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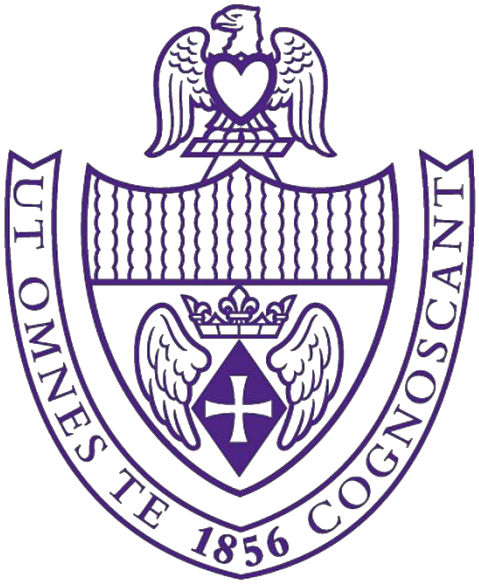

CHEMICAL HYGIENE PLAN

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For campus emergencies contact Campus Security (286-8111 or x8111)

1.0 Introduction

1.1 Purpose - The purpose of this Chemical Hygiene Plan (CHP) is to establish a written program that protects laboratory personnel from the potential hazards associated with the use, storage, and disposal of hazardous chemicals in a laboratory work area. It is the responsibility of the University and its employees to ensure that the educational programs and other activities protect and promote the health and safety of our students, our employees and the environment. Every effort is made to ensure the safety and security of NU students, residents and employees.

Additional information can be obtained by referring to the publications Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards published by the National Research Council and the American Chemical Society's Safety in Academic Chemistry Laboratories.

1.2 Scope - Niagara University's CHP applies to all laboratory personnel and campus laboratories. The CHP does not cover work with radioactive materials or biological agents.

1.3 Responsibilities

1.3.1 President: The President of Niagara University is ultimately responsible for chemical hygiene within the University and must, with other administrators, provide continuing support for institutional chemical hygiene.

1.3.2 Chemical Hygiene Officer (CHO): defined as an employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan. Responsibilities include:

- Establishes, maintains, and revises the chemical hygiene plan (CHP).
- Creates and revises safety rules and regulations.
- Serve on appropriate safety committees.
- Monitors procurement, use, storage, and disposal of chemicals.
- Conducts regular inspections of the laboratories, preparations rooms, and chemical storage rooms, and submits detailed laboratory inspection reports to administration.
- Maintains inspections and other records.
- Oversees chemical inventory updates.
- Assists principal investigators in developing and maintaining adequate facilities.
- Seeks ways to improve the chemical hygiene program.

1.3.3 Department Chair: defined as the head of the department. Responsibilities include:

- Assumes responsibility for personnel engaged in the laboratory use of hazardous chemicals.
- Provides the CHO with the support necessary to implement and maintain the CHP.
- After receipt of laboratory inspection reports, meets with principal investigators to discuss violations and ensure corrective measures are taken.

- Provides budgetary arrangements to ensure the health and safety of department personnel, visitors and students.

1.3.4 Principal Investigator (PI)/Laboratory Supervisor/Faculty: defined as the person in charge of the laboratory; Must know, implement and follow this CHP in their respective areas of responsibility. Responsibilities also include:

- Ensures their respective laboratories and personnel comply with the CHP.
- Ensures individuals working in their labs are properly trained on applicable hazards.
- Oversees the selection and use of personal protective equipment (PPE) in their labs.
- Always wears appropriate PPE and follows safety rules to set a good example.
- Maintains and implements safe lab practices.
- Maintains Chemical Inventory and provides access to SDS's in their laboratory.
- Familiarizes themselves with the necessary steps to be taken in the event of an emergency.

1.3.5 Laboratory Personnel: Includes people who conduct their work in a campus laboratory and are at risk of possible exposure to hazardous chemicals on a regular or periodic basis. These personnel include laboratory technicians, instructors, researchers, visiting researchers, administrative assistants, student aides, student employees, research students, and part-time and temporary lab employees. All those working in a lab environment must:

- Read, understand and follow all safety rules and regulations in their work area.
- Be familiar with the hazards associated with working in a laboratory and the proper procedures outlined in this CHP.
- Promote good housekeeping and safe practices in the laboratory work area.
- Wear proper PPE for the task being performed.
- Inform their principal investigator of any unsafe practices, conditions, or general hazards present in their work area.
- Familiarize themselves with the steps to be taken in the event of a spill or emergency situation.
- Immediately report any job-related illness or injury to the principal investigator.

1.3.6 Contractors, Vendors, and Visitors: PI/Supervisor will inform any contractors, vendors, custodial workers, and visitors of the hazards associated with the area they are visiting. Any necessary personal protective equipment (PPE) must be provided and worn while in laboratory areas.

2.0 Chemical Hygiene Plan General Requirements

2.1 Plan Availability

Niagara University's Chemical Hygiene Plan is available online at https://www.niagara.edu/assets/Uploads/chemical-hygiene-plan.pdf

2.2 Review and Update - The plan shall be reviewed annually and updated as necessary.

2.3 Training

2.3.1 General laboratory safety training will be provided by the University to laboratory employees upon initial assignment and annually thereafter.

2.3.2 Principal Investigators shall provide all laboratory personnel with the necessary information concerning chemical hazards in his/her lab. Training shall consist of:

- Chemical Hygiene Plan overview
- Potential hazards of common chemicals in their lab
- How to protect yourself from these hazards, proper PPE, safe work practices, etc.
- Safety data sheets (SDS) – Where to find and interpret
- Location and use of safety equipment including telephones, alarms, fire extinguishers, safety showers, eyewash stations, spill kits and emergency exits.
- How to respond to a spill.

2.3.3 Each semester, lab students who will work with chemicals are given a safety briefing on the location of and how to operate safety equipment such as eyewashes, safety showers, fire extinguishers, emergency exits, telephones and alarms. Information on how to access SDS's for lab chemicals may also be provided to students.

2.3.4 All training is documented and retained by the trainer for at least 5 years.

2.4 Chemical Hygiene Committee - A Chemical Hygiene committee will consist of: Dean, Chemistry and Biology Department Chairs, Director of Contract Services and Risk Manager (CHO), Faculty and Student representative, Chemical Safety Manager, Teaching Laboratory Supervisor and Instructor and Executive Vice President. Meetings will take place at least annually.

- Dean
- Chair of Chemistry Department
- Chair of Biology Department
- Environmental Health and Safety Manager (CHO)
- Risk Manager
- Faculty Representative
- Student Representative
- Teaching Laboratory Instructor
- Senior Vice President for Operations & Facilities

3.0 General Classes of Hazardous Chemicals

3.1 Flammable and Combustible Liquids: Flammable and combustible liquids are classified according to their flash points (as determined by ASTM D93-79 or 80) with flammable liquids having a flashpoint of <100° F and combustible liquids a flashpoint between 100-200° F. Both are considered fire hazards; all flames and sparks should be kept away.

3.2 Corrosives: Corrosives are chemicals that can attack and chemically destroy exposed body tissue. Damage is possible from the point it comes in contact with skin. Exposure to corrosives can cause damage to the eyes, skin and respiratory tract. A corrosive can be in the form of a liquid, solid or a gas. Examples include sodium hydroxide, nitric acid and phenol.

3.3 Reactive Chemicals: Reactive and other unstable chemical compounds are materials which under certain conditions have the potential to vigorously or violently polymerize, decompose, or otherwise become self-reactive. They may react under conditions of shock, pressure, or temperature, or may adversely react with other incompatible materials. Examples include explosives, peroxides, water reactives and pyrophorics.

3.4 Extremely Toxic Chemicals: Includes Select Carcinogens, Reproductive Toxins and Highly

Acutely Toxic Substances. Toxic chemicals are chemicals that can produce injury or death when inhaled, ingested, or absorbed through the skin. Damage may result from acute or chronic exposures and involve local tissue or internal organs. The extent of the injury depends on the dose administered, duration of the exposure, physical state, solubility, and interaction with other chemicals.

3.5 Allergens and Sensitizers: This group of chemicals causes exposed persons to develop an allergic reaction in normal tissues after repeated exposures. Exposures to even very small amounts of the same substance can trigger an allergic response. Persons who have developed an allergy can manifest the allergic response as a skin rash, eye irritation, allergic asthma, or, in severe allergic reactions, anaphylactic shock that can result in death if not treated quickly enough.

3.6 Irritants: Irritants are chemicals that can cause inflammation or swelling of body tissue at the site of contact or the eyes. Skin contact should be avoided. In some cases, the damage caused by exposure to irritants can be reversible.

4.0 Measures to Minimize Exposures

4.1 Administrative Controls - Administrative controls consist of various policies and procedures put into place with the purpose of limiting chemical exposures. They may include safety policies, rules, rotating work schedules, door postings and training. These controls help reduce the duration, frequency, and severity of an exposure to a hazardous chemical. This can also include designing experimental procedures that minimize the probability and degree of exposure, including substituting a less hazardous chemical in an experiment.

4.2 Engineering Controls

Engineering controls are those that are put into place to reduce the potential exposure to hazardous materials. Controls may include laboratory chemical fume hoods, glove boxes, biosafety cabinets, etc.

4.2.1 Laboratory Chemical Hoods (Fume Hoods): Laboratory chemical fume hoods must be used whenever a hazardous chemical or material is in use. The hood sash maximum height **must** be set at or below the levels indicated by the certification sticker.

- The face velocity of the fume hood will be checked annually by an outside accredited source. The inspection date as well as the maximum sash height (required to maintain 80-120 fpm) are placed on the front on the hood.
- Keep the sash lowered at all times while hood is not in use.
- Hood fan must be kept on at all times while chemicals are in use or work is being performed inside.
- Practice good housekeeping; hoods should never be used as storage areas for chemicals, apparatus, or other materials. The rear of the hood (baffle area) should be open and clear of obstruction.
- Fume hoods found to not provide minimum protection will be tagged out of service and a warning label will be attached to the window sash. **Under no circumstances is a hood to be used if it is tagged out of service.**

4.2.2 Glove Boxes: A glove box is a sealed container that is designed to allow one to manipulate objects where a separate atmosphere is desired. Built into the sides of the glovebox are gloves arranged in such a way that the user can place their hands into the gloves and perform tasks inside the box without breaking containment. Part

or all of the box is usually transparent to allow the user to see what is being manipulated. Regular inspection and maintenance of all components is essential to make certain the glove box is in working order and not leaking. The glove especially should be checked for cracks, splits, cuts, etc. and replaced if necessary.

4.2.3 **Biosafety Cabinets:** An enclosed, ventilated laboratory workspace for safely working with materials contaminated with (or potentially contaminated with) pathogens requiring a defined biosafety level. Biosafety cabinets containing HEPA filters are in use at the University. Although they will protect the laboratory worker and the surrounding environment from pathogens, they afford little to no protection from chemical vapors, fumes or mists. These units must be certified yearly and when moved to another location. An inspection sticker is affixed to cabinets to show certification.
Note: The University does not work with level BCL-3 biohazards, and maintains facilities suited to handling biohazards classified as Level BCL-2 and below.

4.2.4 **Eyewash and Safety Showers:** In laboratories where hazardous chemicals are in use, an eyewash station and safety shower must be in close proximity to the work area. Laboratory personnel must know the location of the eyewash station and safety shower in their work area. The Chemical Safety Manager is responsible for performing eyewash and safety shower inspections at the required intervals.

- Eyewash stations must be activated for a minimum of 30 seconds on a monthly basis.
- Safety showers are activated quarterly.
- Eyewash/Shower Records are kept with equipment records in facility services; inspections are recorded in TMA (Niagara University's Computerized Maintenance Management Software)
- There must be a clear path to the eyewash/shower unit with no obstructions that may impede access.
- The jets must provide even, sufficient flow.
- Nozzle covers must be kept on the eyewash nozzles at all times.

4.2.5 **Flammable Cabinets:** Flammable liquid storage cabinets are intended for the storage of flammable and combustible liquids and are an important fire prevention and control device within many laboratories. See Section 10.1 for additional information.

4.2.6 **Fire Extinguishers:** In all laboratories where combustible and flammable chemicals are in use, an appropriate fire extinguisher must be available. All extinguishers must be wall mounted or in labeled cabinets. Access to them must be unblocked. Lab personnel must be aware of their location, use and classification in their working areas. Extinguisher training is provided through local fire department that will come on campus annually. Trainees can include faculty, staff and research students.

5.0 **Personal Protective Equipment (PPE)** - In addition to administrative and engineering controls, PPE may be necessary to ensure adequate safety from hazardous materials. Principal investigators must ensure lab personnel are trained on the use, maintenance and limitations of PPE used in their labs. A safety data sheet (SDS) can provide information on the hazards associated with a specific chemical. PPE **must** be worn when laboratory personnel are actively working. This includes any action that involves the movement, transfer, or manipulation of chemicals. Undergraduate students in laboratory research studies should be closely supervised. Principal investigators must ensure that students wear appropriate PPE.

5.1 PPE Selection - In order to choose the proper PPE, OSHA requires a safety assessment be made. Principal Investigators are required to perform this assessment before work begins.

Consult with the Chemical Hygiene Officer if necessary. At a minimum, the assessment should include the following:

- A review of the procedure and/or Standard Operating Procedures (SOP) if available
- The chemicals involved, their concentrations and quantities
- Type of hazard(s) associated with them
- The risk level of the hazards
- PPE choices that will minimize exposure to the hazards

5.1.1 **Minimum** PPE requirements while actively working are as follows, but are not limited to:

- Safety glasses or splash goggles
- Long laboratory coat that covers the arms
- Long pants. No shorts or short skirts, (long skirts are acceptable provided legs are not exposed)
- Closed-toe shoes, no sandals
- Nitrile or other suitable gloves (if handling chemicals, samples, etc.)
- Additional PPE may be required depending on the task as determined by the Principal Investigator.

5.1.2 Before you put on PPE, always keep the following in mind:

- Become familiar with the proper methods for putting on and taking off PPE.
- Always inspect your PPE for damage prior to use. If any rips, tears, holes, etc. are present, discard.
- If any signs of contamination exist, discard. If there is any doubt, throw it out!
- Disposable PPE should be worn only once.
- PPE should be removed prior to leaving your lab area.

5.2 Types of PPE

5.2.1 **Eye Protection:** Eye protection is required at all times when actively working in a laboratory and especially when handling hazardous materials. There are many types of eye protection available; the choice should be based on the physical hazard associated with the chemical you are working with. All eye protection must meet the requirements of the ANSI Z87.1 standard.

The use of contact lenses in the laboratory is permitted but **not recommended**. Safety glasses or splash goggles must be worn over them. Some organic or corrosive vapors such as hydrogen chloride or ammonia may be adsorbed by the lenses and cause damage to the eye. In the event of a splash incident, contact lenses may also interfere with emergency flushing procedures. If you wear contact lenses in the lab and notice any discomfort while working with volatile solvents, or corrosive liquids or gases, leave the lab and remove the lenses.

5.2.2 **Gloves:** It is important that your hands be protected when working with hazardous materials in the laboratory. The correct type of glove must be worn whenever a potential hazard exists from exposure and there is a chance of a chemical being easily absorbed through the skin.

When using gloves in the lab:

- Wear the correct gloves when required (depending on the hazard).
- Do not use the same disposable gloves for prolonged periods of time.
- Disposable gloves must be discarded once removed. Do not save for future use.
- Dispose of gloves into the proper waste container.
- Wash hands once gloves have been removed.
- Gloves should not be worn out of the lab, ex. Hallways, elevators, etc.
- Don't touch personal items such as phones, computers, pens, etc. with gloves on.
- If for any reason a glove fails, and chemicals come into contact with skin, consider it an exposure and wash under running water for at least 15 minutes, seek medical attention if necessary.
- Use lined gloves when using/handling equipment that could easily produce sharp edges from mishandling or breakage.

5.2.3 **Lab Coats:** Lab personnel must wear lab coats when working in an area where chemicals are being handled. Additionally, no shorts or short skirts are to be worn under the lab coat. Tie back loose hair and don't wear loose or floppy clothing that may interfere in the laboratory. If a lab coat becomes grossly contaminated, it should be removed. Labs have flame retardant limited use lab coats for student use. Lab coats should not be taken home for laundering.

5.2.4 **Respirators:** Currently no laboratory personnel are fitted to wear a respirator. If the need arises, employees must pass a specialized physical and respirator fit test as well as receive training before using a respirator.

5.2.5 **Footwear:** Shoes should be comfortable, rubber soled, and cover the entire foot. Because canvas shoes will absorb chemicals, they are not recommended. Leather or a synthetic, fluid-impermeable material is suggested. Do not wear open toed footwear such as sandals, flip-flops, footwear with holes, etc. in the laboratory.

6.0 **Lab Safety Rules - EVERYONE** is responsible for lab safety at Niagara University. If you see something that may lead to an accident or unsafe act, bring it to your PI/supervisor's attention.

6.1 **General Rules**

- Avoid working alone in the lab.
- Unauthorized or unsafe experiments are prohibited.
- Read the SDS for the chemical(s) you are working with.
- Wear appropriate PPE, including eye protection.
- No horseplay! It can lead to accidents.
- Pipetting should never be done by mouth.
- Don't smell or taste chemicals.
- Eating, drinking, chewing gum, etc. are prohibited in areas where chemicals are in use.
- Do not store food, beverages or cosmetic products in areas where chemicals are located.
- Refrigerators must be labeled "No Food or Drink".
- Keep sources of ignition away from flammable chemicals.
- Know where the safety equipment, such as: eyewash, safety shower, etc., is located.
- Avoid mixing chemicals that may react in such a way as to cause an adverse reaction.

- Use appropriate ventilation when working with hazardous chemicals.
- Effort should be made not to touch lab/personal items such as phones, doorknobs, computers, etc. without removing your gloves first; Gloves should be removed before leaving the lab.
- Report all injuries, accidents, incidents, and near misses.
- Unauthorized persons should not be allowed in the laboratory.
- Report unsafe conditions to the principal investigator or CHO.
- Properly dispose of chemical wastes.
- Dispose of cracked glassware in appropriate bins.
- Ensure syringes are properly stored and disposed of when needed.
- Carts, bottle carriers, pails and/or secondary containers shall be used to move chemicals from one area to another.

6.2 Housekeeping

Below are "good housekeeping" practices that should be followed:

- Access to emergency equipment such as eyewash/showers, fire extinguishers, etc. and exits must not be blocked.
- Keep all work areas, especially lab benches, free and clear of clutter.
- Never store chemicals on the floor, even temporarily.
- Do not permanently store chemicals on bench tops or in ventilation hoods.
- Return chemicals to their designated storage area at the end of the day.
- Keep all stairways, aisles, hallways and other well-traveled areas clear of all chemicals and clutter.
- Keep drawers and cabinets closed when not in use.
- Properly label (name, hazard) and store chemicals by compatibility.
- Store chemicals neatly with labels facing outward. Replace any damaged labels.
- Keep chemical containers closed when not in use.
- Do not pile up dirty glassware or other containers in sinks.
- Hazardous chemical wastes must be properly labeled and stored in appropriate containers in a hazardous waste satellite accumulation area (SAA). Grouping by chemical compatibility also applies to the storage of hazardous waste.
- All chemical spills must be promptly cleaned up and the resulting spill residual materials disposed of.
- OSHA regulations require that all electrical outlets have a ground connection for use only with three-pronged plugs.
- Do not use permanent extension cords.
- Inspect cords before use. Do not use equipment with damaged or frayed cords.
- Use power strips correctly. Do not plug into other power strips or extension cords.

6.3 Lab Inspections - Laboratory inspections are necessary to identify and address potential health and safety deficiencies that may arise in the lab.

6.3.1 Laboratory Self-Inspection - A general laboratory self-inspection should be performed at least annually by each principal investigator using the checklist in Appendix G. Copies of the completed forms as well as any corrective action taken are sent to the CHO for review and follow up.

6.3.2 Additional Laboratory Inspections and Audits - The Chemical Hygiene Officer conducts visits to laboratories to ensure compliance with health and safety policies, which may include chemical use and storage, housekeeping, hazardous waste management, use of PPE, compressed gas safety, etc. Findings and suggested corrective actions are shared with affected personnel. Issues will be followed up by the Chemical Hygiene Officer to ensure timely resolution.

7.0 Prior Approval - Laboratory personnel shall seek prior approval from a PI/supervisor and the department chair for use of any sufficiently hazardous substance including carcinogens, reproductive toxins and chemicals with high acute toxicity. Appropriate hazard warning information shall be reviewed including labels and SDSs, along with recommended specific safe work practices. All employees who will be involved or working close to the operation shall be informed of the hazards and safety precautions.

7.1 Special Provisions for Working with Particularly Hazardous Materials - Particularly hazardous substances include select carcinogens, reproductive toxins and substances with a high degree of acute toxicity.

7.1.1 Carcinogens - Any substance or agent that is capable of causing cancer – the abnormal or uncontrolled growth of new cells in any part of the body in humans or animals. Carcinogens are chronic toxins with long latency periods that can cause damage after repeated or long duration exposures and often do not have immediate apparent harmful effects.

Chemicals regulated by OSHA as select carcinogens, are included in the following carcinogen lists:

- Subpart Z of the OSHA Standards
- Under the category "known to be carcinogens" in the latest edition of the *Annual Report of Carcinogens* published by the National Toxicology Program (**NTP**).
- Group 1 ("carcinogenic to humans") of the International Agency for Research on Cancer (**IARC**), latest edition. Chemicals listed in Group 2A or 2B ("reasonably anticipated to be carcinogens") that cause significant tumor incidence in experimental animals under specified conditions are also considered carcinogens under the OSHA Laboratory Standard.

Current List of OSHA-regulated carcinogens as listed in Subpart Z of the OSHA standards:

• Asbestos	• N-Nitrosodimethylamine
• 4-Nitrobiphenyl	• Vinyl chloride
• alpha-Naphthylamine	• Inorganic arsenic

• Methyl chloromethyl ether	• Cadmium
• 3,3' –Dichlorobenzidine (and its salts)	• Benzene
• bis-Chloromethyl ether	• Coke oven emissions
• beta-Naphthylamine	• 1,2-dibromo-3-chloropropane
• Benzidine	• Acrylonitrile
• 4-Aminodiphenyl	• Ethylene oxide
• Ethyleneimine	• Formaldehyde
• beta-Propiolactone	• Methylenedianiline
• 2-Acetylaminofluorene	• 1,3-Butadiene
• 4-Dimethylaminoazobenzene	• Methylene chloride

7.1.2 Reproductive Toxins – includes any chemical that may affect the reproductive capabilities including chromosomal damage (mutations) and effects of fetuses (teratogensis). Examples include dibromochloropropane, lead and ethylene oxide

7.1.3 Substances with High Acute Toxicity – The OSHA Laboratory Standard does not define substances with a high degree of acute toxicity, however, the rule's preamble describes them as those substances that are fatal or cause damage to target organs as a result of a single exposure or exposures of short duration. Examples include Hydrogen cyanide, hydrogen sulfide and nitrogen dioxide.

High acute toxicity includes any chemical that falls within any of the following OSHA-defined categories:

- A chemical with a median lethal dose (LD50) of 50 mg or less per kg of body weight when administered orally to certain test populations.
- A chemical with an LD50 of 200 mg less per kg of body weight when administered by continuous contact for 24 hours to certain test populations.
- A chemical with a median lethal concentration (LC50) in air of 200 parts per million (ppm) by volume or less of gas or vapor, or 2 mg per liter or less of mist, fume, or dust, when administered to certain test populations by continuous inhalation for one hour, provided such concentration and/or condition are likely to be encountered by humans when the chemical is used in any reasonably foreseeable manner.

NOTE: Since not all hazardous chemicals are included in these lists, laboratory personnel are encouraged to research a chemical's toxicity prior to beginning work with an unfamiliar chemical.

In order to minimize risks posed by particularly hazardous substances, consideration will be given to the following:

- If possible, evaluate whether a safer chemical alternative can be used and substitute.
- Work with the smallest quantities possible.
- Designated Area - Confine operations involving particularly hazardous materials to a designated work area in the laboratory. Isolate area from food/drink areas. Limit access to all laboratories where particularly hazardous materials are in use to appropriately trained and authorized personnel.
- Containment - Procedures involving extremely toxic chemicals that can generate dust, vapors, or aerosols must be conducted in a hood, glove box, or other suitable containment device. Any substances having high chronic toxicity should be stored in a secondary tray or container with appropriate warnings. Access shall be limited.
- Waste Disposal - Wastes of acutely hazardous materials are generally on the EPA's P-list, and care must be taken to not exceed the limits (1 Quart) that can be accumulated at a satellite accumulation area. Transfer of particularly hazardous wastes should be done only by authorized personnel.
- Decontamination - Establish a procedure for the decontamination of work surfaces and equipment. It should be performed according to procedure when necessary, and should be conducted in a designated chemical fume hood.

8.0 Working alone in the lab – Laboratory personnel should not work alone when using hazardous materials or performing hazardous procedures. If you must work alone, use the buddy system or contact your PI/supervisor so he/she is made aware that you are alone.

Students should not work alone in the laboratory. If after hours work is necessary, the buddy system is recommended and it should only be done with approval of the principal investigator. The permitted activities form (Appendix F) should be used to document approval. A case-by-case analysis should be performed to determine if working alone will be permitted. The following items should be taken into consideration:

- Task and hazards.
- Consequences from worst case scenario.
- The possibility of an accident or incident that would prevent the person from calling for help.
- Person's training and experience.
- Time the work is conducted. (ex. Evening or weekend)
- Person's physical condition.
- Students should be clear about what activities your research advisor approves you to do, at what times of the day, and with what level of buddy.
  - ex. - just computer work might not require a buddy.
  - ex. - no hazardous chemicals may be used alone, or possibly not even without a supervising staff or faculty member.
  - No unapproved experiments.

9.0 Lab Specific Standard Operating Procedures (SOPs) - Lab specific SOPs are created by principal investigators when a procedure poses an identified potential risk to the health and safety of the worker

and of others present in the lab. A copy of each SOP should be provided to the Chemical Hygiene Officer for review. SOP training will be provided and documented by lab the Principal Investigator.

10.0 Storage of Reagent Chemicals - Reagent chemicals must be properly stored and segregated to prevent an unexpected reaction. Store chemicals according to compatibility, not alphabetically. Do not store chemicals in laboratory hoods where they may interfere with the hood's airflow and contribute to the possibility of an accidental release. Do not store chemicals on bench tops, as this also increases the risk of an unexpected reaction. See Chemical Storage Classes below and Appendix B for common incompatible chemicals.

Consider the following when storing reagent chemicals:

- Label all chemicals with the date of receipt and the date of initial opening.
- Ensure that security procedures are adequate to prevent unauthorized access to stored chemicals.
- Consider purchasing in smaller quantities to reduce the amount of chemicals that need to be stored.
- The proper method to follow when storing reagent chemicals is according to compatibility and not alphabetically. Reagents should only be stored alphabetically if they are in the same compatibility group.
- Compatibility can be determined by referring to the labeling on the reagent bottle or by reviewing the SDS.
- Separate storage areas must be designated for compatibility groups such as oxidizers, reducers, acids, etc. Each area must be labeled accordingly. If possible, use secondary containment for compatible groups.
- When possible, store chemicals below eye level to prevent accidents that may occur when removing containers from a high shelf. If it is necessary to store reagent chemical containers above eye level, use extra caution when moving them around.
- Do not store chemicals on bench tops, floors or in hoods. Return to proper storage area after use.
- All containers must be kept sealed and closed except when removing material from them.
- Storage areas should not be exposed to extremes of heat or sunlight.
- When storing chemicals in a laboratory, segregate the chemicals into storage classes:

Storage Class	Examples
Organic Bases	Diethylamine, Piperidine, Benzylamine
Pyrophoric & Water reactive	Sodium Borohydride, Zinc Dust, Benzoyl Chloride
Inorganic Bases	Sodium Hydroxide, Ammonium Hydroxide
Organic Acids	Glacial Acetic Acid, Citric Acid
Oxidizers including Peroxides	Nitric Acid, Nitrates, Nitrites, Permanganates, Perchlorates, Chlorates, Chlorites
Inorganic Acids (non-oxidizing)	Hydrochloric, Sulfuric, Phosphoric Acids
Poison Compressed Gases	Sulfur Dioxide
Nonreactive Flammables and Combustibles	Benzene, Methanol, Toluene, Tetrahydrofuran
Explosives & Highly Unstable Materials	TNT, Dry Picric Acid, Tetrazole, Urea Nitrate
Incompatible with all other chemicals	Moist Picric Acid, Phosphorus, Benzyl Azide

10.1 Storage of Flammable Liquids

Flammable Cabinets**:** Flammable liquid storage cabinets are intended for the storage of flammable and combustible liquids. Per New York State Fire Code and Office of Fire Prevention and Control policy, flammable cabinets must be used in any laboratory or area where the volume of flammables exceeds certain levels. Per local fire marshal, flammable

liquids stored outside of an approved cabinet should not exceed 10 gallons per laboratory. Flammables should be placed back in the approved cabinets when not in use.

- Storage of flammable liquids in household grade refrigerators is a fire hazard and is not permitted. If flammable liquids need to be refrigerated, small volumes can be stored in a UL approved refrigerator rated for flammable liquids.
- Flammable storage cabinets must be UL listed, self-closing, and otherwise meet New York State Fire Code requirements.
- Cabinets are not required to be vented.
- The quantity of Class I or Class II liquids shall not exceed the 45 gallon cabinet which is the standard for NU laboratories.
- Keep only working amounts of flammable chemicals in the laboratory – return flammables to cabinet when done.
- Prohibit smoking and eliminate other sources of ignition such as heat, direct sunlight, open flames, etc.
- Use proper bonding and grounding to avoid sparks and static charges.

10.2 Special Considerations for Peroxide Forming Chemicals

Some NU laboratories use chemicals/solvents that are susceptible to peroxide formation. Auto-oxidation may occur under normal storage conditions as these materials typically react with air, moisture, or impurities to produce potentially dangerous peroxide by-products. Peroxides are highly reactive and can explode upon shock, friction, or spark. Since the peroxides are less volatile than the solvent itself, they tend to concentrate. It's important to note that distillation and evaporation increases the danger of peroxide formation. ***Always check for peroxide formation prior to use. If the area of the cap appears to contain salts or if you are unsure whether the chemical contains peroxides, DO NOT OPEN OR USE.*** Contact the Chemical Safety Manager for disposal.

When storing and using peroxide forming chemicals:

- Place the date of purchase and the date opened on the container. Discard the entire contents when the recommended storage time period has expired.
- Do not purchase these chemicals in quantities greater than can be used within their specified storage time period.
- Certain peroxide-forming solvents such as ethers should be stored in the dark and under nitrogen, if possible.
- Store in airtight containers. Keep containers tightly closed.
- Keep opaque containers stored in areas away from light sources.
- Refrigeration does not retard peroxide formation.
- If possible, purchase only chemicals that contain stabilizers that retard the formation of peroxides (presence should be noted on labels).
- Know the properties and dangers of the chemical you are working with. Read and review the SDS.

Common Peroxide Forming Chemicals and Retention Time
Peroxide forming chemicals are categorized into groups depending on peroxide formation susceptibility. *Note: The lists cover common peroxide formers but are not all-inclusive.*

Group A: Chemicals that Form Explosive Levels of Peroxides without Concentration
Suggested safe storage period: Discard 3 months after opening or 12 months if unopened.

• Divinyl acetylene	• Potassium metal	• Potassium Amide
• Divinyl ether	• Sodium Amide	
• Isopropyl Ether	• Vinylidene chloride	

Group B: Chemicals that Form Peroxide Hazards on Concentration
Suggested safe storage period: Discard after 12 months.

• Acetal	• Diglyme	• 4-penten-1-ol
• Acetaldehyde	• Diethyl ether (ethyl ether)	• 1-Phenylethanol
• Benzyl alcohol	• Ethylene glycol ether acetates	• Tetrahydrofuran
• 2-Butanol	• Furan	• Tetrahydronapthalene
• Dioxanes	• 4-Heptanol	• Vinyl ethers
• Chlorofluoroethylene	• 2-Hexanol	• Secondary Alcohol
• Cumene (isoproplybenzene)	• Methyl Acetylene	• Cyclohexene
• Decahydronapthalene (decalin)	• 4-methyl-2-pentanol	• 2-Cyclohexen-1-ol
• Diacetylene (butadiyne)	• 3-methyl-1-butanol	• Cyclopentene
• Dicyclopentadiene	• Methyl-isobutyl-ketone	• Methyl cyclopentane
	• 2-Pentanol	• Ethylene glycol dimethyl ether (glyme) (1,2-dimethyloxyethane (DME)

Group C: Chemicals that are Hazardous Due to Peroxide Initiation of Polymerization
Suggested safe storage period: Discard after 12 months.

• Acrylic Acid	• Methyl Methacrylate	• Vinyl Chloride
• Acrylonitrile	• Styrene	• Vinyl Pyridine
• Butadiene	• Tetrafluoroethyene	• Chlorobutadiene
• Chloropropene	• Vinyl acetate	
• Chlorotrifluoroethylene	• Vinyl Acetylene	

11.0 Hazard Communication and Identification - It is important that all hazards that may be present in a laboratory be identified. You have a right to know about the hazards you are exposed to in the workplace. The OSHA Hazard Communication Standard requires that "anyone who might handle, work with or be exposed to hazardous materials must have access to the Safety Data Sheets." They are intended for lab personnel who may be exposed to the chemical as well as emergency personnel such as firefighters who may respond to an incident, such as a spill. There are many sources of information available including Safety Data Sheets (SDS), safety literature, information on container labels, etc.

11.1 Safety Data Sheets (SDS) - An SDS is a formal document designed to provide information on how to handle a specific chemical. It contains specific sections that detail the chemical properties, health, safety and fire hazards, storage and disposal requirements, protective equipment, and spill handling procedures. SDSs must be “readily accessible” to all personnel. Employees must be aware of the how to access the SDS library in your work area. Training must include where they are located. At NU, SDSs are available in binders in every laboratory.

11.2 Chemical Management

11.2.1 Procurement of Chemicals - Chemicals are ordered by individual Principal investigators. It is recommended that new chemical orders should be reviewed by the Chemical Hygiene Officer prior to ordering. Before purchasing the following considerations are made:

- Is the material already available in another laboratory within the department?
- What is the minimum quantity that will suffice for current use?
- What is the maximum size container allowed in the area the chemical will be used and stored?
- Can the chemical be managed safely when it arrives? Does it require special storage?
- Does the chemical present any unique security risks, ex. Controlled substance?
- Can the waste be managed safely? Is it an acute hazardous waste?
- Thoroughly read the SDS to make sure NU has the proper safety and regulatory equipment necessary to handle the chemical

11.2.2 Receiving Chemicals – Upon receipt, inspect containers and ensure they are sealed and in good condition. No leaks should be detected. Ensure the original label is undamaged and legible. New chemicals are labeled with the date of receipt, moved to the appropriate storage area, and the SDS is entered into SDS binder.

11.2.3 Chemical Inventory - An inventory of chemicals that are present in the laboratory must be maintained. The Principal Investigator is responsible for the maintenance of their

respective inventory. Inventory should be verified at least annually. Benefits of maintaining an up-to-date inventory include:

- Laboratory personnel can readily be made aware of what chemicals are present in each laboratory. It can be used as an aid for Right-To-Know training that identifies the relative hazards of a particular chemical.
- Provides the ability to identify unneeded or unwanted materials that can be removed from the laboratory and properly disposed.
- Duplicate and redundant purchases can be avoided by referring to the inventory beforehand.
- Can alert emergency responders to the hazards in a room during an emergency.

Inventory must contain these minimum items:

- Building, room number and location within the room
- Proper name of the chemical (limit the use of abbreviations) and CAS Number
- Owner
- Number and size of containers
- Date Received
- Manufacturer
- Expiration Date (Recommended)
- Hazard identifier

11.2.4 Disposal – When a chemical is no longer wanted, determine whether the chemical is a hazardous waste. Dispose of remaining chemical in appropriate waste container. Consult with the Chemical Safety Manager if necessary. Chemicals should be removed from inventory when they are disposed of or used up.

11.2.4.1 Empty containers - A container that held any hazardous chemical is considered empty if:

- All traces have been removed that can be removed using practices commonly employed (e.g., pouring, pumping, and aspirating) AND it does not contain acutely hazardous waste (see sect. 14.1)
- If the waste container held acutely hazardous waste, the container MUST be triple rinsed using a solvent capable of removing the residual chemical product before disposing of the container:
  - The solvent can be water or any liquid that will remove the hazardous residue in the container.
  - Make sure you collect wash solvent and add to a compatible hazardous waste accumulation container in the lab.
- When empty, (so it is clear that the container no longer contains hazardous materials) do one of the following:
  - Remove **all** labels
  - Completely deface labels by covering with tape or paint.
- Empty containers may be placed in the trash.
- If containers are repurposed, **all** former labels must be removed prior to re-use.

12.0 Labels and Signs

12.1 Labeling of Chemicals - All containers in the laboratory must be properly labeled, regardless of whether the material is hazardous or not. Any compound or chemical that is known to cause

a health hazard or physical hazard requires GHS labeling. In the event of an incident such as a personal exposure or a chemical spill, a properly labeled container will assist in identifying the physical and health hazards associated with that particular chemical. Principal investigators are responsible for proper labeling of all containers in their respective areas. Laboratory personnel should not work with a chemical from an unlabeled container when the contents are not known. Labels can be requested from facility services if desired.

12.1.1 Original (Primary) Containers - Normally, the original manufacturer's label in good condition will satisfy this requirement. However, if a container arrives without the manufacturer's label, an appropriate label must be affixed to it. The manufacturer's label should remain in place until the container is empty.

If re-labeling is required, the label must include, at a minimum, the following items found on the material's SDS;

- Name of the chemical
- Signal Word (Danger, Warning)
- Hazard Statement(s)
- Precautionary Statement(s)
- Pictogram(s)
- Manufacturer's name, address and phone number

12.1.2 Secondary Containers - A secondary container is any container used when a chemical is transferred from its original manufacturer's container into another container. At a minimum, the name of the chemical and the appropriate hazard warnings (words, symbols and/or pictures) must appear on the secondary container label.

Limited Exceptions to Labeling Requirement - A container may be unlabeled if it is a portable container intended for the **immediate use (same work shift)** of the lab personnel who transferred the chemical from a properly labeled container.

General Labeling Guidance:

- **All** containers must be labeled.
- Hazardous chemicals must include the name as well as the hazard warnings.
- The label must be in plain English with no chemical structures, formulas or abbreviations.
- Labels that are falling off, torn, unreadable, etc. must be replaced.
- Reagent squirt bottles must also be properly labeled.
- All containers used for baths, such as mineral oil, alcohol, etc. must be labeled.
- If it is not practical to label a container, appropriate information may be placed on a sign **next** to the container.
- If a bottle is repurposed, all previous labels must be removed before new labels are applied.

12.2 Signs - Safety Signs are an important part of a good health and safety program. Signs must be posted where there is a significant risk to health and safety that has not been avoided or controlled by other means. Signs are meant to use symbols and graphical images to convey safety messages at a glance.

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

- Emergency telephone numbers for emergency personnel/facilities.
- Locations signs for safety showers, eyewash stations, other safety and first aid equipment, exits and areas where food and beverage consumption are permitted.
- Warnings at areas or equipment where special or unusual hazards exist.

13.0 Handling of Compressed Gases - Compressed gas cylinders are routinely used in many laboratories on campus. However, they can expose users to both chemical and physical hazards. A compressed gas can be toxic, corrosive, flammable, an oxidizer, etc. or a combination thereof. Since a gas cylinder is pressurized it can quickly contaminate a lab space when released.

13.1 Storage of Compressed Gas Cylinders:

- All gas cylinders including lecture bottles must be secured upright to a stable structure at all times. For larger cylinders, a chain or appropriate strap located above the midpoint but below the shoulder is the best way to achieve this. Smaller cylinders can be secured using approved stands or wall brackets. **NOTE: New York State Fire Code requires all cylinders to be secured regardless of size.**
- Do not store gas cylinders in exit areas or within egress routes.
- Empty gas cylinders must be stored separately from those that are full. Mark empty cylinders "empty" or "MT".
- Oxygen cylinders that are considered to be in storage must be kept at least 20 feet away from all flammable, combustible, or incompatible materials.
- Cylinders containing flammable gases such as hydrogen or acetylene must not be stored in close proximity to open flames, areas where electrical sparks are generated, or where other sources of ignition may be present.

13.2 Safe Use of Compressed Gas:

- Review Safety Bulletins, SDS sheets, and become familiar with what gases are in use.
- Leak check cylinders immediately after placing in use.
- Always open cylinder valves slowly.
- Always make sure that the gas regulator and valve fittings are compatible. Some regulators are designed to be used only with specific gases; regulators should not be interchanged.
- Leave caps on until gas is ready to be used and replace them if the cylinder will be inactive for a period of time.

13.3 Safe Transport of Cylinders:

- Remove the regulator and protect the valve by attaching the cap prior to transport. Damaged valves can lead to the sudden release of compressed gas in a cylinder, which can propel it like a rocket and cause serious injury and damage to property.
- Always use a specialized cart when transporting cylinders. They must be secured to the cart with a strap, chain or other suitable restraining material.
- Cylinders must never be dragged, rolled or pulled. Do not use a flat cart to transport; the cylinder can roll off and be damaged or cause injury.
- Only move one cylinder at a time.

13.4 Gas Leaks - <u>If you smell natural gas and think there is a leak:</u>

- Natural gas should not be run more than a few (ten) seconds before being ignited.

- Notify others in the area.
- If room is equipped, turn off emergency gas shutoff (know the location of these shutoffs!).
- Evacuate the building (pull fire alarm).
- Do NOT turn off lights (spark could ignite gas).
- Call campus safety at ext. 8111 or 716-286-8111.

14.0 Managing Hazardous Wastes - Hazardous wastes must be properly managed according to applicable USEPA and NYSDEC hazardous waste regulations. When managing hazardous waste:

- Hazardous waste containers must be labeled with the words "Hazardous Waste" and a description of the contents as soon as the first drop of waste is added.
- Waste must be stored at or near the point of generation and be managed under the control of the operator (principal investigator). Waste must be placed in a satellite accumulation area (SAA) within your lab. Regulations require you keep all hazardous wastes in the same lab in which it was generated. Transfer from lab to lab is not permitted.
- Waste containers must be in good condition and be compatible with their contents.
- Keep containers closed except when adding material to them.
- All liquid hazardous wastes must be stored in secondary containment.
- Do not overfill containers, leave volume for expansion.
- Incompatible wastes must be stored away from one another.
- Do not accumulate more than 55 gallons of hazardous waste (or 1 quart for acutely hazardous waste) per accumulation area.
- Never use a fume hood to "dispose" of chemicals by evaporation.
- Contact the Chemical Safety Manager for new/replacement containers. Containers must be added to SAA inventory.
- When containers are full and require removal, contact the Chemical Safety Manager for pickup. Waste will not be picked up without a confirmation that the hazardous waste disposal form (Appendix H) has been filled out accurately and completely. This serves as our record of waste contents to ensure proper disposal of waste.

NOTE: Failure to list the contents can lead to the material becoming an "unknown" hazardous waste. Determining the contents of an "unknown" hazardous waste is an involved and costly process. Please take care to avoid creating "unknown" hazardous wastes in your laboratory.

14.1 Acutely Hazardous Waste - Wastes of acutely hazardous materials are generally on the EPA P-list (Appendix I), and care must be taken to not exceed the limits (1 Quart) that can be accumulated in a satellite accumulation area. An empty container that has held an acutely hazardous waste must be triple rinsed using a solvent (which might be water) capable of removing the acute hazardous waste prior to disposal of the container as regular trash. Each rinse should be performed with an amount of solvent equal to approximately 5 percent of the volume of the container. The rinsate must be collected and disposed of as hazardous waste. Remember to remove or deface any chemical or hazardous waste labels prior to disposal as regular trash.

15.0 Chemical Spills - Spills of toxic and hazardous chemicals require prompt actions by laboratory group members in order to control chemical exposures to personnel and to minimize impacts to the environment and property. Immediate response and quick cleanup are imperative. **Report any injuries immediately!** If anyone has been exposed to the chemical, get him or her immediately to a nearby

safety shower or eyewash station.

Spills can be avoided by following these general practices and guidelines:

- Store liquid in secondary containment bins and keep containers closed when not in use.
- Use plastic coated or plastic containers whenever possible.
- Eliminate clutter, follow good housekeeping practices.

Use a spill kit only if:

- You have been trained to do so.
- You feel comfortable using it.
- The amount of chemical spilled is relatively small.
- Never attempt to clean a spill if you feel it is beyond the capability of the spill kit.

15.1 Spill Response - All significant (greater than 1 liter of liquid) chemical spills must be reported to the Chemical Hygiene Officer. Small routine spills can be handled by lab personnel provided they have been trained in the use of a spill kit and feel comfortable using one. Spills are documented on an incident report.

15.1.1 Large Spill (>1 Liter Flammable, Volatile, Corrosive)

- If a large spill occurs, evacuate the area and contact Campus Safety (286-8111).
- As you leave the lab, close the door behind you and direct people to the nearest fire exit. Notify others from adjoining labs and offices of the spill and keep people away from the area.
- Remain in the area to direct first responders to the spill.
- If the area of the spill reaches outside your lab and into a public area and vapors from the spilled chemical threaten the safety of others, pull the fire alarm and evacuate the building.

15.1.2 Small Spill (<1 Liter)

- If you have been trained and feel comfortable, proceed to clean up the spill using the spill kit located in your lab.
- Once you have cleaned up the spill, place all clean up residuals (spill pads, paper towels, PPE, etc.) in a bag. Label the contents and contact the Chemical Safety Manager for pickup.

15.1.3 Mercury Use and Spill Cleanup

- Mercury is found in many items and devices such as thermometers, manometers, switches, etc. Metallic mercury and mercury compounds are very hazardous and unwanted and spilled materials are regulated as hazardous wastes. **Never** throw materials such as spilled mercury or glass from a broken thermometer into the trash and **never** pour metallic mercury down the drain.

16.0 Incident Reporting - Laboratory personnel and students are required to report all occupational illnesses or injuries to a principal investigator as soon as possible. Students and employees are encouraged to report all “near misses”, which are considered a precursor to possible accidents and may help prevent future incidents. The principal investigator will fill out an incident report (Appendix E). An investigation should ensue to determine the cause and correct any deficiencies that may have contributed to the incident. All accidents and near-misses shall be reported to the chemical hygiene officer, department chair, and human resources (for employees).

17.0 Medical Consultation and Examination - Medical surveillance is required under the following circumstances:

- When an employee shows signs and symptoms of exposure to a hazardous chemical. Could include headache, rash, nausea, coughing, tearing, irritation or redness of eyes, irritation of nose or throat, dizziness, loss of motor dexterity or judgment, etc.
- When exposure monitoring shows concentrations above action levels or permissible exposure limits (PEL).
- A spill, leak or other occurrence which results in a possible overexposure.
- Anyone working with substances at concentration levels which exceed OSHA action limits.

Medical examinations will be performed by or under the supervision of a licensed physician at no cost to the employee, without loss of pay and at a reasonable time and place. NU currently uses:

- Mount St Mary's hospital, 5300 Military Rd., Lewiston NY 14092
- Niagara Falls Memorial Medical Center, 501 Tenth St., Niagara Falls, NY 14301

The following information should be supplied to the physician:

- Identity of the hazardous chemical(s) to which employee may have been exposed and the SDS for the chemical(s).
- Conditions under which exposure occurred including exposure date if available.
- Description of signs and symptoms of exposure, if any.

The written opinion that the employer receives from the physician shall include:

- Recommendations for future medical follow up.
- Results of examination and associated tests.
- Any medical condition revealed which may place the employee at increased risk of a chemical exposure.
- A statement that the employee has been informed by the physician of the results of the examinations/consultation and told of any medical conditions that may require additional treatment.
- The material returned to Niagara University by the physician shall not include specific findings and diagnosis which are unrelated to occupational exposure.

18.0 Recordkeeping - All memos, notes and reports related to a complaint of actual or possible exposure to hazardous chemicals are to be maintained as part of the record. These records will be retained for the OSHA required duration or duration of employment plus 30 years. All other records, such as training and inspections, are retained for at least 5 years.

19.0 Definitions

ACGIH - American Conference of Governmental Industrial Hygienists - An organization of professional personnel in governmental agencies or educational institutions engaged in occupational safety and health programs. ACGIH develops and publishes recommended occupational exposure limits (see "TLV") for hundreds of chemical substances and physical agents.

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

Acute - Severe, often dangerous conditions in which relatively rapid changes occur.

Acute Exposure – Acute exposure is a single, brief exposure to toxic substances. Adverse effects on the human body if applicable are evident soon after the exposure and come quickly to a crisis.

Asphyxiant - A chemical (gas or vapor) that can cause death or unconsciousness by suffocation. Simple asphyxiants, such as nitrogen, either use up or displace oxygen in the air. They become especially dangerous in confined or enclosed spaces. Chemical asphyxiants, such as carbon monoxide and hydrogen sulfide, interfere with the body's ability to absorb or transport oxygen to the tissues.

Aspiration Hazard – Danger of drawing a fluid into the lungs, causing an inflammatory response to occur.

Auto Ignition Temperature - Lowest temperature at which a flammable gas or vapor-air mixture will ignite from its own heat source or other contacted heat source.

C.A.S. Number - The number assigned to chemicals or products by the Chemical Abstracts Service.

Carcinogen - (see select carcinogen).

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

Chemical Hygiene Plan means a written program developed and implemented by the employer which sets forth procedures, equipment, personal protective equipment and work practices that (i) are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace.

Chronic Effect - An adverse effect on a human or animal in which symptoms develop slowly over a long period of time or recur frequently.

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

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

Corrosive or Corrosive Material - As defined by the Department of Transportation (DOT), a corrosive material is a liquid or solid that causes visible destruction or irreversible alterations in human skin tissue at the site of contact or in the cases of leakage from its packaging, a liquid that has a severe corrosion rate on steel.

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

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

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

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

Exposure Limit - Limit set to minimize occupational exposure to a hazardous substance. Recommended occupational exposure limits used are American Council of Governmental Industrial Hygienists' Threshold Limit Values (TLV's) and Occupational Safety and Health Administration Permissible Exposure Limits (PEL's).

Flammable - A chemical that falls into one of the following categories:

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

Flammable Limits - The range of a vapor/gas concentration in air that will burn or explode if an ignition source is present.

- LEL – (Lower Explosive Limit) - The lowest concentration of a gas or vapor in the air that can produce ignition or explosion.
- UEL – (Upper Explosive Limit) - The highest concentration of a gas or vapor in air that can produce ignition or explosion.

Flashpoint - the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(i) Tagliabue Closed Tester (See American National Standard for Flash Point by Tag Closed Tester, Z11.7-1979 (STM D93-79))- for liquids with a viscosity of less than 45 Saybolt Universal Seconds (SUS) at 100°F (37.8°C), than do not contain suspended solids and do not have a tendency to form a surface film under test; or

(ii) Pensky-Martens Closed Tester (see American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79))-for liquids with a viscosity equal to or greater than 45SUS at 100°F (37.8°C), or that contain suspended solids, or that have a tendency to form a surface film under test; or (iii)Setaflash Closed Tester (see American National standard Method of Test for Flash Point by Setaflash Closed Tester (ASTM D3278-78)). Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

Hazardous chemical - a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic systems, and agents which damage the lungs, skin, eyes, or mucous membranes. Appendices A and B of the Hazard Communication Standard (29CFR 1910.1200) provide further guidance in defining the scope of health

hazards and determining whether a chemical is to be considered hazardous for purposes of this standard.

Hazard Communication Program - The written program employers must develop and use. This program specifies employee training for routine and emergency use of all potentially hazardous chemicals in the workplace. It also specifies details pertaining to chemical labels, chemical storage, MSDS, and the complete list of all hazardous chemicals in the workplace.

Hazardous Material - Any substance or compound that has the capability of producing adverse effects on the health and safety of humans.

Hepatotoxins - Substances that produce liver damage (e.g. nitrosamines, carbon tetrachloride).

Ignition Source - Anything that provides heat, sparks, or flame sufficient to cause combustion/explosion.

Incompatible - Materials that could cause dangerous reactions from direct contact with one another.

Ingestion - The drawing of a substance into the body (gastrointestinal tract) through the nose, mouth, and breathing passages, in the form of a gas, vapor, fume, mist, or dust.

Inhalation - The drawing of a substance into the body (lungs) through the nose, mouth, and breathing passages, in the form of a gas, vapor, fume, mist, or dust.

Irritant - A substance that will cause an inflammatory response or reaction of the eye, skin, or respiratory system, following single or multiple exposures.

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

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

Laboratory Supervisor or Principal Investigator - The individual in charge of the laboratory. May be laboratory instructor.

Laboratory-type hood - A device located in a laboratory, enclosure on five sides with a moveable sash or fixed partial enclosed on the remaining side; constructed and maintained to draw air from the laboratory and to prevent or minimize the escape of air contaminants into the laboratory; and allows chemical manipulations to be conducted in the enclosure without insertion of any portion of the employee's body other than hands and arms. Walk-in hoods with adjustable sashes meet the above definition provided that the sashes are adjusted during use to that the airflow and the exhaust of air contaminants are not compromised and employees do not work inside the enclosure during the release of airborne hazardous chemicals.

Laboratory use of hazardous chemicals - Handling or use of such chemicals in which all of the following conditions are met:

(i) Chemical manipulations are carried out on a "laboratory scale;"

(ii)Multiple chemical procedures or chemicals are used;

(iii) The procedures involved are not part of a production process, nor in any way simulate a production process; and

(iv) "Protective laboratory practices and equipment" are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

LC50 - Lethal Concentration 50 the concentration in air that causes the death of 50% of the test animals. The concentration is expressed in mg/liter, mg/m3.

LD50 - Lethal Dose 50 a single dose of material which on the basis of laboratory tests is expected to kill 50% of a group of test animals. The material may be administered by mouth (oral) or applied to the skin (dermal or cutaneous). The dose is expressed in g/kg of body weight.

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

Nephrotoxin – Substances causing damage to the kidneys (e.g. certain halogenatedhydrocarbons).
Neurotoxin – Substances that produce their primary toxic effects on the nervous system (e.g. mercury, acrylamide, carbon disulfide).
Neutralize - To render chemically neutral or harmless, e.g., neither acidic nor basic, to counteract the activity or effect, the addition of a base (sodium hydroxide) to an acid (hydrochloric acid) results in water and a salt (sodium chloride), thus the acid has been "neutralized" or rendered harmless.
Non-Laboratory personnel – Laboratory personnel such as administrative staff, plumbers, and heating, ventilation & air conditioning (HVAC) technicians entering research laboratories to perform maintenance, administrative, or other non-research laboratory tasks.
OSHA – Occupational Safety and Health Administration of the U.S. Department of Labor. OSHA is a federal agency with safety and health enforcement authority for most of U.S. industry and business.
Organic peroxides - An organic compound that contains the bivalent -O-O- structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.
Oxidizer - A chemical other that a blasting agent or explosive as defined in 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.
Particularly Hazardous Substances – These consist of “select carcinogens,” reproductive toxins and substances that have a high degree of acute toxicity (also defined as highly toxic).
PEL - Permissible Exposure Limit is an exposure limit established by OSHA's regulatory authority. PELs may be expressed as either a time weighted average (TWA) limit or a maximum concentration exposure limit.
Physical hazard - A chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.
Protective laboratory practices and equipment - Those laboratory procedures, practices and equipment accepted by laboratory health and safety experts as effective, or that the employer can show to be effective, in minimizing the potential for employee exposure to hazardous chemicals.
Polymerization - A chemical reaction in which a large number of relatively simple molecules combine to form a large chainlike molecule. A hazardous polymerization is a reaction that takes place at a rate which releases large amounts of energy.
PPM - Parts per million
Principal Investigator or Laboratory Supervisor - The individual in charge of the laboratory. May be laboratory instructor.
Pyrophoric – A chemical that ignites spontaneously with air at 130°F or less. Pyrophoric substances are extremely reactive and can ignite spontaneously when contacted with air even in the absence of heat or fire. Extreme caution must be taken when working with them. Pyrophoric chemicals can be handled and stored safely so long as exposure to atmospheric oxygen and moisture is avoided.
Reproductive Toxins - Chemicals which affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis).
SDS – (Safety Data Sheet) Written or printed material about a chemical that specifies its hazards, safe use and other information. It is prepared by the chemical manufacturer and is required by federal law.
Secondary Alcohol - A secondary alcohol is a compound in which a hydroxy group, –OH, is attached to a saturated carbon atom which has two other carbon atoms attached to it
Select carcinogen - Any substance which meets one of the following criteria:

(i) It is regulated by OSHA as a carcinogen; or
(ii) It is listed under the category, "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP) (latest edition); or
(iii) It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC) (latest editions); or

(iv) It is listed in either Group 2A or @B by IARC or under the category, "reasonably anticipated to be carcinogens" by NTP, and causes statistically significant tumor incidence in experimental animals in accordance with any of the following criteria:

(A) After inhalation exposure of 6-7 hours per day, 5 days per week, for a significant portion of a lifetime to dosages of less than 10 mg/m3;

(B) After repeated skin application of less than 300 (mg/kg of body weight) per week; or

(C) After oral dosages of less than 50 mg/kg of body weight per day.

Sensitizer - A substance, which on first exposure, causes little or no reaction in man or test animals, but which on subsequent exposure(s) may cause a marked response not necessarily limited to the contact site. Skin sensitization is the most common form of the problem in the industrial setting, although respiratory sensitization to a few chemicals has been known to occur.

Systemic - Spread throughout the body, affecting many or all body systems or organs, not localized in one spot or area.

TLV - Threshold Limit Value (exposure limit for a specific substance as per ACGIH). TLV is a measure of exposure to inhalation only.

Target Organ - The specific organs or body systems that sustain hazardous effects from a toxic chemical, either long or short-term. Target organs could be the liver, kidney, central nervous system or skin.

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

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

APPENDIX A
Safety Equipment

Location of Safety Equipment:

Safety Equipment						
Room	Hoods	Bio Cabinets	Eyewash	Shower	Pull Down Eyewash	Glove Box
Chemistry						
Golisano 108	1	1	1	1	1	0
Golisano 110	5	0	1	1	1	0
Golisano 112	4	0	1	1	1	0
Golisano 114	4	0	1	1	1	0
Golisano 116	1	0	1	1	0	0
Golisano 211	1	0	1	1	1	0
Golisano 212	1	1	1	1	1	0
Golisano 213	0	0	0	0	1	0
Golisano 216	0	0	0	0	1	0
Golisano 218	4	0	1	1	1	1
BIOLOGY						
Golisano 122	1	1	1	1	1	0
Golisano 123	0	0	0	0	1	0
Golisano 124	1	0	1	1	1	0
Golisano 127	0	1	0	0	1	0
Golisano 220	1	1 (225)	1	1	2	0
Golisano 222	1	1	1	1	1	0
Golisano 226	0	1	0	0	2	0
Golisano 230	1	1	0	0	1	0
Golisano 233	0	2	0	0	0	0
Golisano 234	0	1	0	0	1	0
DePaul 11	1	0	0	0	0	0
BTG West Hall Entrance	0	0	1	1	0	0

Appendix B
Incompatible Chemicals
Use this table only as a guide. Specific incompatibilities are listed in SDS's.

Chemical	Incompatible With
Acetic Acid	Oxidizing Agents, ex, chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetone	Nitric acid, sulfuric acid, other oxidizing agents
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Alkali and alkaline earth metals	Water, carbon tetrachloride, other chlorinated compounds, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury (ex. In manometers), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid
Ammonium Nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic or combustible materials.
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Reducing agents
Azides	Acids
Bromine	See Chlorine
Calcium Oxide	Water
Carbon (activated)	Calcium hypochlorite, other oxidizing agents
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chlorine Dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Chromium trioxide (Chromic Acid)	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids
Copper	Acetylene, hydrogen peroxide
Cyanides	Acids
Flammable Liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Hydrocarbons (ex. Butane, propane, benzene)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide, other oxidizing agents
Hydrocyanic acid (anhydrous)	Alkali
Hydrofluoric Acid	Potassium permanganate, sulfuric acid
Hydrogen sulfide	Metal oxides, powdered copper, oxidizing gases
Hyprochlorites	Acids, activated carbon, ammonia
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia
Nitrates	Powdered metals and non-metals, metal sulfides, flammable/combustible liquids
Nitric Acid	Acetic acid, aniline, sulfuric acid, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable/combustible liquids and gases, copper, brass, heavy metals, alkalis
Nitrates	Ammonium salts, amides, phosphides, reducing agents
Nitroparafins	Acids, bases, amines, halides
Oxalic acid	Silver, chlorites, urea
Oxygen	Oils, grease, hydrogen, and other reducing agents, including flammable liquids, solids and gases

Perchlorates	See Chlorates
Perchloric acid	Reducing agents such as acetic anhydride, bismuth and its alloys alcohols, paper, wood, grease, oils
Phosphorus (white)	Air, oxygen, alkalis, halogens, halogen oxides, oxidizing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium Permanganate	Glycerol, ethylene glycol, benzaldehyde, other reducing agents, sulfuric acid
Sodium	Carbon Tetrachloride, carbon dioxide, water
Sodium Peroxide	Ethyl and methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerin, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulfides	Acids
Sulfuric acid	Permanganates, water, aqueous solutions, reducing agents, chlorates, perchlorates, nitric acid, acetone

Source: Safety in Academic Laboratories, Volume 1, ACS

APPENDIX C

LABORATORY SAFETY RULES AND PROCEDURES AGREEMENT (Chemistry Dept.)

To ensure that the experiments performed are safe, positive learning experiences, students should read, discuss and sign this laboratory safety rules and procedures agreement. The student and laboratory instructor should each keep a copy of the signed agreement and the original should be filed with the Director of Laboratories. Violations of this agreement, and any other conditions of working in the lab, may be both addressed by the Instructor, lab staff, and Campus Safety, as well as referred to the Dean of Students as a violation of Niagara University's Disciplinary Rules (see: Student Handbook).

1. Any laboratory can be a dangerous place. Many compounds are volatile and flammable or explosive while others are toxic. Some chemicals can cause lung damage, some can cause chemical burns, some can lead to cirrhosis of the liver and others are carcinogenic (cancer causing). Yet, chemists generally live as long as the rest of the population. They simply learned to be careful in the hazardous laboratory environment. **The first thing on your mind when you come to the laboratory should always be safety.**

2. Safety precautions in the laboratory are nothing more than common sense. **Always expect the unexpected**. Never work alone in the laboratory. Only authorized experiments can be performed. Deliberately creating a hazard will result be met with severe consequences on the first offense.

3. **Lab coats and safety goggles or glasses should be worn at all times in the laboratory. Although it is permissible, the use of contact lenses is not recommended in Chemistry labs**. Users of contact lenses should be aware that some vapors may be absorbed by the lens and could cause damage to the cornea. Contact lens wearers that own glasses should strongly consider wearing them.

4. Memorize the location of the following in the laboratory.
   a. Fire extinguishers and Fire blankets (if available)
   b Eye wash fountains
   c. Emergency showers
   d Location of all exits.

5. **Students with long hair** must secure it for the duration of the experiment. Avoid wearing scarves in the laboratory.

6. Clothing should not be loose and floppy, especially in the sleeves. Avoid wearing highly flammable synthetic fabrics. Never wear short skirts, shorts, or bare-midriff shirts in the laboratory. Arms and legs should be covered.

7. Wear leather shoes, or other footwear constructed with thicker upper material, that covers the entire foot. **Open-toed shoes, sandals** and **high heeled shoes** as well as thin canvas sneakers, are not permitted in the laboratory.

8. **Smoking, chewing gum, eating or drinking is not allowed in the laboratory**, since you may inadvertently ingest some chemical substance. Your hands may be contaminated with an unsafe chemical. **Always wash your hands before you leave the lab**. Do not place any

object, including pens or pencils, in your mouth during or after the laboratory period. These objects may have picked up a contaminant from the laboratory bench. Never sniff, inhale, or taste chemicals.

9. Always use the smallest amount of substance required for an experiment; more is never better in chemistry. **Never return unused portions of a reagent to the original reagent bottle.**

10. **Never remove any chemical substance from the laboratory**. Removal of chemicals from the laboratory is grounds for severe disciplinary action.

11. Chemicals should not be stored in your laboratory drawer or area unless you are specifically directed to do so by the instructor.

12. **Keep your work area clean**, and help keep the common areas of the laboratory clean. If you spill something in a common area, remember that this substance may injure someone else.

13. In the case of any spill (including water):
- Alert your neighbors and the laboratory instructor immediately
- Clean up the spill as directed by the instructor
- If the substance is volatile, flammable or toxic, warn everyone of the accident.
- If necessary help will be called in to clear up the spill.

14. **Avoid fully inhaling the vapors of any substance**. Make use of the fume hoods when using concentrated acids or substances with strong aromatic vapors.

15. **When heating liquids**, always add 2-3 boiling stones to make the boiling action smoother.

16. Never add water to a concentrated reagent when diluting the reagent. **Always add the reagent to the water**. If water is added to a concentrated reagent, local heating and density effects may cause the water to be splashed back.

17. **Never work in the laboratory unless the instructor is present**. Report to the Director of Laboratories if your instructor is not present during your assigned lab time.

18. **Dispose of all reaction products as directed by the instructor**. Observe carefully the special disposal techniques necessary for flammable or toxic substances. The inappropriate disposal of chemicals may have a significant effect on our environment, both within the Lab building and around Niagara Falls.

19. **All broken glass products** should be disposed of in the special labeled container provided in the lab. Clean up broken glass immediately or as soon as safely possible, depending on the situation.

20. **Inform yourself of the hazards of the materials with which you are working.**

21. **List your allergies at the bottom of this page.** If the experiment deals with something to which you are allergic, consult with your instructor.

22 **Never fool around or play games with chemicals in the laboratory**. Always remember that chemical laboratories are hazardous environments and although every precaution will be taken by your instructor for your protection, you bear the ultimate responsibility for safety in the laboratory. A little carelessness could leave you or other students disabled for life.

I,_____have read, understand and agree to follow these laboratory safety rules and procedures. I agree to abide by any additional instructions, written or verbal, provided by laboratory instructor. I realize that my failure to follow these rules and instructions may result in serious disciplinary action.

_____

Student's Signature Date

*** List any allergies or medical problems that your instructor should be made aware of. Students may also wish to ensure Niagara University Health Services is given this information.**
**** The Niagara University Chemical Hygiene Plan is the base document for the above procedures.**

APPENDIX D

NEUROSCIENCE LABORATORY SAFETY RULES AND PROCEDURES AGREEMENT

1. All accidents or injuries should be reported to the lab director immediately, no matter how minor.
2. Only those laboratory activities where instructions and permission have been given by the lab director should be performed.
3. Laboratory animals are to be handled under the supervision of the lab director or senior research assistant until students have acquired the necessary skills to work on their own.
4. White lab coats and gloves should be worn when working with laboratory animals.
5. Safety glasses with side shields should be worn where appropriate.
6. No food or beverages should be carried to the animal room.
7. Students' hands should be washed when finished working in the lab.
8. Students should know the location of the emergency eyewash, fire extinguisher, and all exits.
9. Student apparel should be appropriate for laboratory work. Long hanging necklaces, bulky and baggy clothing, and open shoes are not appropriate for laboratory work.
10. Broken glass should be removed from a work area and placed in the glass receptacle.
11. Biological waste should be placed in the appropriate waste container.
12. In the case of any spill (including water): alert other students and the lab director immediately, clean up the spill as directed by the instructor; if the substance is flammable or toxic warn everyone of the accident. Help will be called to clean up the spill if necessary.
13. All laboratory equipment is to be handled in a responsible manner.
14. Never fool around or play games with chemicals in the laboratory.

Agreement

I,_____have read, understand and agree to follow these laboratory safety rules and procedures. I agree to abide by any additional instructions, written or verbal, provided by laboratory director. I realize that my failure to follow these rules and instructions may result in my permanent suspension from this lab.

_____ _____

(Student Signature) (Date)

*** List any allergies or medical problems that we should be made aware of.**
**** The Niagara University Chemical Hygiene Plan is the base document for this agreement.**

Appendix E –Laboratory Incident Report Form

Incident Report

This form must be filled out for every injury or fire, no matter how small, and for chemical spills involving hazardous substances or use of a spill kit. Forms should be completed by the supervisor/PI and completed copies should be distributed to the Department Chair and Chemical Hygiene Officer. This form may also be used to document near misses.

Personal Injury

Place of accident _____

Date and time of accident _____

Nature of accident _____

_____

_____

Name of injured person _____

Nature of injury _____

First aid given by _____

Was person sent to emergency room?_____Was person hospitalized? _____

Fire

Type of Incident: Fire_____Chemical Spill _____

Name(s) of Person(s) Involved _____

Location of Incident_____Date_____Time_____

For Fires: Fire Dept. Called (Y/N)___Number of Extinguishers Used _____

Extinguishers used were from (room numbers _____

Chemical Spill

For Chemical Spills: Chemical Name _____

Amount Spilled_____Spill Kit Used_____Type_____

Cause of Incident _____

Extent of Damage _____

Near Miss

Place of incident _____

Date and time of incident _____

Nature of incident _____

_____

_____

Names of involved parties_____

Eyewitness accounts

Victim's description of accident:

Faculty witness to accident: _____

Faculty witness's description of accident:

Student witness to accident: _____

Student witness's description of accident:

Additional Comments:

Supervisor/PI Signature:_____ Date:_____

Appendix F – Permitted Activities Form

Permitted Activities Form

In Lab Room(s):_____ **Date(s):**_____

PI/Supervisor:_____ **PI/Supervisor Signature:**_____

Student:_____ **Student Signature:**_____

Activity / Activities	Times/Days Permitted	Buddy Requirement

Appendix G

Laboratory Inspection Checklist

Building/Room:	**Inspected By:**
PI/Lab Supervisor:	**Date Inspected:**

Any item with a "No" response must be corrected. Document any corrective actions in comments section.

Y	N	N/A	General Safety
			1. Is general housekeeping neat, clean and orderly?
			2. Area around fire extinguishers, pull alarms, emergency showers/eyewashes, and electrical panels kept clear?
			3. Emergency contacts and evacuation plan posted?
			4. Is ceiling clearance maintained? (24" without sprinklers, 18" with sprinklers)
			5. Food and drink stored and consumed away from toxic and infectious materials?
			6. Laboratory Refrigerator/freezers labeled "No Food or Drink"?
			7. Extension cords and power strips not daisy chained and no permanent extension cords in use?
			8. No exposed wiring or damaged electrical cords?
			9. Are floors clear, dry and free of slip hazards?
			10. Are aisles and adjacent hallways unobstructed?
			11. Bench tops (including hoods) reasonably organized and clean?
			12. Storage in fume hoods is minimized and sashes kept closed while not in use?
			13. Is appropriate PPE worn in lab?
			14. Are sharps stored appropriately?
			15. Have eyewashes and safety showers been inspected? (Eyewashes - monthly, Safety showers – quarterly)
			16. Fume hoods and biological safety cabinets: inspection within one year?
			17. Is fire extinguisher present and inspected?
			18. Spill cleanup kits are available and properly stocked?
			Hazardous Materials
			1. All containers, including non-hazardous chemicals, legibly labeled with the full chemical name (no abbreviations, formulas, etc)?
			2. All hazardous chemicals labeled with name and hazards?
			3. Hazardous materials used/stored in the laboratory are limited to working quantities?
			4. Unused and outdated chemicals are disposed of as needed?
			5. Are SDS's available?
			6. Is chemical inventory up to date?
			7. Incompatible materials properly segregated? (see Sect. 10.0/Appendix B CHP)
			8. Are peroxide forming chemicals disposed of within recommended time period? (see Sect. 10.2 CHP)
			9. Flammable liquids (including glacial acetic acid) stored in flammable cabinets? (Up to 10 gallons per room may be stored outside of cabinets)

Y	N	N/A	
			10. Flammables that are refrigerated are placed in explosion proof or flammables refrigerators only?
			11. Secondary containment used for hazardous liquids?
			12. Do lab practices minimize volatilization?
			Hazardous Waste
			1. Waste containers in good condition (no leaks) and compatible with waste?
			2. Waste containers kept closed unless waste is being added? (No funnels)
			3. Chemical sharps are segregated and disposed of as hazardous waste?
			4. Liquid hazardous waste kept in secondary containment?
			5. Waste containers are kept at or near the point of generation? (Do not move containers from original area)
			6. Each container of hazardous waste is labeled “Hazardous Waste” with a description of contents?
			7. Quantity of waste does not exceed 55 gallons (1 quart for acute waste) per area?
			8. Contents are recorded on waste disposal form?
			9. Are biological sharps containers available and in use?
			Compressed Gases
			1. Are cylinders properly stored, secured and labeled?
			2. Are cylinder valves closed and valve caps in place when cylinders not in use?
			3. Are empty cylinders marked?
			4. Are gas cylinders transported on a cart with chains?

Comments and Corrective Action:

Appendix H – Hazardous Waste Disposal Form

Hazardous Waste Disposal Form

LOCATION (Building and Room #):						
Container ID:			Hazards			
Volume or Weight in Container (ex. 100 mL, 500g)	Identification/Description of Waste Chemicals (Do not use chemical structures or formulas)	Physical State (Solid (S), Liquid (L), etc)	Water Reactive	Corrosive	Flammable	Oxidizer

Please ensure identification of waste chemicals is accurate and complete and contact Ami Lis 286-8244 or alis@niagara.edu for pickup.

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Appendix I

EPA "P-Listed" Chemicals (Acutely Toxic)

Waste Code	CASRN	Substance
P023	107-20-0	Acetaldehyde, chloro-
P002	591-08-2	Acetamide, N-(aminothioxomethyl)-
P057	640-19-7	Acetamide, 2-fluoro-
P058	62-74-8	Acetic acid, fluoro-, sodium salt
P002	591-08-2	1-Acetyl-2-thiourea
P003	107-02-8	Acrolein
P070	116-06-3	Aldicarb
P203	1646-88-4	Aldicarb sulfone.
P004	309-00-2	Aldrin
P005	107-18-6	Allyl alcohol
P006	20859-73-8	Aluminum phosphide (R,T)
P007	2763-96-4	5-(Aminomethyl)-3-isoxazolol
P008	504-24-5	4-Aminopyridine
P009	131-74-8	Ammonium picrate (R)
P119	7803-55-6	Ammonium vanadate
P099	506-61-6	Argentate(1-), bis(cyano-C)-, potassium
P010	7778-39-4	Arsenic acid H3 AsO4
P012	1327-53-3	Arsenic oxide As2 O3
P011	1303-28-2	Arsenic oxide As2 O5
P011	1303-28-2	Arsenic pentoxide
P012	1327-53-3	Arsenic trioxide
P038	692-42-2	Arsine, diethyl-
P036	696-28-6	Arsonous dichloride, phenyl-
P054	151-56-4	Aziridine
P067	75-55-8	Aziridine, 2-methyl-
P013	542-62-1	Barium cyanide
P024	106-47-8	Benzenamine, 4-chloro-
P077	100-01-6	Benzenamine, 4-nitro-
P028	100-44-7	Benzene, (chloromethyl)-
P042	51-43-4	1,2-Benzenediol, 4-[1-hydroxy-2 (methylamino)
		ethyl]-, (R)
P046	122-09-8	Benzene ethanamine, alpha,alpha-dimethyl-
P014	108-98-5	Benzenethiol
P127	1563-66-2	7-Benzofuranol, 2,3-dihydro-2,2-
		dimethyl-, methylcarbamate.
P188	57-64-7	Benzoic acid, 2-hydroxy-, compd. With
		(3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,8-
		trimethylpyrrolo[2,3-b]indol-5- yl methyl
		carbamate ester (1:1).
P001	\1\81-81-2	2 H-1-Benzopyran-2-one, 4-hydroxy-3-(3-
		oxo-1-phenylbutyl)-, & salts, when present at
		concentrations greater than 0.3%
P028	100-44-7	Benzyl chloride

Waste Code	CASRN	Substance
P015	7440-41-7	Beryllium powder
P017	598-31-2	Bromoacetone
P018	357-57-3	Brucine (methylthio)-, O-[(methylamino)
		carbonyl] oxime
P021	592-01-8	Calcium cyanide
P021	592-01-8	Calcium cyanide Ca(CN)2
P189	55285-14-8	Carbamic acid, [(dibutylamino)-thio]methyl-, 2,3-
		dihydro-2,2-dimethyl- 7-benzofuranyl ester.
P191	644-64-4	Carbamic acid, dimethyl-, 1-[(dimethyl-amino)
		carbonyl]- 5-methyl-1H- pyrazol-3-yl ester.
P192	119-38-0	Carbamic acid, dimethyl-, 3-methyl-1-(1-methyl-
		ethyl)-1H- pyrazol-5-yl ester.
P190	1129-41-5	Carbamic acid, methyl-, 3-methylphenyl ester.
P127	1563-66-2	Carbofuran.
P022	75-15-0	Carbon disulfide
P095	75-44-5	Carbonic dichloride
P189	55285-14-8	Carbosulfan.
P023	107-20-0	Chloroacetaldehyde
P024	106-47-8	p-Chloroaniline
P026	5344-82-1	1-(o-Chlorophenyl)thiourea
P027	542-76-7	3-Chloropropionitrile
P029	544-92-3	Copper cyanide
P029	544-92-3	Copper cyanide Cu(CN)
P202	64-00-6	m-Cumenyl methylcarbamate.
P030	.....	Cyanides (soluble cyanide salts), not otherwise
		specified
P031	460-19-5	Cyanogen
P033	506-77-4	Cyanogen chloride
P033	506-77-4	Cyanogen chloride (CN)Cl
P034	131-89-5	2-Cyclohexyl-4,6-dinitrophenol
P016	542-88-1	Dichloromethyl ether
P036	696-28-6	Dichlorophenylarsine
P037	60-57-1	Dieldrin
P038	692-42-2	Diethylarsine
P041	311-45-5	Diethyl-p-nitrophenyl phosphate
P040	297-97-2	O,O-Diethyl O-pyrazinyl phosphorothioate
P043	55-91-4	Diisopropylfluorophosphate (DFP)
P004	309-00-2	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexa-
		chloro-1,4,4a,5,8,8a,-hexahydro-, (1alpha,4alpha,
		4abeta,5alpha,8alpha,8 abeta)-
P060	465-73-6	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-
		hexa- chloro-1,4,4a,5,8,8a-hexahydro-,
		(1alpha,4alpha,4abeta,5beta,8beta,8abeta)-
P037	60-57-1	2,7:3,6-Dimethanonaphth[2,3-b]oxirene,
		3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-
		octahydro-, (1aalpha,2beta,2aalpha,3beta,6beta,6a
		alpha,7beta, 7aalpha)-
P051	\1\ 72-20-8	2,7:3,6-Dimethanonaphth [2,3-b]oxirene,

Waste Code	CASRN	Substance
		3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-
		octahydro-, (1aalpha,2beta,2abeta,3alpha,6alpha,6
		abeta,7beta, 7aalpha)-, & metabolites
P044	60-51-5	Dimethoate
P046	122-09-8	alpha,alpha-Dimethylphenethylamine
P191	644-64-4	Dimetilan.
P047	\1\ 534-52-1	4,6-Dinitro-o-cresol, & salts
P048	51-28-5	2,4-Dinitrophenol
P020	88-85-7	Dinoseb
P085	152-16-9	Diphosphoramide, octamethyl-
P111	107-49-3	Diphosphoric acid, tetraethyl ester
P039	298-04-4	Disulfoton
P049	541-53-7	Dithiobiuret
P185	26419-73-8	1,3-Dithiolane-2-carboxaldehyde, 2,4-dimethyl-,
		O- [(methylamino)- carbonyl]oxime.
P050	115-29-7	Endosulfan
P088	145-73-3	Endothall
P051	72-20-8	Endrin
P051	72-20-8	Endrin, & metabolites
P042	51-43-4	Epinephrine
P031	460-19-5	Ethanedinitrile
P194	23135-22-0	Ethanimidothioic acid, 2- (dimethylamino)-N-[[
		(methylamino) carbonyl]oxy]-2-oxo-, methyl ester.
P066	16752-77-5	Ethanimidothioic acid, N-[(methylamino)carbonyl]
		oxy]-, methyl ester
P101	107-12-0	Ethyl cyanide
P054	151-56-4	Ethyleneimine
P097	52-85-7	Famphur
P056	7782-41-4	Fluorine
P057	640-19-7	Fluoroacetamide
P058	62-74-8	Fluoroacetic acid, sodium salt
P198	23422-53-9	Formetanate hydrochloride.
P197	17702-57-7	Formparanate.
P065	628-86-4	Fulminic acid, mercury(2+) salt (R,T)
P059	76-44-8	Heptachlor
P062	757-58-4	Hexaethyl tetraphosphate
P116	79-19-6	Hydrazinecarbothioamide
P068	60-34-4	Hydrazine, methyl-
P063	74-90-8	Hydrocyanic acid
P063	74-90-8	Hydrogen cyanide
P096	7803-51-2	Hydrogen phosphide
P060	465-73-6	Isodrin
P192	119-38-0	Isolan.
P202	64-00-6	3-Isopropylphenyl N-methylcarbamate.
P007	2763-96-4	3(2H)-Isoxazolone, 5-(aminomethyl)-
P196	15339-36-3	Manganese, bis(dimethylcarbamodithioato-
		S,S[prime])-,
P196	15339-36-3	Manganese dimethyldithiocarbamate.

Waste Code	CASRN	Substance
P092	62-38-4	Mercury, (acetato-O)phenyl-
P065	628-86-4	Mercury fulminate (R,T)
P082	62-75-9	Methanamine, N-methyl-N-nitroso-
P064	624-83-9	Methane, isocyanato-
P016	542-88-1	Methane, oxybis[chloro-
P112	509-14-8	Methane, tetranitro- (R)
P118	75-70-7	Methanethiol, trichloro-
P198	23422-53-9	Methanimidamide, N,N-dimethyl-N[prime]-
		[3-[[(methylamino)- carbonyl]oxy]phenyl]-,
		monohydrochloride.
P197	17702-57-7	Methanimidamide, N,N-dimethyl-N[prime]-[2-
		methyl-4-[[(methylamino)carbonyl]oxy]phenyl]-
P050	115-29-7	6,9-Methano-2,4,3-benzodioxathiepin,6,7,8,9,10,
		10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide
P059	76-44-8	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-
		heptachloro-3a,4,7,7a-tetrahydro-
P199	2032-65-7	Methiocarb.
P066	16752-77-5	Methomyl
P068	60-34-4	Methyl hydrazine
P064	624-83-9	Methyl isocyanate
P069	75-86-5	2-Methyllactonitrile
P071	298-00-0	Methyl parathion
P190	1129-41-5	Metolcarb.
P128	315-8-4	Mexacarbate.
P072	86-88-4	alpha-Naphthylthiourea
P073	13463-39-3	Nickel carbonyl
P073	13463-39-3	Nickel carbonyl Ni(CO)4, (T-4)-
P074	557-19-7	Nickel cyanide
P074	557-19-7	Nickel cyanide Ni(CN)2
P075	\1\ 54-11-5	Nicotine, & salts
P076	10102-43-9	Nitric oxide
P077	100-01-6	p-Nitroaniline
P078	10102-44-0	Nitrogen dioxide
P076	10102-43-9	Nitrogen oxide NO
P078	10102-44-0	Nitrogen oxide NO2
P081	55-63-0	Nitroglycerine (R)
P082	62-75-9	N-Nitrosodimethylamine
P084	4549-40-0	N-Nitrosomethylvinylamine
P085	152-16-9	Octamethylpyrophosphoramide
P087	20816-12-0	Osmium oxide OsO4, (T-4)-
P087	20816-12-0	Osmium tetroxide
P088	145-73-3	7-Oxabicyclo[2.2.1]heptane-2,3- dicarboxylic acid
P194	23135-22-0	Oxamyl.
P089	56-38-2	Parathion
P034	131-89-5	Phenol, 2-cyclohexyl-4,6-dinitro-
P048	51-28-5	Phenol, 2,4-dinitro-
P047	\1\ 534-52-1	Phenol, 2-methyl-4,6-dinitro-, & salts
P020	88-85-7	Phenol, 2-(1-methylpropyl)-4,6-dinitro-

Waste Code	CASRN	Substance
P009	131-74-8	Phenol, 2,4,6-trinitro-, ammonium salt (R)
P128	315-18-4	Phenol, 4-(dimethylamino)-3,5-dimethyl-
P199	2032-65-7	Phenol,(3,5-dimethyl-4-(methylthio)
		methylcarbamate
P202	64-00-6	Phenol, 3-(1-methylethyl)-, methyl carbamate.
P201	2631-37-0	Phenol, 3-methyl-5-(1-methylethyl)-,methyl
		carbamate.
P092	62-38-4	Phenylmercury acetate
P093	103-85-5	Phenylthiourea
P094	298-02-2	Phorate
P095	75-44-5	Phosgene
P096	7803-51-2	Phosphine
P041	311-45-5	Phosphoric acid,diethyl 4-nitrophenyl ester
P039	298-04-4	Phosphorodithioic acid, O,O-diethyl
		S-[2-(ethylthio)ethyl] ester
P094	298-02-2	Phosphorodithioic acid, O,O-diethyl
		S-[(ethylthio)methyl] ester
P044	60-51-5	Phosphorodithioic acid, O,O-dimethyl S-
		[2-(methylamino)-2-oxoethyl] ester
P043	55-91-4	Phosphorofluoridic acid, bis(1-methylethyl) ester
P089	56-38-2	Phosphorothioic acid, O,O-diethyl O-(4-
		nitrophenyl) ester
P040	297-97-2	Phosphorothioic acid,O,O-diethylO-pyrazinyl ester
P097	52-85-7	Phosphorothioic acid, O-[4-[(dimethylamino) sulfonyl]phenyl] O,O-dimethyl ester
P071	298-00-0	Phosphorothioic acid, O,O,-dimethyl O-
		(4-nitrophenyl) ester
P204	57-47-6	Physostigmine.
P188	57-64-7	Physostigmine salicylate.
P110	78-00-2	Plumbane, tetraethyl-
P098	151-50-8	Potassium cyanide
P098	151-50-8	Potassium cyanide K(CN)
P099	506-61-6	Potassium silver cyanide
P201	2631-37-0	Promecarb
P070	116-06-3	Propanal, 2-methyl-2-(methylthio)-,
		O-[(methylamino)carbonyl]oxime
P203	1646-88-4	Propanal, 2-methyl-2-(methyl-sulfonyl)-
		O-[(methylamino)carbonyl] oxime.
P101	107-12-0	Propanenitrile
P027	542-76-7	Propanenitrile, 3-chloro-
P069	75-86-5	Propanenitrile, 2-hydroxy-2-methyl-
P081	55-63-0	1,2,3-Propanetriol, trinitrate (R)
P017	598-31-2	2-Propanone, 1-bromo-
P102	107-19-7	Propargyl alcohol
P003	107-02-8	2-Propenal
P005	107-18-6	2-Propen-1-ol
P067	75-55-8	1,2-Propylenimine
P102	107-19-7	2-Propyn-1-ol

Waste Code	CASRN	Substance
P008	504-24-5	4-Pyridinamine
P075	\1\ 54-11-5	Pyridine, 3-(1-methyl-2-pyrrolidinyl)-(S)-, & salts
P204	57-47-6	Pyrrolo[2,3-b]indol-5-ol, 1,2,3,3a,8,8a-hexahydro-
		1,3a,8-trimethyl-methylcarbamate (ester),(3aS-cis)-
P114	12039-52-0	Selenious acid, dithallium(1+) salt
P103	630-10-4	Selenourea
P104	506-64-9	Silver cyanide
P104	506-64-9	Silver cyanide Ag(CN)
P105	26628-22-8	Sodium azide
P106	143-33-9	Sodium cyanide
P106	143-33-9	Sodium cyanide Na(CN)
P108	\1\ 57-24-9	Strychnidin-10-one, & salts
P018	357-57-3	Strychnidin-10-one, 2,3-dimethoxy-
P108	\1\ 57-24-9	Strychnine, & salts
P115	7446-18-6	Sulfuric acid, dithallium(1+) salt
P109	3689-24-5	Tetraethyldithiopyrophosphate
P110	78-00-2	Tetraethyl lead
P111	107-49-3	Tetraethyl pyrophosphate
P112	509-14-8	Tetranitromethane (R)
P062	757-58-4	Tetraphosphoric acid, hexaethyl ester
P113	1314-32-5	Thallic oxide
P113	1314-32-5	Thallium oxide Tl2 O3
P114	12039-52-0	Thallium(I) selenite
P115	7446-18-6	Thallium(I) sulfate
P109	3689-24-5	Thiodiphosphoric acid, tetraethyl ester
P045	39196-18-4	Thiofanox
P049	541-53-7	Thioimidodicarbonic diamide [(H2N)C(S)]2 NH
P014	108-98-5	Thiophenol
P116	79-19-6	Thiosemicarbazide
P026	5344-82-1	Thiourea, (2-chlorophenyl)-
P072	86-88-4	Thiourea, 1-naphthalenyl-
P093	103-85-5	Thiourea, phenyl-
P185	26419-73-8	Tirpate.
P123	8001-35-2	Toxaphene
P118	75-70-7	Trichloromethanethiol
P119	7803-55-6	Vanadic acid, ammonium salt
P120	1314-62-1	Vanadium oxide V2 O5
P120	1314-62-1	Vanadium pentoxide
P084	4549-40-0	Vinylamine, N-methyl-N-nitroso-concentrations
		greater than 0.3%
P205	137-30-4	Zinc, bis(dimethylcarbamodithioato-S,S[prime])-,
P121	557-21-1	Zinc cyanide
P121	557-21-1	Zinc cyanide Zn(CN)2
P122	1314-84-7	Zinc phosphide Zn3 P2, when present at
		concentrations greater than 10% (R,T)
P205	137-30-4	Ziram.

\1\ CAS Number given for parent compound only.