Policy and Procedure

Policy: Chemical Hygiene Plan
Division: Academic Affairs

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McDaniel College is fully committed to providing a safe and healthy work environment for faculty and staff. At times, it is necessary for faculty and staff to work with or around materials that may be identified as potentially hazardous. To conduct this work safely, it is important that faculty and staff be aware of the potentially hazardous material, its properties and any safeguards recommended by the manufacturer while working with or around the potentially hazardous material. The McDaniel College Chemical Hygiene Plan (CHP) provides details to all faculty and staff of the approved practices, policies and procedures to minimize potential exposure, accidents or incidents in the work environment, especially in areas of laboratory and facilities maintenance work areas. Additionally, McDaniel College offers faculty and staff personal protective equipment when dealing with potential hazards as indicated. All faculty and staff are expected to follow the Chemical Hygiene Plan as prescribed.

Federal laws (29 CFR 1910) require that you know the information in the Chemical Hygiene Plan. If after reviewing this information you have any questions, please address questions to the Chemical Hygiene Officer, your direct supervisor, or the professor in charge of the laboratory you are working within. If you need any accommodations to review this plan, please contact the Office of Human Resources at 410-857-2229 for assistance.
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A. GENERAL RULES FOR ALL WORK SPACES THAT CONTAIN CHEMICALS

1. Consider ALL chemicals as potentially dangerous. Be alert to the hazards of chemicals that are used in your work area and laboratory. Information on chemical dangers can be found in the Safety Data Sheet (SDS) recorded in Chimera. Review the SDS prior to working with the chemicals/hazardous materials.

2. Smoking is prohibited in all buildings and in outside areas in which potentially hazardous chemicals/materials are being used.

3. Be aware of locations and proper usage of emergency safety exits, fire extinguishers and first aid kits. If any of the Fire Extinguishers are missing or have been discharged, notify the appropriate faculty member and/or the Campus Safety (extension 2202) immediately.

4. Know the location of the red emergency phone. There is a label showing numbers for Campus Safety, the Wellness Center nurse, and 911 for an ambulance.

5. Know the location and use of the eye wash fountain. A person who suspects that a chemical has gotten in his/her eye should flush with eyes open in the eye wash fountain for several minutes or until medical help arrives.

6. Know the location of the safety shower. It should be used by a person who has spilled a large amount of a chemical on her/himself. While in the shower remove any clothing covered by the chemical. If a person's clothing has caught on fire they should STOP, DROP AND ROLL first to put out the flame most quickly then get under the safety shower.

7. Know the location of the first aid kit in your workspace. This should only be used for minor injuries. More serious injuries should be handled by professionals. For urgent issues that require immediate medical attention, call Campus Safety at ext 2202. For faculty or staff, non-life threatening care may be obtained through Carroll Occupational Health. To obtain authorization for services, contact Human Resources at ext 2229. For students, care may be obtained through the Wellness Center in Winslow Hall.

8. Wear appropriate clothing for what you are working with. For any position that is deemed safety sensitive such as those within Grounds, Physical Plant, Steam Plant or Campus Safety, closed toe shoes are mandatory. In the laboratories, cut-offs, no shorts, tank tops, bare feet or sandals are not permitted.

9. Personal protective equipment such as safety goggles, lab coats (or protective aprons), and closed toe shoes are mandatory in spaces in which chemicals are used. Disposable gloves are always available when required.

10. Should a faculty, student or staff employee wish to use a respirator, please see the Voluntary Respirator Policy for further instructions.

11. Shoulder length hair and neckties should be secured.
12. Eating, drinking, smoking and the application of cosmetics in laboratories and work areas are strictly forbidden.

13. Food or drinks are never to be placed in laboratory refrigerators, ovens, microwaves or other areas in which potentially hazardous materials may be stored.

14. Always wash hands after handling chemicals or bacteria cultures.

15. Always be alert for unsafe conditions and report them to your direct supervisor, the Chemical Hygiene Officer or the laboratory supervisor immediately upon discovery of them.

16. Always keep your lab space clean. Spill should be cleaned immediately. Refer to the SDS for manufacturer’s guidelines. Wear gloves and place all contaminated absorbent material in a proper hazardous waste container for disposal. Larger spills should be cleaned by qualified personnel. There is a spill kit in each lab with materials for acids, bases and volatile liquids.

17. Broken glassware should be cleaned using a dust pan and brush. Never pick up broken glass by hand. Do not put broken glass in the trash can. Use the appropriate broken glass container found in each lab.

18. Use equipment only as intended and as approved by the manufacturer.

19. Horseplay and other related unsafe behaviors are strictly prohibited in the laboratory space and other workplaces that contain potentially hazardous chemicals.

20. Never work alone in a laboratory or in a chemical storage area without the express permission of the responsible faculty member, department head, or the Chemical Hygiene Officer.

21. Use personal protective equipment when performing tests, handling samples and anyone handling test reagents. Lab coats, plastic aprons, masks, face shields and goggles are available to wear if there is a risk of fluid being splashed into the face area.

22. Shoulder length hair, neckties, necklaces etc. should be secured to avoid mishap around equipment.

23. Obey regulations that protect against fire and explosion hazards.

24. Ensure that each individual has the proper training, credentials, and supervision to perform the procedure or test attempted.

25. Review the Hazard Communications Program and Exposure Plan.
B. LABORATORY SAFETY PROCEDURES

1. Know the location of the first aid kit in the laboratory. This should only be used for minor injuries. More serious injuries should be handled by the Wellness Center in Winslow Hall.

2. Be aware of the emergency evacuation plan for laboratory or research area. Emergency evacuation plans are posted in the hallways, classrooms and offices.

3. Know the location of eye wash station and safety shower.

4. Never work alone in the laboratory.

5. Wear appropriate clothing in the laboratory. No shorts, tank tops or sandals are allowed.

6. Safety goggles, lab coats or aprons, and closed toe shoes are mandatory in a lab in which chemicals are used. Disposable gloves are always available.

7. Shoulder length hair and neckties should be secured.

8. Eating, drinking, smoking and the application of cosmetics in laboratories and work areas are strictly forbidden.

9. Food, food containers or drinks are never to be placed in laboratory refrigerators, ovens or microwaves.

10. Laboratory glassware is not to be used for food or beverages.

11. Report all accidents to the laboratory instructor. An incident report must completed by the instructor and signed by the department chair and submitted to the Chemical Hygiene Officer and the Department of Human Resources. Incident report forms are available from the Chemical Hygiene Officer.

12. Ice from any refrigerators or freezers in the laboratory is not safe for human consumption.

13. Contact lenses are discouraged in the laboratory where chemical fumes are possible. The fumes may become concentrated in the moisture between the eye and contact lens.

14. Centrifuges must be properly balanced before being used to prevent tube breakage. A centrifuge should NOT be opened until it has come to a full stop. Do not attempt to brake, or stop a centrifuge by hand.
15. Pipetting by mouth is PROHIBITED.

16. Broken glassware should be cleaned using a dust pan and brush. Never pick up broken glass by hand. Do not put broken glass in the trash can. Use the appropriate broken glass container found in each lab.

17. All indoor spaces are smoke-free. Please see the Smoking Policy for more information on approved smoking areas to the exterior of buildings.

C. ACCIDENTS

In case of an accident or injury in the laboratory or research area:

1. Assess the level of injury. First Aid kits are located in each laboratory or research area.

2. If the injury requires medical attention other than immediate first-aid, a registered nurse is available in Winslow Center for students at extension 2700. For faculty or staff, care is available through Carroll Occupational Health. To obtain authorization and instructions, contact the Office of Human Resources at extension 2229.

3. If the injury is severe and requires immediate attention, call Campus Safety at extension 2202; or an ambulance at 9-911.

4. Once the immediate safety issues have been addressed, inform the direct supervisor or faculty member IMMEDIATELY of any laboratory, or on-the-job accident or injury to anyone. (student, faculty, staff or visitor.) The direct supervisor or faculty member is responsible for informing the Office of Human Resources at extension 2229 within the same workday.

5. The Incident/Accident Report must be completed for each accident/injury, and submitted to the appropriate Department Head and the Office of Human Resources as soon as possible after an accident or injury. Incident/Accident Report Forms are available in each department.

6. The Incident/Accident Report must be completed and reviewed by McDaniel College's Chemical Hygiene Officer or his/her designee within 24 hours of occurrence. A log of such reports will be maintained in the Chemical Hygiene Office and the Office of Human Resources.
D. CHEMICAL INVENTORY

All chemicals brought onto campus will be entered into the Chimera tracking system by the Chemical Hygiene Officer or designee upon delivery. All chemicals will have the Globally Harmonized System of Classification Labels and will have Safety Data Sheets (SDS) in the online system Chimera.

A. The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

GHS was designed to replace the various classification and labeling standards used in different countries by using consistent criteria on a global level. All chemicals purchased after 2015 must include the following 3 elements on the label; hazard pictogram, signal word and hazard statement.

**Pictogram:** There are 9 different pictograms representing various health, physical or environmental hazards. All pictograms consist of a black symbol on a white background with a red diamond frame.

**Signal Words:** Either the word WARNING or DANGER will be on the label corresponding to the most severe hazard associated with the chemical.

**Hazard Statements:** Standard phrases assigned to a hazard class and category that describe the nature of the hazard.

When chemicals are placed in secondary containers they must also be labeled with the pictograms and signal word. Pictogram stickers may be obtained from the chemical hygiene officer and the signal words must be written on the label with red ink. See Appendix D for a listing of the symbols.

B. Ordering Chemicals Procedure

1. Check the inventory listing in Chimera to see if the item is already available. If it is not, determine the smallest amount of the given chemical that is needed.

2. Submit the request for chemicals to the Department Secretary, the Chemical Hygiene Officer (CHO), or the Chemical Stockroom Manager (CSM). Orders must be placed by one of these authorized individuals and must be delivered to the department's main office. PLEASE NOTE: Department funds may no longer be used to directly reimburse faculty for chemical purchases.

3. When the chemical arrives:
   a. The Chemistry Departmental secretary will contact the CSM, who will collect the item from the main office and inventory the chemical in Chimera.
   b. Departmental secretaries from Biology, Psychology, Physics, EPE, Art and Theatre will contact the CHO who will collect the item from the main office and inventory the chemical in Chimera.
   c. The CHO will confirm that the chemical is labeled with the appropriate Global Harmonized System (GHS) symbols
Once the inventory has been collected and inventoried, it will be delivered to the relevant faculty/staff member. Note: Please let Academic Affairs know if you prefer to have your Department Secretary trained to directly inventory the chemicals when they arrive.

C. Maintaining Inventory in Chimera

1. Give all empty barcoded containers to the CSM (Chemistry) or the CHO (Biology, Psychology, Physics, EPE, Art, Theatre) who will update Chimera and dispose of the container.

2. The CHO will conduct a visual check of the inventory on an annual basis to ensure that the inventory list matches the actual stock.

D. Existing Chemical Inventory and Utilization

1. Each chemical will be labeled with the appropriate Global Harmonized System (GHS) symbols which identifies laboratory substances (reagents, specimen, etc.) must be observed.

2. All chemical containers, including secondary, must be labeled with the following:
   i. Chemical Name - avoid abbreviations
   ii. Concentration
   iii. Date
   iv. Your Name (if other than the supervisor of the laboratory area)
   v. GHS symbols that apply

E. Safe Practices Before, During and After Any Laboratory Operations

1. Hands and face must be protected to avoid contact between skin and chemicals. Safety glasses are mandatory, and gloves will be provided if required.

2. Avoid touching hands to face, lips, mouth, etc.

3. Review the appropriate SDS Sheets through Chimera before the operation.

4. Faculty and staff who wear contact lenses should exercise caution in a laboratory. The wearing of contact lenses in the laboratory is discouraged. Some chemicals may interact with lenses, complicating a situation beyond the extent of the chemical alone. Bacteria may become trapped between the eye and the lens.

5. Hand Washing shall be performed between each procedure. Hands shall be vigorously lathered and rubbed together for approximately fifteen seconds under a moderate stream of water. Hands shall be thoroughly rinsed, then dried with a paper towel, and using the same towel, the faucet shall be turned off.

6. Be familiar with instructions and safety features of laboratory and work area equipment.
7. Some instruments and equipment are under service maintenance contracts. Check with the responsible faculty or department heads to determine which equipment is covered by these contracts before attempting repairs or modification.

8. Be aware of possible electrical shock dangers with electrical instruments. All electrical instruments must be properly installed and used.

9. Be aware of the moving parts on certain instruments and equipment. Keep hair, fingers and clothing from becoming entangled.

10. Centrifuges must be properly balanced before being used to prevent tube breakage. A centrifuge should NOT be opened until it has come to a full stop. Do not attempt to brake, or stop a centrifuge by hand is permitted.

11. If breakage occurs within a centrifuge, turn off the machine immediately. Wait for the centrifuge to come to a full STOP. Use forceps to remove large pieces. Use paper towels to remove the remaining material. Decontaminate any affected area. Use appropriate clean-up materials. Dispose of gloves, towels and breakage as appropriate (i.e. non-hazardous, hazardous, or bio-hazardous).

12. Exercise extreme caution when operating an autoclave. An autoclave should only be operated by a trained and qualified operator. Follow all safety instructions.

13. Equipment which is exposed to blood and/or blood products must be cleaned on a regular basis to avoid contamination. Use a solution of 10% Sodium Hypochlorite (bleach).

14. Spills must be cleaned up immediately. See “Spillage and Breakage Policy” below for more information.

15. Place dangerous chemicals or solutions in properly marked waste containers when no longer needed.

16. Pipetting by mouth is PROHIBITED.

17. Utilize disposable latex gloves where appropriate.

18. Prevent aerolization:
   a. Pour liquid specimens gently and with caution.
   b. Gloves and masks must be worn when making suspensions.
   c. Never forcefully eject or discard any materials which have been in contact with chemicals.
19. Report any breakage or damage to the responsible supervisor immediately. Send a
copy of incident report to the Chemical Hygiene Officer. All breakage and material
must be removed from equipment before operation may be continued.

20. Clean the work area including all surfaces daily, especially at the end of the work
period. Return all reagents and supplies to proper storage facility.

21. All broken glass or shards shall be placed into special containers, clearly identified to
alert maintenance and housekeeping staff. The waste containers shall consist of
rigid-walled, impervious materials capable of resisting punctures and tears from the
broken glass.

F. Spills and Breakage Procedures

Spillage - Chemicals and/or Biologicals

Spill kits are located in each lab with materials to clean up spills involving acids, bases and
volatile liquids. For assistance and advice, contact the Chemical Hygiene Officer. Spills
that are not considered an emergency and can be cleaned without assistance from other
individuals should be wiped up immediately with absorbent materials then cleaned and
decontaminated. All materials used for clean-up and decontamination must be placed in
proper hazardous or bio-hazardous waste container for disposal.

The following are general procedures to be followed in the event of chemical or biological
spills in a laboratory:

1. If personnel are injured or contaminated by the incident, they should be taken or
directed to a safety shower or eyewash station located in the laboratory. Appropriate
decontamination actions and any first aid or medical assistance should be initiated.
Heavily contaminated clothing should be removed.
2. If a flammable chemical is involved, turn off all electrical equipment, and sources of
flames, and ventilate the room.
3. Chemicals must be cleaned according to manufacturers’ directions as indicated on
the appropriate Material Safety Data Sheet.
4. Avoid skin contact during clean up. Dispose of gloves, towels, and clean up materials
as hazardous, bio-hazardous, or non-hazardous waste as appropriate.
5. Saline and hydrogen peroxide solutions will remove blood stains.
6. Dilute (10%) sodium hypochlorite (bleach) can be used to disinfect biologically
contaminated areas.

In the event that the spill does constitute an emergency, please contact Campus Safety at
410-857-2202 immediately to report the spill. Please have the name of the chemical(s)
that were spilled.

Breakage - Glassware
Use available items such as brushes and dust pans to clean up broken glassware. Never use bare hands to clean up broken glass. Place broken glass only in cardboard receptacles labeled Broken Glass, which are provided in each laboratory. Never put broken glass in trash cans used for general paper waste.

For large amounts of breakage or assistance call maintenance/physical plant, ext. 2710.

**G. Disposal of Hazardous Wastes**

Hazardous chemical wastes will be professionally disposed of on an annual or biannual basis, depending on the volume collected during the year. All hazardous wastes will be labeled in accordance with the chemical inventory guidelines.

Each department should contact the Chemical Hygiene Officer whenever there are hazardous materials to be removed. The Chemical Hygiene Officer will determine how best to dispose of the materials. If possible, the material will be safely disposed of in-house, under the supervision of the Chemical Hygiene Officer. If the material cannot be safely disposed of in-house, it will be collected and stored until the annual or biannual disposal by a qualified hazardous waste contractor.

Biological wastes will be collected, packaged, and disposed of on a regular basis by a qualified contractor under the direction of the Chemical Hygiene Officer.

**H. Ventilation and Safety Equipment**

**Ventilation**

1. Room ventilation is measured once every semester.

2. The calculated room ventilation should be not less than eight air changes per hour. This is a minimum standard, and does not protect against toxins having a low air concentration limit, or a high vapor pressure.

**Fume Hoods**

1. Fume hood air flow is measured once every semester.

2. Fume hoods should provide an air flow of 70 to 90 linear feet/min.

3. Fume hoods are never to be used to 'dispose' of chemicals by evaporation unless the vapors are trapped and recovered for proper waste disposal. Equipment in a fume hood should be placed on the counter top of the hood at least six inches from the front edge.
4. Fume hood windows should be closed (lowered) at all times except when necessary to adjust or move the items inside the fume hood.

5. The fume hood ventilation fan should be operating whenever a chemical is inside the hood.

6. Personnel should be trained in procedures to be taken in the event of a power failure, or fume hood failure.

7. Ducts, vents and fans should be inspected at frequent intervals. Fume hood maintenance should be scheduled with Physical Plant at the end of each spring semester.

8. Fume hoods should never be used for the storage of chemicals, apparatus or other materials.

9. If a fume hood alarm sounds, cease work in that hood immediately and transfer any hazardous materials to a properly functioning hood. Immediately notify the Department Chair and the Chemical Hygiene Officer of the hood failure.

**Eyewash Fountains and Safety Showers**

1. Laboratories must be equipped with tepid water eyewash fountains and safety showers.

2. Faculty, staff, and students must know the location of the eyewash fountains and safety showers.

3. Access to eyewash fountains and safety showers must NEVER be blocked by temporary storage of objects, or in any other way.

4. Eyewash fountains are to be checked once each week to verify that the fountains are operational, and the water is clean and sterile. Running water through the eyewash fountains reduces the chance of infectious amoeba growth.

5. Safety showers are to be checked once each month to verify that the showers are operational, and the water is clean and sterile. Safety shower checks may be scheduled with Physical Plant operations.

6. Record logs are to be kept of the eyewash fountains and safety showers checks.

**I. Flammable Storage**

1. Flammable materials in excess of 500 ml should be stored in flammable storage cabinets.

2. Storage of flammable materials should not exceed the cabinet limits.
3. Combustible materials, including paper, and cardboard, should NOT be stored near flammable storage cabinets.

J. Corrosive Storage

1. Corrosive materials in excess of 500 ml should be stored in vented, corrosive safety cabinets.

2. Storage of corrosive materials should not exceed the cabinet limits.

3. Store only compatible corrosive materials inside each safety cabinet.

4. The following chemicals should be considered for corrosive safety cabinets: Poisons, Oxidizers, Dangerous When Wet, Flammable Solids, and, Explosives

K. Vapor Detection

1. Whenever there is reason to suspect that a toxic chemical inhalation limit might be exceeded, or a suspicious odor is noticed, notify the Chemical Hygiene Officer.

2. NEVER use odor as a means of determining that inhalation exposure limits are being exceeded.

3. Personnel may wear appropriate respirators for protection against the suspect vapor until measurements show the suspect is absent OR the laboratory or room should be vacated until tests verify the safety of the air.

L. Safe Handling of High Field NMR

High Strength Magnetic Fields

* Standards for Exposure - The ACGIH (American Conference of Governmental Industrial Hygienists) has set guidelines for continuous exposure to static electromagnetic fields as follows:

Note: 1 Gauss (G) = 0.1 milliTesla (mT)

5 G Highest allowed field for persons with implanted cardiac pacemakers.

600 G Allowed time weighted average routine exposure to the whole body.

6000 G Allowed time weighted average routine exposure to the extremities.

2 T Ceiling limit (no exposure is allowed above this limit).
Note: Time of exposure is normally only a concern for extremely high flux exposure to the whole body.

* Magnetic Field Measurements - NMR magnets commonly produce core fields from 0.2 T to 20 T. These fields decrease in intensity as the distance from the core increases. A flux (field strength) map of the area surrounding the magnet should be developed and posted for use by staff.

* Posting of Magnetic Field Hazards - Rooms containing magnets shall be marked with magnetic field hazard signs (available from chemistry stockroom manager). The 5 G threshold line shall be clearly identified with floor tape, rope, or equivalent markings. The location of the 5 G line will vary with the operating frequency and resulting magnetic flux. As an example, one vendor indicates the following values for their product line:

  Operating frequency of 200 MHz - 5 G threshold line @ 1.3 meters
  Operating frequency of 500 MHz - 5 G threshold line @ 3.5 meters
  Operating frequency of 800 MHz - 5 G threshold line @ 6.0 meters

* Access Restrictions - Persons with cardiac pacemakers shall be restricted to areas outside the 5 G threshold line. Security (locked doors) should be maintained to prevent unauthorized access to the magnet area.

* Hazards and Bioeffects - Ferrous objects may present a kinetic energy hazard if brought into areas closer than 3 meters from the magnet (where the fields exceed 10 G). There are no known adverse bioeffects for flux densities within the ACGIH limits.

* Kinetic Energy Hazards - Due to the large flux associated with NMR magnets, ferrous objects can be accelerated toward the magnet with sufficient energy to seriously injure staff and/or damage the magnet. As a precaution, even small metal objects such as tools, razor blades, and paper clips should be kept at least 3 meters from the magnet. Large ferrous objects (equipment racks, tool dollies) should never be moved around in the room while the magnet is energized.

**Cryogen Safe Handling**

* Types and Expansion Ratios - The cryogenic (liquefied) gases used in NMR magnets are Liquid Nitrogen (-320 deg. F) and Liquid Helium (-452 deg. F). If these liquids are raised to room temperature, the resulting gases expand to hundreds of times their liquid volumes, displacing the air in the room (LN = 694/1, LH = 700/1).

* Quench - Quench is the unexpected loss of superconductivity in a NMR magnet that results in rapid heating through increased resistance to the high current. This can violently
damage the magnet and cause rapid venting of large volumes of gas into the room, quickly resulting in an oxygen deficient atmosphere. To avoid a quench situation, check cryogen level sensors at least weekly and always refill or de-energize the magnet if low cryogen levels are indicated on the sensors.

* Personal Protective Equipment (PPE) - When handling cryogens, the use of insulated gloves (to protect against thermal burns), face shields or other splash eye/face protection, closed toed shoes, and lab coat are required.

* Dewars - The containers used for transporting cryogens should be made of metal. Glass dewars can easily implode, causing seriously injury. All dewars should have appropriate vents. Unvented containers can rupture as the liquids warm and expand. All transfers of cryogens should be continuously attended to prevent spills or frozen valves.

* Room Ventilation - Generally speaking, 5 complete room changes per hour is considered adequate for managing small spills or releases. In the event of a major release, the staff should immediately leave the room and the room doors should be left open. If the risk of a catastrophic release exists, auxiliary ventilation may be needed to prevent the formation of an oxygen deficient atmosphere.

* Bioeffects of Cryogen Exposure - Direct contact with the skin or eye tissues can cause severe damage through frostbite (tissue damage from freezing). If the frostbite is severe, the damaged tissues may need to be amputated. Inhalation of concentrated cryogen gases may cause loss of consciousness and death through asphyxiation (oxygen deprivation).

**M. Safe Handling of LASERS**

Laser is an acronym for "light amplification by stimulated emission of radiation." Radiation in this case occurs in the portions of the electromagnetic field with insufficient energy to induce ionization or breaking up on the atom (i.e., it is non-ionizing). Non-ionizing radiation occurs in the radio frequency, microwave, infrared, visible and ultraviolet ranges.

Lasers operate in two modes: pulsed (e.g. Q-switched lasers) and continuous wave (CW). Generally, pulsed lasers are more hazardous than CW lasers. Lasers using CO2 and certain other materials emit beams that are not visible to the eye, hence they are particularly hazardous.

Biological damage caused by lasers includes thermal burns, photochemical burns and retinal injury. Electrical safety and fire are also important concerns.

In the use of a laser, safety procedures must be established and followed so that protection is provided for students, teachers, workers, visitors, bystanders and passersby.
All rooms that contain a laser must be adequately marked in accordance with the GHS labeling system on the entering door and in the room so that everyone (students, faculty, staff, and/or visitors) is aware of its presence.

Hazards may include:

Vaporized target material from high-energy laser cutting, drilling and welding operations.

Gases from lasers

Gases from cryogenic coolants

Ultraviolet infrared radiation

Electrical hazards--cables between the power supply and laser head must be properly selected and placed and the capacitor system safeguarded.

All electrical equipment must be well-maintained to prevent shocks and burns. Energy sources for lasers are essentially high-voltage equipment. Capacitors must be de-energized before cleaning or any repairing. All voltage on capacitors must be removed before leaving equipment. Interlocks must be provided to prevent access to components of high-voltage currents. Fire buttons must be remote from the charge and hold buttons to prevent accidental discharge of a laser. All ultraviolet and infrared radiation must be shielded.

Safe Laser Operations:

1. Do not look into the primary beam or at reflections of the beam.

2. Avoid aiming the laser with the eye to prevent looking along the axis because of the hazard of reflection.

3. Work with lasers should be done in areas of high general illumination to keep pupils constricted.

4. Proper safety glasses should be worn to filter out specific injurious frequencies of the unit.

5. Terminate the laser beam with material that is non-reflective and fire resistant.

6. Provide adequate clear space around the laser path.

7. Provide protection from electrical shock from the potentially dangerous electrical sources of high and low voltage.
8. High-voltage rectifiers may generate x-rays and require protection.

There are many special precautions that must be taken from the particular lasers as high-powered pulsing lasers and low-powered gas and semi-conducted systems. Carbon dioxide and nitrogen lasers are fire hazards.

Security of the equipment against inadvertent intrusion must always be considered when operating a laser.

At least two people should be present at all times when lasers are in operation. Under no circumstances should a room containing an active laser be left unattended or unlocked.

Ventilation of the room must be considered to remove any accumulation of hazardous gases or fumes that are generated in the operation of the laser.

All personnel in the laser area should be informed about the potential eye hazard of accidental exposure to the beam. It is the responsibility of the project supervisor to give each person concerned a copy of these rules and ensure that all safety precautions are observed.

More detailed information is given in the American National Standard for the safe use of lasers (ANSI Z136.1-1973) and OSHA 29 CFR 1910.32 for eye protection; 21 CFR 1040 (U.S. Food and Drug Administration’s control of commercial devices); and OSHA’s 29 CFR 1926.54 construction uses. These standards cover facilities, program requirements and safety measures. It is strongly recommended these standards be reviewed as supplementary information to be followed.

N. Special Consideration for Peroxide Forming Chemicals

When using chemicals that have the potential to form explosive peroxides, the following applies:

1. Correct Labeling: In addition to the original manufacturer’s label or secondary label, the container for all peroxide formers, whether Class I, II, or III, shall be labeled with the following:
   - WARNING – POTENTIAL EXPLOSIVE PEROXIDE
   - Date of purchase
   - Date of first opening
   - Required discard date based on class disposal requirements
   - GHS symbols

2. Inspection, Testing and disposal: Peroxide forming chemicals fall into 3 classes. Class III includes high hazard compounds that form explosive levels of peroxides without concentration in relatively short periods of time. They must be inspected three months after opening. Check liquids
for crystal formation and solids for color change. Test using Peroxide Detection Dip Strips, available from the Chemical Hygiene Office. If no indication of peroxides is present, reset the discard date 3-months forward. If peroxides are present, especially at a concentration above 10 ppm, discard by turning container over to the Chemical Hygiene Office.

Class II includes compounds that form peroxides upon concentration by evaporation or distillation. These containers must be inspected 12 months after opening. Check for crystal formation or color change and test with Peroxide Detection Dip Strips. If inspection and testing indicates no peroxide, reset discard date 6 months forward. Always test for peroxides before distilling or evaporating or if concentration is suspected. If peroxides are indicated, turn over to the Chemical Hygiene Office for disposal.

Class I includes autopolymerizers. These are typically unsaturated solutions of low molecular weight. After opening do not store under an inert atmosphere. A polymerizer inhibitor should be added if container is to be stored more than 24 hours. Inspect and test for peroxides 12 months after opening. If there is no indication of peroxides, reset the discard date 12 months forward, otherwise turn over to Chemical Hygiene for disposal.

3. The peroxide-forming chemicals are ranked in three different classes based on their level of hazard. See Appendix A for a chart identifying each chemical and their classification.

O. Faculty, Staff and Student Responsibilities

Faculty, Staff and Designated Student Workers

1. Must read and understand the provisions of the Chemical Hygiene Plan (CHP)

2. Must review the Chemical Hygiene Plan at least yearly and sign a log indicating they have read and understand its provisions.

3. Review Safety Data Sheets (SDS) for chemicals in use.

4. Apply all procedures and practices as described in the Chemical Hygiene Plan, Hazard Communication Program and Exposure Control Plan in all workspaces.

5. Upon hire and annually, complete training on bloodbourne pathogens and the Right to Know Act

6. Use Chimera as needed to locate applicable SDS information

Chemical Hygiene Officer Responsibilities

A. Review and update the Chemical Hygiene Plan (CHP) yearly. The CHO will review the CHP in May of each year, and make any updates by August of that same year.
B. Inform faculty and staff of the existence and location of the Chemical Hygiene Plan at the beginning of each semester.

C. Keep records of faculty and staff exposed to hazardous materials.

D. Provide faculty and staff and students with:
   1. Training and information regarding chemical, biological and physical hazards.
   2. Identification of other hazards.
   3. Access medical consultation and examination.
   4. Special safety equipment when required.

E. Maintain chemical inventory and associated Safety Data Sheets within Chimera.

F. When hazardous chemicals are generated, train personnel in their safe handling.

G. If chemicals are produced for off-site use, comply with appropriate Environmental Protection Agency, (EPA) regulations for that chemical as stated in 29 CFR 1910.1000 through 1910.1199.

I. Follow the Respiratory Protection Standard, 29 CFR 1910.134, if respirators are necessary to keep exposures below the applicable standards.

President of College Responsibilities

The President of the College, has the ultimate responsibility for safety and will appoint a Chemical Hygiene Officer (CHO).

The Chemical Hygiene Officer should be qualified by training and experience to provide technical guidance in the development of the Chemical Hygiene Plan (CHP).

The Chemical Hygiene Officer acts as a representative of the Chief Executive Officer for Safety.

The Chemical Hygiene Officer may appoint qualified laboratory personnel to supervise sections of the Chemical Hygiene Plan.

A chart of the organizational responsibility is shown on the next page.
P. Prior Approval

Staff and students must obtain prior approval to proceed with a laboratory task from the responsible faculty or Chemical Hygiene Officer whenever:

A. A new procedure or test is to be carried out.

B. It is likely that toxic limit concentrations could be exceeded, exposures to pathogenic organisms may be excessive, or that other harm is likely to occur.

C. There is a change in a procedure or test, even if it is very similar to prior practices. A 'change' in procedure means:

1. A ten percent increase or decrease in the amount of one or more reagents.

2. A substitution or deletion of any of the chemicals in a procedure is to be conducted.

3. Any change in other conditions under which the procedure is to be conducted.

D. There is a failure of any of the equipment used in the process especially of safeguards such as ventilation systems, fume hoods, electrical apparatus and warning devices.

E. Personnel become ill, suspect that they or others have been exposed to a hazard, or there is any suspicion about a failure of safeguards.
Q. Medical Consultation and Examination

There may be times to suspect that faculty, staff or students have been exposed to a chemical or biological hazard to a degree and in a manner that might have caused an injury to the person(s).

If the circumstances suggest a reasonable suspicion of exposure, that person is entitled to a medical consultation and, if so determined in the consultation, also to a medical examination at no cost, without loss of work time attributed to that person.

A. Criteria for Reasonable Suspicion of Exposure

1. The College will promptly investigate all incidents in which there is even a remote possibility of employee over-exposure to a chemical or biological hazard.

2. Events or circumstances that might reasonably constitute over-exposure include:
   a. A chemical or biological leak, spill or rapid release in an uncontrolled manner.
   b. Skin, mouth, or eye contact with a chemical or biological hazard.
   c. Personnel exhibit symptoms such as a rash, headache, nausea, coughing, tearing, irritation or redness of the eyes, irritation of nose or throat, dizziness, loss of motor dexterity or judgement, etc. and
   d. some or all of the symptoms disappear when the person is taken away from the exposure environment and breathes fresh air, and
   e. the symptoms reappear soon after the employee returns to the suspect environment with the same chemical or biological hazards.
   f. Two or more persons in the same suspect environment have similar complaints.

B. Procedures for Obtaining Care Post-Exposure

1. The immediate safety of the faculty or staff is the first priority. If emergency care is needed, contact Campus Safety at ext 2202 for first responder care. If emergency care is not deemed necessary, the faculty or staff member will contact the Office of Human Resources at ext 2229 to request a medical examination. The faculty or staff member will also complete First Report of Injury form and obtain the authorization for care form. The Office of Human Resources will provide the care provider with all pertinent information related to possible exposure including the identity of the chemical or biological agent to which the person was exposed, the exposure conditions and, the signs and symptoms of exposure, if any, the person is experiencing.
2. The faculty or staff member may be evaluated at Carroll Hospital Center if the situation is deemed emergent or Carroll Occupational Health if it is not emergent. The faculty or staff member also has the ability to go to an alternate licensed physician provider of choice at no cost to the employee.

3. All records of exposure and medical records will be maintained in the Office of Human Resources with the Worker’s Compensation records. All medical records provided by treatment provider will be maintained in the file as well.

The Office of Human Resources will request from the treatment provider any recommendations for further medical care and/or monitoring, any results of medical tests and/or examinations related to the exposure (no other information not related to occupational exposure shall be included), any medical condition that may be compromised by the occupational exposure or place the faculty or staff member at an increased risk of exposure due to condition and an affirmation that the faculty/staff was made aware of the diagnosis/results of tests and aftercare.

The medical record will be preserved for the period of employment plus thirty years. The medical record will exclude health insurance claims records maintained separately, first aid records for one time treatments on minor injuries that do not require additional medical care.

The exposure record will preserved for the period of employment plus thirty years. The exposure record will include any and all memos, notes, and reports related to a complaint of actual or possible exposure to hazardous chemicals or biological agents.

4. In addition to First Report of Injury, the Chemical Hygiene Officer will also conduct an Accident/Injury/Exposure Assessment Review. The review is initiated after the subject personnel have been treated. The exposure assessment determines the extent to which an exposure might have caused an injury and, if so, to identify the chemical or biological hazard involved. The exposure assessment is conducted to determine facts, not to make recommendations. It is NOT conducted to assign blame for failure to follow standard or regulated practices. The assessment will be shared with the Risk Management Committee for review. The review will include:

   A. Interview the complainant and/or injured person(s).
   B. List the essential information about the circumstances of the complaint:
      - the status of the complainant and/or injured person(s).
      - the laboratory, and the suspected chemical or biological agent before, during, and after the exposure took place, specifically cite:
      - The chemical or biological hazard under suspicion
      - Other chemical or biological hazards exposures.
      - All chemical or biological hazards being used in the immediate area.
      - Symptoms claimed and exhibited by the complainant and/or injured person.
- How these symptoms compare to symptoms stated in the Safety Data Sheets for each of the identified chemical or biological hazards.
- Were control measures, such as gloves, or fume hoods, shields, etc. used appropriately?
- Were any sampling or monitoring devices in place? If so, are the measurements obtained from these devices consistent with other information?
- Monitor or sample the air in the area for suspect chemical or biological hazards.
- Determine whether the present control measures and safety procedures are adequate to prevent a recurrence.
- Within one day of receipt of the results of any monitoring, submit copies to the Office of Human Resources.

5. The Office of Human Resources will arrange for the concentration measurement of an agent, if there is reason to suspect that exposure limits have been exceeded for any chemical or biological agent with a substance-specific standard. If the concentration exceeds the established standard(s), the applicable personnel will be notified of the results of the measurements and any applicable OSHA regulations will be complied with.

C. Records and Record Keeping

1. Federal law requires that records of monitoring, exposures, medical consultations and examinations be maintained for the duration of employment plus 30 years and that they be accessible to faculty and staff and their representatives.

2. Chimera will be the repository for and the distribution of Safety Data Sheets.

3. Training records will be maintained for the lifetime of the institution.

4. The Office of Human Resources will complete the OSHA Form 300/300A to record lost workdays that occur as needed.

5. The Physical Plant will maintain repair and maintenance records.

R. Additional Protection for Work with Select Carcinogens, Reproductive Toxins, Unknown Materials and Substances with a High Degree of Toxicity

1. Select carcinogens, Reproductive Toxins, and Substances with a High Degree of Toxicity are known as "Acute Biohazards".

2. "Select Carcinogen" means a substance which meets one of the following criteria:
   
   A. It is regulated by OSHA as a carcinogen.
B. It is listed in the latest edition of the Annual Report on Carcinogens published by the National Toxicology Program, or is listed by the latest edition of the International Agency for Research on Cancer Monographs.

C. Causes tumors when exposed to experimental animals after specified oral, dermal or inhalation exposure.

3. "Reproductive Toxin" means a substance which affects the reproductive capabilities, including chromosomal damage (mutations) and effects on fetuses (teratogenesis).

4. "Substances with a High Degree of Toxicity" are so classified by the appropriate Safety Data Sheet.

5. "Designated Area" means a fume hood, glove box, portion of a laboratory, or an entire laboratory designated as the only areas where work with "Acute Biohazards" in excess of limits specified by the Chemical Hygiene Officer shall be permitted.

A. "Designated Areas" shall be posted and their boundaries clearly marked.

B. Only those persons trained to work with "Acute Biohazards" will work with those substances in a designated area. All such persons will:

- Use the smallest amount of the acute biohazard substance consistent with the requirements of the work to be done.
- Use high efficiency particulate air filters and high efficiency scrubber systems to protect vacuum lines and pumps.
- Store the Acute Biohazard substances or remove them from storage.
- Decontaminate a designated area.
- Prepare wastes from work with chemicals for waste disposal in accordance with the Resource Conservation and Recovery Act and as designated by the college Chemical Hygiene Officer.

C. Store Acute Biohazard substances in locked and enclosed spaces with slight negative pressure compared to the rest of the building.

D. Wear appropriate protective clothing when working in the "designated area".

D. When working in the "designated area" do NOT wear jewelry since decontamination of jewelry may be extremely difficult.
S. Other Polices to Review

1. Hazard Communication Program and Exposure Plan
2. Smoking Policy
3. OSHA Right to Know Act
4. Procedures for Ordering, Delivering, and Handling Compressed Gas Tanks
5. Voluntary Respirator Policy
### APPENDIX A: Peroxides

<table>
<thead>
<tr>
<th>Class I (Autopolymertizers)</th>
<th>Class II (Concentration Peroxides)</th>
<th>Class III (High Hazard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrylic acid</td>
<td>Acetal</td>
<td>Divinelly acetylene</td>
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<tr>
<td>Acrylonitrile</td>
<td>Acetaldehyde</td>
<td>Potassium metal</td>
</tr>
<tr>
<td>1,3-Butadiene (g)</td>
<td>Benzyl alcohol</td>
<td>Butadiene (liquid</td>
</tr>
<tr>
<td>2-Chloro-1,3-butadiene</td>
<td>Butadiyne (butadiene)</td>
<td>monomer)</td>
</tr>
<tr>
<td>Chloroprene (g)</td>
<td>2-Butanol</td>
<td>Isopropyl (disopropyl)</td>
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<tr>
<td>Chlorotrifluoroethylene</td>
<td>Cellosolves</td>
<td>ethyl</td>
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<tr>
<td>Dibenzocyclopentadiene</td>
<td>Chlorofluoroethylene</td>
<td>Sodium amide</td>
</tr>
<tr>
<td>9,10-Dihydroanthracene</td>
<td>Cumene</td>
<td>Chloroprene (liquid</td>
</tr>
<tr>
<td>Indene</td>
<td>Cyclohexene</td>
<td>monomer)</td>
</tr>
<tr>
<td>Methyl methacrylate</td>
<td>Cyclohexanol</td>
<td>Potassium amide</td>
</tr>
<tr>
<td>Styrene</td>
<td>Decahydronaphthalene</td>
<td>Vinylidene chloride six</td>
</tr>
<tr>
<td>Tetrafluoroethylene (g)</td>
<td>Decalin</td>
<td>Tetrafluoroethylene</td>
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<tr>
<td>Vinyl acetate</td>
<td>Deacetylene (Butadiene)</td>
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<tr>
<td>Vinyl acetylene</td>
<td>Dicyclopentadiene</td>
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<tr>
<td>Vinyl chloride</td>
<td>Diethyl ether</td>
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<tr>
<td>Vinylidene chloride</td>
<td>Diethylene glycol dimethyl ether</td>
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<tr>
<td>Vinyl pyridine</td>
<td>Diglyme</td>
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<td></td>
<td>Dioxanes</td>
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<td>Ethyl ether</td>
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<td>Ethylene glycol dimethyl ether</td>
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<td>Ethylene glycol ether acetate</td>
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<td></td>
<td>Furan</td>
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<td>Glyme</td>
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<tr>
<td></td>
<td>4-Heptanol</td>
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<td>2-Hexanol</td>
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<tr>
<td>Isopropyl alcohol</td>
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<td>Isopropyl benzene00...</td>
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<tr>
<td>Methyl acetylene</td>
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<tr>
<td>3-Methyl-1-butanol</td>
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<tr>
<td>Methylcyclopentane</td>
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<td>Methyl isobutyl ketone</td>
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<td>4-Methyl-2-pentanol</td>
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<tr>
<td>1-Phenylethanol</td>
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<tr>
<td>2-Phenylethanol</td>
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<tr>
<td>2-Propanol</td>
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<tr>
<td>Tetrahydrofuran</td>
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<tr>
<td>Tetrahydronaphthalene</td>
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<tr>
<td>Tetralin</td>
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<tr>
<td>Vinyl ethers</td>
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<tr>
<td>Other secondary alcohols</td>
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Appendix B – Safety and Emergency Action Plans for All Buildings

Situations could arise that would require that all or parts of buildings be evacuated. Examples are major fires, power outages, major chemical spills or severe weather. All possible attempts shall be made to circulate information as to the type of emergency and the proper evacuation routes. In each room, there is an emergency procedure created by the Office of Campus Safety posted by the exit. As you enter a room, please review the emergency procedure including the evacuation site. An example is indicated below.
Major chemical spills and gas leaks: This type of emergency is similar to fire with the exception the fumes are usually invisible and heavier than air. They may accumulate in low areas. If you are below ground, leave the building as soon as possible. Many fumes are flammable or even explosive. Put out all potential sources of ignition immediately. Do not turn light or any other electrical equipment on or off. Avoid any action that may create sparks.

Power failures or loss of ventilation: This type of emergency also requires evacuation of the building, although in this case leaving can be more orderly. Experience has shown that the air within the building may become unhealthy once the ventilation system stops working.
Appendix C: Formaldehyde

Formaldehyde or formalin, a 37% solution of formaldehyde in water, is a known human carcinogen as well as an irritant to skin, eyes and throat. Formaldehyde occurs most commonly in McDaniel science labs in the form of preserved animal specimens to be dissected but may also be used for fixing tissues. Students and other campus personnel must take the following precautions when handling formaldehyde or preserved specimens fixed or preserved with formaldehyde.

1. Work in a fume hood where feasible.
2. Wear disposable exam gloves.
3. Wear chemical goggles or face shield.
4. Wear a lab coat or apron.
5. Wash hands when finished.
6. If vapors become irritating to eyes, nose or throat leave the area and breathe in fresh air.
Appendix D: GHS Pictograms

OSHA requires that all users be alerted to any chemical hazards that s/he may be exposed too. The GHS pictograms must be as pictured below. Users can obtain pictogram stickers from the Chemical Hygiene Officer for use on secondary containers.

Adapted from: https://www.osha.gov/Publications/HazComm_QuickCard_Pictogram.html