



California State University, Stanislaus

**Biosafety/Biohazard Manual
for
Academic and Research Laboratories**

Department of Biological Sciences

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General Safety Procedures and Prudent Practices

Regulations do not take the place of personal responsibility. The instructor must help keep the teaching laboratories safe.

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I. Purpose of the Manual

This manual provides the policies and procedures for the safe handling and disposal of biohazards used in teaching and research laboratories of the department of Biological Sciences at California State University, Stanislaus (CSUS). These requirements are based on present knowledge and may change as research and teaching needs expand and new legislation is written.

The intent of this manual is to provide procedures to ensure the safety of students and faculty in the teaching and research laboratories and to comply with the following federal and state regulations:

- 29CFR 1910, 1915, and 1926 (=Code of Federal Regulations or “General Safety Orders”)
- American Chemical Society Lab Safety Best/Prudent Practices
- Cal OSHA, California Code of Regulations Title 8 Section 3203

The Biosafety/Biohazard Manual should not be considered the only reference for health and safety concerns. However, this document does provide a compilation of suggested work practices, protocols and systems to work safely in the Department of Biological Sciences laboratories. In addition, the Office of Environmental Health and Safety (EH&S) is available to address health and safety concerns. This document will be evaluated and updated at least annually by the department Health and Safety Committee. There are also several appendices to this manual on the proper disposal of hazardous wastes, the Injure and Illness and Prevention Program and the university Exposure Control Plan.

II. Responsibility in Safety and the use of Biohazards

A. Department Chair

1. Ensuring that faculty, students and staff have received training in identifying hazards in the laboratory.
2. Disseminate and inform faculty and staff of University and department health and safety policies
3. Maintain records of safety training of faculty, staff and students.
4. Designate a Department Safety Coordinator (DSC).

B. Course Instructor or Principle Investigator

1. Implement all applicable health and safety policies in the laboratory
2. Supervise and be responsible for all lab personnel, including students.
3. Instruct lab personnel and students on the location and use of all safety equipment in the laboratory.
4. Be well-versed on the use and biohazard potential of all lab materials
5. Supervise the laboratory to ensure that safe practices and engineering controls are employed.
6. Develop emergency procedures specific to the biohazards in their lab.
7. Clearly label all biohazards and biohazard work areas.

8. Fill out and return the Department of Biological Sciences Safety Instruction and verification form to the department chair the first week of each term or the first day or after the first class meeting.
9. Ensure the proper disposal of all hazardous materials as listed in Appendix A.

C. Department Safety Coordinator (DSC)

1. With the department Health and Safety committee, coordinate and develop the department biosafety/biohazard program.
2. Provide information on the handling and disposal of biohazards.
3. Organize disposal of biohazards.
4. Train personnel including students in basic safety techniques as needed.
5. Respond to emergency situations
6. Document violations of the safety policies and report to the Department Health and Safety Committee.
7. Report injuries requiring medical attention to the University Department of Environmental Health and Safety (EH&S)

D. Department Health and Safety Committee (DHSC)

1. Review all department safety procedures yearly and provide updates to the policies and procedures.
2. Review current and new laws affecting the use of biohazards.
3. Review all biohazards and approve their use and procedures for their disposal.
4. Conduct yearly safety inspections of all laboratories, providing the primary users of the laboratories with a list of any deficiencies and then ensuring the deficiencies have been corrected.
5. Keep all committee records in the department office.

E. University Director of Environmental Health and Safety (EH&S)

1. Provide consultation to Department Deans, Directors, Chairpersons, and Coordinators regarding program compliance, including but not limited to: issues of hazard identification and evaluation, procedures for correcting unsafe conditions, systems for communicating with employees, holding regularly scheduled safety meetings, providing employee training programs, regulatory compliance strategies, and recordkeeping.
2. Provide centralized monitoring of campuswide activities, on a consultative basis, in the areas of biological safety, chemical hygiene, emergency preparedness, fire safety, hazard communication, hazard identification, hazardous materials management, industrial hygiene, occupational safety, pest management, public health and sanitation, radiation safety, risk management, and safety education and training.
3. Maintain centralized environmental and employee monitoring records, allowing employee access as directed by law.

III. General Safety, All Laboratories

- Learn the locations of the nearest fire extinguishers, safety showers, first aid kit, spill kits, eye-wash fountain, and phone, so that you can use them quickly in the case of an emergency.
- When working with chemicals or biohazards, wear safety goggles, or use a face shield or other appropriate safety measures as outlined in the MSDS. If you get chemicals in your eyes, wash them with flowing water from the tap, sterile eye-wash solution, or eye-wash fountain for 15 to 20 minutes. Seek IMMEDIATE medical attention for all chemical splashes into your eyes. Call 9-1-1 from any campus phone for immediate assistance.
- Wear gloves when handling corrosive chemicals or biohazardous materials. Gloves should be removed and hands washed before leaving laboratories.

If corrosive acids or bases come in contact with your skin, WASH THE AREA IMMEDIATELY WITH WATER FOR AT LEAST 10 MINUTES. If the contaminant is an acid, then after washing with water bathe the skin with dilute sodium bicarbonate (baking soda; 1 teaspoon per liter or quart of water) for about 10 minutes. If the contaminant is a base, then after washing bathe the skin with a dilute solution of acetic acid or boric acid for about 10 minutes. If the skin blisters, seek immediate medical attention. If biohazardous materials get on uncovered skin, wash the area IMMEDIATELY with soap and water.

- Never use mouth suction to fill pipettes. Use a mechanical device to fill pipettes.
- Do not eat, drink or smoke in the lab. Do not store food in refrigerators located in laboratory rooms. Do not eat ice from the laboratory ice machines. Never eat or drink from laboratory glassware.
- Label containers to identify their contents. Label wash bottles as “water” or “acetone” or “ethyl alcohol”, etc., not with abbreviations. If appropriate, include an NFPA designation label.
- All chemicals must be collected in proper containers for waste disposal. Before you use a chemical, find out how you will dispose of the waste. No chemicals may be put down the drains in the laboratories.
- If you have HOT glassware, place it on a mat to cool, or place protective gloves next to it; this will signify to all laboratory personnel that the glassware is hot.
- Do not force glass tubing into rubber stoppers. Lubricate the tubing and introduce it gradually and gently. Protect your hands with a towel when you are inserting lubricated tubing into a stopper. In clamping glass tubing or glassware for apparatus setups, don't tighten the clamps any more than necessary to hold the glass in place (i.e. do not squeeze the glass).
- Confine long hair, dangling jewelry or clothing.
- Be extremely cautious when you are lighting a Bunsen burner. Most laboratory fires can be smothered if done immediately. A cloth towel should be kept handy for this purpose. In the event of a fire, immediately turn off the gas cock that feeds any burner. If necessary, use a fire extinguisher to put out the fire (fire extinguishers should be used by trained personnel, contact the office of EH&S for training 667-3035).

- Do not wear open-toed shoes (Sandals) or shorts when handling chemicals or other hazards. They do not provide enough protection to the body.
- Avoid wearing contact lenses in the labs when working with chemicals that produces vapors or dust. If you must wear contacts, protect your eyes with goggles.
- Point a test tube containing a reacting mixture away from yourself and other personnel. Use a test tube holder when a reaction in a test tube is anticipated.
- Do not work alone while using hazardous materials. Have someone remain nearby in case of an emergency.
- Read the label carefully and review the MSDS before removing a chemical from its container.
- Report all accidents requiring medical attention to:
 1. University Police (9-1-1 for immediate assistance or 667-3114 to report a non-emergency incident).
 2. Department Safety Coordinator/Department Chair
 3. Environmental Health and Safety (667-3035 to conduct a follow-up investigation).
 4. If an employee is injured, please complete a Supervisor's Report of Injury and forward it to Human Resources.

IV. General Housekeeping

Students are responsible for keeping their own work areas clean. The facilities staff empties trash routinely, but does not clean labs.

If a lab needs to be mopped, or you find damaged furniture or faulty plumbing or electrical fixtures, floors or ceiling tiles, call facilities at 667-3211 and schedule a repair.

- Lab work areas such as benches, shelves, tables, etc., should be orderly, clean and uncluttered before lab work even begins. Clean your work bench area, put away all equipment and reagents, and wash your hands at the end of each work session.
- Properly store or secure laboratory chemicals.
- If a chemical or procedure could contaminate your clothes, wear a lab coat.
- Place broken glass into dedicated waste containers labeled "Glassware Only." when full, notify the Biology Support Technician.
- To dispose of sharps (needles, razor blades, scalpels, etc.), place sharps into a red "BIOHAZARDOUS SHARPS" container. When full, seal the container (most have a permanent locking lid) and give it to the Department Safety Coordinator (DSC) to be disposed through a biohazard pick up.
- Keep areas around balances clean. Immediately clean up any chemicals spilled on or around the balance.

V. Maintenance and Inspections

To ensure that all laboratory equipment is functioning properly, routine maintenance and inspections may be necessary. Protective/safety equipment such as fume hoods or eyewash fountains **MUST** be kept in proper working order and special measures need to be taken to maintain adequate performance of such equipment. Maintenance and inspections of protective equipment are the responsibility of Facilities. If you believe your safety equipment is not being routinely inspected, contact the DSC.

A. Fume hoods and biological safety cabinets.

A fume hood moves chemical fumes and vapors out of a work area to the outside of the building. A biological safety cabinet circulates air so it forms a laminar flow. This prevents cultures or other materials inside the work area from being contaminated by the outside air. Laminar flow of air also prevents aerosols or microbes inside the hood from escaping. In general, a safety cabinet is not tied into the central ventilation system. Both fume hoods and biological safety cabinets should be inspected annually for adequate airflow. Do not use a hood without a current inspection tag. Contact the DSC if you suspect a hood is not performing as required. Defective hoods and cabinets must be repaired before they are used again.

B. Eye-wash fountains.

Emergency eye-wash fountains are located in all labs in Naraghi Hall. Some are located at sinks and at least one is a stand alone eye-wash station. Like other safety equipment, emergency eye-wash fountains should be inspected annually by Facilities.. If an eyewash station in your lab is not being inspected routinely, let the DSC know of your concerns.

C. Safety showers.

Emergency safety showers are located in the laboratories of Naraghi Hall. Note there are no floor drains in the laboratories, use of the showers should be for emergencies only.

VI. Personal Protective Equipment: Lab Coats, Gloves, Eyewear etc.

The personal protective equipment (PPEs) most often used in biology labs are gloves, goggles, face shields, and lab coats. All personnel should receive lab-specific safety training on when and how to use these items. If you need a refresher, here are some guidelines.

A. Appropriate dress/lab coats.

A laboratory is not the place for impractical clothing. When possible, wear sturdy cotton trousers or long skirts and thick, well-worn shirts with long sleeves. If used, cotton lab coats are preferable to those made from other fabrics. Some other resilient material may be just as good, but synthetic fabrics tend to melt and adhere to skin if they burn. Keep your feet completely covered with leather or thick canvas shoes that are comfortable for extended periods of standing and walking around. Sandals and clogs are not appropriate footwear in laboratories.

B. Eyewear.

Always wear goggles or use a face shield when working with chemicals, strong acids or bases, biohazardous materials, or organic solvents. Contact lenses should be removed in laboratory situations where you will be around chemicals that readily generate vapors of any sort, i.e. volatile organic liquids or solids, corrosive mineral acids, lachrymators, and dust-like solids. These vapors and particles easily become trapped underneath the lenses thus concentrating the chemical vapors, causing irritation and making lens removal difficult. If contact lenses must be worn for some reason, cover your face with tight-fitting safety goggles. More elaborate eye protection, including full face shields, may be appropriate when there is a high risk of contamination.

C. Gloves.

Wear impermeable gloves when working with hazardous chemicals or infectious agents. As a general rule of thumb, always wear gloves with any hazardous chemicals that require you to wear safety goggles. Which type of gloves you choose to wear is dictated by the general class of chemical you will be exposed to in the lab. Disposable latex and PVC gloves are most common and have an important practical role in the lab. *If your hands swell or develop a rash when you wear latex gloves, you may have a latex allergy. Switch to nitrile or other non-latex disposable gloves.* Always remove gloves and wash your hands before leaving a laboratory. If you are uncertain of the type of gloves to wear, contact the DSC.

D. Disposable dust masks.

Disposable dust masks should be used for chemical operations that tend to generate dust, air-borne powders and potentially toxic aerosols. For example, a dust mask may be worn while weighing fine chemical powder on an analytical balance.

VII. Guidelines for Specific Situations

Not every laboratory uses the same equipment or procedures. This section describes basic safety practices for the most commonly encountered situations. If your laboratory has other procedures that pose a risk to personnel, you are required to write your own safety guideline, and after approval by the Department Health and Safety Committee, append it to this manual.

A. Biohazards

Some toxic chemical compounds are not synthesized, but purified from biological sources. Examples include mushroom or spider toxins, or plant poisons. At other times, live biological materials (viruses, bacteria, parasites, etc.) that could infect humans, other animals, or crop plants are used. Finally, some manufactured chemicals are strong mutagens or carcinogens. These materials do not fit in the National Fire Protection Association (NFPA) labeling system. Instead they are labeled as “*biohazardous*”. The international standard logo for biohazardous materials is fluorescent orange and black, and is reproduced below.



Each biohazard has its own unique properties, handling requirements, and proper technique for disposal. It is important that you know these requirements, as well as signs and symptoms of exposure. The best source for information will be the MSDS for that material. Any biohazard must be cleared by submitting a protocol to the Department Health and Safety Committee (DHSC) before starting work. Approval of the BHSC must be obtained before work begins.

If a particular laboratory will be handling large quantities of biohazardous materials, “BIOHAZARD” placards must be placed on the door. If a lab you must work in has been posted for biohazardous materials:

- Familiarize yourself with the properties of the hazard, even if you are not working with it.
- Be SURE to follow ALL disposal and decontamination procedures.
- Wear gloves and safety goggles at all times.
- Remove and properly dispose of your gloves and wash your hands thoroughly before leaving the laboratory.

B. Disposing of carcasses, sharps, and similar biohazardous waste

Disposing of animal remains, boxes of used sharps, and other Regulated Medical Waste is coordinated by the DSC. Contact the DSC to schedule the removal of sharps. Twice a year, a commercial vendor removes our biohazardous waste and incinerates it, usually at the end of fall and spring semesters. Additional pickups can be scheduled if the need arises.

To dispose of biohazardous waste, follow the guidelines in Appendix A. Except in unusual circumstances, all biohazardous waste must be in Room 134 no less than two weeks prior to a scheduled pickup. For animals, use the following procedures to hold for disposal:

- Place all animal remains in labeled (Name, phone #, date) plain plastic bags in a laboratory freezer, or in the large animal waste freezers in the Vivarium in Room 234H. Do not risk contaminating a -80°C freezer by using it for biohazardous waste storage.
- Place used and contaminated needles, razor blades and other sharp items in a Red Biohazard Sharps Container. Sharps containers can be acquired through the stockroom.
- If you have biohazardous waste OTHER than animal carcasses, it must be sealed in specially marked “Biohazard” bags. Biohazard bags and boxes can be obtained in the stockroom.

If you see that the freezer in Room 234H is nearly full, inform the Biology Support Technician so he can schedule removal. The binder describing the materials taken for disposal are kept on file in Room 235.

C. Procedures for Microbiological Materials

Potential pathogens and toxic microorganisms such as bacteria, yeast, filamentous fungi, etc., are not shipped out for destruction. Individual laboratories are responsible for destroying all microorganism-related waste they generate. Follow these procedures for disposal.

- Prior to beginning a procedure, obtain an unlabeled red plastic bag from the stockroom. Attach the label to the bag and use it to collect contaminated solids, spent agar plates, etc. Also obtain a large beaker or flask from your own laboratory glassware. Use this container to collect contaminated liquids such as spent media or liquid cultures.
- As you work, place contaminated liquids into the liquid container. When you are finished working for the day, the liquid waste should be autoclaved. After autoclaving, the liquid can then be flushed down the drain, followed with at least 20 volumes of water.
- ***Do not collect liquid waste for more than one day; liquid wastes should not be left in the lab.***
- Instruments and any liquid hazardous biological materials should be decontaminated by autoclaving them. Containers to be autoclaved can not be more than $\frac{1}{2}$ full.
- If you have not filled a red bag with spent agar plates, disposable pipets and plastic ware, it may be saved and filled at a later date. Fold down the unused portion and tape it shut. ***Do not hold bags containing these solid wastes for more than 7 days; autoclave them.***
- To sterilize a red bag, fold down the top portion and tape it loosely with autoclave indicator tape. Place the bag in a shallow tray to catch any leaking media, then autoclave it for at least 20 minutes at 121°C .
- After the bags have cooled, they must be relabeled before disposal. Obtain a Non-Hazardous Waste sticker label from Room 235. Cover the original Biohazardous Waste label with the new label. The red bags can now go into general trash.

D. Using a Fume Hood

Fume hoods are important pieces of safety equipment in a laboratory. They should not be used as an “out of the way” storage space. Chemicals should never be stored in a fume hood.

- Prior to using a hood, check to make sure that exhaust fan is operating and that air is entering the hood.
- Avoid placing your head inside the hood. Also, keep hands outside of the hood as much as is practical (within limits of the procedure).
- Always work as far back in the hood as possible. Work with materials that produce fumes AT LEAST 6" behind the front sash.
- Keep hoods clean and organized. Clean up spills immediately. Periodically clean hood interiors. Replace burned out light bulbs to maintain maximum illumination.
- If corrosive or volatile materials are used, the hood exhaust system must be in operation at all times.
- Avoid blocking off baffle exhaust slots with bottles or equipment.
- Always keep the sash positioned as low as possible, when working with hazardous materials.
- Air disturbances may draw fumes out of hoods. Block all cross drafts, and keep personnel from walking directly in front of hoods as much as possible while you are working in the hood.
- DO NOT place large, bulky objects directly on the hood working surface. Block them up 2" to 3" to allow a flow of air under the object and into lower exhaust slot in the back of the hood.
- Periodically check for proper air flow by hanging a Kimwipe or piece of tissue paper from the front sash. If there is not sufficient air flow to draw the tissue into the hood, check to see that the exhaust fan is operating.

If the fan is not working properly, contact the Biology Support Technician.

VIII. Mechanical & Electrical Equipment

A. Sterilizers

Sterilizers pose potentially serious hazards. They use high–pressure steam, which can cause severe or even lethal burns. Fortunately, the new sterilizers have built-in safety devices to prevent accidents, but when using them you still should adhere to a few simple rules.

- No one should use the autoclave unless specifically trained by the Biology Support Technician.
- Always wear safety equipment (goggles and thermal gloves) when operating the sterilizer.
- Make sure that caps are loose on all bottles and other vessels. A tightly closed bottle may implode under pressurization. Worse, if a vessel is pressurized during sterilization, but does not vent pressure during the exhaust phase, it may explode as it is removed from the chamber.
- Be careful not to touch the walls of the sterilizer chamber. Though not as great a risk as the steam, the chamber walls can still burn you seriously.
- Always select the ‘liquids’ cycle if any component of the load contains liquid. Never sterilize containers filled with liquids that are more than ½ full, they may boil over and create a mess in the autoclave. It is fine to sterilize dry goods like instruments or empty bottles on the liquid cycle; it will not hurt them.
- Always make sure that the door is seated before turning on the steam.
- NEVER open the door until the display screen prompts the operator. If opened when the pressure or temperature is higher, the rush of steam can burn your hands, face or body. The pressurized steam may even penetrate the cloth of uncoated thermal gloves, or condense on disposable latex gloves.
- When unloading, be especially cautious of vessels that contain liquids. Superheated solutions may boil over as soon as the vessel is touched or moved. Large volumes of liquid are more likely to be superheated than small–volume solutions. If the liquid shows any signs of boiling, let it sit for a few minutes before attempting to move the vessel.
- When finished, always leave the door closed and in the Standby condition..
- The department currently has 2 autoclaves. The one in Room N335 and the other in N235.

B. Electrophoresis Power Supplies

Electrophoresis units present electrical and chemical hazards. All of these hazards need to be addressed before using the units. Many laboratories on campus routinely use electrophoresis equipment without incident. However, power supplies operate at sufficiently high voltage and amperage to deliver a potentially fatal electric shock. Please follow these guidelines when conducting electrophoresis experiments:

- Electrophoresis experiments are potentially very hazardous because of the presence of ionic solutions in proximity to high voltage and currents. The amount of current through

the human body for a given voltage depends on the resistance of the body. The interior of the human body is a good conductor due to the abundance of ions in body fluids. The main barrier to current flow is the skin. The resistance of the skin decreases when it is wet, and decreases greatly when it is wet with an ionic solution such as an electrophoresis buffer. The following electrical current guidelines have been provided for your safety:

AC Current	DC Current	Effect *
1mA	10mA	Threshold of sensation
>10mA	>60mA	Strong involuntary muscle contractions. You may not be able to release a live wire, or you may be thrown across the room by the contraction.
>100mA	>500mA	Cardiac Arrest

* Typical electrophoresis power supplies produce direct current (DC) up to 3,000 volts and 500 mA.

- Set up the equipment properly. Place electrophoresis units and their power supplies so that the ON/OFF switch is easy to reach and the power-indicator lights are easily seen. Locate the equipment where it will not be easy to knock over or trip on.
- Routinely inspect electrophoresis units and their power supplies to ensure that they are working properly. Power supplies should be inspected to ensure that all switches and lights are in proper working condition, that power cords and leads are undamaged and properly insulated, and that “danger—high voltage” warning signs are in place on the power supply and buffer tanks.
- Watch out for fluid leaks! They can act as pathways for current and electrical shock, or lead to fires. Inspect gaskets on vertical electrophoresis chambers to ensure they are not leaking. If leaks are found, contact the manufacturer for replacement gaskets. Inspect the electrophoresis chamber for buffer leaks. Leaks may also occur if there is crazing or cracking of the plastic. DO NOT wash plastic tanks with organic solvents; that is the main cause of crazing.
- Use Safety Guards. Inspect the safety guards that are found on your equipment to ensure they still function properly. These may include a no load sensor, open load sensor or ground leakage detector on the power supply, and safety interlocks on the electrophoresis tank cover.
- The user should always turn “OFF” the main power supply switch and wait 15 seconds (the voltage may not be completely discharged from internal capacitors) before making any disconnection (or connections). After use, turn power supply off first, and then disconnect both leads from the power supply. **remember: power supply on last...off first!**

- Avoid large electrical ground or conductors, (sinks, metals plates, aluminum foil, jewelry, pipes or metal equipment) when working around or near a power supply. A non-conducting (wood or plastic) bench and floor (and/or rubber mats) are preferred in the lab.
- **“Caution: high voltage”** signs must be posted around electrophoresis equipment and on shield barrier while an electrophoresis system is in operation.
- Always maintain adequate clearance around your apparatus. Don't permit leads to dangle below the lab bench. Never position the power supply so that you must reach across the apparatus to make connections or turn the power ON or OFF. Whenever possible set the power supply on a shelf above the gel box.
- DO NOT place other equipment or perform procedures in close proximity to electrophoresis equipment (do not crowd it!). Keep the area free of organics solvents or combustibles. **good housekeeping is essential!**
- Connect BOTH supply leads to the power supply just BEFORE turning on the power supply. This keeps one lead from being live in your hand.
- If electrophoresis buffer is spilled or leaks from the gel box, then stop the run and clean up the bench top.
- Always think and look BEFORE you touch any part of the apparatus. Be sure that your hands are dry BEFORE you touch any electrical apparatus.
- DO NOT touch any part of the apparatus while the power is ON, not even the plastic parts. A thin, inconspicuous film of moisture can still act as a good conductor of electricity.
- Some power supplies produce high voltages when they are first turned on, even if the voltage is set to zero. Don't ignore safety rules just because the voltage is low. Changes in load, equipment failure or power surges can raise the voltage anytime.
- DO NOT rely on safety interlocks—they can fail! Always turn “OFF” the power BEFORE removing a cover.
- DO NOT touch any cooling apparatus connected to a gel. The current can be conducted through the tubing.
- Make sure power supplies and apparatus are properly matched. Some chambers may be damaged by excessively high voltages.

C. Centrifuges

Centrifuges are used to separate liquid and solid materials, or non-miscible liquids. Centrifuges present a laboratory hazard because of the high-speed rotor mechanism, and because the materials being separated are often in glass tubes. Although centrifuges seem simple to use, you should adhere to some important rules.

- Before starting, it is essential to make sure that the tubes used are of equal weight, and are positioned symmetrically across the rotor. If a rotor becomes unbalanced due to uneven weight, it can ruin the centrifuge, as well as hurl dangerous metal or glass debris at anyone nearby.
- Tubes should be weighed to make sure that they are equal in weight, with the caps included in the weight.

- Be sure that lids are tightly closed, so that no leakage occurs during centrifugation.
- Tubes should be placed in the rotor, so that tubes of equal size and weight or volume are directly across from each other. This is particularly important when using a swinging bucket rotor.
- If there is one, be sure that the lid to the rotor is screwed on tightly.
- BEFORE beginning centrifugation, use the charts that indicate the maximum rotor speed. **never exceed the rated maximum speed for a rotor; if you do, the rotor can shatter!**
- After starting a centrifugation run, stay close enough to make sure that the rotor reaches the correct speed and that the centrifuge is operating properly.
- When the centrifuge is finished, let it completely stop before opening it. Most centrifuges have mechanisms that prevent lock the lid until the centrifuge stops completely stopped. There may be an emergency override mechanism for the lid locks. Do not use this override to open the centrifuge just because you are impatient.
- After removing tubes, check for leakage and condensation in the rotor. If there is either, remove and rinse the rotor with water or appropriate soap, if needed.
- If there are chemical or radioactive spills, then use appropriate decontamination procedures.
- After washing, invert and let the rotor dry before returning it to the centrifuge.

D. Safe Use of Compressed Gas Cylinders

In the Biology Department there is a relatively small variety of compressed gas cylinders, mostly carbon dioxide (CO₂) and some oxygen (O₂) and nitrogen (N₂) gases. The Biology Department owns all of their gas cylinders, but on occasion my rent. When a gas cylinder is empty and needs to be ordered contact the technician. The local gas company's delivery person will pick up the empty gas cylinders and install the refilled cylinders to the regulators. Follow these general guidelines when using compressed gas cylinders.

- Leave the identifying labels on cylinders.
- Store flammable gases like hydrogen away from oxidizers and corrosives, like oxygen and hydrogen chloride gas or ammonia.
- DO NOT use inappropriate hose material as dispensing tubes from gas cylinder regulators. Corrosive gases may destroy rubber or latex tubing. Use Tygon tubing or some other durable material.
- When cylinders are no longer in use, take off their regulators, cap them, and call the Biology Support Technician for removal. Don't allow unused cylinders to accumulate in your laboratory.
- Cylinders that have corroded valve stems, gas line fittings, or regulators are dangerous and should be removed or exchanged.
- Handle gas cylinders with extreme care. The contents are under a high pressure and they become powerful missiles when the valve stem is sheared off. This often happens when they are dropped, especially if the valve stem falls against something on the way down. Prevent this by keeping the valve cap ON while moving a cylinder.

- NEVER leave cylinders unstrapped in the lab. By law, they must be secured to a wall with heavy straps or a chain.
- DO NOT grease or oil the thread of a cylinder valve. If the valve is rusted, don't use the cylinder. Oil on a gas cylinder thread will soon be under high pressure. If the gas reacts at all with organic material, this could lead to an explosion. Teflon tape can be used for gas line threading, but it is best not to use it on the primary fitting connection between the regulator and the cylinder.
- NEVER open a cylinder without a regulator attached.
- Flashback can occur when flames actually travel through a gas line back to the cylinder outlet. To prevent flashbacks, add "flashback arresters" to oxygen and hydrogen cylinders used to feed glassblowing, glass-working, or other torches.
- DO NOT over-tighten a hand-valve on a gas cylinder. If hand tightening will not completely close the valve, call the gas cylinder company immediately.
- NEVER completely expend a compressed gas cylinder. Leave approximately 20–25 psi in the cylinder prior to recycling.

E. Using Liquid Nitrogen Safely

Liquid nitrogen (N₂) can cause freezing burns of unprotected skin or eyes. It also creates a moderate danger of asphyxiation. In the Biology Department, liquid nitrogen is stored in small, insulated storage tanks especially designed to reduce warming and evaporation. Generally, these storage tanks are refilled from larger tanks purchased by the technician for individual labs. It is the primary user's responsibility to monitor liquid nitrogen levels and request refilling using the appropriate form. To work with liquid nitrogen safely:

- Always wear thick thermal gloves (e.g. Cryo-gloves) and goggles when handling materials being removed from or placed into the storage tanks and when dispensing liquid nitrogen from the storage tank for external use.
- Liquid nitrogen splashes and spatters very easily, especially when pouring it between vessels, or placing warm materials into storage tanks. Always wear goggles and a lab coat while working with open containers of liquid nitrogen.
- Keep your work area well ventilated. Keep the lab door open while working with liquid nitrogen. This reduces the chance that evaporating nitrogen will displace enough room air to cause you to faint.
- Keep the cap of all storage tanks in place as much as possible. Depending on the atmospheric conditions of the laboratory, liquid nitrogen may evaporate quickly. Liquid nitrogen is too expensive to waste because of careless handling.
- Check the level of liquid nitrogen in storage containers weekly. Allowing all of the liquid nitrogen to evaporate can destroy irreplaceable research work.
- Even if there is still ample nitrogen in a storage tank, it should be completely refilled at least every two months. This reduces the chances that a storage tank inadvertently runs dry.
- Brief skin contact with liquid nitrogen is relatively harmless. However, if liquid nitrogen is allowed to stay on the skin, serious skin damage occurs. If your skin comes in contact with liquid nitrogen, remove it immediately! If a burning sensation develops, seek

medical attention (by calling 9-1-1 from any campus phone); you may have been injured severely.

- In the event of a large liquid nitrogen spill, leave the room until the liquid nitrogen has completely evaporated. Do not stay and try to clean up, because you risk suffocation and death.

IX. Emergencies and Accidents

A. Emergency Assistance

To request emergency assistance on campus (fire, police or ambulance), dial 911 from a phone found in the lab or hallway. In all emergencies and accidents, the first consideration is your safety and the safety of those around you.

B. Preparation

In order to be prepared for an emergency, know the hazards of each compound you work with. MSDS sheets for all chemicals found in a laboratory listed in appendix D are found in appendix E.

C. Chemical Spills

In the event of a chemical spill, alert all persons nearby and evacuate the lab. The laboratories are equipped with chemical spill kits for volumes of 500 mls or less. For any spill of more than 500 mls, evacuate the lab and contact public safety (9-1-1), the DEPARTMENT SAFETY COORDINATOR and EH&S (in that order) and make no attempt to clean up the spill yourself. Be prepared to provide the identity, amount and location of the spill, as well as your location and phone number where you can be reached (not the lab phone since you should not remain in the area).

D. Biological Spills

The proper procedures to deal with biological spills vary depending on the agent, quantity and location of the event. For small spills (<500 mls) of BSL-1 or BSL-2 material use the following procedure:

1. Wearing gloves, lab coat and goggles, cover the spill with paper towels and disinfectant (Rocol or a 1:10 dilution of bleach).
2. Allow at least 20 minutes contact time with disinfectant.
3. Pick up towels and discard into biohazard waste container.
4. Pick up broken glass with forceps and place in Sharps container.
5. Re-wipe the spill area with disinfectant and wash your hands with soap and water.

For larger spills (>500 mls), evacuate the laboratory and call public safety (9-1-1), the DEPARTMENT SAFETY COORDINATOR and EH&S. Keep people out of the lab until the spill has been properly cleaned up.

E. Fires or Explosion

In the event of a fire or explosion in your lab:

1. Evacuate the building
2. Activate the building fire alarm
3. Dial 911 and report the exact location of the fire
4. Move away from the building onto grassy areas to avoid blocking emergency vehicles.

F. Accidents and Injuries

Each lab is equipped with a basic first aid kit with sterile gauze, adhesive bandages, and a CPR face shield. There are three additional first aid kits, one in N213, N235 and N335 with additional supplies in the event of an injury. Serious injuries that require medical attention must be reported to Public Safety (9-1-1). All injuries, even minor cuts, must be reported to the DEPARTMENT SAFETY COORDINATOR. EH&S may also need to be contacted, the DEPARTMENT SAFETY COORDINATOR will determine if an injury is reportable to EH&S.

X. Research Animals

When using animals for research or teaching purposes, two separate issues must be addressed. The first issue is the safety and welfare of the animals. The second issue is the occupational safety and welfare of individuals who work with animals during research and/or teaching. In describing proper safety precautions, “animals” refers here to both ectothermic and endothermic vertebrate species, including all mammals, birds, reptiles, amphibians, and non-pet fish. Generally, hazards associated with multi-cellular and unicellular invertebrate animals used for research or teaching that are prevented by good general lab practices.

Regulations for using vertebrates clearly state that study animals must be kept in facilities that limit or prevent infection with parasites or zoonoses that can be transmitted to humans. Moreover, animals must be housed in a manner that does not create hazardous working conditions for caretakers or other personnel. In order to obtain research funding, California State University, Stanislaus must abide by these standards. Therefore, all regulated animals used for research or teaching must be purchased, housed, and cared for according to federal guidelines. Compliance is monitored by the University Institutional Animal Care and Use Committee.

Any research or teaching project that uses purchased or captured live vertebrate animals, must be approved in advance by the university’s institutional animal care and use committee (IACUC). Forms for writing an animal care protocol are available from the Office of Research and Sponsored Programs Web site. Once a protocol is approved, laboratory strains of mammals and birds must be housed in accordance to procedures approved by the IACUC.. The university will not allow amphibians, reptiles, or fish to be housed on campus without a pre-approved animal protocol.

There are 3 types of occupational exposure to animals:

Continuous exposure. These individuals work all day with a mixture of animal species. Examples are animal caretakers. Continuously exposed individuals are at risk for exposure to a variety of zoonoses. Therefore, they must be trained directly by the DEPARTMENT SAFETY COORDINATOR, and must participate in a routine health monitoring program.

Intermittent exposure. Faculty, technicians, and graduate students are typically exposed to only one or two vertebrate species, and not every day. Subsequently, the principal investigator is responsible for explaining all of the following to technical staff and students:

- Specific zoonoses or infections to which they may be exposed (the most common are tetanus, and rabies).
- How to safely hold, restrain, and transport study animals.
- Required tests and immunizations (the most common is a tetanus booster).

Acute exposure. This includes undergraduates in teaching and research labs, and individuals having single or very infrequent exposures to vertebrates. Generally, these individuals can work with vertebrate animals ONLY if they are under the direct supervision of a faculty member or the Biology Support Technician.

A. General Guidelines: Personal Hygiene

- Do not eat, drink, smoke, or apply cosmetics in areas where animals are housed or used.
- Wear a laboratory coat over your street clothes when working with animals. This will minimize the contamination of street clothing. Laboratory coats should be left in the lab and should not be worn while eating, or in public areas.
- Wash hands thoroughly after handling of animals and prior to leaving the laboratory.
- Decontaminate all work surfaces daily and after any spill of animal related materials.
- Infections can be transmitted from animals to humans by fine particles of feces or urine that adhere to our hands, then get into our mouths. Organisms utilizing this mode of transmission include *Salmonella* spp., *Shigella* spp. and *Entamoeba* spp. Additional health problems are encountered when these organisms are carried home and children/infants are exposed. Take precautions to avoid this mode of transmission. Wash your hands frequently, change gloves, and wear a disposable face mask when working with animals.

B. First Aid for Bites, Scratches, Cuts, Abrasions, etc.

- Control bleeding by applying direct pressure with a sterile gauze or bandage.
- Disinfect the wound by washing with copious soap and water. (if available, Betadine surgical soap is recommended)
- Seek medical attention if the injury is extensive, is a deep puncture bite, if any skin lesions or neurologic symptoms (such as itching, pain, or numbness) appear near the site of the wound, or any other unusual illness develops. For immediate assistance call 9-1-1 from any campus phone.

Appendicies

[Exposure Prevention Program](#)

[Injury and Illness Prevention Program](#)

List of chemicals found in this laboratory
Laboratory specific and not included

MSDS for chemicals used in this laboratory
Laboratory specific but can be found at: <http://csustan.chemwatchna.com/>

**DEPARTMENT OF BIOLOGICAL SCIENCES
SAFETY INSTRUCTION AND VERIFICATION FORM
(STUDENT LABORATORY AND/OR FIELD WORK)**

TO THE INSTRUCTOR: Please read the applicable information printed on the "Instructions for Student Safety Verification Form" to your class (document available in your Department Office/Biological Sciences Website). **Check off each topic on this form as you discuss it with them. Write "N/A" for topics that do not apply.** Return the completed sheet to your Dept. Office the first week of each term or after the first class meeting. It is your responsibility to describe the hazards associated with the course and the appropriate health and safety measures needed to minimize the risks posed by the hazards. This document was designed to facilitate this task. Throughout the semester, it is your responsibility to ensure that the appropriate health and safety measures are followed. Any questions regarding this safety training and documentation and enforcement should be directed to the Department Chair, or the Department Safety Coordinator.

TO THE STUDENT: It is your responsibility to be knowledgeable in the safety-related matters associated with this course and to abide by the safety policies and procedures presented by the instructor. Part of the evaluation of your performance in this laboratory will be based upon your strict attention to these safety policies. **Failure to meet these requirements may result in expulsion or reduced grade.**

INSTRUCTOR NAME: _____ COURSE: _____ SECTION
NO.: _____

Part I. GENERAL SAFETY MATTERS: This entire section is required information for everyone.

- ___ 1. Right-to-know/Hazard Communication – Labeling containers and rooms
- ___ 2. Material Safety Data Sheets (MSDS)
- ___ 3. Goggle policy for liquids, UV light, flying particles.
- ___ 4. No eating/drinking/food and no smoking policies
- ___ 5. Housekeeping/clean-up
- ___ 6. Conduct in the laboratory or field site
- ___ 7. Reporting of accidents, exposures and injuries (Instructor must turn in an *Incident Report Form* too)
- ___ 8. Student medical costs (no coverage!)

Part II. SAFETY EQUIPMENT AND PROCEDURES: Points 5 and 6 apply to everyone.

- ___ 1. Safety shower
- ___ 2. Eyewash
- ___ 3. Fire extinguishers
- ___ 4. Proper Laboratory Attire (closed-toe shoes **REQUIRED AT ALL TIMES – NO sandals!**)
- ___ 5. Emergency evacuation route (required information for everyone)
- ___ 6. Emergency phone procedures (required information for everyone)
- ___ 7. College safety supply cabinet
- ___ 8. Chemical and/or biological hood

Part III. CHEMICAL AND EQUIPMENT HAZARDS: Point 10 applies to everyone. Point 14 may apply to many.

- ___ 1. Chemical storage and incompatibilities
 - ___ 2. Proper disposal of chemical wastes
 - ___ 3. Use and handling of concentrated acid and bases
 - ___ 4. Use and handling of toxic chemicals & exposure routes
 - ___ 5. Use and handling of carcinogenic chemicals
 - ___ 6. Use and handling of biohazards
 - ___ 7. Use of scientific glassware
 - ___ 8. Handling and reporting of chemical spills
 - ___ 9. Proper disposal of broken glassware/sharps (required information for everyone)
 - ___ 10. Use and handling of water reactive chemicals
 - ___ 11. Use and handling of oxidizing and reducing chemicals
 - ___ 12. Use and handling of reproductive toxins
 - ___ 13. Use and handling of compressed and/or liquefied gas
 - ___ 14. Equipment hazards (list the equipment to be used on this line)
- _____

Part IV. FIELDWORK AND TRAVEL HAZARDS: (Additional documentation required prior to departure. See NOTE to instructors below.)

NOTE: All instructors/trip leaders who conduct field trips **MUST** review the current *Field Trip Safety Manual*. This Manual is available in Department Office and Biological Sciences website. Prior to the first field exercise, the instructor/trip leader shall present the applicable portions of the Manual to the students and require the students to sign a separate training sheet at that time. You must give the sign-up sheet to your Dept. Office.

- ___ 1. Motor vehicle and driver requirements
- ___ 2. Field Trip Safety Manual (covers equipment, buddy system, emergencies, climate, terrain, wildlife etc. details.)

INSTRUCTOR CERTIFICATION

I Certify that I presented the applicable safety and health information to the students of this class as indicated above based upon the current Department of Biological Sciences *Instructions for Student Safety Verification Form*.

PRINT INSTRUCTOR'S NAME: _____

INSTRUCTOR SIGNATURE: _____ **DATE:** _____

=====

STUDENT CERTIFICATION

I hereby acknowledge that I have been instructed in and understand the applicable safety and health information, and safe use of materials, equipment and machinery as given by the instructor for this course as appropriate. I realize that inappropriate behavior and/or the misuse of equipment, materials etc. can lead to serious injury. I hereby agree to follow all instructions for student safety as given by my instructor now and in the future. I hereby agree to fully comply at all times with all Department of Biological Sciences and University policies and procedures associated with safety as pertains to this course. I hereby agree to work safely at all times, protecting both myself and those around me. I hereby agree to handle materials, equipment, machinery and other items identified by the instructor in accordance with the safety instructions provided during this course. I further agree that I will not operate any equipment or machinery or use any materials or other items identified as applicable by the instructor without appropriate instruction, supervision and understanding of the potential hazards involved. I understand that I am responsible for medical treatment costs if I am injured in this class.

Print Name	Signature	Print Name	Signature

Department of Biological Sciences

INSTRUCTIONS FOR STUDENT SAFETY

VERIFICATION FORM

Check off each item on the Safety Verification Form as you address it. **Obtain student signatures on the reverse side of the form and return the completed form to your Department Office within the first week of class or the first day the laboratory meets.**

YOU MUST PROVIDE CONTINUOUS OVERSIGHT DURING LAB/CLASS SESSIONS! *The presence of the instructor in the laboratory/classroom is required in order to respond to problems and to ensure that safety rules are enforced. Except for very brief intervals, instructors must not leave their class during laboratory/class sessions. It is your responsibility to relay the safety issues below to each of your students and to enforce these safety provisions throughout the semester.* Contact the Department Safety Coordinator if you have questions.

Part I - General Safety Matters

1. Right-to-know/Hazard Communication and Labeling: We all have the right to know (and are expected to know) about all chemicals (including consumer products) we will be exposed to in the lab class. YOU must make sure that all unattended materials are labeled with the **NAME** (no abbreviations) of the material and its **HAZARD** if any (e.g. flammable, corrosive, oxidizer etc.). We consider the material to be “Unattended” once the class has left the area.

2. Material Safety Data Sheets (MSDS): Additional information about chemicals/products is available in the form of Material Safety Data Sheets from the Department Safety Coordinator or via MSDS search engines linked from the department web page. Requests for MSDS’ will be honored (29CFR1910.1200(b)(3)(ii))

3. Goggle Policy: Chemical splash goggles with indirect vents must be worn by EVERYONE as soon as anyone in the class handles a hazardous material. **NO EXCEPTIONS!!!** (Per OSHA 3151 and 29CFR1910,1915, 1926)

[INSTRUCTORS: this includes you! Remember that you set the example! However, if you think that this rule is too restrictive for your class due to very limited hazardous material use,

contact the Department Safety Coordinator who will, in conjunction with the University Environmental Health and Safety Office (EH&S), provide for approval to set up an alternative setup such as a “goggle station” or a “splash shield station”.

Goggles are required even when using very small quantities of a hazardous material, such as when you are adjusting the pH of a buffer by adding a few drops of acid or base. Know what you are working with; chemicals such as Nitrate A and B, Kovac’s Reagent, Folin’s Reagent, Coomassie Blue, Biuret’s Reagent, ammonia etc. all require the use of goggles.

If you wear glasses, you **MUST** wear the goggles over the glasses since glasses do not provide acceptable protection. Contact lenses are allowed when worn under goggles. Wear the appropriate eye protection when working with anything that can injure the eyes, including flying particles, laser light, UV light, electric arc etc. If I see you not wearing your goggles when hazardous materials are handled I will be required to dismiss you from the lab. Remember:

ONLY those with proper goggles will be allowed in the lab! The bookstore sells goggles.

4. No eating/drinking/food/smoking: No food or drink is allowed in laboratories. Smoking is prohibited in university buildings and within 30 feet of entrances. You must leave these things outside, or keep them in your closed backpacks. **THIS INCLUDES PERSONAL WATER BOTTLES!** Putting on makeup or installing contact lenses is also prohibited in the lab.

5. Housekeeping: You must clean up after yourselves and make sure you clean up all spilled reagents. Never throw chemicals in the trash or into the broken glass box, and never pour them down the drain.

INSTRUCTORS: you MUST make sure that all spilled reagents have been cleaned up BEFORE you leave your lab!!! Don’t forget to inspect the balances for spills. If you enter your lab and find spilled reagents, please notify the Department Safety Coordinator immediately!

If any water is spilled on the floor, it must be cleaned up immediately to prevent slip/fall injuries and damage to the rooms below/adjacent etc. There is a mop available in N235. If the water can’t be promptly cleaned up, facilities should be called at X 3211. Prompt action is essential! In the case of chemical spill (including the use of emergency showers since the wash water will contain the chemicals), contact UPD/EH&S (X 3114) or 9-1-1 if an emergency. Evacuate the lab and report any chemical spill over 500 mls. Do not attempt to clean up larger spills, the labs are only equipped with spill kits for small spills.

6. Conduct: Inappropriate behavior will not be tolerated. Everyone must treat each other with respect. Visitors to the lab are not permitted. I, your instructor, am required to ask you to leave if you are behaving inappropriately, are disrupting class, or are refusing to promptly and fully comply with any Department Safety Policies. If you do not leave the class when asked, I may call the campus police (X 3114). Police will then escort you from the class. I am required to report problems of this nature to the appropriate authority.

7. Reporting Accidents/Incidents: Please report all injuries, dangerous equipment failures, chemical spills etc. the DSC and report them to EH&S. Injured students should go to the Student Health Center for medical evaluation. They may walk there with an escort or may be transported

by University Police. Neither you nor I may clean up blood! The EH&S office will do that for us once notified.

8. Medical: Please inform me if you think your health might be adversely impacted by any class activity, or if you think your state of health might adversely affect the ability of the class to perform the activity. I will make reasonable accommodation for you as necessary and when appropriate. You may be asked to consult your Doctor before proceeding with an activity.

Part II - Safety Equipment and Procedures

1. Safety shower: When working with hazardous materials that can injure the eyes or skin, a working emergency shower must be no more than “ten seconds” away. The path to the shower must be clear. The shower turns ON when the handle is pulled and will not turn off until the handle is pushed UP. The injured person must stay in the shower for 15 minutes minimum. Contaminated clothing must be removed. MOST SHOWERS HAVE NO DRAIN! Don’t worry about flooding the floor, the health of the person is more important. Never apply sodium bicarbonate or any other treatment to the injury – flush with water only!

2. Eyewash: The same rules apply as above. During the 15-minute flushing, the injured person should use her/his fingers to hold eyelids open and EHS should be called, and also 9-1-1 as necessary. Do not worry about flooding the floor. Inert absorbent is available in the Stockroom to put on the wet floor.

3. Fire extinguishers: These are in the room by doors exiting to the main hallway or just down the hall in a box. They should only be used by trained people. DON’T BE A HERO. Evacuate the room and pull the fire alarm as appropriate.

4. Laboratory attire: Close-toed footwear must be worn at all times (all semester long, from the second day of class through the last day) in any lab class that will **EVER** use hazardous chemicals at any point during the year (Per OSHA 3151 and 29CFR1910,1915, 1926). You must also wear a lab coat or apron in this lab if hazardous materials are used, in which case shoulders must be covered (no spaghetti strap-type tops). If you forget to wear close-toed shoes, you will not be allowed to stay in the lab.

5. Emergency evacuation procedure & route: We must always keep the doors to the lab closed during the lab session, but we can still hear the alarms since they sound inside each lab. If the alarm sounds, or you are ordered out of the lab, remember to TAKE YOUR BACKPACK! Turn off Bunsen burners etc. if possible. EVERYONE MUST GET 200 FEET AWAY from the building and occupy grassy areas so as to not block access by emergency vehicles– Do not bunch-up just outside the doorway!!! **[INSTRUCTORS:** *tell the class which exit would be*

safest for them, and lead them out when the alarm sounds] Please refer to the Emergency Procedures flip chart (red/white) for standard instructions and map of designated gathering areas

6. Emergency phones/blue boxes: These are located on walls in the science building hallways and in elevators. Use them to speak directly to university police, or dial 911 from a standard campus office or pay phone.

7. Safety Cabinet: *[INSTRUCTORS: A supply of safety items is available to you in the lab to help make your class safe. This includes a first-aid kit and a spill kit. Additional supplies are located in N213, N235 and N335. Notify the Department Safety Coordinator as you use materials as we want to keep them stocked.]*

8. Chemical and/or biological hoods: These hoods are used to protect people when lab work may produce harmful or bad-smelling/smoky emissions. Gas masks, respirators or dust masks are usually not allowed for protection on campus. To use the hood for protection, the glass sash MUST be at or below the sash "stop" catch. If arrow stickers are in place, the sash MUST be at or lower than those arrow markers. Never put your head inside the fume hood when chemicals are present. Don't use the interior of the hood as a writing desk! Report defective/alarming hoods to the Department Safety Coordinator promptly. An ineffective/suspect hood may not be used for protection.

Part III - Chemical and Equipment Hazards

INSTRUCTORS: You are required to know which chemicals will be used in your lab and the appropriate use/handling/disposal procedures. Ask the course coordinator if necessary.

1. Chemical storage and incompatibilities: Always return chemicals to their proper place, and store them compatibly! Hazardous liquids must be stored in secondary containers such as trays or buckets but remember to store incompatibles in separate trays. Separate acids from bases, oxidizers from organic materials such as combustibles/flammables/reducing agents etc. It is CRITICAL that you all remember that nitric acid will react violently with organic materials such as acetic acid! Always use a "bottle carrier" or other secondary containment carrier when transporting any chemicals to or from the lab. "Bottle carriers" are kept in the stockroom (N235).

Also watch out for flammable materials such as alcohols, acetone, ethers etc. and keep them away from ignition sources. **NEVER store them in standard refrigerator/freezers!** These are ignition sources (door opens, light comes on, spilled flammable ignites). If you must keep your flammables cold, store them ONLY in special "Flame-rated" refrigerators. Read the labels on the refrigerator so you know what kind it is! If you open a bottle of ether, don't forget to write the "opened" date on it as old ether may form explosive compounds.

2. Chemical Wastes: NO Chemical wastes may be poured down the drains in the labs.

Most labs have several, DIFFERENT waste containers. You MUST make sure you know which container is the correct one for your waste! Ask me if you're not sure! Otherwise you could cause a fire, explosion or some other unwanted chemical reaction. Containers must not be overfilled. It is everyone's responsibility to NOTIFY THE DEPARTMENT SAFETY COORDINATOR WHEN A CONTAINER IS $\frac{3}{4}$ FULL. They will then replace the container with an empty one. Waste containers must be kept closed when not in use. Remember, **DO NOT FILL A WASTE JUG MORE THAN $\frac{3}{4}$ FULL!!!**

ONE LAST TIME: WATCH OUT! DO NOT FILL A WASTE JUG MORE THAN $\frac{3}{4}$ FULL!!

[INSTRUCTORS: You are required to close any open waste containers at the end of your lab session]

3. Acids and Bases: Watch out for these corrosives as they can cause severe burns and blindness. Never mix acids and bases in a common waste container, or it may blow up! Use caution when adding concentrated acids or bases to a solution. "Do what you ought'er, add acid to water". Neutralize tiny acid spills/drips (NOT injuries) with bicarbonate solution.

4. Toxins: Many of the reagents used in the lab are toxic poisons. Ingestion, inhalation, and skin contact must be avoided. Even small amounts of some chemicals can kill immediately. We Instructors will provide specific safety/handling warnings as these materials are introduced into each lab exercise.

5. Carcinogens: Some chemicals may be classified as carcinogenic (capable of causing cancer) in addition to the other hazardous properties (e.g. Benzene is a flammable liquid, is toxic, but also can induce leukemia with extended exposure).

6. Biohazards: Some classes use pathogenic agents; all microbial waste and contaminated items, including waste contaminated with *E. coli*, must be collected and autoclaved prior to disposal. Items contaminated with human blood/blood products must be collected in specific RED containers.

[INSTRUCTORS: Prior approval from the EH&S and Department Health and Safety Committee is required if your class will use human products of any kind.]

7. Scientific glassware: If glass tubing or a thermometer must be inserted in a rubber stopper or cork, LUBRICATE IT so it goes in easily. If you don't it may break off and cut you!

8. Handling and reporting of chemical spills: We will call EH&S before cleaning up significant spills or spills which we do not feel capable of addressing safely. Once remedied report the spill to EH&S. An email to EH&S can fulfill the reporting requirement. Call 911 and/or pull the fire alarm if necessary to address a spill that may impact others in the building.

9. Broken glass and other sharp items: Broken glass must be cleaned up promptly, but NEVER put sharp items in the regular trash!! Put them in the special “Broken Glass” box. There is a broom and dust pan in each laboratory for such incidences. When full, tape shut and place in the hallway. Do not overfill and do not let the box get wet or too heavy. If the broken glass is contaminated with a hazardous material, package and label it as hazardous waste. Needles and scalpel blades must be discarded into approved needle boxes [***INSTRUCTORS:** You must follow the EH&S Needle Handling Policy”(on their website and appendix ? in the BioSafety/Biohazard Manual) when using needles.]*

10. Water reactive (also air-reactive) chemicals are especially dangerous. You will be alerted and given special instruction if such materials are introduced into the lab.

11. Oxidizing chemicals (such as hydrogen peroxide, and many chemicals whose names end in “ate”) are especially dangerous and may ignite or form explosive compounds on contact with organic materials such as flammables, combustibles, or other reducing materials, OR reducing agents such as metals etc. Oxidizers may not be mixed with or stored beside these materials. You will be alerted and given special instruction if oxidizers are to be handled. Remember, watch out for nitric acid, it is a very strong oxidizer and may react violently with organic materials such as acetic acid!

12. Reproductive Hazards: Some common chemicals, once in the body, target male and/or female reproductive systems or developing fetuses. As in the case of the toxic and carcinogenic chemicals, it is imperative that everyone in the lab strive to avoid exposure to the chemicals through use of the fume hood, gloves etc. Some low level exposures may be unavoidable. Anyone with concerns about chemical exposures associated with this lab can take the list of the chemicals associated with this lab to their medical doctor to consider if participation is appropriate.

13. Use and handling of compressed gas: Gas cylinders will be moved by the vendor. The installation and removal of regulators will be done under the direction of the DSC. Liquid nitrogen safety training will be presented if it is introduced into the lab.

14. Equipment hazards: We will discuss this according to use in the lab [***INSTRUCTOR:** consult course coordinators]* Some equipment is dangerous if improperly used (lasers, centrifuges etc.) MOST equipment is expensive and fragile! Specific safety issues associated

with equipment used in this lab will be presented when the equipment is first used. Anyone who misses all or part of that equipment safety instruction will not be allowed to use the equipment.

Part IV-Fieldwork and Travel Hazards

1. Motor vehicle and driver requirements: Anyone using a personal vehicle for University business must fill out the appropriate travel form in the Department Office. Anyone using a University vehicle, or a personal vehicle on University business, must complete the Defensive Driver Training Class conducted by the State Dept. of General Services.

2. Field Trip Safety Manual: *[INSTRUCTORS/TRIP LEADERS: Obtain the “Biological Sciences Field Trip Safety Manual” from the Department Office Or Biological Sciences Website. Discuss all pertinent issues with the field trip participants prior to departure on your field trip. Document this using the signup sheet found at the end of the manual (or equivalent) and bring the signup sheet to your Department office.]*