

CHEMICAL HYGIENE PLAN
DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY
UNIVERSITY OF MICHIGAN-FLINT

1. PURPOSE

The purpose of Chemical Hygiene Plan (CHP) is to provide information required to recognize, evaluate and control health hazards associated with the use of hazardous chemicals in academic laboratories. In addition, it serves as a tool for compliance with Federal, State and Local laws.

2. ORGANIZATIONAL STRUCTURE

The organizational structure for ensuring safe work practices in the Department and efficacy of the CHP program is shown in Figure 1.

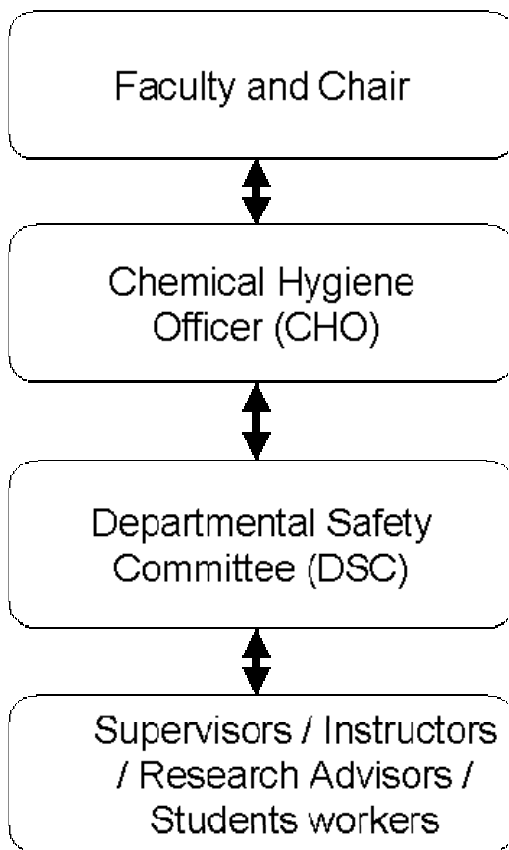


Figure 1: Organizational Structure for Laboratory Safety in the Department.

3. RESPONSIBILITIES

a. Chemistry and Biochemistry Faculty

- (i.) Approve CHP and the Departmental safety rules and regulations.
- (ii.) Schedule an annual review of the CHP.
- (iii.) Enforce all safety rules and regulations.
- (iv.) Provide the CHO and DCS with the support necessary to implement and maintain the CHP.
- (v.) Deliberate on appeals concerning actions taken by the DSC and be the final decision maker in all matters relating to Departmental CHP.
- (vi.) Review accident reports, and recommendations from the Departmental Safety Committee (DSC).
- (vii.) Ensure that the Department remains in compliance with both Departmental and Institutional CHP.

b. Chair

- (i.) Ensures that the Department remains in compliance with both Departmental and Institutional CHP.
- (ii.) Provides budget arrangements for health and safety improvements.
- (iii.) Enforces all safety rules and regulations.
- (iv.) Appoints members to serve on the DSC and as well as the chair of the committee.

c. Chemical Hygiene Officer (The supervisor of laboratories in the Department).

- (i.) Maintains recordkeeping of safety related Departmental inventories (the CHP, a comprehensive file of material safety data sheets, accident reports, and employee and student training records).
- (ii.) Monitors procurements, use, storage, and disposal of chemicals.
- (iii.) Ensures that emergency situations are handled expeditiously and in compliance with both Departmental and Institutional policies.
- (iv.) Conducts inspections of laboratories, prep rooms, and storage areas to ensure compliance with Departmental and Institutional safety regulations.
- (v.) Recommends to the Department any safety equipment which should be acquired or replaced.
- (vi.) Assists faculty members in their initial safety review of experiments.
- (vii.) Works with the DSC to review and revise the CHP and Departmental safety rules and regulation, as needed.
- (viii.) Works with other units of the university to ensure physical changes in the laboratories meet safety and health standards.
- (ix.) Arrange safety equipment inspections and ensures that the equipment are updated and remains in compliance with Local, State and Federal standards.

- (x.) Ensure that any physical changes made in the laboratories meet health and safety standards.

d. Departmental Safety Committee

This five-member committee is composed of faculty, staff, and student representatives. It will serve as safety resources for laboratory workers and students.

- (i.) Review all accident reports in order to identify and address unsafe work practices as well as determine preventive measures.
- (ii.) Identify unsafe practices and unsafe conditions, and discuss their findings with the individual(s) responsible for specific operations and submit to the Department a report of these findings.
- (iii.) Review the list of chemicals stored in each laboratory annually to ensure compliance with Departmental policy.
- (iv.) Recommend to the Department any safety equipment which should be acquired or replaced.
- (v.) Assist faculty members in their initial safety review of experiments.
- (vi.) Evaluate student complaints about safety.
- (vii.) Conduct inspections of laboratories, prep rooms, and storage areas to ensure compliance with Departmental and Institutional safety regulations. Copies of inspection documents and follow-ups will be forwarded to EHS.
- (viii.) Review and make recommendations on the CHP and Departmental safety rules and regulations, as needed.
- (ix.) Ensure that any physical changes made in the laboratories meet health and safety standards.

e. Laboratory Supervisors/ Laboratory Instructors/ Research Advisors Approve CHP and the Departmental safety rules and regulations.

- (i.) Conduct safety reviews of all work performed in the laboratory in consultation with the DSC.
- (ii.) Inspect all equipment / apparatus prior to laboratory activity.
- (iii.) Educate students and laboratory workers on the locations and use of all safety equipment and emergency equipment prior to any laboratory activity.
- (iv.) Discuss safety concerns and potential hazards relating to all laboratory activities with students.
- (v.) Ensure that students have read, and signed the sign-off sheet indicating that they will abide by the Departmental rules at all times while they are in the laboratory.
- (vi.) Ensure that visitors comply with safety rules.
- (vii.) Follow and enforce safety rules, procedures and practice in assigned laboratory space.
- (viii.) Establish a laboratory-specific Standard Operating Procedure (SOP) for each assigned laboratory space.

- (ix.) Ensure that appropriate personal protective equipment (PPE) compatible to the degree of hazard of the chemical in use is available, and the PPE are used properly.
 - (x.) Update on-hand chemical inventory annually.
 - (xi.) Be proactive in every aspect of safety.
- f. Laboratory Workers**
- (i.) Be a model for good safety conduct.
 - (ii.) Enforce all safety rules and procedures at all times.

4. CONTROL MEASURES

a. Chemical Compatibility Chart (Refer to Appendix A)

b. General Safety Rules

- Safety is an absolute necessity in the laboratory. Accidents in the laboratory are a result of improper or careless procedures, or lack of supervision. Laboratory is designed to teach proper techniques of chemistry as well as instruction in the fundamentals of laboratory safety. Not only will observance of precautions avoid mishaps, it may improve your grade! The following rules must be observed:
- (i.) Before performing any experiment in the laboratory, you must first know the location of fire extinguishers, safety showers, eye wash fountains, fire blankets, and first aid kits; the instructor will discuss their proper usage.
 - (ii.) Wear approved safety goggles in the laboratory any time there is work in progress by anyone! Failure to comply with this precaution could result in the suspension of laboratory privileges. Contact lenses must not be worn in the lab.
 - (iii.) Gloves that are appropriate to the degree of hazard must be worn at all times when handling hazardous materials and must not be worn outside the laboratory.
 - (iv.) Eating, chewing gum, drinking, and / or smoking in the laboratory are strictly forbidden.
 - (v.) Laboratory chemicals are not to be tasted since many are toxic. When instructed to smell reagents, do so with great caution, **never** put your nose over the bottle! Avoid looking into the mouth of any reaction vessel in which a reaction is in progress. Never point a test tube that contains a heated liquid at anyone.
 - (vi.) Proper attire (non-loose fitting shirts and slacks, and shoes (not open-toed or sandals)) must be worn at all times!
 - (vii.) No one will perform any unauthorized experiments, nor will anyone work in the lab alone.
 - (viii.) All lab work and schedules must be approved by the instructor or advisor.

- (ix.) Report ALL injuries, allergies and / or medical problems to the Instructor or Advisor.
- (x.) Fire polish all glass tubing and stirring rods; protect your hands with a towel and lubricate the glass tubing or thermometers when inserting them into stoppers.
- (xi.) Read the label on a reagent bottle before using it and be certain that you are using the correct material; always hold the bottle by placing your hand over the label.
- (xii.) Label every chemical container and specify the name of chemical, concentration and major hazard to avoid mix-ups.
- (xiii.) If you spill something, clean it up (GET HELP WITH HAZARDOUS MATERIALS)! Wash your hands immediately after skin contact with any chemical reagent. Also wash them after lab. If liquids drip down the side of the bottle while pouring, wash the drip off the bottle.
- (xiv.) NEVER return excess chemicals to the reagent bottle.
- (xv.) Dispose of the excess chemicals in the proper waste container, as directed by the Instructor or Advisor.
- (xvi.) All sharps and glass should be disposed in the proper waste container, as directed by the Instructor or Advisor.

c. Chemical Procurements, Distribution and Storage.

- (i.) All chemical procurement will be processed by the Laboratory Supervisor. Procurement will be made in a manner compliant with all University policies and procedures.
- (ii.) The Lab Supervisor will ensure that the Departmental inventory and the EHS Hazardous Materials inventory are updated, that the necessary MSDS is on site, and that records of all purchases are maintained.
- (iii.) All materials transferred from other sources (other University Departments, research collaborators, other institutions, etc.) will be reported to the Laboratory Supervisor.
- (iv.) The Laboratory Supervisor will maintain an itemized record of all chemical distributions.
- (v.) All materials will be stored in a manner consistent with current OSHA & EPA standards.

d. Hazardous Waste Storage and Disposal

Important information about proper procedures for handling, storing, and disposal of chemicals can be found in the Material Safety Data Sheet (MSDS) for specific chemicals. Materials that should be collected for disposal as hazardous waste include all flammables (including Methanol, Ethanol, and Acetone), highly corrosive materials, highly reactive materials, strong oxidizers, toxic or poisonous materials, carcinogens, mutagens, teratogens, any chemical that causes fetal or reproductive effects, heavy metals,

water sensitive / reactive materials, or any material that has an MSDS that warns of ecological effects. If you are unsure of the category of your material, collect it as a hazardous waste and we will dispose of it appropriately. The general rules for collecting waste materials are:

- (i.) Hazardous Waste (HazWaste) label must be the only label on waste containers.
 - (ii.) Label HazWaste materials with a designated label that contains identification of all of the materials in the bottle (including water and buffers) and a date indicating when collection of the material began.
 - (iii.) Use an appropriately sized container that can be sealed (bottles with **caps, no open beakers or flasks** unless otherwise instructed). The container used must be in good condition as well as compatible with the contents.
 - (iv.) Use plastic containers whenever possible to decrease the likelihood of breakage in transit.
 - (v.) Use small-mouth bottles for liquids and large mouth bottles for solids.
 - (vi.) Keep HazWaste in the designated HazWaste containment area for your lab.
 - (vii.) Store HazWaste containers on a HazWaste containment tray to control leakage. Do not store other materials on this tray.
 - (viii.) Be sure that all HazWaste containers are closed after adding materials.
 - (ix.) Do not fill any container beyond the shoulder of the bottle.
 - (x.) Clean up all spills immediately (this includes spills down the sides of containers and on containment trays).
- (e) **Handling Biohazards**
- (i.) Do not handle broken glassware directly by hand. Use mechanical means such as a brush and dust pan or tongs.
 - (ii.) Always keep a container of disinfectant (e.g. 10 % bleach, 70 % ethanol) in work area for decontaminating, or in case of a spill.
 - (iii.) All work surfaces should be decontaminated at least once a day and after any spill of viable material.
 - (iv.) All materials (e.g. glassware, plastics) in contact with bacteria must be bleached with a 10% bleach solution.
 - (v.) Disposable items must be placed in a University standard autoclave bag after treatment with bleach and autoclave (biweekly schedule or when full) with bag open.
 - (vi.) Non-disposable contaminated items should be soaked in 10% bleach overnight then washed with soap or autoclave for reuse.
 - (vii.) Mouth-pipetting any material, however innocuous is prohibited.
 - (viii.) Avoid contamination to or from fingers by using the pipet tip ejector.
 - (ix.) Always use cotton-plugged pipet when pipetting biohazards.

- (x.) Contaminated pipet tips are to be soaked in 10% bleach overnight before disposal in disposal bucket.
- (xi.) Always ensure that all biohazards (e.g. cultures or tissues) are in containers that prevent leakage during collection, handling, processing, storage, transport, or shipping.
- (xii.) Spills and accidents should be reported to the Advisor, Instructor or CHO.
- (xiii.) All materials in contact with bacteria must be bleached with a 10% bleach solution.
- (xiv.) Disposable items must be placed in the “biohazards to be autoclaved” vessel after bleaching. This material should be autoclaved on a biweekly schedule or when full.
- (xv.) Non-disposable items are to be placed in 10% bleach overnight then washed with soap.
- (xvi.) Pipet tips are to be immersed in 10% bleach overnight then disposed of in the pipet tips disposal bucket

(f) Standard Operating Procedures (Refer to Appendix B for template and specific example)

5. EMERGENCY RESPONSE EQUIPMENT AND KITS

The following emergency response equipment is available in all laboratories. Know the location of the equipment in any laboratory you're working in. You should know how to operate and use the equipment. The CHO will ensure that the appropriate unit (s) of the university conducts regular equipment inspections.

- a. Showers
- b. Fire Blanket
- c. Eyewash Fountains
- d. Fire Extinguishers
- e. Chemical Spill Response Kits
- f. First Aid Kits

6. PERSONAL PROTECTION EQUIPMENT

The following are important personal protection equipment for your safety. They must be used correctly, and when appropriate.

- a. **Eye and Face Protection**
The type used depends on circumstances and the use of proper eye protection is required of everyone including visitors to the laboratory. Refer to the information provided by the manufacturer for specific guidance and talk with your Supervisor, Instructor or Advisor.
- b. **Laboratory Coats**
Your Supervisor, Instructor or Advisor will require the use of lab coats when appropriate.
- c. **Gloves**

The type use depends on material being handled and the hazard involved. Gloves that are appropriate to the degree of hazard must be worn at all times when handling hazardous materials and must not be worn outside the laboratory. Consult the MSDS and refer to the information provided by the manufacturer for specific guidance and consult your Supervisor, Instructor or Advisor.

d. Respirators

The type use depends on hazard and circumstances. Specialized training and certification will be required prior to use of a respirator.

e. Fume Hoods

The fume hoods must be use when working with a system under reduced pressure, and operations that generate toxic or flammable vapors. Keep you face outside the plane of the hood sash.

7. EMERGENCY RESPONSE PROCEDURES

a. Chemical Spills

- (i) Assess the overall situation (risk, quantities, potential impact as well as whether the spill is a simple or a complex spill).
- (ii) Determine the appropriate action. Simple spills can be cleaned up by a trained on-site individual while complex spills require assistance from trained HazMat Emergency Response individuals. For simple spill clean up, make sure you put on appropriate PPE and contain the spill so that exposure and/or damage does not increase. Below are some possible recommended actions:
 - For solids, minimize dust spread by closing doors and increasing ventilation. Warn all individuals who may be at risk and immediately notify your Supervisor or Advisor for help. Decontaminate the spill area and contaminated equipment (including those used to clean up the spill). Place contaminated residues in an appropriate container for disposal.
 - For liquids, minimize spread by building dikes around the spill with absorbent. Warn all individuals who may be at risk and immediately notify your Supervisor or Advisor for help. Use absorbents such as sodium hydrogen carbonate (to neutralize acids), vinegar (5% acetic acid solution to neutralize bases, and absorbents from spill control kit (such as vermiculite, kitty litter) to absorb liquid spills/neutralized chemicals. Sweep up and dispose in an appropriate container for disposal.
 - For flammable materials, warn all individuals to extinguish all flames. Minimize spread by closing doors and increasing ventilation. Immediately notify your Supervisor, Instructor or Advisor.

b. Chemical Exposure

The three principal routes for exposure to chemicals in the laboratory are dermal (skin), inhalation (nose or mouth), and ingestion (mouth). Consult specific MSDS for appropriate action.

c. Medical Emergency

All medical emergencies must be reported immediately to Public Safety. If you require, or if you become aware of an individual who requires emergency medical care immediately:

- (i) Call Public Safety at 762-3333 or 911 from any campus phone. The exception is if you are calling from a pay phone on campus, 911 will connect you with the City of Flint Police, Fire and emergency response Departments. Ask them to notify the UM-Flint Public Safety.
- (ii) Provide the following information to the Public Safety Dispatcher:
 - Your name and telephone number.
 - The name of the individual requiring medical attention, if known.
 - Description of individual requiring medical attention.
 - Exact location of the individual (building and room number).
 - Describe what is happening.
 - Any other relevant information.
- (iii) Do not hang up the telephone until the Public Safety dispatcher has indicated that you have provided all of the necessary information.
- (iv) Only individuals trained in first aid, CPR, or emergency medical procedures should respond directly to medical emergencies. All other individuals should call 911 for medical assistance. Universal Precautions should be followed at all times during a medical emergency when there is exposure or potential exposure to bodily substances to protect yourself and others from communicable illness or disease.
- (v) For complete information refer to Campus CHP.

d. Fire and Fire Arms

Refer to Campus CHP.

8. HOUSEKEEPING

- (i.) Keep work area neat.
- (ii.) Inspect all equipment for damage before use.
- (iii.) Put away equipment and apparatus not in use
- (iv.) Drawers and cabinets should remain closed when not in use
- (v.) Glass and sharps should be disposed in proper containers
- (vi.) Access to aisles, emergency equipment, utility controls and exits should always be kept clear.
- (vii.) Store only limited quantities of hazardous chemicals.
- (viii.) Always check the labels on chemicals to verify that it is the correct one before use.

- (ix.) Never use chemicals or gas cylinders with missing or unreadable label.
- (x.) Securely attach all gas cylinders (empty or full) to a wall or lab bench with the appropriate safety clamp or chain.
- (xi.) Check all cylinders for damage before use and use the appropriate regulator.
- (xii.) Containers for chemical storage must be in good condition and compatible with their contents.

9. RECORDKEEPING

The following safety records will be maintained by the Department and the CHO will oversee the recordkeeping.

- (i.) Copies of past and current CHP
- (ii.) A comprehensive file of material safety data sheets (accessible upon request)
- (iii.) Accident reports
- (iv.) Employee and student training records
- (v.) Equipment inspection records

10. WORK REQUIRING PRIOR APPROVAL

- (i.) Radioactive materials
- (ii.) Pathogens
- (iii.) Explosives
- (iv.) Human subjects
- (v.) Animals

11. LABORATORY SECURITY

- (i.) The stockrooms will be locked at all times and only authorized persons will be allowed entry.
- (ii.) All laboratories will be locked when not in use.

12. TRAINING

All individuals working in the Department will be provided with safety training appropriate to their laboratory responsibilities.

Appendix A

Chemical Compatibility Chart

Chemical Class																	
1	Inorganic Acids	1															
2	Organic Acids	X	2														
3	Caustics	X	X	3													
4	Amines & Alkaholamines	X	X	X	4												
5	Halogenated Compounds	X	X	X	X	5											
6	Alcohols, Glycols & Glycol Ethers	X					6										
7	Aldehydes	X	X	X	X		x	7									
8	Ketones	X		X	X			x	8								
9	Saturated Hydrocarbons									9							
10	Aromatic Hydrocarbons	X									10						
11	Olefins	X				X						11					
12	Esters	X		X	X								12				
13	Halogens			X			X	X	X	X	X	X	X	13			
14	Ethers	X													14		
15	Acid Anhydrides	X	X	X			X	X							X	15	
16	Oxidizers	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16

NOTE: Identify class to which a specific compound belongs, read unsafe combinations with other classes both horizontally and vertically.

X = Unsafe Combination

Appendix B1

Standard Operating Procedures Template

NAME

CAS

XXXXXXXXXXXXXXXXXX

Synonyms

XX

Hazards

XXXXXXXXXXXXXXXXXXXXXXXXXX

Exposure Controls/Protective Equipment

Engineering Controls: “Use in fume hoods to avoid breathing fumes.”, “Have eyewash station nearby.”, “Use general ventilation to avoid exposure to mist, vapor, or dust.”

Personal Protective Equipment

Eye Protection: “Safety glasses with splash guards.”, “Safety goggles that completely cover eyes from splashes”

Skin Protection: “disposable latex gloves”, “disposable nitrile gloves”, “lab coat recommended”

Inhalation Protection: “Use in ventilation hoods to avoid inhalation”, “use in well-ventilated room”

Precautionary Measures: “Do not ingest.”, “Avoid contact with: eyes, skin, clothing.”, “Do not breathe: dust, vapor.”, “Protect from: light, heat, moisture.”

Storage Considerations

Containment

Type of container, cabinets, etc.

Stability

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Conditions to Avoid

Incompatible materials, moisture, light, etc.

Hazardous Decomposition Products

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Waste Disposal

Sink, drain, type of haz waste container (glass vs. plastic, wide vs. narrow mouth)

Spill Management

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Appendix B2

Standard Operating Procedure for Acetone

Acetone

CAS

67-64-1

Synonyms

Dimethylformaldehyde; Dimethyl ketone; 2-Propanone; Pyroacetic acid; Pyroacetic ether

Hazards
Extremely flammable liquid and vapor. Irritating to eyes, skin, respiratory tract. Breathing vapors may cause drowsiness or dizziness.

Exposure Controls

Use in fume hoods, when possible. Wear chemical goggles. Do not use near open flame.

Storage Considerations

Containment

Acetone should be contained in glass containers and stored in an approved "FLAMMABLES" cabinet

Stability

Stable

Conditions to Avoid

Incompatible with strong acids and oxidizing materials. Avoid high temperatures (above 220°C) and ignition sources.

Hazardous Decomposition Products

Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

Waste Disposal

All generated waste should be collected in a small mouthed glass bottle labeled as hazardous waste with all constituents listed and placed in the designated hazardous waste collection area

Spill Management

Control all spills from spreading. Absorb spills with vermiculite. Collect contaminated absorption material and store in a closed large mouth container labeled for Hazardous Waste that is placed in the designated hazardous waste collection area.

