Chemical Hygiene Plan

Department of Chemistry

Eastern Illinois University

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I. INTRODUCTION

The purpose of this Chemical Hygiene Plan **(CHP)** is to define work practices and procedures to help ensure that laboratory workers and students in the Department of Chemistry at Eastern Illinois University are protected from hazards associated with working in a chemical laboratory. The Chemical Hygiene Plan is part of the University's compliance with the regulations promulgated by the U.S. Department of Labor Occupational Safety and Health Administration (OSHA) entitled "Occupational Exposures to Hazardous Chemicals in Laboratories" (Code of Federal Regulations, 29 CFR 1910.1450).

II. RESPONSIBILITIES

A. University Responsibilities

Deans, Directors, and Heads of Academic and Administrative Units have the primary responsibility for the health and safety of their staff and students. Specifically, they should (1) collaborate with faculty and staff to develop an appropriate chemical hygiene plan for each relevant unit and (2) make and/or support budget requests for health, safety, and hazardous waste improvements.

B. Environmental Health and Safety Department Responsibilities

The Environmental Health and Safety (EHS) Department at Eastern Illinois University will oversee university safety and hazardous waste concerns. Specifically, this department will:

1. Appoint a Campus Chemical Hygiene Officer who will routinely review departmental/unit chemical hygiene plans and suggest modifications as needed.
2. Provide technical assistance to laboratory workers and supervisors regarding appropriate storage, handling, and disposal of hazardous chemicals.
3. Provide general laboratory training upon request.
4. Conduct exposure assessments and laboratory inspections upon request and on a routine basis.
5. Assist Health Services in medical consultation as needed.
6. Provide technical assistance concerning personal protective equipment and laboratory safety equipment.
7. Maintain a library of manufacturer's Material Safety Data Sheets and other laboratory and chemical safety literature.
8. Remain current on rules and regulations concerning chemicals used on campus.

C. Departmental Responsibilities

i. Chemistry Department Chair

The Chair of the Department of Chemistry at Eastern Illinois University will work with administrators, the Chemical Hygiene Officers of the University and the Department, laboratory supervisors, employees and students to help ensure safe working conditions and to seek ways to improve the chemical hygiene program. Also, in consultation with the Departmental Chemical Hygiene Officer, the Chair shall have the authority to suspend laboratory operations—in part, or in the whole—if deficiencies in laboratory procedures or equipment pose a significant threat to the safety of laboratory personnel, if well established environmental practices are not followed, or if procedures and rules

of conduct established in this CHP are violated on a recurring basis. A written report of the reasons for suspension will be made available to the relevant laboratory supervisor.

ii. Departmental Chemical Hygiene Officer

The departmental Chemical Hygiene Officer is an employee appointed by the chemistry department chair who is qualified, either by training or experience, to provide technical guidance in the development and implementation of the Chemical Hygiene Plan. The Chemical Hygiene Officer will perform the following tasks:

1. Issue regulations that apply to the use of chemicals and help laboratory supervisors develop safe procedures.
2. Keep and analyze records of chemical accidents.
3. Monitor the safety policies of the Chemistry Department for effectiveness.
4. Arrange for proper disposal of hazardous waste.
5. Be a member of the Departmental safety committee.
7. Maintain a library of MSDS's for chemicals purchased by the department.
8. Ensure that up-to-date copies of the CHP are located in all research laboratories, the Chemical Department Stockroom, and the Chemistry Department Office.

iii. Department of Chemistry Safety Committee

The department will maintain a Safety Committee. The Safety Committee will conduct the following tasks:

1. Review the CHP annually and revise as needed.
2. Ensure and document that all incoming graduate students receive training in chemical safety and hazardous waste disposal.
3. Conduct and/or arrange for annual laboratory inspections and provide feedback to laboratory supervisors to assist them in proper chemical hygiene.

iv. Laboratory Supervisors

Laboratory supervisors are Departmental faculty members who supervise chemistry laboratory courses or who direct the research of students and/or associates involving chemicals. Laboratory supervisors will have the following responsibilities:

1. Provide continuing support to ensure that laboratory work is conducted within the guidelines as set forth in this CHP and according to generally accepted principles of laboratory behavior as described in Prudent

Practices in the Laboratory, Handling and Disposal of Chemicals, prepared by the Committee on Prudent Practices for Handling, Storage, and Disposal of Chemicals in Laboratories of the National Research Council, National Academy Press, 1995. A copy of this publication is available from the Department of Chemistry Stockroom.

2. Stress to laboratory workers the importance of conducting research and laboratory work in a safe and prudent manner.
3. Ensure that laboratory workers receive safety training pertaining to the lab and their laboratory work.
4. Provide, and enforce the use of, protective apparel and personal protection equipment required for each laboratory procedure.
5. Ensure that facilities and training are adequate before ordering any materials.
6. Enforce the Departmental policy regarding solitary work as described in the standard operating procedures.
7. Conduct weekly chemical hygiene and housekeeping inspections.
8. Ensure disposal of hazardous waste as specified in this CHP.
9. Report laboratory incidents and injuries on the form contained in this CHP.

v. Laboratory Workers

Laboratory workers are individuals who work with chemicals in the Department of Chemistry including students, teaching assistants, research assistants, and post-doctoral associates. Laboratory workers are required to:

1. Plan and conduct each operation in accordance with the Departmental CHP.
2. Develop good personal chemical hygiene habits.
3. Report to their supervisor any situations that are inconsistent with the CHP or generally accepted safe practices.
4. Dispose of hazardous waste in accordance with the CHP.
5. Use personal protective equipment where appropriate.
6. Inform the lab supervisor of all accidents.

II. Standard Operating Procedures

A. Introduction

The Department of Chemistry recognizes that this CHP is an ongoing effort to improve safety and chemical hygiene within the department. It will be improved and updated as new procedures and information become available.

The following SOP's are intended to provide guidance as to how to safely work with and dispose of chemicals. Please consult additional sources for further safety information.

B. General Safety Notes

1. No solitary work by students is permitted in laboratories unless supervised by responsible faculty. Permission from the laboratory supervisor is required for after hours work.
2. Unattended operations and/or short term absences from the laboratory which might cause a problem require the approval of the laboratory supervisor. Provisions must be made for secondary containment of chemicals in the event of spillage or container breakage and condenser hoses must be sufficiently secure. A note must be left identifying the experimenter and back-up personnel.
3. Careful planning should precede all laboratory operations. A written procedure should be in place, reviewed and understood prior to starting any experiment.
4. Be prepared for accidents. Know specific actions to be taken in case of an accidental release of a hazardous substance. Know the location of safety equipment and the nearest fire alarm and telephone. Know the location of relevant telephone numbers to call and whom to notify in the event of an emergency.
5. Perform only the assigned experiments. Unauthorized experiments are strictly forbidden.
6. A serious working atmosphere needs to be maintained. Absolutely **NO** horseplay, fooling around or practical jokes will be allowed.
7. **NO** eating, drinking or smoking is permitted in any laboratory. No laboratory chemicals, glassware or apparatus should be used in the refrigerator or in the microwave in room 3180 (lunchroom/conference room). No chemical demonstrations should be performed in room 3180.
8. Consult your lab supervisor if you are unsure of the hazards or proper use of any reagent or piece of equipment.

9. Maintenance of a safe and clean work area (personal housekeeping) is the responsibility of each lab worker and lab supervisor.

C. Personal Protective Equipment

1. Chemical splash goggles should be worn in teaching and research laboratories at all times by instructors, students, and visitors. Research and stockroom workers should wear goggles when carrying out operations in which there is any danger of splashing from corrosive or toxic chemicals. Special goggles must be worn in the Laser Lab (room 3421) when lasers are operating.

2. Face shields or safety shields should be used in laboratory operations which have the potential to result in fires or explosions or which utilize pressurized or high vacuum operations. Prior authorization of the laboratory supervisor is required. Check the safety equipment (fire extinguishers, shields, safety showers, etc...) prior to such operations.

3. Protective gloves may be needed for some procedures. The type of glove selected should protect against the chemical that you are using, or against heat, cold, and sharp objects. Consult the laboratory supervisor and Appendix A.

4. Long hair should be tied back to keep it away from flames and chemicals.

5. Clothing worn in the laboratory should be comfortable and not restrict motion yet not so loose (esp. sleeves) as to catch on equipment. The flammability of the fabric should be considered.

6. Sturdy shoes that cover your feet should be worn. Sandals and open-toed shoes are dangerous footwear in the lab. Canvas shoes also do not provide the necessary protection from laboratory accidents.

7. The use of lab coats is optional.

D. Chemical Safety

i. Let knowledge, caution and common sense add up to chemical safety.

1. Assume any unfamiliar chemical is hazardous.

2. Consider a mixture to be at least as hazardous as its most hazardous component.

3. Do not use unlabeled chemicals.

4. Never combine substances unless you understand the chemistry that likely will occur, including heat evolution and gas production, and have prepared

for the consequences. Students should never combine substances unless they have been explicitly instructed to do so.

5. Follow all chemical safety instructions and procedures to the letter.

ii. Chemical exposure can be minimized by careful use of chemicals and good housekeeping.

1. Promptly clean up and properly dispose of small chemical spills, including water spills.

2. Clean up your work area prior to leaving the laboratory.

3. Wash hands, face, and arms thoroughly if contaminated and always wash before leaving the laboratory.

4. Always wash before eating, drinking, smoking, visiting the rest room, or applying make-up after working in the laboratory.

5. Depending on the chemicals used, a shower after working may be wise.

6. Personal clothing and protective equipment like lab coats should be laundered or cleaned regularly and immediately after contamination.

iii. All chemical use should be preceded by a knowledge of the potential hazards of the chemical. Treat all chemicals with respect. Know the hazards before you handle the material.

1. Check your lab write-up for special hazards.

2. Read the chemical labels very carefully to assure that you have the correct chemical. Read labels three times: when you pick it up; just before you use it; and after you are finished. Match name, formula and concentration on the label to lab directions.

3. Read the container labels and Material Safety Data Sheets (MSDS - located in the Chemistry Department Stockroom or locate on-line at http://msds.pdc.cornell.edu/msdssrch.asp or http://siri.uvm.edu/msds/). They will tell you: 1) any hazardous ingredients; 2) physical and chemical characteristics; 3) health hazards; 4) precautionary measures; 5) proper storage and handling procedures; 6) how to handle leak and spill cleanup and proper disposal; 7) first-aid procedures.

4. Beware of poisons.

    a. Never taste a chemical.

    b. Check odors (only if instructed to do so) by gently wafting some of the vapor towards your nose with your hand over the open container top.

c. Pipetting by mouth is forbidden.

d. Laboratory fume hoods should be used for all operations that have the potential to release fumes, gases, or volatile solvent vapors in excess of recommended exposure levels.

5. Work with corrosive agents such as acids and bases should be conducted with particular care to avoid skin and eye contact. If you spill acid or base on yourself, rinse the affected area with lots of water. If the outside of a reagent bottle is contaminated, handle with gloves and rinse the bottle before using the reagent.

6. Report all mercury spills to the Departmental Chemical Hygiene Officer. The mercury must be cleaned up thoroughly under the direction of the Departmental Chemical Hygiene Officer to avoid contamination of the lab with poisonous mercury vapor.

7. Always add acid to water. Pour water and acid into the mixing container in the order of the spelling of "water". The "w" for water precedes the "a" for acid, thus, add water first followed by the acid.

8. Remember that organic compounds, especially solvents, often are very flammable. Verify that no flammable vapors are present before lighting a Bunsen burner.

9. If any chemical is splashed or spilled on your skin or body, immediately wash off the chemical and rinse for15 minutes. Remove contaminated clothing immediately. Notify your lab supervisor.

10. Use of low temperature operations require special procedures. Such operations require the prior approval of your lab supervisor.

11. Compressed gases should be used as described in this CHP in section G.

iv. Chemicals should be stored and dispensed properly.

1. Flammable liquids should be dispensed in containers complying with NFPA (National Fire Protection Association) and OSHA (U.S. Occupational Safety and Health Administration) codes, and storage should be in special cabinets also complying with NFPA and OSHA codes.

2. The shelf-life of some chemicals is prolonged by storage at a low temperature. The refrigerators and freezers used for chemical storage must be clearly marked as either **explosion-resistant** or **explosion-proof**. Absolutely **NO** storage of food is permitted in chemical coolers.

3. Ideally, hoods should not be used for chemical storage; bottles sitting in a hood interfere with the proper air flow. However, if chemicals are stored in a hood it should be used for storage only; no experiments should be conducted in hoods containing stored chemicals.

4. Never return unused reagents to the reagent bottle. Be careful to take only what you need. Do not contaminate reagents by exchanging caps or stoppers or by laying stoppers on the desk top. Dispose of excess reagent as directed by the laboratory supervisor and this CHP.

5. In general, do not insert pipets or medicine droppers into the reagent bottle. Where possible transfer a small amount into a beaker and dispense from there.

6. Keep only the necessary chemicals in the lab. All others should be returned to the Chemistry Department Stockroom.

7. Report any deterioration of a chemical, broken containers or broken caps to the laboratory supervisor.

8. All chemicals should be stoppered or capped at all times when not in immediate use. This includes hazardous waste.

9. Highly reactive chemicals stored in breakable containers should be provided with secondary containment.

10. Do not store chemicals near heat, in sunlight, or near other substances with which they might react.

11. Do not store chemicals and equipment on bench tops. They should be put away each day, or, at the minimum, placed at the very back of the bench top away from the countertop edge.

12. Store dangerous items like biohazards, radioactives, carcinogens, poisons, water reactive chemicals, etc..., in special cabinets designed for their safe storage. Warning labels must be on such chemicals and cabinets.

13. Do not place reagents directly on the balance pan. A weighing container must be used.

14. It is the responsibility of both the laboratory supervisor and the lab worker to properly label any chemical taken from its original container. This label should include: 1) the chemical name, fully written out; 2) the date; and 3) hazard information including the NFPA coding. Reaction intermediates and products of uncertain or undetermined structure should be labeled with the researcher's name and the corresponding page number of the research notebook.

15. Body fluids used in experimental techniques or from accidents should be handled in special ways. Contact the laboratory supervisor and Departmental Chemical Hygiene Officer for appropriate protocol (see section III.J of this Chemical Hygiene Plan).

16. Chemicals which have a limited shelf life--peroxidizable solvents, e.g., diethyl ether; chemicals which decompose upon storage to form

potentially dangerous pressures, e.g., formic acid; chemicals which can become unstable upon storage, e.g., moist picric acid which can become explosive upon water evaporation--require special procedures. These chemicals should be ordered on an as-needed basis in quantities no greater than anticipated for six months usage. Container sizes should be minimized. Containers will be dated upon receipt and upon opening.

E. Equipment and Glassware Safety

1. Beware of broken glass. Do not use damaged, cracked or broken glassware. Fire polish any chipped edges on beakers, test tubes, stirring rods, etc... or replace with a new item.

2. Dispose of broken glassware and dangerous items such as syringes in special containers. Do not place in the regular trash. These items should be as clean as possible of chemical contamination before disposal.

3. Wrap evacuated glass containers (with, for example, black electrical tape) to protect against implosion.

4. Broken glass cuts deeply. When inserting thermometers or glass tubing into stoppers or corks, lubricate them with water or glycerine and twist, using short strokes and minimum pressure. Covering the thermometer or tubing with a towel protects hands and fingers from injury in case the article being inserted breaks.

5. Treat a test tube, graduated cylinder, or separatory funnel as you would a gun. Never point these items at anyone, especially when it is being heated or agitated. Never look down into a test tube or flask in which an experiment is being conducted.

6. Be careful with Bunsen burners, hot plates, hot plate-stirrers and other hot objects. Remember that hot glass looks just like cool glass.

7. Use carts, trays, boxes or other containers to transport materials between the stockroom and labs or between labs.

8. Do not store equipment, backpacks, coats, chemicals or other materials on the floor or in other places where laboratory workers can trip or knock over the item, or in places that would block fire exits.

9. Electrical equipment always means the chance of shock or fire. Do not touch with wet hands or while standing on a wet floor. Report any shocks and defective equipment to the laboratory supervisor. Do not attempt to repair the equipment yourself. Equipment cords should not be entangled or allowed to drape in inappropriate locations (e.g., sinks). All electrical powered equipment should be wired with safety ground and 3-prong

plugs. Extension cords are not appropriate. Report frayed cords or defective plugs to personnel in the Chemistry Department Stockroom. Be especially careful around equipment with moving parts. These items can catch your clothing or open up suddenly, showering you with dangerous material.

10. Never take equipment, chemicals, or glassware out of the Chemistry Department without the consent of the laboratory supervisor.

11. Before leaving the laboratory, clean up your lab area and turn off and put away all unused equipment. Assure that all gas and water valves have been turned off. Return borrowed equipment to the stockroom.

F. Laser Safety

i. Laser Classification

Lasers are generally classified and controlled according to the following criteria:

Class 1: Low-power lasers and laser systems that cannot emit radiation levels greater than the Maximum Permissible Exposure (MPE). Class 1 lasers and laser systems are incapable of causing eye damage and are therefore exempt from any control measures.

Class 2: Visible, low power lasers or laser systems that are incapable of causing eye damage unless they are viewed directly for an extended period (greater than 1000 seconds).

Class 3: Medium-power lasers and laser systems capable of causing eye damage with short-duration (<0.25 s) exposures to the direct or specularly reflected beam. Includes Class 3a and 3b lasers.

> Class 3a: Lasers or lasers systems that normally would not produce a hazard if viewed for only momentary periods with the unaided eye. They may present a hazard if viewed using collecting optics.
>
> Class 3b: Lasers or lasers systems that can produce a hazard if viewed directly. This includes intrabeam viewing of specular reflections.

Class 4: High power lasers and laser systems capable of causing severe eye damage with short-duration (<0.25 s) exposures to the direct, specularly reflected, or diffusely reflected beam. Class 4 lasers and laser systems are also capable of causing severe skin damage and igniting flammable and combustible materials.

ii. Laser Hazard Control Precautions

1. Eye Protection: laboratory supervisors who operate or supervise the operation of a laser are responsible for determining the need for laser eye

protection for a particular laser. If required, eye protection will be provided by the supervisor for staff and visitors to the area.

2. Dye lasers normally use a lasing medium composed of a complex fluorescent organic dye dissolved in an organic solvent. These dyes vary greatly in toxicity, mutagenicity, and potential carcinogenicity. All dyes must be treated as hazardous chemicals. Most solvents suitable for dye solutions are flammable and toxic by inhalation and/or skin absorption.

3. The minimum laser radiant energy or laser power level required for the application should always be used.

4. Warning signs should be posted at entrances and in prominent locations near the laser work area when the laser is in operation.

5. Beam Control: To minimize direct eye exposure, the following precautions should be observed:

    a. Do not intentionally look directly into the laser beam or at a specular reflection, regardless of its power.
    b. The laser beam should be safely terminated at the end of its useful path.
    c. The beam path should be located at a point other than eye level when standing or when sitting at a desk.
    d. The laser must be oriented such that the beam is not directed toward entry doors or aisles.
    e. Specular reflections should be minimized.
    f. The laser system should be securely mounted on a stable platform to maintain the beam in a fixed position during operation and limit beam traverse during adjustments.
    g. Primary beams and dangerous reflections must be confined to the optical table.
    h. Beam paths should be clearly identified and they must not cross populated areas or traffic paths.
    i. Alignment of laser optical systems (mirrors, lenses, beam deflectors, etc...) must be performed in such a manner that the primary beam, or a specular or diffuse reflection of a beam, does not expose the eye to dangerous levels of radiation.
    j. When the beam path is not totally enclosed, the laser system should be located so that the beam will be outside the normal eye-level range, which is between 1.2 to 2 meters from the floor.

The intensity of laser radiation is often such that exposure can result in serious and permanent injury to skin and eyes. There are also a number of non-beam hazards associated with laser systems. These include electrical shock,

exposure to dyes and chemicals, and production of potentially hazardous beam plumes.

G. Compressed Gases

i. General Notes

1. Cylinders must be stored and transported in a manner to prevent their falling. Escaping gas from a broken cylinder valve can propel a cylinder through a brick wall.

2. Some gases are toxic, some flammable. Knowing about the gas you are working with is as important as knowing about the reactants in your experiment.

3. Always use a cylinder cart to transport cylinders.

4. Cylinders should be stored and moved with caps in place. Cylinders and caps have either coarse threads or fine threads. Do not force a cap with one type of threading on a cylinder with a different type of threading, e.g., a coarse threaded cap on a fine threaded cylinder.

5. Cylinders should be chained or strapped at all times. Do not use a cylinder cart as a securing device in your lab.

6. Use the correct regulator for a particular gas; never attempt to used improvised adaptors.

7. Electrically ground cylinders that contain flammable gases.

ii. Cylinder Changing Procedures

1. Obtain a full cylinder from room 4149. Do not place empty cylinders into room 4149.
2. Move the cylinder to your lab with a cylinder cart.
3. Place the initials of the Laboratory Supervisor on the paper tag attached to the full cylinder.
4. Remove the empty cylinder from the system (use a crescent wrench, not a pipe wrench which roughens the edges of the nut) and replace the cap.
5. Install the new cylinder.
6. Take the capped, empty cylinder to the holding area in front of the third floor Chemistry Department Stockroom, room 3409; leave it there on the cart. Notify stockroom personnel of its presence.

iii. Procedure for Dispensing a Compressed Gas

1. After the cylinder has been secured with a safety clamp, remove the cap and screw on the pressure regulator using a crescent wrench.

2. Make sure the flow control valve (the needle valve on the outlet side of the regulator) is closed (clockwise, finger tight) and the delivery pressure screw (the screw that delivers pressure from one side of the regulator to the other) is closed (counterclockwise until it feels loose). Both gauges should read zero.

3. Open (counterclockwise) the main valve (top of the gas cylinder) fully by hand. The cylinder pressure gauge will now register the cylinder pressure.

4. Turn the delivery pressure adjusting screw clockwise until the desired reading on the delivery pressure gauge is reached.

5. The flow rate can now be adjusted using the flow control valve.

6. Shut off the gas supply by closing the valves in the same order in which they were opened. Shut off the main tank first and allow the residual compressed gas in the valves to escape. When the gauges read zero, shut the delivery pressure screw and the flow control valve.

H. Fume Hoods

1. Fume hoods will be inspected annually by, or under the supervision of, the campus Chemical Hygiene Officer. Hood face velocities will be determined by readings taken over a grid across the open hood face. A record of these inspections will be maintained at the Chemistry Department Stockroom (room 3409).

2. Stickers on each hood will indicate proper sash positioning for optimum performance.

3. Stickers on each hood will document inspection date and hood velocity.

4. A simple visible test can be done to check for hood flow. Tape a piece of KimWipe to the sash of the hood and note its movement when the exhaust fan is turned on. A properly functioning hood should cause the Kim Wipe to flutter into the hood.

5. Questions regarding fume hood operation should be directed to the laboratory supervisor, Departmental Chemical Hygiene Officer, or Campus Hygiene Officer.

I. Hazardous Waste Procedures

i. General

1. It is the responsibility of the laboratory supervisor and lab worker to discard or dispose of chemicals in an environmentally sound manner and to assist with inventory procedures for complying with this Chemical Hygiene Plan.

2. Absolutely **NO** chemicals or chemical materials are to be put down the drain or placed in the trash without prior authorization. Any sink/sewer or trash disposal of chemicals from the laboratory is the responsibility of the laboratory supervisor in consultation with the Departmental Chemical Hygiene Officer and Campus Chemical Hygiene Officer.

ii. The following rules apply for all "satellite" hazardous waste (HW) collection locations (laboratory collection).

1. The volume of HW accumulated at a satellite point must not exceed 55 gallons.

2. Containers must be labeled "Hazardous Waste" and labeled with chemical names of waste.

3. Containers must be labeled with the date upon which accumulation of the waste began.

4. Containers must be compatible with the collected hazardous waste and be sealed with a lid at all times other than when waste is being added.

5. Containers must be inspected weekly by the laboratory supervisors or under the supervision of the laboratory supervisor. The results of such inspections will be recorded on the HW container log sheet.

6. Containers should not be filled more than 70% full.

7. Incompatible wastes must not be mixed nor should the separate waste containers be stored near each other (for example, cyanides must be stored well away from acids).

8. All employees must be trained in proper hazardous waste procedures.

9. Hazardous waste should be handled so as to minimize unplanned releases (for example, HW containers should not be stored in sinks with drains and if possible should be stored within secondary confinement systems).

10. Bulk organic waste (at EIU) consists of solvents and spent reactions that are predominantly solvents and that contain no chemicals of the type

listed within Appendix B. Bulk organic waste should have a label, available in the Chemistry Department Stockroom, on the container (usually 3 to 5 gallons) denoting that it is "Bulk Organic Waste" and that it is flammable and toxic. A log sheet describing the solvents and quantities should accompany each container. When the hazardous waste container is 70% full, notify personnel in the Chemistry Department Stockroom.

11. No hazardous wastes other than "Bulk Organic Waste" may be combined, whether organic or inorganic, with the bulk waste or with each other. Wastes that are not combined should be labeled specifically as to the chemical or chemicals in the waste (the appropriate hazardous properties should be denoted on the label obtained in the Chemistry Department Stockroom) and personnel in the Chemistry Department Stockroom notified so appropriate disposal may be arranged.

J. Blood Borne Pathogen Precautions

i. Universal Precautions

Precautions must be observed when dealing with body fluids of any types and amounts. The only safe assumption during cleaning up of body fluids is that the fluid contains the infectious HIV, HBV, and various and other blood borne pathogens. Where differentiation of types of body fluids is difficult or impossible, all body fluids are to be considered as potentially infectious.

ii. Accidental spillage (cuts, nosebleeds, etc...)

1. When blood or body fluids are released isolate the area to be cleaned and disinfected by lacing a barrier tape around the site, post appropriate signs, and contact the Departmental Chemical Hygiene Officer. Building service workers (janitors) are trained in handling blood spills. If one is not immediately available, call 581-3416 and request clean-up assistance. A 5% bleach solution is an effective decontaminant for a few blood drops.

2. Our institution has established a specific set of procedures to provide hepatitis B vaccinations to laboratory workers who have a potential for an exposure to Blood borne Pathogens and post-exposure evaluation and follow-up for all laboratory workers and students who have had and exposure incident to Blood borne Pathogens. Contact the Departmental Chemical Hygiene Officer or the University Chemical Hygiene Officer.

iii. Storage

1. Containers, refrigerators, and freezers containing any potentially infectious materials must be labeled BIOHAZARD.

2. All containers of potentially infectious blood, blood components, or blood products at this facility must be properly labeled. A proper label must include at least the use of the BIOHAZARD symbols, fluorescent orange, or orange-red background with contrasting lettering.

3. Sharps containers should be used to properly store and dispose of sharps. Approved sharps containers are designed to isolate the cut or puncture hazard associated with handling sharp items such as needles, scalpels, or Pasteur pipettes. Approved sharps containers are:

   X puncture-resistant

   X red in color or labeled with a biohazard warning label

   X leak-proof on the sides and bottom

   X closable

4. Containers for reusable sharps must meet the same requirements as containers for disposable sharps, with the exception that they are not required to be closable. Reusable sharps will not be stored or processed in a manner that requires reaching **into** containers of contaminated sharps.

5. Approved sharps containers are available through the departmental stockroom. Contact the Departmental Chemical Hygiene Officer. Food containers such as coffee cans should not be used to dispose of contaminated sharp objects.

K. Emergency Procedures and Reporting

1. Report any accidents (injuries, spills, explosions, fire, etc...) to the laboratory supervisor immediately. Even minor injuries should be reported to ensure appropriate treatment. Medical staff can better treat cuts, burns, or inhalation of fumes. The laboratory supervisor is responsible for filling out the Eastern Illinois University Accident/Injury Report Form and giving the form to the Chemistry Department Chemical Hygiene Officer.

2. Treat minor burns immediately by placing the burned area under cold water for at least 15 minutes. Cold water markedly reduces the subsequent pain and blisters. Do not attempt to treat major burns; call an ambulance.

3. Treat chemical spills to the body by flushing the contaminated area for 15 minutes with water. Remove jewelry and contaminated clothing immediately. Modesty should not prevent the immediate removal of affected clothing. For large areas of contamination, rinse under an emergency shower. Check the MSDS or other reliable source to see if any delayed effects should be expected. Inform your laboratory supervisor immediately.

4. Contact of any lab chemical with the eyes requires immediate treatment. Flush the eyes with water for fifteen minutes, holding the eyelids away from the eyeball and moving the eyeball up and down and from side to side. Seek medical aid after the first aid is accomplished.

5. Inhalation of all laboratory chemicals should be minimized. Substances with a high level of acute toxicity (LD_{50}<50 mg), carcinogens and reproductive toxins must always be used in the hood. Threshold limit values, TLV's, and permissible exposure limits, PEVs, give respective long-term and short-term limits for exposure and are often quoted in the MSDS. Chemicals with PELs or TLVs less than 50 ppm must not be used outside a hood. Persons with a noticeable reaction to inhaled chemicals should be removed from the laboratory to fresh air and medical attention.

6. Ingestion of laboratory chemicals can be caused by eating, drinking, taking medicine, applying cosmetics, pipetting by mouth and chewing gum in the laboratory—all of which are forbidden. Should ingestion occur, follow instructions on the label of the chemical bottle or in the MSDS and seek medical attention if appropriate.

7. Clean up any spilled reagents immediately, especially near the balances or reagent shelf. Acid or base spills must be cleaned up thoroughly and the affected area rinsed with water. For larger spills, use the solid sodium bicarbonate, $NaHCO_3$, provided to neutralize the spill, then clean up thoroughly, and take the $NaHCO_3$ bottle to the Chemistry Department Stockroom for refill for future clean-ups. Custodians are not trained for chemical spill clean up; this is the responsibility of the lab workers and laboratory supervisor.

8. Small spills of low toxicity organic solvents (e.g., petroleum ether, hexanes, diethyl ether, tetrahydrofuran, alcohols, acetone) should be absorbed using vermiculite and the used vermiculite placed into a hood. Notify the Departmental Chemical Hygiene Officer so that the solvent/vermiculite can be dealt with properly. Contact the Departmental Chemical Hygiene Officer or laboratory supervisor for spills larger than 500 mL or of any amount of highly toxic substances (see Appendix C).

9. Report allergies to your lab supervisor.

10. If you suspect you have been exposed to a hazardous substance, inform your laboratory supervisor and get medical attention.

11. All larger chemical spills, accidents, fires, explosions, chemical exposure, etc... must be reported immediately to the Campus Environmental Health and Safety Department (x 7068). For after hours reporting, contact work control, x 3416.

12. Emergency exiting procedures for each laboratory including assembly point and verification of evacuation completeness (headcount) shall be documented. Emergency shut-off locations for gas and other utilities shall be documented and clearly marked. The Chemistry Department Chemical Hygiene Officer is responsible for this documentation.

13. If self-contained breathing apparatus, or respirators, are required for an emergency, the Charleston Fire Department will be called for such services.

14. A list of emergency phone numbers will be maintained at relevant telephones. The Chemistry Department Chemical Hygiene Officer has responsibility to maintain this list.

IV. Employee Training

Laboratory worker training shall include:

1. Detection methods and observations that may be used to detect the presence or release of a hazardous chemical. Examples of detection methods include visual appearance, odor, and an understanding of chemical monitoring devices.

2. Physical and health hazards of the chemicals.

3. The work practices, personal protective equipment, and emergency procedures to be used to ensure that the employee may protect himself/herself from overexposure to hazardous chemicals.

   The manufacturer's Material Safety Data Sheets will generally contain much of the above information needed to comply with the information and training requirements of the OSHA Lab Standard. Hence, laboratory workers should peruse and understand the relevant MSDSs and/or other comparable literature on the hazardous chemicals which are used or stored in their laboratory. MSDS sheets are stored in the Chemistry Department Stockroom (Room 3409) and are available from the Environmental Health and Safety Department or from the WEB.

4. Additional training for specific lab hazards must be provided by the laboratory supervisor.

5. Laboratory workers shall be made aware of the existence of this CHP. A copy of the CHP will be available in each research laboratory, the Chemistry Department Stockroom, and the Chemistry Department Office.

6. Upon receiving training as described in this CHP, laboratory workers will fill out and sign an appropriate signature sheet (see Appendix D). Signatures will be collected by the Department of Chemistry Safety Committee and will be stored in the Chemistry Department Stockroom.

V. Prior Approval

1. The circumstances under which a particular laboratory operation, procedure or activity are to be carried out shall require prior approval from the employer or the employer's designee before implementation.

2. The responsibility for approval of the acquisition and use of toxic chemical agents rests with the laboratory supervisor. Certain materials including radioactive materials, recombinant DNA, and certain biohazards require prior internal approval at various levels. If there are questions concerning the need for approval, the Campus Chemical Hygiene Officer should be consulted.

VI. Medical Consultation

An opportunity to receive medical consultation shall be provided under the following circumstances: if an employee develops any symptoms thought to arise from chemical overexposure; after an event such as a major spill, leak or explosion which may have resulted in an overexposure; or, an overexposure is identified as the result of an evaluation by the Chemical Hygiene Officer. Health Service will designate one or more physicians at any given time to be consulting physicians. Following notification of overexposure, arrangements for an appropriate medical examination must be completed before the exposed individual may return to work. Any medical examination required by this Plan shall be provided without cost to the employee, without loss of pay and at a reasonable time and place. Records of any medical examination will be maintained at Health Service.

VII. Special Provisions for Select Carcinogens, Reproductive Toxins and Acutely Toxic Chemicals

A. General

1. For chemicals considered as select carcinogens, reproductive toxins or acutely toxic chemicals specific consideration shall be given to the following provisions which shall be included where appropriate: (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 (d) Decontamination procedures.

2. In addition to the general safety guidelines mentioned in the first section and throughout the CHP, special precautions are needed when handling genotoxins, reproductive toxins and chemicals with a high degree of acute toxicity. A minimum set of guidelines that should be followed are listed below. The lab supervisor should ensure that these and other precautions designed to minimize risk of exposure to these substances are taken.

B. Guidelines

1. Quantities of these chemicals used and stored in the laboratory should be minimized, as should their concentrations in solution or mixtures.

2. Work with genotoxins, reproductive toxins and acutely toxic chemicals should be performed within a functioning fume hood, biological safety cabinet, ventilated glove box, sealed system, or other system designed to minimize exposure to these substances. (The exhaust air from the ventilation systems may require scrubbing before being released into the atmosphere.) In all cases, work with these types of chemicals shall be done in such a manner that the OSHA permissible exposure limits or similar standards are not exceeded.

3. Compressed gas cylinders which contain acutely toxic chemicals such as arsine and nitrogen dioxide should be kept in ventilated gas cabinets.

4. The ventilation efficiency of the designated fume hood, glove box or gas cabinet, and the operational effectiveness of mechanical and electrical equipment used to contain or manipulate these special substances should be evaluated periodically by the laboratory personnel at intervals determined by the laboratory supervisor. The interval of evaluating systems may vary from weekly to biannually depending upon the frequency of usage, quantities employed and level of hazard.

5. Each laboratory utilizing these substances must designate an area for this purpose and must sign or mark this area with an appropriate hazard

warning. The designated area may be an entire laboratory, an area of the laboratory, or a device such as a fume hood or glove box. the designated area should be marked with a DANGER, specific agent, AUTHORIZED PERSONNEL ONLY or comparable warning sign.

6. All laboratory workers who work in a laboratory which has an area designed for use with genotoxins, reproductive toxins and acutely toxic chemicals must be trained about the deleterious effects of these substances as well as signs and symptoms regarding exposure to these substances, whether or not they actually work with the substance themselves. Training to ensure the safe handling and storage of these substances is required for those who use these materials. This training is the responsibility of the laboratory supervisor and must be done prior to the use of any of these materials.

7. Laboratory workers working with these chemicals must have access to appropriate protective equipment and clothing (available at no expense to the workers) and must be trained on how to properly utilize the safety equipment. For example, when working with highly toxic gases, it is often recommended that the workers have available and be trained to use self-contained breathing apparatus.

8. Detection equipment may be required in laboratories where chemicals (especially poisonous gases) with a high degree of acute toxicity are utilized.

9. All wastes contaminated with these substances should be collected and disposed of in a timely manner and appropriately as outlined in this CHP. For special disposal information, call the Campus Safety Officer (Ext. 3727). If possible and as soon as practical, waste products shall be destroyed by a suitable, generally acceptable chemical procedure to lessen or eliminate their toxicity.

10. The designated working area shall be thoroughly and appropriately decontaminated and cleaned at regular intervals determined by the laboratory supervisor. The interval may be as short as one day or as long as six months depending upon the frequency of usage and level of hazard.

11. Special precautions to avoid release and exposure to highly toxic chemicals, genotoxins and reproductive toxins must be utilized. For instance, volatile substances should be kept cool and contained; gases should have properly functioning valves, check valves, regulators, containment which can withstand pressure buildup, and appropriate piping; and dispersive solids should be kept in closed containers, used in places with minimum air currents, and appropriate contact materials should be used to avoid static charging.

12. Emergency response planning for releases or spills shall be prepared by the lab supervisor and included in the training of the laboratory workers and others who may be affected in the building.

Appendix A: Glove Compatibilities
Taken from Prudent Practices for Handling Hazardous Chemicals in Laboratories, 1981

Note: check with manufacturer for up-to-date information

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	F
Acrylonitrile	P	G	----	F
Ammonium hydroxide (sat)	G	E	E	E
Aniline	F	G	E	G
Benzaldehyde	F	F	E	G
Benzene	P	F	G	P
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
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[a]	P	F	G	G
Tricresyl phosphate	P	F	----	F
Triethanolamine	F	E	E	E
Trinitrotuluene	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, nitrile rubber, or vinyl materials was available from this source; one manufacturer of the substance recommends the use of butyl rubber gloves.

Appendix B. Sample of hazardous waste log form

Hazardous Waste Log Sheet
Organic Waste
(see other side for exclusions)

Bottle Number______________ Room Number________________

Date	Chemical Added	Estimated Volume Added	Inspection Information

Bulking of Liquid Waste

The ultimate disposal of our hazardous waste requires that these wastes be separated according to the method of disposal. The majority of our waste can be burned in a total consumption incinerator—a responsible and ecologically sound method. However, in order to use this method and to ensure the safety of those involved, that waste must exclude chemicals that would interfere with the incineration process or would react with common organic compounds.

The following is a list of chemicals that should be excluded from the general organic waste. Please see Ken Osborne in the stockroom for alternative methods of disposal. This list is illustrative, not exhaustive. In general, do not place any strong reducing agent, oxidizing agent, catalyst, or unstable compound into the liquid bulk organic waste.

All Solids
Monosubstituted acetylenes
Acids, mineral
Acyl halides
Aluminum
Ammonia solutions
Anhydrides, organic
Alkali and alkaline earth:
- carbides
- hydrides, e.g., NaH
- hydroxides, e.g. KOH
- metals
- oxides
- peroxides

Azides
Strong bases
Chlorates
Chromates
Chromic Acid
Chromium trioxide
Cyanides, inorganic
Dichromates
Halogenating agents
Hydrogen peroxide
Mercury and its amalgams
Heavy metal salts
Group IA and IIA metals
Metal hydrides
Nitrates, inorganic
Perchlorates
Peroxides
Permanganates
Persulfates
Phosphorus
Phosphorus pentoxide
Sulfides, inorganic
Sulfur

Each time you add to the liquid organic waste bottle, you must denote the chemical(s) added and the amount on the log sheet (see other side). Each log sheet will correspond to a bottle of waste. Attach a hazardous waste label to the bottle in use and write the bottle number on the log sheet. A new bottle for waste, log sheets, and hazardous waste labels can be obtained in the stockroom.

Other Waste

Solid waste and liquid waste that is unsuitable for bulking should have a label denoting the contents, the date, known hazards, and the generator. These wastes should be kept individually and not combined. Contact Ken Osborne for disposal.

Appendix C: Highly Toxic Chemicals—Examples

Acrolein
Arsine
Chlorine
Diazomethane
Diborane (gas)
Hydrogen cyanide
Hydrogen fluoride
Methyl fluorosulfonate
Nickel carbonyl
Nitrogen dioxide
Osmium tetroxide
Ozone
Phosgene
Sodium azide
Sodium cyanide
(and other cyanide salts)

Appendix D: Sample of Laboratory Worker Training Record Form

LIST OF LABORATORY PERSONNEL

Chemistry Department Building_____ Floor/Room_____ Phone (if present)_____

Laboratory Supervisor_____ Degree_____ CHP Read on_____ Signature_____

Name of Laboratory Worker	Major Field of Study	CHP Read on:	Dates of training course or semester enrolled in CHM 3500	Signature

Appendix E: Sample of Laboratory Information Sheet

LOCATION OF THE NEAREST SAFETY EQUIPMENT

Building/Floor/Room:_____ Phone (if present)_____

Safety Shower_____

Eye Wash Station_____

Fire Blanket_____

Fire Extinguisher (CO_2 or Dry Chemical) _____

Spill Clean-up Kits

- Acids_____
- Alkalis_____
- Organic Solvents_____
- Mercury_____

MSDS (Material Safety Data Sheets)_____

Personal Protective Equipment (PPE)

- Safety eye wear (goggles)_____
- Gloves_____
- Aprons_____
- Face Shields_____

Mask/Respirator_____

Laboratory Chemical Hygiene Plan_____

Safety References_____

POST A COPY OF THIS PAGE IN A CONSPICUOUS PLACE IN THE LABORATORY

Appendix F

Emergency Phone Numbers

Post in Lab

EMERGENCIES: CALL 911

Emergency Phones are located in the hallways on the north and south wings of the 4th floor, and on the south wings of the 2nd and 3rd floors.

FIRST AID

- **DEEP CUTS – Apply pressure to stop bleeding.**
- **SEVERE BURNS – Do not rinse area with water.**
- **CHEMICAL IN EYE – Continuously flush with water for 10 minutes. Report to the Health Service.**
- **CHEMICALS ON SKIN – Remove affected clothing and rinse area on skin with water for 10 minutes. Report to the Health Service.**
- **GLASS IN EYE – Notify 911.**

HEALTH SERVICE:

Phone 3013

FALL & SPRING HOURS:

Monday – Friday	**7:30 AM – 4:30 PM (full staff)**
	4:30 PM – 6:00 PM (nurse on duty)
Saturday:	**10:00 AM – 2:00 PM (nurse on duty)**
Sunday:	**CLOSED**

SUMMER HOURS:

Monday – Friday	8:00 AM – 4:00 PM (full staff)
Saturday – Sunday	Closed

PHYSICAL PLANT EMERGENCIES:

(Burst water pipes, temperature control, etc.)
After hours, phone Plant Operations at 3416.