alkalis, but not hydrofluoric acid.

2. Inert absorbents such as vermiculite, clay, sand, kitty litter, and Oil Dri®. Paper is not an inert material and should not be used to clean up oxidizing agents such as nitric acid.

3. Neutralizing agents for acid spills such as sodium carbonate and sodium bicarbonate.

4. Neutralizing agents for alkali spills such as sodium bisulfate and citric acid.

5. Large plastic scoops and other equipment such as brooms, pails, bags, and dust pans.

6. Appropriate personal protective equipment, warnings, barricade tapes, and protection against slips or falls on wet floor during and after cleanup.

XIII. Records

All accidents or near accidents should be carefully analyzed with the results distributed to all who might benefit.

Accident records should be written and submitted to the CHO and forwarded to the School District Safety Director.

Chemical Hygiene Plan records should document that the facilities and precautions were compatible with current knowledge and regulations.

Medical exposure records should be retained by the School District in accordance with the requirements of State and Federal agencies.

XIV. Signs and Labels

Prominent signs and labels of the following types should be posted:

A. Emergency telephone numbers of emergency personnel/facilities, supervisors, and laboratory workers. Post at chemical storage room. Numbers shall include at least one 24 hour number for a school employee with knowledge of the area.

B. Identity labels, showing contents of containers (including waste receptacles) and associated hazards.

C. Location signs for safety showers, eyewash stations, spill kits, other safety and first aid equipment, exits and areas where food and beverage consumption and storage are permitted, and;

D. Warnings at areas or equipment where special or unusual hazards exist.

XV. Waste Disposal Program

A. Aim – To assure that minimal harm to people, other organisms, and the environment will result from the disposal of waste laboratory chemicals.

B. The waste disposal program should specify how waste is to be collected, segregated, stored, and transported and include consideration of what materials can be incinerated. Transport from the institution must be in accordance with DOT regulations.

C. Discarding Chemical Stocks – Unlabeled containers of chemicals and solutions should undergo prompt disposal; if partially used, they should not be opened. Before a worker's employment in the laboratory ends, chemicals for which that person was responsible should be discarded or returned to storage.

D. Frequency of Disposal – Waste should be removed from laboratories to a central waste storage area and from the central waste storage area at regular intervals.

E. Follow all local, state and federal disposal regulations. See Material Safety Data Sheet.

XVI. Air Monitoring

Monitoring shall be conducted when there are airborne concentrations of toxic substances; or when highly toxic substances used on a regular basis; or the permissible exposure limits for OSHA regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard are above the 1992 exposure limits of PEL's, ALs, STELs, and CLs (Permissible Exposure Limits, Action Levels, Short Term Exposure Limits, and Ceiling limits).

In lieu of 29 CFR 1910.1000, July 1, 2003 edition and employee's exposure to air contaminants shall be in accordance with the requirements of 29 1910.1000, July1, 1992 edition. The employer shall implement the monitoring or measuring of any substance listed in Table Z-1-A where exposure at or above the time weighted average, short-term exposure or ceiling limit is reasonably likely to occur.

XVII. Medical Program

A. Employees who work with hazardous chemicals shall have an opportunity to receive medical attention, including any follow-up examinations which the examining physician determines to be necessary, under the following circumstances:

1. Whenever an employee develops signs or symptoms associated with a hazardous chemical to which the employee may have been exposed in the laboratory.

2. Where exposure monitoring reveals an exposure level routinely above the action level (or in the absence of an action level, the PEL) for an OSHA regulated substance for which there are exposure monitoring and medical surveillance requirements.

3. Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure.

B. All medical examinations and consultations shall be performed by or under the direct supervision of a licensed physician and shall be provided without cost to the employee, without loss of pay and at a reasonable time and place.

The Employer will provide the following information to the physician:

1. Identify of hazardous chemical.

2. Description of conditions under which exposure occurred.

3. Description of signs and symptoms employee is experiencing.

A written opinion from the physician shall be provided to the employer including:

1. Recommendation for further medial follow-up.

2. Results of medical exam and tests.

3. Any medical condition revealed during the exam that places the employee at increased risk.

4. A statement that the employee has been informed by the physician of the results of the exam and any medical condition that may require further treatment or examination.

C. Routine surveillance – Anyone whose work involves regular and frequent handling of toxicologically significant quantities of a chemical should consult a qualified physician to determine on an individual basis whether a regular schedule of medical surveillance is necessary.

D. First aid – Personnel trained in first aid should be available during working hours and emergency numbers posted at the chemical storage area.

XVIII.Definitions

Action Level – A concentration designated in 29 CFR part 1910 for a specific substance, calculated as an eight (8)-hour time-weighted average, which initiates certain required activities such as exposure monitoring and medical surveillance.

Assistant Secretary – The Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Carcinogen (**see select carcinogen**).

Chemical Hygiene Officer – An employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. This definition is not intended to place limitations on the position description or job classification that the designated individual shall hold within the employer's organizational structure.

Chemical Hygiene Plan – A written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that (i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace and (ii) meets the requirements of paragraph (e) of this section.

Combustible Liquid – Any liquid having a flashpoint at or above 100 deg. F (37.8 deg. C), but below 200 deg. F (93.3 deg. C), except any mixture having components with flashpoints of 200 deg. F (93.3 deg. C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

Compressed gas –
(i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 deg. F (21.1 deg. C); or
(ii) A gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 deg. F (54.4 deg C) regardless of the pressure at 70 deg. F (21.1 deg. C); or
(iii) A liquid having a vapor pressure exceeding 40 psi at 100 deg. F (37.8 C) as determined by ASTM D-323-72.

Designated Area – An area which may be used for work with "select carcinogens," reproductive toxins or substances which have a high degree of acute toxicity. A designated area may be the entire laboratory, an area of a laboratory or a device such as a laboratory hood.

Emergency – Any occurrence such as, but not limited to, equipment failure, rupture of containers or failure of control equipment which results in an uncontrolled release of a hazardous chemical into the workplace.

Employee – An individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments.

Explosive – A chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

Flammable – A chemical that falls into one of the following categories:
(i) **Aerosol, flammable** means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame protection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;
(ii) **Gas, flammable** means:
(A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less; or
(B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit.
(iii) **Liquid, flammable** means any liquid having a flashpoint below 100 deg F (37.8 deg. C), except any mixture having components with flashpoints of 100 deg. C) or higher, the total of which make up 99 percent or more of the total volume of the mixture.
(iv) **Solid, flammable** means a solid, other than a blasting agent or explosive as defined in § 1910.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flashpoint – The minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:
(i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24 - 1979 (ASTM D 56-79)) - for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100 deg. F (37.8 deg. C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or
(ii) Pensky-Martens Closed Tester (See American National Standard Method of Test for Flashpoint by Pensky-Martens Closed Tester, Z11.7 - 1979 (ASTM D 93-79)) - for liquids with a viscosity equal to or greater than 45 SUS at 100 deg. F (37.8 deg. C), or that contain suspended solids, or that have a tendency to form a surface film under test; or
(iii) Setaflash Closed Tester (see American National Standard Method of test for Flash Point by Setaflash Closed Tester (ASTM D 3278-78)).
Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

Hazardous chemical – A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes.

Note: Appendices A and B of the Hazard Communication Standard (29 CFR 1910.1200) provide further guidance in defining the scope of health hazards and determining whether or not a chemical is to be considered hazardous for purposes of this standard.

Laboratory – A facility where the "laboratory use of hazardous chemicals" occurs. It is a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory Scale – Work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safety manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Laboratory-type Hood – A device located in a laboratory, enclosure on five sides with a movable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms.

Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use so that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

Laboratory Use of Hazardous Chemicals – Handling or use of such chemicals in which all of the following conditions are met:
(i) Chemical manipulations are carried out on a "laboratory scale;"
(ii) Multiple chemical procedures or chemicals are used;
(iii) The procedures involved are not part of a production process, nor in any way simulate a production process; and
(iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

Medical Consultation – A consultation which takes place between an employee and a licensed physician for the purpose of determining what medical examinations or procedures, if any, are appropriate in cases where a significant exposure to a hazardous chemical may have taken place.

Organic Peroxide – An organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

Oxidizer – A chemical other than a blasting agent or explosive as defined in § 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

Physical Hazard – A chemical for which there is scientifically valid evidence tat it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer pyrophoric, unstable (reactive) or water-reactive.

Protective Laboratory Practices and Equipment – Those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.

Reproductive Toxins – Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

Select Carcinogen – Any substance which meets one of the following criteria:
(i) It is regulated by OSHA as a carcinogen; or
(ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP)(latest edition); or
(iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for research on Cancer Monographs (IARC)(latest editions); or
(iv) It is listed in either Group 2A or 2B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:
(A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m(3);
(B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or
(C) After oral dosages of less than 50 mg/kg of body weight per day.

Unstable (Reactive) – A chemical which is the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

Water-reactive – A chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

XIX. Appendices

SUBSTANCES WITH GREATER HAZARDOUS NATURE THAN EDUCATIONAL UTILITY

NOT RECOMMENDED FOR USE OR STORAGE IN SCHOOLS

Chemical	Potential Hazard	Flinn Storage Location	Baker Color Codes	Special Storage Consideration
Acrylonitrile	Flammable (NFPA = 3), Probable Carcinogen	Organic #2	Red	3
Ammonium chromate	Oxidizer; known human carcinogen	Inorganic #8	Blue	-
Aniline (or any of its salts)	Combustible; Highly Toxic	Organic #2	Red	2
Aniline hydrochloride	May be fatal if inhaled, ingested, or absorbed	Organic #2	Red	2
Anthracene	Irritant, may cause an allergic skin reaction	Inorganic #3	Orange	
Antimony trichloride	Corrosive	Inorganic #2	White	2
Arsenic and its compounds	Known human carcinogen	noganic #7/10	Blue	4
Asbestos	Known human carcinogen	Inorganic # 4	Blue	-
Ascarite II	Corrosive, may be fatal if ingested	Inorganic #4	White Stripe	-
Benzene	Flammable; known human carcinogen; mutagen	Organic #3	Red Stripe	3
Benzidine	Known Carcinogen	Organic #2	Blue	-
Benzoyl peroxide	Flammable (NFPA = 3), explosive, oxidizer	Organic #6	Yellow Stripe	5
Calcium cyanide	May be fatal if inhaled or ingested	Inorganic #7	Blue	4
Carbon disulfide	Flammable (NFPA = 4), Highly toxic	Inorganic # 5	Red	3
Carbon tetrachloride	May be fatal if inhaled/ingested; Prob. Carcinogen	Organic #4	Blue	-
Chloral hydrate	Controlled barbiturate	Cont. Subs.	Blue	
Chlorine	Oxidizer, corrosive, may be fatal if inhaled	Bottled Gas	Yellow	2
Chloroform	Reasonably anticipated human carcinogen	Organic #4	Blue	5
Chloropromazine	Controlled substance	Contr. Subs		
Chromium hexavalent compounds	Known human carcinogen			
Chromium Powder	Known human carcinogen	Inorganic #1	Blue	-
Chromium trioxide (Chromium VI Oxide)	Oxidizer, Corrosive, known human carcinogen	Inorganic #4	Yellow	2
Colchicine	May be fatal if ingested, mutagen	Organic #8	Blue	2,4
p-Dichlorobenzene	Combustible; Probable carcinogen	Organic #4	Red	1
Dimethylaniline	May be fatal if inhaled, ingested, or absorbed	Organic #2	Red	
Diisopropyl Ether	Explosive	Organic #4	Red	3
p-Dioxane	Flammable; Forms peroxides; Prob. carcinogen	Organic #4	Red	2
Ethyl Ether	Explosive	Organic #4	Red	3
Ethylene dichloride (1,2-Dichloroethane	Flammable; Probable carcinogen; mutagen	Organic #4	Red	3
Ethylene oxide	Explosive; Highly Toxic; Carcinogen	Organic #5	Red	3
Gunpowder	Explosive			
Hexachlorophene	May be fatal if inhaled, ingested or absorbed	Organic #8	Blue	
Hydrobromic acid	Corrosive, may be fatal if inhaled or ingested	Inorganic #9	White	-
Hydrofluoric acid	Corr.; May be fatal if inhaled/ingested/absorbed	Inorganic #9	White	No Glass
Hydrogen	Flammable (NFPA = 4)	Bottled Gas	Red	-
Hydriodic acid	Corrosive, may be fatal if inhaled or ingested	Inorganic #9	White	-
Lead arsenate	Known human carcinogen, teratogen	Inorganic #7	Blue	
Lead carbonate	May be fatal if inhaled or ingested, neurotoxic	Inorganic #4	Blue	1
Lead (VI) chromate	May be fatal if inhaled or ingested; Carcinogen	Inorganic #8	Blue	1
Lithium, metal	Combustible, water reactive	Inorganic #1	Red Stripe	5, Under Oil
Lithium nitrate	Oxidizer	Inorganic #3	Yellow	2
Magnesium, metal (powder)	May ignite spontaneiously on contact with water	Inorganic #1	Red	5
Mercury	Corrosive, may be fatal if inhaled or ingested	Inorganic #1	Blue	1
Mercuric chloride	May be fatal if inhaled, teratogen	Inorganic #2	Blue	1,4
Mercuric Iodide	Highly Toxic	Inorganic #2	Blue	4
Mercuric Nitrate	Highly Toxic	Inorganic #3	Yellow	1,4
Mercuric Oxide	Highly Toxic	Inorganic #4	Blue	1,4
Mercuric Sulfate	Highly Toxic	Inorganic #2	Blue	4

1 - Chem-Safe Bag, 2 - Chem-Safe Bag inside Chem-Safe Can,
3 - Store inChem-Safe Can or Flammable Cabinet, 4 - Store in Poison Cabinet,
5 - Chem-Safe Can

SUBSTANCES WITH GREATER HAZARDOUS NATURE THAN EDUCATIONAL UTILITY

NOT RECOMMENDED FOR USE OR STORAGE IN SCHOOLS

Chemical	Potential Hazard	Flinn Storage Location	Baker Color Codes	Special Storage Consideration
Methyl iodide (iodomethane)	May be fatal if inhaled, ingested or absorbed	Organic #4	Blue	
Methyl methacrylate	Flammable (NFPA = 3), explosive (vapor)	Organic #3	Red Stripe	3
Methyl orange	Possible mutagen	Organic #9	Orange	-
Methyl red	Possible mutagen	Organic #9	Orange	-
Nickel, metal	Probable carcinogen; Mutagen	Inorganic #1	Orange	-
Nickel oxide	Probable carcinogen; Mutagen	Inorganic #4	Blue	-
Nicotine	May be fatal if inhaled, ingested, or absorbed	Organic #2	Blue	1,4
Osmium tetroxide	May be fatal if inhaled or ingested	Inorganic #2	Blue	Refrigerate
Paris green	Toxic if inhaled/ingested/absorbed; Carcinogen	Dye	Blue	-
Perchloric Acid	Explosive	Inorganic #6	Yellow	-
Phenol	Corrosive; May be fatal if inhaled/ingested/absor.	Organic #8	Blue	1,4
Phosphorus pentoxide	Water reactive, corrosive	Inorganic #10	Red Stripe	2
Phosphorous, red, white	May ignite spontaneously in air	Inorganic #10	Red Stripe	3, Under Water
Phthalic anhydride	Fine particles form explosive mixtures in air	Organic #1	White	1
Picric Acid	Explosive	Organic #8	Red	-
Potassium, metal	Flammable; Water reactive; Forms peroxides	Inorganic #1	Red Stripe	3, Under Oil
Potassium oxalate	Corrosive, may be fatal if ingested	Inorganic #2	Blue	1
Potassium sulfide	Spontaneously combustible; Corrosive	Inorganic #5	Red	-
Pyridine	Flammable (nfpa = 3), possible mutagen	Organic #2	Red	3
Selenium	Severe irritant	Inorganic #1	Orange	-
Silver cyanide	May be fatal if inhaled, ingested or absorbed	Inorganic #7	Blue	4
Silver nitrate	Oxidizer, corrosive, may be fatal if ingested	Inorganic #3	Yellow	1,4
Silver oxide	Oxidizer	Inorganic #4	Orange	-
Sodium arsenate	May be fatal if inhaled or ingested; Carcinogen	Inorganic #7	Blue	1,4
Sodium arsenite	Known human carcinogen, teratogen	Inorganic #7	Blue	1,4
Sodium azide	Explosive; May be fatal if ingested or absorbed	Inorganic #3	Blue	1,4
Sodium chromate	Oxidizer, corrosive, known human carcinogen	Inorganic #8	Yellow	1,4
Sodium cyanide	May be fatal if inhaled, ingested or absorbed	Inorganic #7	Blue	1,4
Sodium dichromate	Oxidizer; Corrosive; Highly Toxic; Carcinogen	Inorganic #8	Yellow	1,4
Sodium nitrite	Oxidizer	Inorganic #3	Yellow	1,4
Sodium sulfide	Corrosive, may be fatal if inhaled or ingested	Inorganic #5	Red	2
Sodium thiocyanate	Contact with acid liberates very toxic gas	Inorganic #7	Orange	1
Stannic chloride (anhydrous)	HCL liberated upon contact with moisture & heat	Inorganic #2	White	1
Stearic acid	May form combustible dust concentration in air	Organic #1	Orange	-
Strontium	Water reactive	Inorganic #1	Red Stripe	5, Under Oil
Strontium nitrate	Oxidizer	Inorganic #3	Yellow	-
Sudan IV	Irritant; Toxic properties have not been evaluated	Organic #9	Dye	-
Sulfuric acid, fuming	Corrosive, may be fatal if ingested	Inorganic #9	White	-
Tannic acid	Irritant	Organic #1	Orange	-
Tetrabromoethane	May be fatal if inhaled, ingested or absorbed	Organic #2	Blue	-
Thioacetamide	Reasonably anticipated human carcinogen	Organic #2	Blue	-
Thiourea	Reasonably anticipated human carcinogen	Organic #2	Blue	1,4
Titanium trichloride	Water reactive, corrosive	Inorganic #2	Red	5
Titanium tetrachloride	Water reactive, corrosive, may be fatal if inhaled	Inorganic #2	Red	5
o-Toluidine	Probable carcinogen; Mutagen	Organic #2	Blue	-
Uranium	Radioactive material			
Uranyl acetate	Radioactive material			
Urethane	Combustible; Probable carcinogen	Organic #2	Orange	-
Wood's metal	Highly Toxic; Carcinogen (cadmium); Neurotoxic	Inorganic #1	Orange	-

1 - Chem-Safe Bag, 2 - Chem-Safe Bag inside Chem-Safe Can,
3 - Store inChem-Safe Can or Flammable Cabinet, 4 - Store in Poison Cabinet,
5 - Chem-Safe Can

SUBSTANCES WITH A HAZARDOUS NATURE, BUT MAY HAVE POTENTIAL EDUCATIONAL UTILITY
APPROPRIATE FOR ADVANCED-LEVEL HIGH SCHOOL CLASSES ONLY

Chemical	Potential Hazard	Flinn Storage Location	Baker Color Codes	Special Storage Consideration
Acetamide	Combustible solid	Organic #2	Orange	1
Acridine Orange	Mutagen	Organic #9	Dye	-
Adrenaline	Highly Toxic	Organic #2	Orange	4
Aluminum chloride	Water reactive, corrosive	Inorganic #2	Yellow	1
Ammonium Bichromate	Mutagen	Inorganic #8	Yellow	-
Ammonium dichromate	Oxidizer; Corrosive; Carcinogen	Inorganic #8	Yellow	-
Ammonium oxalate	May be fatal if inhaled or ingested	Inorganic #2	White	-
Ammonium vanadate	May be fatal if inhaled or ingested	Inorganic #2	White	1
Anthracene	Mutagen	Organic #3	Orange	-
Antimony	May be fatal if inhaled, irritant	Inorganic #1	Blue	-
Antimony oxide	Irritant	Inorganic #4	Blue	-
Antimony potassium tartrate	Irritant	Inorganic #2	White	-
Barium chloride	May be fatal if ingested, irritant	Inorganic #2	Blue	1
Barium Hydroxide	Highly Toxic	Inorganic #4	Blue	1
Benzone (phenylbutazone)	Irritant			
Beryllium carbonate	Irritant	Inorganic #4	Blue	1
Bromine	Oxidizer; Corrosive; Highly Toxic	Inorganic #2	Yellow	2
Cadmium and cadmium compounds	Known human carcinogen	Inorg. 1/2/4	Blue	3
Carmine	Burning may produce poisonous gasses	Misc.	Dye	-
Catechol	Corrosive	Misc.	Orange	-
Chromic acid	Oxidizer, known human carcinogen	Organic Acid	Blue	-
Chromium acetate	Irritant	Inorganic #2	Blue	1
Cobalt, metal	Possible human carcinogen	Inorganic #1	Orange	-
Cobalt nitrate	Oxidizer, irritant	Inorganic #3	Yellow	1
Cyclohexane	Flammable (NFPA = 3)	Organic #3	Red	3
Cyclohexene	Flammable (nfpa = 3), corrosive, forms peroxides	Organic #3	Red	3
Dichloroindophenol sodium salt	Irritant	Organic #8	-	1
2,4-Dinitrophenol	Irritant	Organic #8	-	1
Ferrous Sulfate	Irritant	Inorganic#2	Orange	1
Formaldehyde (formalin)	Flammable (NFPA = 3); Probable carcinogen	Organic #3	Red	-
Fuchsin (acid/basic)	Irritant	Misc.	Orange	-
Gasoline	Flammable (NFPA = 3)	Organic #3	Red	3
Hematoxylin	Irritant	Organic #2	Blue	2
Hydrogen sulfide	Corrosive	Inorganic #5	Red	2
Hydroquinone	May be fatal if ingested	Organic #3	Red	-
Indigo Carmine	Mutagen	Misc.	Dye	-
Isoamyl alcohol (isopentyl alcohol)	Irritant, combustible liquid and vapor	Organic #2	Red	3
Isobutyl alcohol	Flammable (NFPA = 3)	Organic #2	Red	3
Lead Diacetate	Animal Carcinogen, Mutagen	Inorganic #2	Blue	1
Magnesium chlorate	Irritant	Inorganic #6	Yellow	1
Methyl ethyl ketone	Irritant, flammable (NFPA = 3)	Organic #2	Red	3
Methyl oleate	Toxic properties not investigated			
Nickel (II) Acetate	Animal Carcinogen	Inorganic #2	Blue	-
Nickel carbonate	Reasonably anticipated human carcinogen	Inorganic #6	Blue	-
Nickelous acetate	Reasonably anticipated human carcinogen	Inorganic #6	Blue	-

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NOTE: These chemicals should be removed from the school if alternatives can be used. Fore those that must be retained, amounts sould be kept to a minimum. These are appropriate for advanced-level High School classes only.

SUBSTANCES WITH A HAZARDOUS NATURE, BUT MAY HAVE POTENTIAL EDUCATIONAL UTILITY
APPROPRIATE FOR ADVANCED-LEVEL HIGH SCHOOL CLASSES ONLY

Chemical	Potential Hazard	Flinn Storage Location	Baker Color Codes	Special Storage Consideration
Paradichlorobenzene	Irritant	Organic #4	Red	1
Pentane	Irritant, flammable (NFPA = 4)	Organic #3	Red	3
Petroleum ether	Flammable (NFPA = 4)	Organic #4	Red	3
1-Phenyl-2-Thiourea (Phenylthiocarbam	May be fatal if inhaled or ingested	Organic #2	Blue	1,4
Potassium chlorate	Oxidizer	Inorganic #6	Yellow	-
Potassium chromate	Oxidizer, known human carcinogen	Inorganic #6	Yellow	1,4
Potassium Cyanide	Highly Toxic	Inorganic #7	White Stripe	1,4
Potassium periodate	Oxidizer	Inorganic #6	Yellow	1
Potassium permanganate	Oxidizer, corrosive	Inorganic #8	Yellow	-
Pyrogallic Acid	Mutagen	Organic #8	Blue	4
Salol (phenyl salicylate)	Irritant	Organic #3	-	-
Sodium bromate	Oxidizer	Inorganic #6	Yellow	-
Sodium chlorate	Oxidizer	Inorganic #6	Yellow	-
Sodium fluoride	May be fatal if inhaled or ingested	Inorganic #2	Blue	1,4
Sodium oxalate	Corrosive, may be fatal if ingested	Inorganic #2	Blue	-
Sodium nitrate	Oxidizer, irritant	Inorganic #3	Yellow	-
Sodium silicofluoride	Toxic	Inorganic #4	-	4
Sudan III	Decomposes to oxides of nitrogen	Misc.	Dye	-
Sulfamethazine	Irritant			
Toluene	Flammable; Irritant; May be fatal if ingested	Inorganic #3	Red	3
Trichloroethylene	Reasonably anticipated human carcinogen	Organic #4	Red	3
Xylenes	Flammable; Irritant; May be fatal if ingested	Organic #3	Red	3

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INCOMPATIBLE CHEMICALS

Chemical	Potential Hazard
Acetic Acid	Chromic acid, Nitric acid, Peroxides, Permanganates
Anetic Anhydride	Hydroxyl group containing compound, Ethylene glycol, Perchloric Acid
Acetone	Concentrated Nitric and Sulfuric acid mixtures, Hydrogen peroxide
Acetylene	Bromine, Clorine, Copper, Fluorine, Mercury, Silver
Ammonium Nitrate	Acids, Chlorates, Flammable liquids, Nitrates, powdered metals, Sulphur, finely divided organic or combustible materials
Aniline	Hydrogen peroxide, Nitric acid
Calcium Oxide	Water
Carbon, activated	Calcium hypochlorite, other oxidants
Chlorates	Acids, Ammonium salts, Metal powders, Sulphur, finely divided organic or combustible materials
Chromic Acid	Acetic acid, Camphor, Glycerol, Naphthalene, Turpentine, other flammable liquids
Chlorine	Acetylene, Ammonia, Benzene, Butadiene, Butane and other petroleum gases, Hydrogen, Sodium carbide, Turpentine, finely divided metals
Copper	Acetylene, Hydrogen peroxide
Hydrazine	Hydrogen peroxide, Nitric acid, other oxidants
Hydrocarbons	Bromine, Chlorine, Chromic acid, Fluorine, peroxides
Hydrocyanic Acid	Alkalis, Nitric Acid
Hydrofluoric Acid, Anhydrous	Ammonia (Aqueous or Anhydrous)
Hydrogen Peroxide	Aniline, Chromium, combustible materials, Copper, Iron, most metlas and their salts, Nitromethane, any flammable liquid
Hydrogen Sulfide	Fuming nitric acid, oxidizing gases
Iodine	Acetylene, Ammonia (Aqueous or Anhydrous)
Mercury	Acetylene, Ammonis, Fulminic Acid
Nitric Acid, concentrated	Acetic acid, Acetone, Alcohol, Aniline, Chromic acid, flammable gases, flammable liquids, Hydrocyanic acid, Hydrogen Sulfide, Nitratable substances
Nitroparaffins	Amines, inorganic bases
Oxalic Acid	Mercury, Silver
Oxygen	Flammable liquids, solids or gases, grease, Hydrogen, oils
Perchloric Acid	Acetic anhydride, Alcohol, Bismuth and its alloys, grease, oils, paper, wood
Peroxides, organic	Acids (organic or mineral)
Phosphorus (white)	Air, Oxygen
Potassium Chlorate	Acids (also refer to chlorates)
Potassium Perchlorate	Acids (also refer to percholoric acid)
Potassium Permanganate	Benzaldehyde, Ethylene glycol, Glycerol, Sulfuric acid
Silver	Acetylene, Ammonium compounds, Fulminic Acid, Oxalic acid, Tartaric acid
Sodium Peroxide	Any oxidizable substances (e.g., Acetic anhydride, Benzaldehyde, Carbon disulfide, Ethanol, Ethyl acetate, Ethylene glycol, Furfural, Glacial acetic acid, Methanol, Methyl acetate)
Sulphuric Acid	Chlorates, Perchlorates, Permanganates

SAMPLE CHEMICAL STORAGE PLAN

Storage of laboratory chemicals presents an ongoing safety hazard for school science departments. There are many chemicals that are incompatible with each other. The common method of storing these products in alphabetical order sometimes results in incompatible neighbors. For example, storing strong oxidizing materials next to organic chemicals can present a hazard.

A possible solution is to separate chemicals into their organic and inorganic families and then to further divide the materials into related and compatible families. Below is a list of compatible families. On the next page you will find this family arrangement pictured as shelf areas in your chemical stores area. The pictured shelf arrangement will easily enable you to rearrange your inventory into a safer and more compatible environment.

Inorganic

1. Metals, Hydrides
2. Acetates, Halides, Iodides, Sulfates, Thiosulfates, Phosphates, Halogens
3. Amides, Nitrates (except Ammonium Nitrate), Nitrites, Azides
4. Hydrozides, Oxides, Silicates, Carbonates, Carbon
5. Sulfides, Selenides, Phosphides, Carbides, Nitrides
6. Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide
7. Arsenates, Cyanides, Cyanates
8. Borates, Chromates, Manganates, Permanganates
9. Acids (except Nitric) (Nitric Acid is isolated and stored by itself.)
10. Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide
11. Inorganic miscellaneous

Organic

1. Acids, Amino Acids, Anhydrides, Peracids
2. Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides
3. Hydrocarbons, Esters, Aldehydes, Oils
4. Ethers, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide
5. Epoxy Compounds, Isocyanates
6. Peroxides, Hydroperoxides, Azides
7. Sulfides, Polysulfides, Sulfoxides, Nitriles
8. Phenols, Cresols
9. Dyes, Stains, Indicators
10. Organic miscellaneous

Surely this list is not complete and is intended only to cover the materials possibly found in an average school situation. This is not the only method of arranging these materials and is only offered as a suggestion.

Suggested Chemical Storage Pattern - inorganic

INORGANIC #10 Sulfur, Phosphorus, Arsenic, Phosphorus Pentoxide	**INORGANIC #7** Arsenates, Cyanides, Cyanates (Store away from any water.)
INORGANIC #2 Acetates, Halides, Iodides, Sulfates, Thiosulfates, Phosphates, Halogens	**INORGANIC #5** Sulfides, Selenides, Phosphides, Carbides, Nitrides
INORGANIC #3 Amides, Nitrates (except Ammonium Nitrate), Nitrites, Azides (Store Ammonium Nitrate away from all other substances – Isolate it!)	**INORGANIC #8** Borates, Chromates, Manganates, Permanganates
INORGANIC #1 Metals, Hydrides (Store away from any water.) (Store flammable solids in flammables cabinet.)	**INORGANIC #6** Chlorates, Bromates, Iodates, Chlorites, Hypochlorites, Perchlorates, Perchlorates, Perchloric Acid, Peroxides, Hydrogen Peroxide
INORGANIC #4 Hydrozides, Oxides, Silicates, Carbonates, Carbon	**MISCELLANEOUS**

Acid cabinet

Inorganic #9

Acids, except Nitric
(Nitric Acid is isolated and stored by itself.)

Suggested Chemical Storage Pattern - organic

ORGANIC #2
Alcohols, Glycols, Sugars, Amines, Amides, Imines, Imides
(Store flammables in a dedicated cabinet.)

ORGANIC #3
Hydrocarbons, Esters, Aldehydes, Oils
(Store flammables in a dedicated cabinet.)

ORGANIC #4
Ethers, Ketones, Ketenes, Halogenated Hydrocarbons, Ethylene Oxide
(Store flammables in a dedicated cabinet.)

ORGANIC #5
Epoxy Compounds, Isocyanates

ORGANIC #7
Sulfides, Polysulfides, Sulfoxides, Nitriles

ORGANIC #8
Phenols, Cresols

ORGANIC #6
Peroxides, Hydroperoxides, Azides

ORGANIC #1
Acids, Amino Acids, Anhydrides, Peracids
(Store certain organic acids in acid cabinet.)

ORGANIC #9
Dyes, Stains, Indicators
(Store alcohol-based solutions in flammables cabinet.)

MISCELLANEOUS

FLAMMABLE CABINET

organic #2
Alcohols, Glycols, etc.

organic #2
Hydrocarbons, etc.

organic #2
Ethers, Ketones, etc.

organic #2
Alcohol-based Indicators, etc.

POISONS CABINET

Store severe poisons in locked Poisons Cabinet.

ADDITIONAL STORAGE SUGGESTIONS

1. Avoid floor chemical storage (even temporary).
2. No top shelf chemical storage.
3. No reactive liquid chemicals stored above eye level.
4. Shelf assemblies are firmly secured to walls. Avoid island shelf assemblies.
5. Provide anti-roll-off lips on all shelves (at least ¼")
6. Ideally shelving assemblies would be of wood construction
7. Avoid metal, adjustable shelf supports and clips. Better fixed, wooden supports.
8. Store acids in dedicated acid cabinet(s). Store Nitric Acid in that same cabinet ONLY if isolated from other acids. Store both inorganic and some organic acids in the acid cabinet.
9. Store severe poisons in a dedicated poisons cabinet.
10. Segregate known or suspect carcinogens from other chemicals.
11. If you store volatile materials (either, hydrocarbons, etc.) in a refrigerator, the refrigerator must be explosion-proof. The thermostat switch or light switch in a standard refrigerator may spark and set off the volatile vapors in the refrigerator and cause an explosion.

LABORATORY CHECKLIST

DATE: **BUILDING:**

INSPECTOR: **ROOM:**

ITEMS				COMMENTS
LAB SIGNAGE	OK	DEFICIENT	PIC #	
Emergency contacts posted				
Emergency routes posted				
Shower and eyewash signs posted				
Chemical storage room labeled				
Flammable, Acid and Corrosive cabinets labeled				
SAFETY EQUIPMENT	OK	DEFICIENT	PIC #	
Fire extinguishers - mounted, unobstructed				
inspected monthly, serviced annually				
Safety Shower - present, unobstructed				
activated weekly, documented monthly				
Eyewash - present, unobstructed				
activated weekly, documented monthly				
Proper PPE in place (goggles, gloves,aprons)				
Fire blanket present, in good condition, unobstructed				
Universal gas shut off accessible				
Fume Hoods Tested Annually				
Spill kit availability(mercury,acid,base)				
HOUSEKEEPING	OK	DEFICIENT	PIC #	
Aisles and exits are free of obstructions				
Food and chemicals stored together				
Lab and storage areas uncluttered and orderly				
Chemical storage above eye level				
CHEMICAL STORAGE	OK	DEFICIENT	PIC #	
Proper chemicals storage system used				
Lips on shelving units				
Chemicals properly labeled				
Approved acid, flammable and corrosives cabinets in use				
MSDS sheets, chemical inventory are available				
Storage shelves are in good condition				
Chemical containers are in good condition				
Dedicated direct ventilation to outside				
Compressed Gas cylinders properly stored				
Nitric acid segregation				
Annual Chemical Inventory Maintained				
No dangerous chemical stored (On-Site) (see below)				

OTHER DEFICIENCIES	PIC #	OTHER DEFICIENCIES	PIC #

STUDENT SAFETY AGREEMENT FORM

Name (Please PRINT...last) _____
(first) _____
Class _____
Hour _____

In order to ensure that science experiments are safe and positive learning experiences, please read and sign both copies of this Science Safety Rules and Procedures Agreement. You and your instructor should then each keep a copy for future reference.

1. Perform all experiments as directed. Do not do anything which is not part of an approved experiment. Follow all directions given by your instructor. If there is anything you do not understand about safety, ask your instructor before you start.

2. An unprepared laboratory worker is an unsafe worker; read the written procedures in advance and understand what you are going to do. Lack of familiarity wastes your time and is major cause of injury in the laboratory setting. Read the hazards and precautions before doing any laboratory work.

3. Never work without adult supervision; always have another worker present to help in case of an accident.

4. Safety goggles and an apron must be worn at all times. Wear gloves when required.

5. Know the location of and operating procedure for the eye wash fountains, safety showers, fire extinguishers, fire blanket, spill control devices and first aid supplies.

6. Act in a responsible manner at all times. No clowning around should occur in the lab area. Never run in the laboratory.

7. Wear shoes which cover the entire foot. Clothing (especially sleeves) should not be loose and floppy.

8. Tie back long hair to keep it away from flames and chemicals.

9. Never taste a chemical. Check odors only if instructed to do so, by gently wafting some of the vapor towards your nose with your hand. Never eat or drink in the laboratory.

10. Never let a hot plate or Bunsen burner operate unattended.

11. Treat burns immediately by putting the burned area under cold water for at least 15 minutes. Cold water markedly reduces any subsequent pain and blisters.

12. Read the chemical label carefully. Read it 3 times: when you pick it up, just before you use it, and after you are finished. Many mistakes result from mixing the wrong chemicals.

13. Report all accidents, injuries, and close calls to your teacher immediately.

STUDENT SAFETY AGREEMENT FORM CONTINUED

14. Follow the specified disposal procedures given for each waste material produced during an experiment. Broken glass goes in the broken glass container. Never remove any chemicals, supplies, or equipment from the laboratory.

15. Be careful to take only what you actually need. Never return unused chemicals to the stock (reagent) bottle unless specifically instructed to do so. Do not contaminate the stock solutions.

16. Clean up all spills immediately. This includes water.

17. List your allergies at the bottom of this page. If the experiment deals with something to which you are allergic, or if you have a color blindness concern, consult with your instructor.

18. Treat all chemicals with the respect they deserve. Read or know about any hazards related to the chemical before you handle the material.

19. Wash your hands frequently; always wash your hands immediately after finishing laboratory work. Wash spilled chemicals from your skin immediately and for 15 minutes.

20. Clean your lab area and put away all equipment and chemicals.

21. Fabricating, falsifying, or sharing laboratory data when not told to do so will be interpreted as cheating and will be dealt with in accordance with School District policy.

I, _____, have read, understand and agree to follow these science safety rules and procedures. I agree to abide by any additional instructions, written or verbal, provided by my science instructor. If I do not abide by these rules, I understand that it may be cause for an administrative referral and possible removal from this course.

_____ _____

Signature Date

Any allergies or medical problems that your instructor should be made aware of:

Chemical Hazard Evaluation Form

Use this form when preparing for a laboratory procedure that involves the use of hazardous chemicals and attach to the lesson plan. If multiple chemicals are used, multiple forms are required.

LESSON PLAN: _____

SOP	NFPA RATING circle those that apply HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).	Chemical Identified to be used: Chemical Name: _____
	**Health** 0 1 2 3 4 **Flammability** 0 1 2 3 4 **Instability** 0 1 2 3 4 **Special Hazard: ACID ALK**  **W SA OX**	***Will this chemical be used with an incompatible?*** ***Check: NO YES Name: _____*** ***Is there a less hazardous chemical that could be used:*** ***Check: NO YES***

Check the Row(s) below and column(s) to the right indicating what safety equipment and procedures are to be used and when they should be followed.			**Pre-Lab**	**Lab**	**Post-Lab**
Hazard Category	**Check all that apply**	**Corrosive Solid**			
		Corrosive Liquid			
		Reactive			
		Volatile			
		Other: _____			
PPE - Personal Protection Equipment	**Check and circle**	**Safety Glasses**			
		Goggles			
		Splash Shield			
		Gloves: N-dex 7005 **or** Nitri-Solve Nitrile 727			
		Body Protection: Apron Hair Tie Loose Clothing			
		Foot : No sandals, perforated or open-toed shoes			
		Respiratory			
		OSHA Personal Exposure Required?			
Engineering Controls	**Check all that apply**	**Ventilation**			
		Use Fume Hood			
		Eyewash Station in working order			
		Safety Deluge Shower in working order			
		Use diluted or small quantities of hazards			
		Fire Extinguishers present			
Waste Disposal	**Check all that apply**	**Sanitary Sewer Disposal**			
		Sanitary Solid Waste Disposal (Garbage)			
		Store Waste in Separate Accumulation Container and Make Proper Request to CHO or SD for Disposal			
List any hazardous products, by products or wastes that may be created anytime during the use of the chemical identified above. **** Handle and Dispose of properly.***		1.			
		2.			
		3.			
		4.			

Chemical Hygiene Officer (CHO)
Compliance Checklist

Administrative

- ☐ Have background knowledge and training in chemicals/chemistry, their potential hazards and applicable safety requirements and be qualified by training or experience to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan (CHP).
- ☐ Act as the School District representative in matters relating to laboratory chemical hygiene.
- ☐ Appoint a Chemical Hygiene Committee (CHC), if appropriate, and hold meetings as appropriate.
- ☐ Ensure that appropriate training has been provided to all employees/students in the laboratory facilities and that they know and follow the chemical hygiene rules. Update training as site conditions and/or procedures change.
- ☐ Make sure the Chemical Hygiene Plan (CHP) is available for review upon request to science employees.
- ☐ Ensure MSDS Sheets are readily accessible to all employees who use chemicals.
- ☐ Report deficiencies and/or safety concerns to the CHC, if appointed, and District Administration as appropriate.
- ☐ Maintain records of all accidents, employee exposure monitoring, medical records, etc.

Written Plans and Procedures

- ☐ Work with School District Administrators and the CHC, if appointed, in the development and maintenance of a District specific CHP.
- ☐ Ensure the CHP is maintained and reviewed annually with any significant changes documented.
- ☐ Ensure lesson plans and instruction in the laboratory facilities are conducted according to the CHP and includes an evaluation of potential hazards, preventative measures and emergency procedures for hazards identified.
- ☐ Verify completion of lab science safety contracts.
- ☐ Develop safety policies and procedures for the School District laboratory facilities specific to each operation involving the use of chemicals.
- ☐ For chemicals used on the "not recommended for use in schools list", develop detailed written procedures for the proper use, storage, handling, disposal and exposure monitoring of these chemicals may be required.

Personal Protective Equipment

- ☐ Oversee laboratory facilities and procedures; determining that laboratory facilities, personal protective equipment (PPE) and training levels are adequate for chemicals in use.
- ☐ Determine the proper level of personal protective equipment (PPE), and coordinate procurement of PPE as well as training specific to the PPE used.

Safety Equipment and Inspections

- Ensure that weekly activation of eyewash stations is conducted and documented.
- Ensure that weekly activation of safety showers is conducted and documented.
- Ensure that safety inspections of the laboratory facilities, lab equipment, fire extinguishers and lab glassware are conducted on a regular basis
- Inspect for proper operation of ventilation equipment (hoods and storage room ventilation) and report any equipment deficiencies to the maintenance department.
- Ensure that proper chemical spill kits are available and accessible.
- Recommend safety improvements for the School District laboratory facilities.

Emergency Plan

- Annually review emergency evacuation procedures
- Annually review emergency medical plan

Warning signs and Labels

- Ensure adequate signage to proper identify locations and types of safety equipment (eye wash, shower, fire extinguisher)
- Ensure Chemical storage room is labeled.
- Ensure all hazardous chemical containers are properly labeled with hazard information.
- Ensure emergency contacts are posted directly outside chemical storage room.

Science Chemical Procurement and Storage

- Develop and maintain a list of chemicals acceptable for use in the laboratory facilities.
- Be directly involved in all purchasing of science chemicals.
- Coordinate delivery, receipt and storage of purchased science chemicals
- Maintain a complete inventory of all hazardous chemicals in the laboratory facilities. If, upon investigation, chemicals not recommended for use in schools are found, a disposal of these chemicals shall be immediately coordinated.
- Ensure all chemicals are stored in a recognized storage pattern
- Ensure proper storage of hazardous chemicals in approved storage cabinets (acid, corrosive, flammable, etc…) and/or chemical storage room with dedicated exhaust ventilation.
- Ensure material safety data sheets (MSDS's) are obtained and maintained for all chemicals purchased and utilized in the laboratory facilities.
- Oversee the disposal of all hazardous chemicals from the laboratory facilities.