SUNY FREDONIA

LABORATORY SAFETY GUIDELINE PROGRAM

CHEMICAL HYGIENE PLAN

Prepared by the
OFFICE OF COLLEGE SERVICES
1991

Review and Revisions done by the office of: Environmental Health & Safety

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IN AN EMERGENCY DIAL 3333 FROM A CAMPUS PHONE, 673-3333 FROM YOUR CELL PHONE, OR USE A RED EMERGENCY TELEPHONE

SECOND FLOOR HOUGHTON NEAR ROOM 223

FIRST AND SECOND FLOOR JEWETT CENTER OF HALL

This is a direct line to University Police. Report the incident

and stay on the line until you are told to hang up.

Or call 911 and then call the University Police (3333).

Emergency Telephone Numbers:

Emergency & University Police	673-3333
Fire & Rescue	673-2125 (also call 3333)
Ambulance	366-8177 (also call 3333)
Health Center	673-3131 (call 3333 for transportation if needed)

PREFACE AND ACKNOWLEDGEMENT

The philosophy of the State University of New York at Fredonia is to ensure a safe and healthy environment for all employees, students, and visitors.

In keeping with this philosophy, the Chemical Hygiene Plan Committee has prepared the "Laboratory Safety Guideline Program / Chemical Hygiene Plan" to provide you with general information and specific procedures with permission on chemical safety in the laboratory. The Committee utilized the booklet "Laboratory Safety Guideline / Chemical Hygiene Plan" developed by the Office of Environmental Health and Safety of the University of New York Health Science Center at Syracuse. This program has been prepared in accordance with all applicable Federal and State laws. It is intended to set a uniform standard for health and safety in the laboratories of Fredonia and meet the requirements set forth in the OSHA standard 29 CFR 1910.1450, regarding "occupational exposure to hazardous chemicals in laboratories".

The Chemical Hygiene Plan Committee would like to acknowledge and express our sincere appreciation to the Health Science Center at Syracuse for sharing their work with us.

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I. GOAL OF LABORATORY SAFETY PROGRAM

The primary objective of this program is to provide a reference guide to laboratory workers who use, or potentially may be exposed to, hazardous substances which could endanger their health. Only by conscious effort on the part of all laboratory personnel will a safer work environment be achieved.

No one is excluded from appropriate safety precautions. In particular, the basic science faculty should serve as role models for their technical staff and students. There must be some assurance that appropriate laboratory procedures will be followed. It is the policy of the University that responsible investigators will not conduct research in a manner which could potentially jeopardize the health and safety of themselves or others under their supervision.

Support personnel in proximity to a laboratory may also be exposed to potential physical and chemical hazards associated with a laboratory. These individuals should also be informed and educated about the potential hazards present and what to do in the event of an accident or emergency.

Beyond the laboratory, there must be a sincere concern for the environment. Chemicals must be disposed of in a responsible and environmentally sound method that minimizes the potential harm of laboratory wastes. Everyone, including technical and support personnel should know and use acceptable disposal methods for all hazardous substances. The increasing burden of chemical wastes on the environment is well known and the associated costs of chemical disposal necessitates every effort to reduce, recycle, and reuse all our laboratory chemicals, wherever possible.

II. ENSURING LABORATORY SAFETY

The department chairperson is obligated to ensure a safe working environment. Essential to an effective departmental safety program is a Department Safety Officer (DSO). A DSO is to have a background and training relevant to the activities and safety issues of the department. The department duties of a safety officer are to:

1. Cooperate with administrators and other employees to develop and implement appropriate laboratory safety and hygiene policies and practices specific to his/her area;
2. Monitor the procurement, use, and disposal of potentially hazardous chemicals used in the department;
3. See that the appropriate audits, inventories and inspections are performed;
4. Assist project directors in developing the needed precautions to ensure adequate facilities;
5. Maintain and disseminate current legal requirements for all regulated substances handled or used within his/her department.

The responsibility for initiating and overseeing a research project rests with the project directors or principal investigators. They shall ensure that the projects under their supervision are conducted in such a way that the safety and health of all personnel associated, either directly or indirectly, with the project are not potentially jeopardized. Specifically, the laboratory director or supervisor must make certain that:

1. All personnel are aware of, and practice, appropriate safety precautions;
2. Adequate emergency equipment is available and in working condition;
3. Training in the use of emergency equipment has been provided;
4. Information on special or unusual hazards in non-routine procedures has been provided;
5. An appropriate safety orientation has been given to new or casual project participants;
6. Appropriate safety plans and emergency procedures have been developed and are followed.

To ensure safe conditions for laboratory personnel, a laboratory safety program also must include:

1. Regular and frequent safety inspections;
2. Disposal procedures which ensure the removal of waste chemicals at regular intervals;
3. Safety training programs which ensure that all personnel are trained in the proper use of laboratory equipment, emergency equipment, and work procedures;
4. Periodic monitoring of ventilation systems to ensure adequate air quality.

All accidents and near accidents should be carefully investigated and analyzed to prevent possible reoccurrence. The intent is not to find fault or fix blame, but rather to contribute toward a safe working environment. The results of such findings and the corresponding recommendations for the prevention of similar occurrences should be documented and distributed to those who might benefit.

III. GENERAL RECOMMENDATIONS FOR SAFE PRACTICES IN THE LABORATORY

The most important rule to ensure a safe work environment is that everyone involved in laboratory operations - from the highest administrative level to support staff – must be safety minded. Safety awareness can become part of the workplace attitude through repeated discussions, in-service training, as well as the sincere and demonstrated support of senior faculty, administrators, and staff. It is in everyone's best interest to carry out his/her own work in accordance with good health and safety practices.

While it is impossible to design a set of rules which encompass all possible hazards and occurrences, some general guidelines are given in this program which experience has proven useful to avoid accidents or reduce injuries in the laboratory.

A. GENERAL PRINCIPLES

Everyone in the laboratory should observe the following rules:

1. Understand and apply the safety rules and procedures that apply to any work being performed. Determine the potential hazards (physical, chemical, biological, or radiological) and the appropriate safety precautions to be followed before beginning any new task.
2. Be familiar with emergency procedures by knowing the location of, and how to use, available emergency equipment, as well as how to obtain help when needed.
3. Know the various types of protective equipment available. Use the proper type of personal protective equipment for a given task.
4. Be alert to unsafe conditions and work practices. Call attention to them so that appropriate corrections can be implemented as soon as possible.
5. Do not smoke or consume food or beverages in areas where chemicals are being used or stored. Application of cosmetics or related products in all laboratories is prohibited.
6. Avoid hazards to the environment by following appropriate waste disposal procedures.
7. Be certain that all chemicals are correctly and clearly labeled. Post the designated warning signs or labels when specific hazards, such as radiation, flammable materials, biological hazards or other special hazardous conditions exist.

8. Check all burners and gas outlets to make sure that they are off before leaving the laboratory. Do not place gas burners by open windows or in a draft. No gas burner will be left unattended while in operation.
9. Remain out of the area of a fire, chemical spill or personal injury unless your assistance is required to help meet the emergency.
10. Use laboratory equipment only for its designated purpose.
11. Carefully position and secure equipment. Take the necessary steps to avoid the accidental jarring of an apparatus or piece of equipment. Use caution in handling hot objects.
12. Think, act, and encourage safety.

B. HEALTH AND HYGIENE

The following health practices should be observed:

1. Wear appropriate eye protection, such as safety glasses, goggles, and/or face shield at all times. Contact lenses are not to be worn in the laboratory. In the event that a chemical is splashed into the eye, a contact lens may serve to trap and concentrate the chemical, thereby increasing the potential for eye damage. In some cases, the lens may dissolve or in some way become "glued" to the eye. "Soft" contact lenses can absorb organic solvent vapors and thus potentially damage the eye. There are some exceptional situations in which contact lenses must be worn for therapeutic reasons. In these situations, employees who MUST wear contact lenses MUST inform their supervisor so that appropriate safety precautions can be devised.
2. Use protective apparel, such as gloves, aprons, lab coats, and other special clothing or footwear as needed. Wearing clothing that exposes a large amount of unprotected skin is strictly prohibited. It is imperative that the possibility of skin contact with chemicals be minimized.
3. Confine long hair and loose clothing when in the laboratory.
4. Do not use mouth suction to pipet chemicals or start a siphon. A pipet bulb, aspirator, or vacuum assisted pipet aid must be used for this purpose.
5. Avoid exposure to gases, vapors, particulates, and aerosols. Use a fume hood whenever such exposure is likely. Appropriate safety equipment must be used when work is not conducted under a fume hood.
6. Wash your hands frequently and thoroughly during the day, always before eating, and before leaving the laboratory. Avoid the use of solvents for washing the skin. Solvents tend to remove the natural protective oils from the skin and can cause irritation and inflammation. In some cases, washing with a solvent facilitates

absorption of toxic chemicals or has a potential health effect itself.

7. Do not attempt to identify chemicals by smell or taste.
8. Minimize your exposure to chemicals by protecting the appropriate route(s) of entry (inhalation, ingestions, injection, and absorption). Consult the Safety Data Sheet (SDS) before beginning work with the chemical.

C. FOOD, BEVERAGES, AND CHEMICAL CONTAMINATION

The contamination of food, drink, and smoking material is a potential route for exposure to toxic substances. Food must be stored, handled, and consumed in an area entirely free of hazardous substances.

1. Well defined areas must be established for storage and consumption of food and beverages. No food will be stored or consumed outside of this area.
2. Areas where food is permitted will be prominently marked and a warning sign (e.g. EATING AREA – NO CHEMICALS) posted. No chemicals or chemical equipment are allowed in such areas.
3. Consumption of food or beverages and smoking must not be permitted in areas where laboratory operations are being conducted.
4. Glassware or utensils used for laboratory operations must never be used to prepare or consume food or beverages. Laboratory refrigerators, ice chests, and cold rooms are not to be used for food storage. Separate equipment must be dedicated to that use, and prominently labeled.

D. HOUSEKEEPING

There is a definite relationship between safety performance and orderliness in the laboratory. Where housekeeping standards are lax, safety performance inevitably deteriorates. The work area must be kept clean, with chemicals and equipment properly labeled and stored.

1. Work areas must be kept clean and free from obstructions. Clean-up will follow the completion of any experiment or, at the very least, at the end of each day.
2. Spilled chemicals must be cleaned up immediately and disposed of properly. Disposal procedures must be followed and all laboratory personnel must be informed of them. Chemical accidents and spills are to be attended to promptly.

3. Unknown chemicals and chemical wastes are to be disposed of promptly using the appropriate procedures located in section XVI of this document. Waste must be deposited in appropriate receptacles.
4. Floors are to be cleaned regularly and kept free of clutter.
5. Stairwells and hallways are not to be used for storage.
6. Access to exits, emergency equipment, valves, controls, and electrical panels must not be blocked.

E. LABORATORY EQUIPMENT MAINTENANCE

Good equipment maintenance is important to maintain a safe and efficient work environment. Equipment must be inspected and maintained regularly. Service schedules depend on both the possibility and consequences of failure. Maintenance plans must include a lock out / tag out procedure to ensure that a device out of service cannot be restarted until repaired.

F. GLASSWARE

Accidents involving glassware are the leading cause of laboratory injuries.

1. Careful handling and storage procedures must be used to avoid damaging glassware. Damaged items are to be discarded or repaired. Use designated waste containers to dispose of broken glass.
2. Adequate hand protection must be used when inserting glass tubing into rubber stoppers or corks, or when placing rubber tubing on glass hose connections. Tubing should be fire polished or rounded and lubricated, and hands should be held close together to limit movement of glass should breakage occur. The use of plastic or metal connectors should be considered.
3. Glass-blowing operations are not to be attempted unless proper annealing facilities are available.
4. Vacuum-jacketed glass apparatus is to be handled with extreme care to prevent implosions. Equipment such as Dewar flasks should be taped or shielded. Only glassware designed for vacuum work is to be used for that purpose.
5. Hand protection is to be used when picking up broken glass. (Small pieces should be swept up with a brush into a dust pan.)
6. Proper instruction must be provided in the use of glass equipment designed for specialized tasks.

G. PROTECTIVE APPAREL AND EQUIPMENT

A variety of specialized clothing and equipment is available for use in the laboratory. The proper use of these items will minimize or eliminate exposure to the hazards associated with most laboratory procedures. All laboratory personnel must be familiar with the location and proper use of protective apparel, safety equipment, and emergency procedures.

Each laboratory should include:

1. Protective apparel and equipment recommended for the substances being handled.
2. An accessible drench-type safety shower, or means of providing flushing for chemical splashes, as an immediate first aid treatment.
3. An eyewash fountain or self contained eyewash station or sink with tubing faucet.
4. A carbon dioxide fire extinguisher or fire extinguisher appropriate for the types of fire hazards present in the laboratory. Be aware that combustible metals require specialized fire fighting materials (Class D Fires).
5. A chemical spill kit for small spills. Also available in stockroom.
6. Access, to a fire alarm, and a telephone for emergency use.

H. CRYOGENIC HAZARDS

The primary hazard associated with cryogenic materials is the extreme cold and potential for thermal burns.

1. Gloves and a face shield are required when preparing or using dry ice and cold baths.
2. Neither liquid nitrogen nor liquid air will be used to cool a flammable mixture in the presence of air.
3. Insulated gloves must be used when handling a cryogenic.
4. Avoid lowering your head into a dry ice chest; carbon dioxide is heavier than air, and suffocation may result.

I. SYSTEMS UNDER PRESSURE

1. Reactions must never be carried out in an apparatus that is NOT designed to withstand pressure.
2. All pressurized apparatus MUST have an appropriate relief device.

3. Heat must never be added to an apparatus which is not designed to withstand heating.
4. If a reaction system cannot be vented directly, an inert gas purge and bubbler system should be used to avoid pressure build up.

J. WARNING SIGNS AND LABELS

Laboratory areas that have specific hazards must be posted with warning signs.

1. Use standard signs and symbols that have been established for special situations (e.g. radioactivity hazard, biological hazard, fire hazard, and laser operations).
2. Post signs that show location of emergency equipment (e.g. a safety shower, fire extinguisher, eyewash station, first aid kit).
3. Waste containers must be labeled to indicate the type of waste that can be safely deposited.
4. It is the duty of laboratory supervisors to ensure that all chemicals are labeled in accordance with the Federal Hazard Communication Standard (see Section XIII LABELING).
5. All laboratories must post departmental signs indicating where the Safety Data Sheets (SDS) are located for the department, identify the Departmental Safety Officer and how he/she may be reached.
6. Chemical code sheets are to be used whenever cryptic codes are to be used. (Generated by each lab according to Appendix F).

K. UNATTENDED OPERATIONS

On many occasions, it is necessary to carry out laboratory experiments overnight or run equipment continuously. In these situations it is necessary to plan for interruptions in utilities, such as electricity or water. Such unattended operations must be designed safely, and contingencies provided for potential problems and hazards which may result. Appropriate signs indicating that a particular laboratory operation is in progress must be posted with the name and phone number of the person to contact in an emergency.

L. WORKING ALONE

It is always wise to avoid working in a laboratory alone. If this is not possible, arrange with a co-worker to check in with you periodically. On nights, weekends, and holidays, individuals who must work alone in a laboratory may contact Campus University Police (extension 3333)and arrange for an officer on patrol to check in at your lab.

Experiments known to be extremely hazardous will not be undertaken by individuals working alone in the laboratory. Under these unusual conditions, special rules and safety precautions will be developed to ensure safe working conditions. The laboratory supervisor, in cooperation with the Departmental Safety Officer, will determine what experiments have this need and the special precautions to be taken.

M. LABORATORY SECURITY

For the protection of employees, equipment, supplies, and the public, laboratories will be closed and locked when unattended and not in use. Security within the lab is also important. Locked storage cabinets are advised for sensitive or expensive supplies and equipment. Lockable storage areas or lockers for securing personal property are advised.

Computers, scientific equipment, and research data can be the object of theft, vandalism, or damage from fire or utility failure. Appropriate cabinetry, designed to protect these items should be considered. Upon request, Environmental Health & Safety can assist laboratories with laboratory safety inspections and recommendations.

If you observe suspicious persons or activities in your area, contact Campus University Police, extension 3333, and an officer will be sent to investigate. Also, report all thefts or other crimes immediately. Information from these reports is used to adjust patrol activities and may prevent further problems.

IV. INFORMATION AND TRAINING

All laboratory personnel will be informed of the contents of OSHA's Standard 1910.1450 "Occupational exposure to hazardous chemicals in laboratories" and the location and availability of the Laboratory Safety Guideline Program / Chemical Hygiene Plan.

All laboratory personnel will be informed of the permissible exposure limits (PEL) for OSHA-regulated substances and other hazardous chemicals, and the signs and symptoms associated with exposure to those hazardous chemicals.

Additional information and reference material will be made available to employees through the Office of Environmental Health & Safety on the hazards, safe handling, storage, and disposal of specific hazardous chemicals.

Environmental Health & Safety, in conjunction with the Department Safety Officers, will train laboratory personnel on the applicable details of the Laboratory Safety Guideline Program / Chemical Hygiene Plan which will include, but not be limited to:

1. Methods and observations that may be used to detect the presence or release of a hazardous chemical.
2. The physical and health hazards of chemicals found in the laboratory and the various means by which laboratory personnel can protect themselves from these hazards. Information and training is to be provided at the time of an employee's initial assignment, and prior to assignments involving new exposure situations. Refresher information should be provided on a routine basis and retraining should be conducted annually.

V. LABORATORY VENTILATION

The best way to prevent or reduce exposure to airborne substances is to control their escape into the work environment by the use of hoods and other ventilation systems.

The two basic types of laboratory ventilation are general dilution and local exhaust ventilation.

A. GENERAL DILUTION VENTILATION

General dilution ventilation refers to the quantity and quality of air supplied, (for example exchanging indoor room air with outdoor air). Laboratory air should be replaced continuously (approximately six to twelve air changes per hour) so that the concentrations of air contaminants are continuously diluted.

General dilution ventilation should NOT BE RELIED ON FOR PROTECTION FROM TOXIC SUBSTANCES RELEASED INTO THE LABORATORY. General dilution ventilation provides only modest protection against toxic gases, vapors, aerosols, and dusts. It is an inefficient way to control highly toxic contaminants because of the amount of air exchange necessary to achieve diluted concentrations within acceptable ranges.

Laboratory air should not be recycled. General dilution ventilation is intended to increase the comfort of the laboratory environment and to serve as a source of air-flow through the ventilation system and through dedicated systems, such as fume hoods.

Typical uses for general dilution ventilation include:

1. Heating, cooling, and humidity control.
2. Dilution of products of respiration, pathogens, and other odors caused by normal human activity.
3. Dilution of low levels of slightly toxic gases or solvent vapors.
4. Dilution of combustible vapors to concentrations below the lower explosive limits.

B. LOCAL EXHAUST VENTILATION (LEV)

Local Exhaust Ventilation (LEV) is a system designed to exhaust contaminants captured near their source without allowing them to escape and disperse into the laboratory atmosphere. Laboratory hoods use LEV to prevent harmful dusts, mists, fumes, toxic gases and vapors from entering the laboratory.

Laboratory hoods offer other types of protection as well. A chemical reaction system located within a hood, with the hood sash correctly lowered, places a physical barrier between

the worker and the chemical reaction system. This physical barrier will provide protection from hazards such as chemical splashes, spills, sprays, fires, and minor explosions from an uncontrolled reaction.

Other Local Ventilation Devices

Ventilated storage cabinets, canopy hoods, snorkels, and other such devices should be provided as needed. Each canopy hood and snorkel should have a separate exhaust duct.

Ductless Hoods

A ductless chemical hood is useful in areas where a ducted chemical hood is not available or is dedicated to another purpose. These devices should only be used under the conditions for which they are designed. The operations manual should be consulted prior to using such a hood and provisions should be made to ensure that the unit is properly maintained and serviced. In general, a ductless hood should not be used for chemical storage, hazardous operations, or continuous operation.

C. SPECIAL VENTILATION AREAS

Exhaust air from glove boxes and isolation rooms should be passed through scrubbers or subjected to other treatment before release into other exhaust systems. Cold rooms and warm rooms should have provisions for rapid escape in the event of equipment or electrical failure.

D. MODIFICATIONS

Any modification of the existing ventilation system is permitted only if the proper function of the system is not compromised, and the laboratory environment continues to be protected from toxic airborne substances.

E. QUALITY

Air flow through the laboratory should be relatively uniform through the laboratory with no high velocity or static areas. Air-flow into and within a fume hood should be uniform. The measured face velocity at the fume hood sash is to be approximately 100-120 cubic feet per minute with the sash approximately twelve (12) inches above the fully closed position.

F. EVALUATION

The ventilation system must be evaluated on installation.

G. INSPECTIONS, MAINTENANCE, AND TROUBLESHOOTING

Local exhaust ventilation systems should be thoroughly inspected by Environmental Health & Safety on a regular basis (semi-annually) and when any problem is noted. Inspection should include all the associated equipment, as well as a review of the operation, exposure level measurements, and air flow measurements.

H. INSTALLATION AND MAINTENANCE

With proper design, use, and maintenance of ventilation systems, an effective and efficient control of occupational health hazards can be achieved. Consulting engineers and vendors should be chosen from those having broad experience in designing ventilation systems for health hazard control. Plans for modification or new installations must be reviewed and approved by the office of Environmental Health & Safety.

I. WORK PRACTICES FOR LABORATORY HOODS

A properly designed hood in a properly ventilated room can provide adequate protection when certain work practices are followed. The following work practices must be adhered to in order for a hood to perform capably and to provide maximum protection to the worker.

1. Conduct all operations which may generate air contaminations at or above the Threshold Limit Value (TLV) inside the hood.
2. Keep all apparatus at least 6 inches back from the face of the hood. A stripe on the bench surface is a good reminder.
3. Do not put your head in the hood when contaminants are being generated.
4. Do not use the hood as a waste disposal mechanism except for very small amounts of volatile materials.
5. Do not store chemicals or apparatus in the hood.
6. Keep the hood sash closed as much as possible.
7. Keep the slots in the hood baffles free of obstruction by apparatus or containers.
8. Minimize foot traffic past the face of the hood.

9. Keep laboratory doors closed.
10. Do not remove sash or panels.
11. Do not place electrical receptacles or other sparks sources inside the hood when flammable liquids or gases are present. No permanent electrical receptacles are permitted in the hood.
12. Use appropriate barricade if there is a chance of explosion or eruption.
13. Provide maintenance for the hood exhaust system and the building supply system.
14. Working sash height should be labeled.

VI. HANDLING CHEMICALS IN THE LABORATORY

A copy of the Fredonia Laboratory Safety Guideline Program / Chemical Hygiene Plan will be readily available in all laboratories and the stockroom. The diversity of laboratory chemicals found within a college campus is as varied as the purposes for which they are used. For this reason, general precautions for handling categories of chemicals are more appropriate than specific guidelines for each one separately. Nevertheless, all laboratories have available Safety Data Sheets (SDS) for all hazardous and toxic substances used, handled, and stored within the work area. They are readily available to all employees and visitors during customary working hours.

Further, all laboratories will post a chemical code sheet for the stock solutions and mixtures utilized within the work area.

A. ACUTE AND CHRONIC EXPOSURE

Recommendations for handling procedures for chemicals begin with the admonition that, even for substances with no known significant hazards, it is prudent to observe good laboratory practices, minimizing exposure by working in an exhaust hood and wearing eye and hand protection, as well as a laboratory coat or apron.

The toxicity of a substance is determined by its ability to damage or interfere with the structure or function of living tissue. An acute exposure is one which can cause damage as the result of a single or short duration exposure. Chronic exposure is one which causes damage after repeated or long duration exposure, or becomes evident only after a long period of latency.

Specific regulations have been established by the Occupation Health and Safety Administration (OSHA) regarding the handling of certain compounds designated as carcinogenic. Anyone contemplating work or who is working with materials on this list should consult the regulations and Departmental Chair for the necessary approvals, training, working conditions, monitoring, record keeping, and medical surveillance.

OSHA has issued very detailed regulations for the 30 chemicals or chemical groups listed below. Any laboratory personnel who use or handle any of these chemicals should contact the departmental stockrooms and/or Environmental Health & Safety for detailed information:

Part 1910 OSHA Subpart Z

Sec. 1910.1000 Air Contaminants
Sec. 1910.1001 Asbestos

Sec. 1910.1002 Coal tar pitch volatiles
Sec. 1910.1003 13 Carcinogens (4-Nitrobiphenyl, etc.)
Sec. 1910.1004 alpha-Naphthylamine
Sec. 1910.1006 Methyl chloromethyl ether
Sec. 1910.1007 3,3'-dichlorobenzidine (and its salts)
Sec. 1910.1008 bis-Chloromethyl ether
Sec. 1910.1009 beta-Naphthylamine
Sec. 1910.1010 Benzidine
Sec. 1910.1011 4-Aminodiphenyl
Sec. 1910.1012 Ethyleneimine
Sec. 1910.1013 beta-Propiolactone
Sec. 1910.1014 Acetylaminofluorene
Sec. 1910.1015 4-Dimethylaminoazobenzene
Sec. 1910.1016 N-Nitrosodimethylamine
Sec. 1910.1017 Vinyl Chloride
Sec. 1910.1018 Inorganic Arsenic
Sec. 1910.1025 Lead
Sec. 1910.1027 Cadmium
Sec. 1910.1028 Benzene
Sec. 1910.1029 Coke oven emissions
Sec. 1910.1043 Cotton dust
Sec. 1910.1044 1,2-dibromo-3-chloropropane
Sec. 1910.1045 Acrylonitrile
Sec. 1910.1047 Ethylene Oxide
Sec. 1910.1048 Formaldehyde
Sec. 1910.1050 Methylenedianiline
Sec. 1910.1051 1,3-Butadiene
Sec. 1910.1052 Methylene Chloride

As with any chemical, it is imperative that the Safety Data Sheet be consulted before using, to determine the proper handling precautions and to follow those precautions.

B. PROCUREMENT

Before a substance is received, information on its proper handling, storage, and disposal should be known to those who will be handling and using the substance. No containers are to be accepted without a proper identifying label. Whenever possible, a less hazardous or toxic

chemical should be substituted.

C. TRANSPORT

Transporting hazardous substances from one location to another within the University campus is a serious safety and health problem. Employees other than those knowledgeable about their use and the handling of leaks or spills could be unduly exposed through carelessness or neglect. For these reasons, extra precautions are not only prudent, but necessary.

Certain chemicals, especially flammable solvents, are received in large quantities by the Chemistry and Biology Departments' stockrooms. The necessity to transport these chemicals from one location to another results in a serious potential hazard. Even a minor leak or spill of flammable liquid in an elevator or open area could result in a serious fire or explosion hazard.

Since such chemical transport is unavoidable, it is essential that unbreakable materials such as Nalgene ™ jugs or other containers approved for flammables are to be used to transport bulk amounts of flammable liquids, such as ethanol. Ideally, chemicals such as acetone should be kept in their original metal cans or small metal safety cans. The lids for such containers should be inspected to ensure their integrity and a suitable cart should be used to help transport these chemicals safely. Flammable chemicals supplied in glass containers should be protected with bottle carriers. This is especially true for corrosive materials or noxious organics, such as formaldehyde. Department stockrooms will not release a hazardous substance to an individual department or laboratory that does not provide a safe and suitable means for their transport.

D. STORAGE

The correct storage of chemicals has become increasingly important to maintain a safe working environment, particularly when the number of chemicals in use increases and their possible toxicity becomes known.

Problems related to chemical storage can be significantly reduced, however, by following the principles of LIMITING and SEGREGATING the chemicals, such as J.T. Barker's "Safe Storage Plan".

1. Toxic substances should be segregated from other chemicals in a well identified area with local exhaust ventilation.

2. Chemicals which are considered highly toxic, carcinogenic, or otherwise hazardous should be placed in an unbreakable secondary container and properly labeled.
3. Stored chemicals should be examined at least on an annual basis for deterioration, container integrity, and possible replacement.
4. The amount of chemicals being stored should be as small as practical.
5. Long term storage on bench tops and in hoods is prohibited.
6. Do not store bottles on the floor or on carts.
7. Exposure of chemicals to heat and direct sunlight should be avoided.
8. A periodic chemical inventory should be conducted with a list of unneeded chemicals given to the office of Environmental Health & Safety for disposal or for recycling within the University.

E. DESIGNATED AREA

Laboratories working with carcinogens, reproductive toxins or substances which have a high degree of acute toxicity must establish a "Designated Area". A "Designated Area" may be the entire laboratory, an area of the laboratory, or a device such as a laboratory hood. The purpose of the "Designated Area" is to focus attention on the fact that a particularly hazardous substance is being used and to ensure, when necessary, that appropriate protective measures are being observed by employees working in or near the vicinity. "Designated Areas" must be identified by signage.

F. APPROVAL

The principal investigator must obtain prior approval from the department chair for particular laboratory operations, procedures, or activities that involve the following:

1. A newly introduced hazardous chemical substance of moderate chronic or high acute toxicity.
2. Working with substances of known high chronic toxicity.
3. Working with the 30 OSHA regulated chemicals or chemical groups listed on page 23.

Consultation with the department safety committee and the chair may be appropriate to ensure that the toxic material is effectively contained during the experiment, safety protocols are established, and the waste material generated can be (and is) disposed of in a safe and legal manner.

VII. CHEMICAL HAZARDS

A number of routine procedures in a laboratory involve the use of corrosive, toxic, reactive, or flammable chemicals. These chemicals should be appropriately labeled to indicate the hazards. Read the chemical labels and observe the precautions.

A. CLASSIFICATION

Dangerous chemicals may be grouped into the following:

1. Caustic or corrosives: Acids and alkalis may cause burns of the skin, mouth, lungs, or eyes and may cause irreversible damage to equipment and storage areas.
2. Toxic Chemicals: Almost any substance in sufficient quantity can be considered toxic. Toxic chemicals are those which damage biological structure and function through exposure or accumulation in tissues. Usually, this involves relatively small amounts of the toxin, although any chemical can be toxic in sufficient quantity. For these purposes, a poison will be defined as a substance (e.g. concentrated phenols) which may cause death or serious health effects if relatively small amounts are inhaled, ingested, or absorbed by the skin. Poisons may be in the form of a gas, liquid, or solid.
3. Carcinogens: Substances designated by the Occupational Safety and Health Administration (29 CFR Part 1910, Subpart Z) as being a carcinogen require special handling. Specific authoritative sources such as the Registry of Toxic Effects of Chemical Substances (RTECS), the National Toxicology Program (NTP) Annual Report on Carcinogens, and the International Agency for Research on Cancer (IARC) Monographs serve as primary sources of toxic chemical information.
4. Flammables are materials that may easily ignite, burn, and serve as fuel for a fire.
5. Reactives are materials that may release large amounts of energy under special circumstances.

B. CAUSTICS AND CORROSIVES

Contact with the skin or eyes represents the greatest risk when dealing with corrosives. Match the hazard presented by the material with which you are working with the protective equipment recommended by the SDS. Always wear resistant gloves and eye protection when dealing with corrosives. In some cases, this may also include respiratory protection.

General First Aid Considerations for Corrosives

In the event that a corrosive contacts the skin, remove any contaminated clothing and immediately flush the area with copious amounts of tap water, using care not to rub or damage the skin. Notify your supervisor and seek medical attention, as needed.

In the event that a corrosive chemical contacts the eyes, eyes and the area under the eyelids must be immediately flushed with large amounts of clean water for at least fifteen minutes. Seek immediate medical attention. AVOID WEARING CONTACT LENSES WHEN WORKING WITH CORROSIVE MATERIALS! If a corrosive material is ingested, do not induce vomiting; seek immediate medical attention.

To report any emergency/accident use the red emergency telephone (which is a direct line to University Police) or call University Police (3333) STAY ON THE LINE UNITL TOLD TO HANG UP. If safe to do so, remain with the victim until Campus University Police arrives and takes charge. University Police will call Fredonia Fire & Rescue at 672-2123. In non-life threatening situations, medical help can be sought at LoGrasso Health Center, Extension 3131. Call University Police then notify the department chair who will notify other appropriate personnel. File an accident report and notify Human Resources, extension 3434 within 24 hours of the accident. If it occurs on Friday, notify by Monday.

Handling

1. Plan ahead for problems; make yourself aware of the nearest eyewash station and safety shower in your work location. Wear a suitable apron, resistant gloves, and appropriate eye protection when handling corrosive materials.
2. If acids or alkalis are used, some form of containment to control breaks and spills must be employed. Included among these methods are bench top spill diapers and resistant trays.
3. Do not pipet by mouth. Use a mechanical or vacuum-assisted pipet aid.
4. Dilution of acids: Always add ACID to WATER, never add water to acid. Allow the acid to run down the side of the container and mix slowly by gentle rotation.
5. Become aware of the methods, materials, and procedures for cleaning up corrosive spills. In the event of a significant spill beyond your immediate ability to control, proceed according to Department Emergency Spill Plan (see Section IX Breaks and Spills pg 37.).

Storage

1. Store corrosives in a cool, dry, and well ventilated area away from direct sunlight. Use storage materials which are resistant to corrosion. Store caustic and corrosive materials near the floor to minimize danger of bottles falling from shelves. Large

amounts of corrosive chemicals may require a dedicated corrosive cabinet.

2. Segregate acids from bases. Store chemicals according to their primary hazard classification.

   Isolate corrosives from the following:

   1) Organics
   2) Flammables
   3) Toxic Materials

   Separate containers to facilitate handling. Organic acids (e.g. acetic acid and acetic anhydride) are to be stored separately from strong oxidizing agents (sulfuric acid, nitric acid, or perchlorate) to prevent interaction of fumes and corrosion of storage cabinets.

3. Acid bottle carriers must be used for containers over one quart or liter in size.

C. TOXIC CHEMICALS

Handling and Storage

1. Isolate, segregate, and clearly label all toxic chemicals.
2. Adequate room ventilation must be provided at the work site area. A fume hood must be used whenever possible.
3. The appropriate personal protective equipment must be worn as directed by the label or SDS. If in doubt, contact the Department Safety Officer.
4. Limit exposure time.
5. Practice good personal hygiene; wash hands and wear a lab coat.

Mercury

Special consideration must be given to this poison.

1. Avoid or minimize spills of elemental mercury as much as possible.
2. Clean up small spills with a pipet or "Sweeper". Ventilate area well to remove mercury vapors. Large spills (>1 ml) should be referred to Chemistry stockroom.
3. Chronic exposure and absorption of mercury may lead to a metallic taste in the mouth, a "lead line" (gray line) around gums and neurological problems (irritable, hyperreflexic, comatose).

4. Do not place elemental mercury waste in drains. Contact Chemistry stockroom for proper disposal.

D. CARCINOGENS

Carcinogens are a class of toxic chemicals capable of increasing the risk of cancer(s) through exposure, usually over time. Teratogens are toxic chemicals capable of causing an increased risk of birth defects in children of exposed workers.

Prudent practices need to be used in dealing with known or suspected carcinogens. The key is to reduce your exposure to these chemicals to within the accepted guidelines and to the lowest possible level through good work habits and common sense. Control exposure by working in a hood whenever possible.

In many cases, the greatest potential harm is a result of repeated or pro-longed exposure to these chemicals.

Other behaviors such as diet and cigarette smoking can contribute to the synergistic or antagonistic effects of carcinogenic materials.

Plan ahead for problems with carcinogenic compounds. A protocol should exist for handling, storing, disposal, and emergency procedures to be followed.

Be aware that certain toxic/carcinogenic chemicals may require special record keeping for personal exposure under provisions of the OSHA Subpart "Z" Substance List. Contact the office of Environmental Health & Safety for those records.

E. FLAMMABLES

Flammable chemicals represent a major safety concern in the Biology and Chemistry Departments because of the immediate physical danger that these materials present to all employees. Our primary interest is in reducing the chance of fire involving these materials. In addition, many flammable chemicals have associated health risks as well.

Organic solvents are the most commonly encountered flammable chemicals in Biology and Chemistry.

Organic solvents produce vapors capable of mixing with air and only require an ignition source to start a fire. The proper storage and handling of flammable chemicals is essential to fire prevention.

Handling and Storage

1. Use small volumes of solvents (100 ml or less) when performing routine tasks. Store larger amounts in approved flammable containers. Never store flammables with reactive chemicals.
2. Transfer solvents in a working fume hood or well ventilated area. There are to be no open flames. Smoking is never permitted.
3. Use solvents at temperatures 10 to 15 degrees or more below their flash point, if possible.
4. Use the necessary grounding on all large drums used for storage or dispensing of solvents. Make sure that all secondary containers are labeled.
5. Plan ahead and note the location and type of fire-fighting equipment needed for your particular needs. Flammable liquid fires are Class B fires. Moreover, note the location of fire-blankets and other equipment used to deal with fire hazards.
6. Remember that flammable liquids may have other health consequences as well. Prudent practices need to be observed in storing and disposing of flammable liquids.
7. Quantities of one gallon or over must be stored in a safety can. If a reagent must be stored in glass for purity, the glass container should be placed in a bottle carrier to lessen the danger of breakage.
8. Small quantities (working amounts) may be stored on open shelves, but bulk storage (more than one gallon) must be in a designated flammable storage area.
9. Approved flammable storage cabinets will be needed for laboratories with a large inventory (ten gallons or more) of flammable chemicals.

Refrigeration and Cooling Equipment

The use of domestic refrigerators for the storage of typical laboratory solvents presents a significant hazard to the laboratory work area and this practice is prohibited at the University.

Only explosion-proof or explosion-safe refrigeration equipment that has been approved by an authorized testing laboratory such as FM or UL is to be used for storage of flammables. Explosion-proof refrigeration equipment is designed to protect against ignition of flammable vapors both inside and outside the refrigeration compartment.

Every laboratory refrigerator will be clearly labeled to indicate whether or not it is acceptable for storage of a flammable material. The required labels are available through the department stockroom.

F. REACTIVES

Reactive chemicals are characterized by their tendency to release large amounts of energy under certain conditions. In many cases, the catalyst for these reactions is found in the everyday environment and special pre-cautions need to be observed to safely use and store these materials. Included in the reactive category are explosives, water reactive materials, air sensitive materials, and mixtures of oxidizing agents and reducing agents.

Handling and Storage

1. Know the specific properties of the materials you will be working with prior to initiating your work.
2. Ensure adequate protection against shock, extremes in temperature, other reactive chemicals, and source of potential ignition.
3. Segregate oxidizers from reducers. Store reactive chemicals according to their primary hazard classification.
4. Isolate reactive chemicals from toxic materials and flammables.
5. Use adequate personal protective equipment. Many reactive chemicals liberate toxic fumes or gases. Small, easily managed amounts must be used in a ducted fume hood.

Ensure that everyone in the workplace is aware of the hazards associated with any reactive chemicals that you are working with and that the necessary course of action is understood should you have a problem. This should include what to do in the event of a spill, special fire protection equipment that may be required, and antidotes that may be needed.

VIII. COMPRESSED GASES

Compressed gases are used throughout the University in a variety of departments. Regardless of the use or content of the cylinder, compressed gas cylinders represent a serious health and safety hazard. An improperly handled cylinder could result in serious injury or death through the sudden release of its contents. A flammable gas suddenly released into an area could create an enormous fire and explosion hazard in a matter of seconds. A toxic gas or reactive gas suddenly released into an area could result in asphyxiation. Even a "harmless" gas could create such high concentrations of gas that it would be impossible to breathe. Moreover, a compressed gas cylinder is a potential projectile or bomb if not properly secured.

A. GENERAL GUIDELINES FOR HANDLING COMPRESSED GASES

These guidelines must be followed for all compressed gas cylinders used at the University.

1. Compressed gas cylinders must be firmly secured at all times using chains or clamps. Compressed gas cylinders are to be located away from traffic areas and clearly labeled as to their contents.
2. The correct cylinder valve is to be used for the particular gas in use. Valve threads may be right handed for non-fuel gases and left handed for fuel gases. Cylinders not in use are to be capped.
3. Transport gases with an approved cart or hand truck. Never roll or scoot a gas cylinder. Do not lift cylinders by the cap.
4. Keep an unregulated cylinder valve closed at all times. Open the main valve only to the extent necessary and regulate the gas flow using the regulator. Ensure adequate ventilation and precaution when using hazardous gases. Remove leaking gas cylinders to an outdoor location and report them to the supplier, the Department Safety Office, Campus University Police (extension 3333) and Facilities Services (extension 3452).
5. Containers must be marked clearly with the name of the contents.
6. Do not use oil, grease, or lubricants on valves, regulators or fittings.
7. Do not attempt to repair damaged cylinders or to force frozen cylinder valves.
8. Before removing the regulator, close cylinder valve first, then release all pressure from the regulator.
9. Cylinders that are not necessary for current needs shall be stored in a safe location outside the laboratory work area.

B. FLAMMABLE GASES

Special care must be used when gases are used in confined spaces.

1. No more than two cylinders should be manifold together. Several instruments or outlets are permitted for a single cylinder.
2. No more than one cylinder of a highly flammable gas may be in a room without specific review by the Department Safety Committee.
3. Cylinder size is limited to 200 cubic feet.
4. Valves on all flammable gas cylinders shall be shut off when the laboratory is unattended.

C. ATTACHING REGULATORS

1. Cylinder throats and surfaces must be clean and tightly fitted. Do not lubricate.
2. Tighten regulators and valves firmly with the proper sized wrench. (Do not use pliers. They may damage the nuts.) Do not force fittings to ensure a tight seal.
3. Open valves slowly. Do not stand directly in front of gauges (the gauge face may blow out). Do not force valves that "stick".
4. Check for leaks at connections. Leaks are usually due to damaged faces at connections or improper fittings. Do not attempt to force an improper fit. (It may only damage a previously undamaged connection and compound the problem.)
5. Valve handles must be left attached to the cylinders.
6. The maximum rate of flow should be set by the high pressure valve on the cylinder. Fine tuning of flow should be regulated by the needle valve.
7. Shut off cylinder when not in use.

D. LEAK TESTING

Cylinders and connections should be tested by "SNOOP" ™ or a soapy water solution. Test the cylinders before regulators are attached and again after the regulators or gauges are attached.

E. EMPTY CYLINDERS
    1. Must be marked empty
    2. Empty or unused cylinders must be returned promptly
    3. Replace valve with safety caps

F. CRYOGENIC LIQUIDS
    1. Store in well ventilated area to prevent displacement of air.
    2. Use only approved storage vessels having fittings to relieve pressure.
    3. Always wear eye protection, preferably a face shield.
    4. Always wear hand protection, preferably heavily insulated gloves.

Further information can be obtained by referring to Appendix I Compressed Gas Association, Inc. publications P-1 "Safe Handling of Compressed Gas in Containers" and P-12 "Safe Handling of Cryogenic Liquids".

IX. BREAKS AND SPILLS

A. PRELIMINARY CONSIDERATIONS

Responding to chemical spills in the laboratory is a likely and foreseeable event for anyone who handles chemicals. Regardless of the chemicals involved, your response to a chemical spill must be appropriate and prompt. All significant chemical spills – aside from the routine – must be reported to the Department Safety Officer, the Department Chair, and the office of Environmental Health & Safety.

You should never attempt to clean up a spill of an especially hazardous substance, such as a chemical with a Threshold Limit Value of less than 55 ppm – regardless of the amount. NEVER attempt to clean up a chemical spill if you are uncertain as to how to do so safely or if you lack the proper protective equipment. Contact the Department Safety officer for assistance.

Safely handling a small chemical spill (less than 1 liter) in the laboratory is easily accomplished provided that you have the proper materials and appropriate training. Commonly encountered spills include acids and bases, as well as polar and non-polar solvents.

Chemical spill kits have been made available by the Department Safety Committees and provided to all laboratory areas where chemicals are used and stored. A training program on how to use this kit is provided by Department Safety Committees. These kits should only be used by trained personnel. Any materials used from the kits should be reported to the Department Safety Committee.

There are two basic options available to you when handling a chemical spill. The first is chemical neutralization and the second is absorption.

ABSORPTION

For most organic solvents (either water soluble or non-soluble) it is best to collect the spilled liquid by absorbing it with a dry absorbent. In doing so, absorption reduces the chance of fire by suppressing flammable vapors and collecting the spilled liquid. The resulting waste is still hazardous and must be properly bagged and stored for disposal by department stockrooms and inventoried by Environmental Health & Safety.

NEUTRALIZATION

Most common laboratory acids and bases can be safely neutralized by the proper use of a commercially prepared neutralizer. These neutralizers contain pH indicators that allow you to know when the neutralization process is complete. It is important that you follow the directions which accompany each neutralizer carefully and avoid over neutralization.

Whereas most neutralized acids and bases are no longer hazardous, the resulting waste should be properly bagged for disposal by department stock rooms and Environmental Health & Safety.

In the event of a major spill or one which involves an especially hazardous chemical, you should leave the area and report the spill immediately.

All spills are to be reported to the supervisor, the Department Safety Committee, the Chair, and Environmental Health & Safety, extension 3796, or to Campus University Police at extension 3333 during off hours.

Be prepared to report the location, chemical, and amount spilled.

Evacuate the area and let knowledgeable personnel clean up the spill.

B. FIRST RESPONSE TO CHEMICAL CONTACT

1. Skin, eye, or mouth contact: wash the affected area immediately with copious amounts of fresh, clean water for at least fifteen minutes, then seek medical attention following the campus emergency/accident procedures as listed below:
    a. In life threatening situations, use the red emergency phone which is a direct line to University Police, or call University Police at extension x3333. Report the situation, the location, and your name. STAY ON THE LINE UNTIL TOLD TO HANG UP. University Police will call the Fredonia Fire & Rescue 672-2123.
    b. In non-life threatening situations, notify Campus University Police extension 3333 and the department chair, who will then notify other appropriate personnel.
2. Chemical contamination of clothing: take the item of clothing off immediately to avoid soaking through to the skin.
3. Contain chemical spills with vermiculite, sand or another absorbent material. Wash the contaminated area thoroughly after cleaning up. Collect the contaminated materials and store them in a suitable container for disposal.

CONTENTS OF TYPICAL CHEMICAL SPILL KIT

Acid neutralizer
Nitrile gloves
Goggles
Chemical sorbent sheets
Set of spill directions
Spill waste disposal labels
Waste disposal bags

X. MEDICAL CONSULTATION AND MEDICAL EXAMINATIONS

Any laboratory employee who works with OSHA regulated substances has the right to receive medical attention, including any follow up examinations which the examining physician determines to be necessary, under the following circumstances:

1. Whenever a lab worker develops signs or symptoms associated with a hazardous chemical to which they were exposed in the laboratory.
2. When exposure monitoring reveals an exposure level routinely above the action level or the Permissible Exposure Level (PEL), where no action level exists.
3. Whenever an event takes place in the work area such as a spill, leak, explosion or other occurrence resulting in the likelihood of a hazardous exposure.

XI. RADIOACTIVE HAZARDS

Radioactive materials are used on campus for teaching and basic science research.

The Radiation Safety Officer (RSO) (Extension 4883) is responsible for overseeing and enforcing the policies established by the University's Radiation Safety Committee. These policies are created to ensure a safe work environment and to comply with federal and state guidelines for the proper acquisition, use and disposal of radioactive materials. The Radiation Safety Office is responsible for licensing designated users, monitoring the use of radioisotopes, record keeping, reports, training, and radioactive emergencies (such as spills).

All laboratories which use radioactive materials should ensure that the entrance to the laboratory is properly labeled with a radioactive hazard sign and that all operations which use radioactive materials are clearly labeled. It is the responsibility of each principal investigator to ensure that the personnel within their laboratory are made aware of the hazards associated with radioactive materials.

All personnel who use radioactive materials should be familiar with the procedures contained in the Radiation Safety Manual located in Jewett 107 for SUNY at Fredonia. You should contact the Radiation Safety Office (extension 4883) for additional information.

XII. BIOLOGICAL HAZARDS

Within the University, Environmental Health & Safety has established a set of Universal Precaution guidelines to be followed in dealing with human blood, body fluids, and tissue (Appendix A). Ensure that bio-hazardous and potentially bio-hazardous materials are handled and disposed of in accordance with the Guidelines for Disposal of Regulated Medical Waste (Infectious Waste) (Appendix B). In accordance with these guidelines, only the red colored biohazard bags may be used wherever body fluid and bacteriological wastes are generated. All bio-hazardous waste generated on campus must be double bagged, securely closed, clearly labeled. If autoclaved, it must be marked with a suitable indicator such as heat sensitive autoclave tape. Bio-hazardous waste should be sterilized as soon as possible.

Infectious radioactive waste shall be bagged in the approved manner for autoclaving and a radioactive materials tag or warning tape applied. After autoclaving, the radioactive material must remain in the direct possession of the user (licensee) until disposal in a manner approved by the Radiation Safety Office. Immediately after removal of the radioactive material from the autoclave, the autoclave must be monitored for radiation contamination using an appropriate method.

Any research work which involves the use of potentially infectious body fluids, recombinant DNA or animal studies must be submitted for approval to the Institutional Animal Care and Use Committee prior to initiating the research. This committee has the authority to ensure that all National Institute of Health, government and University guidelines are adhered to (Appendix C).

XIII. LABELING

A. Label Requirements

The Federal Hazard Communication Standard requires that all chemicals sold to SUNY at Fredonia contain the following information (Appendix E): product identifier, signal word, pictogram, supplier & manufacturer name, address and phone number, hazard statement including hazard class and category, and precautionary statement. These labels should not be removed or defaced. As long as a chemical is in its original container, there are no other label requirements expected.

All vessels containing chemicals (regardless of hazard) must be labeled during use or storage. A chemical that has been transferred from its original container to another must be labeled with the product identifier and words, pictures, symbols, or combination to provide general information on the hazards, as well as the date of transfer, and person responsible.

Each faculty member is responsible for ensuring that all hazardous chemicals used in their work space are properly labeled. The hazard warning can be words, pictures, or symbols which provide an immediate understanding of the primary health and/or physical hazard(s) of the material and the appropriate personal protective equipment to be used while handling the chemical. The faculty member is responsible for reviewing the relevant hazards of the chemical and ensuring that the labels are updated and used.

B. Labeling Exemptions and Alternatives

There are four situations that are exempted from or allow alternatives to, the labeling requirement: (1) containers labeled under other federal laws, (2) portable containers, (3) laboratories, and (4) stationary containers.

C. Containers Labeled Under Other Federal Laws

SOME LABELS REQUIRED BY OTHER AGENCIES

AGENCY	AUTHORITY	JURISDICTION
Environmental Protection Agency	Federal Environmental Pesticide Control Act (formerly FIFRA*)	Insecticides Fungicides Rodenticides

Consumer Product Safety Commission	Federal Hazardous Substance Labeling Act	Packaging & Labeling of food, drugs, cosmetics and medical devices
Bureau of Alcohol, Tobacco & Firearms	Federal Alcohol Administration Act	Distilled beverages, wine, & malt beverages

*FIFRA – Federal Insecticide, Fungicide, and Rodenticide Act

D. Portable Containers

Portable containers into which hazardous chemicals are transferred from labeled containers and which are intended only for the immediate use of the employee performing the transfer are exempt from the labeling requirements of the campus. Hazardous chemicals left in portable containers beyond the employee's work shift must be labeled according to the standard. This labeling exemption is intended to prevent the ineffective use of labels for certain activities, such as the few ounces of pesticide or fertilizer placed in a hand-held spray applicator. However, labels may be appropriate for any container where confusion may subsequently occur if it is not properly labeled.

E. Laboratories

Laboratories receive different treatment in terms of the campus labeling requirements. The issue of what and when to label becomes more complicated in a laboratory since more than one chemical is oftentimes combined to create stock solutions, buffers, washing solutions, and other specialized reagents. In most cases, it is easiest to refer to these mixtures by using a cryptic code. Since personnel outside of this laboratory are not going to be aware of these codes, some provision must be made to post a code sheet within the laboratory. (Appendix F). Whenever a new code is used, it must be noted on the list. Old or changed codes should be crossed off the list. In laboratories only, containers such as test tubes, flasks, beakers, petri plates, and the like need not be labeled with an identity and hazard warning. Common sense and good scientific method dictates however, that labeling and record keeping be kept current.

F. Stationary Containers and Vessels

Alternative methods of labeling, such as signs, placards, and other written forms of warning, are permitted in lieu of affixing labels to individual stationary process containers. Sometimes, stationary containers (e.g. reaction vessels, storage tanks) may be used for several different materials. It is necessary to re-label the container each time the contents

change. Signs, placards, or batch/process sheets can be placed or posted in close proximity to the container. The alternative method of labeling must provide the same information as a label (i.e. the identity of the chemical and its health hazards, target organs, and physical safety hazards.) Moreover, affected employees must be informed (as part of their hazard communication training) of the alternative labeling methods used in their work areas.

XIV. ELECTRICAL SAFETY

The increased reliance on electrically powered analytical equipment in the laboratory is unique to modern science. Such equipment is now being used for heating, cooling, agitation, or mixing, as well as for instruments that make precise physical measurements. Associated with this reliance is the creation of a set of new potential hazards in the laboratory.

A. GENERAL INSTRUCTIONS

1. All 110V outlet receptacles in laboratories are to be of the standard design that accepts a three-prong plug and provides a ground circuit. Ground Fault Interrupters are to be installed where appropriate.
2. All AC-powered electrical devices used in the laboratory must be provided with either a 3-conductor (ground) power cord or must be marked as "double insulated" by the manufacturer.
3. All frayed or damaged line cords must be placed out of service and replaced before the equipment is put into use.
4. Electrical cords should be plugged into the outlet receptacle and unplugged by pulling on the plug itself – never by pulling on the power cord.
5. Turn electrical power switches to the OFF position before either connecting or disconnecting the plug from the outlet.
6. Tape may not be applied to power cords except to provide additional protection from abrasion. Splices are not permitted in power cords. All cuts, abraded or otherwise damaged power cords must be replaced.
7. Do not handle electrical devices with wet hands or while standing on a wet floor.
8. Electrical equipment is to be carefully located so as to minimize the possibility that water or chemicals could accidentally be spilled on it.
9. Keep all books, clothing, etc away from plugs, cords, and equipment.
10. Repair work must be done in accordance with the University Lock Out / Tag Out program which is available through the Environmental Health & Safety department.

B. STATIC ELECTRICITY AND SPARK HAZARDS

Static electricity is a potential hazard in the laboratory due to its ability (under some conditions) to accumulate to voltages great enough to ignite flammable vapors.

Protection from static electricity in handling flammable and other chemicals is obtained by the proper grounding and bonding of containers and equipment. In some cases, a blanket of an appropriate inert gas is needed. Some common potential sources of sparks and electrostatic discharges are:

1. Metal tanks and containers
2. Plastic laboratory aprons
3. High pressure gas cylinders upon discharge
4. Brush motors
5. Areas with low relative humidity and fiber carpeting

XV. FIRE PREVENTION, CONTROL, AND REPORTING

A. Prevention

1. Be aware of potential ignition sources. Included in this list are open flames, cigarettes, heating elements, and electrical sources (motors, light switches, friction, and static).
2. SMOKING is not permitted in the technical work area of any laboratory. Smoking is only permitted outside of the building.
3. Flammable liquids give off vapors which may burn or explode. Therefore, do not use flammable materials in the presence of ignition sources.
4. Do not store flammable materials in a conventional (non-explosion proof) refrigerator.
5. Do not store any flammable liquids in areas exposed to direct sunlight.
6. Be aware of gas/power shut off switch locations.
7. Long hair should be tied back. Jewelry and loose fitting clothing should be avoided.
8. Faculty should keep a class roster nearby in preparation for evacuation.

B. Priorities in Case of Fire

1. Evacuate or Extinguish. The decision to evacuate or extinguish the fire must be made. Evaluate the type and extent of the fire. If it has potential to be a large fire, GET OUT! Pull the nearest alarm. Control measures should only be undertaken for small, isolated fires.
2. It is possible to extinguish the fire if it is small and there is a way to escape the fire if your efforts fail. In most cases, it is best to leave the area contained and allow the fire department to handle the situation. If possible, hit the gas/power shut offs as you leave.

C. Evacuation

1. WALK – DO NOT RUN, to the nearest exit. Assemble all laboratory personnel together outside the building at the primary meeting location as designated for each building. Appropriate evacuation routes should be posted in obvious

places. Primary and secondary evacuation locations are listed in the emergency response booklets located in each classroom and laboratory.

2. Building Safety Coordinators will check to be sure all personnel have been evacuated. Report anyone not accounted for to University Police or the Fire Department. Faculty should assist building coordinators by noting who is missing from their class.

D. Fire Control Methods

Flammable Liquids

1. Carbon dioxide will be effective only on a small fire. DO NOT USE WATER – it only increases the chance of spreading the fire.
2. If a flammable liquid is spilled but has not ignited, a non-flammable absorbent such as vermiculite may be used to prevent spreading and reduce the fire hazard.

Electrical

1. Do not use water unless the source of power has been shut off. (If the power is off, then water can be used).
2. Shut off the power, if possible.
3. Carbon dioxide is the most suitable extinguishing material for electrical fires.

Gas

1. Shut off the gas, if possible, either at the source or using the laboratory's emergency gas shut off.
2. Extinguish the flame with Carbon dioxide (possible only when gas has been shut off).

E. Fire Safety Equipment in the Laboratory

1. Sand or absorbent materials such as vermiculite are useful in controlling the spread of spilled liquids.
2. Fire Blankets may be used to smother a clothing fire by wrapping the victim or rolling him/her on the ground. Fire blankets may also be wrapped around a person who has to pass through a burning area.
3. Heat resistant gloves may be used to move or handle a small burning object, hot vessels, valves, or handles. CAUTION: Heat resistant gloves are permeable. Steam or hot liquids can soak through and cause injury.

XVI WASTE DISPOSAL PROCEDURES

A. Disposing of Waste Chemicals

The disposal of waste chemicals is a serious problem and every effort must be made to take care of them legally, safely, and in an environmentally proper and efficient manner. The duty for the identification and handling of waste chemicals within the laboratory rests with each faculty and staff member who has generated the waste.

B. Procedures

1. The faculty member or lab assistant must plan a procedure for waste disposal before a project or activity is started. The waste disposal procedure should be written into the Standard Operating Procedures or Project protocol.
2. Label waste properly as soon as it is generated. Each department, group or experimenter must identify waste materials properly before disposal.
3. The priority for getting rid of excess chemicals is:
    a. Reduce:
    Inclusion of the treatment of waste as part of the laboratory protocols will serve to reduce the waste.
    b. Reuse:
    For any project or experiment, opportunities for reusing the chemical should be explored
    c. Recycle:
    Contact department storerooms for possible exchange of uncontaminated, dated, original containers of chemicals between faculty members within a department or between departments.
    d. Reclaim:
    Reclaiming used chemicals by such methods as distillation or precipitation of compounds may reduce waste. This process must be built into the protocol for experiments.

e. Treat:

Test tube amounts of water soluble waste may be discharged into the sewer. Small quantities of volatile substances may be safely vaporized in hoods only if the method is approved by the Office of Environmental Health & Safety.

f. Destroy:

Procedures for chemically destroying toxic waste as part of the laboratory procedure should be explored with the Department of Chemistry stockroom and Environmental Health & Safety.

4. Dispose:

An inventory of chemicals for disposal should be sent to Environmental Health & Safety located at 155 McGinnies Hall, ext 3796 for inclusion in the disposal bidding procedure.

XVII INSPECTIONS, AUDITS AND REPORTS

Formal inspection of the laboratory facilities, equipment, and work practices is to be performed. Laboratory inspections will be conducted by the Office of Environmental Health & Safety and appropriate departmental personnel. The Laboratory Safety Inspection checklist will be used. (Appendix G). Results of the inspections will be sent to the Department Safety Officer and Department Head for review and corrective action, if needed.

XVIII PROGRAM EVALUATION

The Department Safety Committee will review and evaluate the effectiveness of the policy and training components of the Laboratory Safety Guideline Program / Chemical Hygiene Plan within their department. The Chemical Hygiene Committee, based on this information, will modify the LSGP/CHP to reflect these conclusions. This will be done annually.

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APPENDIX A

UNIVERSAL PRECUATIONS GUIDELINES

The Occupational Safety and Health Administration (OSHA) has made a preliminary determination that certain employees face a significant health risk as the result of occupational exposure to blood and other potentially infectious materials because they may contain blood borne pathogens. These pathogens include hepatitis B virus (HBV) which causes Hepatitis B, a serious liver disease, and human immunodeficiency virus (HIV) which causes Acquired Immunodeficiency Syndrome (AIDS). OSHA preliminarily concludes that this significant health risk can be minimized or eliminated using a combination of engineering and work practice controls, personal protective clothing and equipment, training, medical follow up of exposure incidents, vaccination (where applicable), and other recommended procedures.

The following memo dated November 19, 1990 from Dr. Terry Weaver, Chairman of the Department of Biology, outlines the policy and standard operating procedure for science personnel who handle human bodily fluids.

SUNY at Fredonia is committed to providing a safe and healthful work environment for our entire staff. In pursuit of this endeavor, the Exposure Control Plan (ECP) is provided to eliminate or minimize occupational exposure to blood borne pathogens in accordance with OSHA Blood Borne Pathogens Standard, Title 29 Code of Federal Regulations 1910.1030. Please refer to that document which is available in appropriate departmental offices and in the office of Environmental Health & Safety 155 McGinnies Hall.

[Hard copy – memo from Terry Weaver 11/19/1990]

APPENDIX B

GUIDELINES FOR DISPOSAL OF REGULATED MEDICAL WASTE
(INFECTIOUS WASTE)

1. Regulated Medical Waste (Infectious Waste) shall be collected in a leak-proof container with a secure lid with a red label marked "Infectious Waste". Waste in the container shall be double-bagged in autoclavable bags. To comply with New York State Law (Senate Bill 5564-B) laboratories must employ approved, red-colored bags for this purpose only (available from the department stockroom). All waste from research and teaching laboratories must first be rendered non-infectious and then be put for collection as ordinary waste. In either case, infectious waste must be double bagged, securely closed, clearly labeled and marked with a suitable indicator of sterilization such as autoclave tape. Approved labels are available from the biology department stockroom. These items will also be made available in the chemistry stockroom should the chemistry department begin work with applicable biohazards.
2. Infectious waste should be transported, properly bagged in a secure container, from the laboratory in which it was generated to the autoclave, and there sterilized without delay. If delay cannot be avoided, the autoclave room must be provided with separate, clearly marked trash receptacles, one for infectious waste that must not be removed from the room, and one for sterilized waste that may be removed as trash. Separate sections of the room should be used for the two receptacles.
3. All autoclaves must be serviced regularly and tested frequently to confirm that they operate properly. The in-house maintenance department is not properly equipped for this function. AU autoclaves used for disinfection of hazardous waste must therefore be placed under service contract that provides preventive maintenance and frequent

testing to validate steam pressure and temperature readings.

4. The Universal Blood and Body Fluid Precautions have been adopted by the CHP Committee. All laboratories that handle human blood, body fluid, or other human tissue must conform to those guidelines in handling and disposing of such material. A copy of the guidelines is attached.
5. Regulated Medical Waste not autoclaved must be bagged in approved red biohazard bags and transported to the collection point in LoGrasso Health Center where it is stored in a sheltered locked storage area until double bagged and packed for pick-up and disposal.
6. It is of primary importance that all employees with access to laboratories that work with infectious agents, and/or human blood, body fluid, or tissues, including professional staff and faculty, be educated in procedures for dealing with hazardous infectious agents, in procedures for dealing with accidents or other emergencies, in proper disposal of infected material, and in the Universal Blood and Body Fluid Precautions. Although these topics are dealt with in the orientation sessions for new employees, there may be several weeks' delay and the special circumstances of each laboratory cannot always be covered. It is the responsibility of the laboratory director to ensure that staff is properly indoctrinated before they undertake any work in a laboratory that works with human pathogens or fresh human specimens. The director of each such laboratory is requested to draw up a written outline of safety procedures appropriate to the particular circumstances, and submit it to the Office of Environmental Health & Safety for review. Since laboratory heads may have liability for employees who are not properly trained, individual laboratories must conduct orientation specific for their areas, and draw up a document for all employees to sign that verifies the training took place.

APPENDIX C

SUMMARY OF GUIDELINES FOR RESEARCH INVOLVING INFECTIOUS AGENTS OR RECOMBINANT DNA MOLECULES

Any research in this institution involving infectious agents or recombinant DNA must be reported to the Institutional Biosafety Committee (IBC) for review. Work with recombinant DNA must be conducted in accordance with the revised Guidelines issued by the Department of Health and Human Services (Federal Register, Vol. 61 #131, July 8, 1996) a copy of which is attached to the end of this appendix. This summary is intended to assist investigators in preparing documents for review by the IBC and should not be taken as a substitute for careful reading of the Guidelines.

Containment: All work with infectious agents must be carried out with appropriate containment measures. The Recombinant DNA Guidelines include a Classification of Microorganisms on the Basis of Hazard, which should be used to determine the level of containment required for a given organism. Containment procedures are described in Health and Human Services Publication "Biosafety in Microbiological and Biomedical Laboratories" which is available electronically in the office of Environmental Health & Safety. Work with any microorganism or infectious agent must be carried out under at least Biohazard Level I containment procedures (BL-1: See pages 10-11 of CDC 84-8395). For work with organisms classified as BL 2 or higher (pages 11-24), the IBC will conduct a site visit of the facilities to be used. To avoid delays with grant submissions, applications to the committee for approval must be made at least one month in advance of the grant deadline. Failure to do so will jeopardize your ability to submit a complete grant application.

Experiments involving recombinant DNA are discussed in part III of the Guidelines, as follows:

III-A Experiments that require specific review by the Recombinant DNA Advisory Committee (RAC) that advises the Secretary of the Department of Health and Human Services and approval by NIH and the IBC before initiation of experiment. These include experiments involving any one of the following:

1. DNAs containing genes for toxic molecules
2. Release of organisms containing recombinant DNA into the environment.
3. Transfer of a drug resistance trait to an organism not known to acquire it naturally.
4. Transfer of recombinant DNA, or RNA derived from it, to human subjects.

III-B Experiments that require approval in advance from the IBC. These include experiments involving any one of the following:

1. Human or animal pathogens (BL 2, 3, 4, or 5) as host-vector systems.
2. DNA from human or animal pathogens (BL 2, 3, 4, or 5) cloned in nonpathogenic prokaryotic or eukaryotic host-vector systems.
3. Infectious or defective animal or plant viruses, in the presence of a helper virus in tissue culture.
4. Introduction of recombinant DNA into whole animals or plants.
5. Procedures employing more than 10 liters of culture at one time.

III-C Experiments that require IBC notice simultaneously with initiation of experiments.

1. Experiments not included in sections HI-A, IH-B, and IH-D are considered in section III-C.

III-D Exempt experiments. No registration with IBC is required. These experiments include:

1. Those that are not in organisms or viruses.
2. Those that consist of nonchromosomal DNA.
3. Those that consist of DNA from a prokaryotic host, propagated only in that host (or closely related strains).
4. Exchange of DNA between species that exchange DNA through known physiological processes. (A list of such species is in the Guidelines.)
5. Other exempt classes of DNA molecules (A list is in the Guidelines.)

REGISTRATION DOCUMENT: Investigators performing experiments described in sections III-B or III-C must submit a registration document to the IBC that contains descriptions of: (i) The source(s) of DNA, (ii) the nature of the inserted DNA sequences; (iii) the hosts or vectors to be used; (iv) whether a deliberate attempt will be made to obtain expression of a foreign gene, and if so, what protein will be produced; and (v) the containment procedures to be followed.

APPENDIX D

SUNY AT FREDONIA

IN-HOUSE LABELING SYSTEM

[Removed 2012]

APPENDIX E

Sample label from the Globally Harmonized System (GHS)

ToxiFlam (Contains: XYZ)

Danger! Toxic If Swallowed, Flammable Liquid and Vapor

Do not eat, drink or use tobacco when using this product. Wash hands thoroughly after handling. Keep container tightly closed. Keep away from heat/sparks/open flame. - No smoking. Wear protective gloves and eye/face protection. Ground container and receiving equipment. Use explosion-proof electrical equipment. Take precautionary measures against static discharge.
Use only non-sparking tools. Store in cool/well-ventilated place.

IF SWALLOWED: Immediately call a POISON CONTROL CENTER or doctor/physician. Rinse mouth.

In case of fire, use water fog, dry chemical, CO_2, or "alcohol" foam.

See Material Safety Data Sheet for further details regarding safe use of this product.

MyCompany, MyStreet, MyTown NJ 00000, Tel: 444 999 9999

Taken from www.osha.gov

APPENDIX F

CHEMICAL CODE SHEETS

In an effort to simplify the demands placed on laboratory personnel for the proper labeling of laboratory stock solutions and other in-house mixtures we are employing the use of Chemical Code Sheets. A code sheet indicates the appropriate hazard warning. These sheets should be posted in laboratories and other work locations which use codes to label chemical containers.

These code sheets should be posted in an obvious location on a wall where laboratory and safety personnel can easily see them. It is intended that these sheets be maintained as a running list and should be updated as needed by simply indicating any new codes used. Any mixture no longer in use should be crossed off the list.

By using a code sheet system, we hope to minimize the inconvenience caused by extensive labeling requirements and still meet the intent of the government regulations for labeling. Your cooperation in this will minimize the inconvenience and disruption to your laboratory.

SUNY

COLLEGE AT FREDONIA

CHEMICAL CODE SHEET

(SAMPLE)

Department: _____

Location: _____

Departmental Safety Officer: _____

CODE	INGREDIENTS	CHEMICAL HAZARD

CHEMICAL HAZARD

CO = Corrosive	TO = Toxic
IR = Irritant	CA = Carcinogenic
FL = Flammable	PA = Pathogenic
RE = Reactive	RA = Radioactive
EX = Explosive	SU = Suspected Hazard
	NO = None

Copies of this form are available through departmental offices.

APPENDIX G

SUNY College at Fredonia
Laboratory Inspection
Checklist

Supervisor _____ Department _____

Room _____ Telephone_____

Inspectors Initials				
Date				
Gas Cylinders Tied Down				
Acid Storage				
Base Storage				
Flammable Storage				
Refrigerators				
Chemicals Labeled Properly				
Personal Safety Equipment				
Updated SDS				
Sinks				
Ovens				
Chemical Spills				
Water Stills				

Glove Boxes				
Gas Lines				
House Cleaning				
Hazardous Waste Container Closed				
Hazardous Waste Labeled				
Hoods Working Properly				
Hoods Cleaned				
Electrical Equipment				
Chemical Storage				

Key:

1-Good
2-Needs Improvement
3-Unacceptable

APPENDIX H

[Hard Copy – Federal Register Vol 71 No 63]

[Hard Copy – 29CRF1910.1450]

APPENDIX I

[Hard Copy – Compressed Gas Association, Inc. P-1: Safe Handling of Compressed Gases In Containers]

APPENDIX J

[Hard Copy]