UAH LABORATORY SAFETY MANUAL

The UAH Laboratory Safety Committee

Revision Date:
2024

Review Dates for Laboratory Safety Manual

The UAH Laboratory Safety Committee (LSC) and the Office of Environmental Health and Safety (OEHS) is responsible for review and evaluation of this manual and to update as needed. The review dates are documented below.

Review Date	**Comments**	**OEHS**	**Lab Safety Committee**
2003	Original Plan	MLP	
2013	Revision 1	MLP	
2020	Revision 2	KO	
2024	Revision 3	HW	

DISCLAIMER

This Laboratory Safety Manual was prepared for use by the faculty, staff, and students at The University of Alabama in Huntsville (UAH). It is provided as a means of presenting the regulations and standards pertaining to safely performing laboratory work, and as guidelines to illustrate standard, accepted practices for conducting laboratory investigations safely. Neither the author nor The University of Alabama in Huntsville warrants its completeness or correctness. Any discrepancies noted should be brought to the attention of the UAH Office of Environmental Health and Safety.

PREFACE

The UAH Laboratory Safety Manual serves as a tool to provide information to the University Community on minimal safety procedures required in campus laboratories. The goal of this manual when paired with appropriate training is to attain zero injuries, illnesses, and or destruction of University property while ensuring faculty, staff, and student awareness of appropriate laboratory safety practices.

This manual also serves to promote the environmental health of UAH and the surrounding community. It is imperative that each member of UAH faculty, staff, and students who are working and learning in laboratories be knowledgeable in the proper procedures associated with the safe handling, storage, and disposal of laboratory chemicals and paraphernalia. Use of the guidelines herein is critical to accomplishing the UAH safety and environmental goals.

As we work to provide accurate laboratory safety information in this manual, please remit any comments and recommendations to the UAH Office of Environmental Health and Safety (OEHS). Our goal is to provide service of the highest quality.

I. Introduction

The UAH Laboratory Safety Manual is for use as a general guide in safety for chemical laboratories on the UAH campus. In-depth information can be obtained from the OEHS or a number of publications. *Prudent Practices for Handling Hazardous Chemicals in Laboratories* is a publication highly recommended for all laboratories utilizing hazardous chemicals.

II. Emergencies

Call the UAH Police Department (UAHPD) for immediate assistance when chemical exposure and or injury has occurred. UAHPD will immediately contact the appropriate parties. The UAHPD can be reached by dialing **(256) 824-6911** on any campus phone. Emergency laboratory situations in which UAHPD should be notified include but are not limited to; hazardous chemical, radioisotope, and biological agent spills. Injuries and exposures should be attended to immediately and the UAHPD contacted as soon as possible to request an ambulance or other assistance. A laboratory door sign indicating emergency phone numbers must be posted in all laboratories; the template is available in Appendix A.

When an employee sustains an OJI, the employee should notify his/her supervisor immediately, if possible, and in any event no more than two (2) business days after the date of the injury. The employee should also contact the Office of Risk Management at (256) 824-6875 or riskmanagement@uah.edu as soon as possible. In the absence of exceptional circumstances, such contact must occur no later than two (2) business days after the date the injury occurred. Information about the injury and the related accident/incident is to be provided by the employee to the Office of Risk Management through completion of an appropriate injury report form.

A. Hazardous Chemical/Substance Spills

must be cleaned as soon as possible. If the spill exceeds five liters or is an acutely hazardous substance, as defined in The UAH Hazardous Waste Management Plan (HWMP), the UAHPD must be contacted immediately at (256) 824-6911.

General procedural guidelines to follow during a chemical spill are listed below. Individual departments may develop more detailed internal procedures. Internal procedures must be at least as stringent as the UAH Laboratory Safety Manual guidelines and are subject to review by the OEHS.

1. Spill Kit Materials

Laboratories should be prepared for chemical spills by having a spill kit or materials available and supervisory personnel trained to respond. The spill kit must be labeled with the words "Spill Kit", placed in an obvious location, and all persons responsible for the activities conducted in the laboratory must be knowledgeable in the location and use of the spill kit. Spill kits can be specialized for individual laboratories or can contain general supplies necessary to handle a

variety of spills. Spill kits are commercially available or you may request a listing from the OEHS on what items must be included in a spill kit. Departments, Centers, or units are responsible for purchasing and refurbishing spill kit items. Recommended items for a universal chemical spill kit are:

SPILL ABSORBENTS & EQUIPMENT

- 1- Container of SPILL-X-A ACID NEUTRALIZER & ABSORBENT
- 1- Container of SPILL-X-B BASE NEUTRALIZER & ABSORBENT
- 1- Container of SPILL-X-S SOLVENT ABSORBENT
- Small broom
- Plastic dustpan
- PERSONAL PROTECTIVE EQUIPMENT
- Safety goggles
- Chemical resistant apron or lab coat
- Nitrile gloves

SPILL CONSUMABLES:

- pH paper
- Chemical waste disposal bags
- Chemical waste labels
- 5-gallon pail

2. General Chemical Spill Guidelines

Determine the extent and type of spill. Contact the UAHPD at (256) 824-6911 if any of the following apply:

- large spill category
- release to the environment
- acutely hazardous chemical (as listed in the HWMP) spill
- no one trained in the proper procedures for cleaning chemical spills

Spill Category Table

Category	Quantity	Response	Treatment Materials
Small	Spilled material< 300 milliliters	Chemical Treatment	Neutralization or absorption spill kit
Medium	300 ml <spilled material< 5 Liters	Absorption	Absorption Spill Kit
Large	Spilled material >5 Liters	Call UAHPD at 6911	

1. Immediately alert area occupants and supervisor, and evacuate the area, if necessary.
2. Contact UAHPD at (256) 824-6911 in the event of a fire or when medical attention is required.
3. Decontaminate any people who may be contaminated if it is safe to do so. Refer to the Safety Data Sheet (SDS) for further guidance. Contaminated clothing must be removed immediately and the skin flushed with water for at least fifteen minutes. Clothing must be laundered separate from other clothing before reuse.

4. Immediately warn everyone in the area when a volatile flammable material is spilled. Control sources of ignition. Ventilate the area by turning on the fume hoods with the sashes completely open and open all windows.
5. Use the appropriate personal protective equipment for the hazard involved. Refer to the SDS or other available references for information.
6. The use of respiratory protection requires specialized training and medical surveillance. DO NOT enter a contaminated atmosphere without protection or use a respirator without training. Call the UAHPD or OEHS when respiratory protection is required and there are no trained personnel available. When respiratory protection is used for emergency purposes, there must be another trained person outside the spill area. This person must have communication abilities with the person in the spill area. Contact UAHPD when no one is available for back up.
7. Cover or block floor drains or any other route that could lead to an environmental release.
8. Use the appropriate media when cleaning spills. Begin by circling the outer edge of the spill with absorbent. Next, distribute spill control materials over the surface of the spill. This will effectively stop the liquid from spreading and minimize volatilization.
9. Place absorbed materials in an appropriate container using a brush and scoop. Small spills can be placed in polyethylene bags. Larger quantity spills may require five-gallon pails or 20-gallon drums with polyethylene liners.
10. Absorbent materials used on the chemical spill will most likely require disposal as hazardous waste. Create a waste card in Chematix and affix it to the container, then submit a waste pickup request.
11. Clean the surface where the spill occurred using a mild detergent and water. **CAUTION** check SDS for incompatible clean up materials.
12. Immediately report all spills to your supervisor.

3. Solvent Spills

1. Apply activated charcoal to the perimeter of the spill.
2. Mix the charcoal into the spilled liquid until it has been completely absorbed.
3. Transfer the absorbed solvent to a hazardous waste container and attach Chematix waste label.
4. Submit pickup request through Chematix.
5. Clean the area with soapy water.

4. Corrosive Spills (Acids and Bases)

Bases can be equally as harmful as acids. Never add a strong acid to a strong base. Use the appropriate neutralizer supplied in the spill kit and follow these steps:

1. Apply neutralizer to the perimeter of the spill.
2. Mix thoroughly until evolution of gas has stopped.
3. Check the mixtures pH with pH paper.
4. Transfer the waste to hazardous waste container, create appropriate waste label in Chematix and submit a waste pickup request.
5. Clean the spill area with soapy water.

Hydrofluoric acid:

If greater than 200ml of HF is spilled outside of a chemical hood:

1. Evacuate the area
2. Close the doors
3. Post the area with a sign to prevent others from entering
4. Notify University Police at 6911

Laboratory staff can clean up HF spills of less than one liter inside a chemical fume hood by containing the spillage and carefully neutralizing the spill with:

- Spill X-C caustic neutralizer
- Caustic soda
- Powder calcium carbonate
- Calcium hydroxide
- Using a commercial HF spill kit

Prevention in the form of proper containment is key. **Never store HF in glass containers**. Instead, keep tightly sealed in the original packaging or a chemically compatible container (e.g. polyethylene or Teflon®). **Secondary containment of polyethylene must also be used.**

5. Mercury Spills

Mercury is classified as a persistent bioaccumulative toxin (PBT). Additionally, some forms of organic mercury readily absorb through gloves and skin. Laboratories utilizing mercury must be prepared with an appropriate cleanup kit. Kits are available through laboratory and safety supply companies.

When more than ten milliliters of mercury has been spilled:

1. Alert others in the area.
2. Mark off the area.
3. Contact the OEHS immediately.

Procedure for use with commercially available mercury clean-up sponge:

1. Dampen the sponge with water and wipe the contaminated area.
2. Perform the procedure slowly to ensure complete absorption of mercury onto the sponge.
3. Place the sponge in its plastic bag, tie shut and create Chematix waste label, then submit a waste pickup request.

6. Radioactive Material Spills

Spills of small quantities of radiological materials present at UAH cause little or no immediate external hazard. Of bigger concern is the spread of contamination and the internal contamination of personnel. Prevent the spread of contamination by limiting the movement of persons present in the area of the spill until they have been found free of contamination. A minor radiation spill is one that can be handled safely without the assistance of the radiation safety staff. Most spills at UAH will be small spills due to the small quantities of radioisotopes

that are utilized in campus laboratories. Contact the OEHS by calling 256-824-6053 of all spills, regardless of size.

Small/Minor Radioactive Material Spill

A small radiation spill is one that can be handled safely without the assistance of the radiation safety staff.

1. Alert persons in the immediate area.
2. Distinguish the spill area with radioactive label tape. Indicate the isotope spilled.
3. Notify the laboratory manager or Principal Investigator.
4. Wear personal protective equipment to include, safety goggles, disposable gloves, shoe covers and long sleeve lab coat. If the substance is a beta emitter, a plastic lab apron may be used to provide additional body shielding.
5. Place absorbent towels over liquid spills and dampened towels over spills of solid materials.
6. Clean the spills beginning from the outside edge and moving towards the center.
7. Place the towels in a plastic bag and put in a radiation waste container.
8. Verify the area and responder hands and shoes are free from contamination by using a survey meter or by performing, wipe tests. Repeat the cleaning process until there is no contamination remaining.
9. Submit a written account to the RSO within 24 hours of the occurrence.

Large/Major Radioactive Material Spill

1. Attend to contaminated and injured persons and protect them from continued exposure.
2. Alert persons in the area to evacuate.
3. Keep contaminated and potentially contaminated persons in one area, (safe distance away from contamination source) until they can be monitored for exposure.
4. Call UAHPD at (256) 824-6911 immediately. (They will contact the RSO.)
5. Ventilation, drafts and air currents should be controlled to prevent the spread of contamination.
6. Close the doors and prevent entrance to the contaminated area.
7. Submit a written report of the spill incident to the RSO through OEHS within 24 hours of the occurrence.

7. Spill of Biohazardous Radioactive Material

Procedures for spill cleanup of a radioactive biological material requires emergency procedures which protect the person from exposure to the radiochemical while disinfecting the biological material.

1. Avoid inhaling airborne material, notify other room occupants, and quickly leave the area.
2. Remove all contaminated clothing by turning exposed areas inward. Place in a biohazard bag.
3. Wash all exposed skin areas with a disinfectant soap. Rinse for a minimum of 5 minutes.
4. Inform the laboratory supervisor and contact the UAHPD at (256) 824-6911.

5. Post a Do Not Enter sign and do not reenter the lab for at least 30 minutes.
6. Contact the RSO through OEHS at (256) 824-6053 to confirm safe entry into the laboratory.
7. Utilize appropriate protective clothing and reenter the spill area. The use of respirators requires special training. Call the OEHS if a respirator-trained individual is required but not available for spill cleanup.
8. Cover the area with disinfectant soaked towels. Pour the disinfectant around the perimeter of the spill area. As the spill becomes diluted with disinfectant, increase the concentration of the disinfectant. Allow 20 minutes for disinfection. **CAUTION: the use of bleach on iodinated material may cause the release of radioiodine gas. An alternative such as, phenolic compounds or an iodophor should be used when radioactive iodine has been spilled.**
9. Collect any broken glass with forceps and place in an appropriate broken glass collection container. To clean splashed material, spray with disinfectant solution and wipe clean or saturate a paper towel with disinfectant solution and wipe clean.
10. Personal protective equipment (PPE) must be disinfected with bleach solution and disposed of as radioactive waste. Place the used PPE on absorbent paper. Spray the PPE with 10% bleach solution and allow a 20 minutes contact time.
11. Place all decontaminated waste materials in an approved container for radiation and label appropriately. Do not autoclave the waste unless the radiation safety officer approves the procedure.
12. Wash hands and potentially exposed areas with a disinfectant.
13. Monitor laboratory occupants for contamination of radioactive materials.
14. Decontaminate under the advisement of the RSO.
15. All contaminated persons must seek medical assistance after decontamination procedures have been completed.
16. Monitor the area for residual activity and handle it according to the UAH Radiation Safety Procedures.

8. Biological Spills or Exposures

A minor spill of a biological agent is defined as one that has occurred and is contained within the biological safety cabinet and which provides personnel protection. It is assumed that no one is contaminated by the spill. If a spill contains BL 2 agents or greater, or the spill is too dangerous or large to be safely cleaned up by laboratory personnel, the UAHPD must be contacted immediately. Any person performing biological research at UAH should be familiar with the UAH Biological Safety Manual, located on the UAH Policy web page.

Biological Spill Kit

Laboratories utilizing biological materials must be prepared with a biological spill kit. Typical kits are packed in a 5-gallon plastic bucket. The bucket should be clearly labeled to indicate that it is a biological spill kit. Biological spill kits can be assembled to fit specific laboratory needs although basic kits must contain the following items:

- Concentrated household bleach
- A spray bottle for bleach solutions
- Face protection
- Utility gloves and nitrile gloves

- Paper towels or other sorbent
- Biohazard bags
- Forceps for handling sharps
- Biohazard symbol labels (for use on the bucket when the cleanup is complete)

9. Biological Spill Procedures

Blood Spills

Blood spills with low concentrations of infectious microorganisms must be handled in the following manner:

1. Wear at least the minimal required laboratory personal protective equipment.
2. Absorb blood with paper towels and place in a biohazard bag.
3. Collect any broken glass with forceps and place in an appropriate broken glass collection container.
4. Clean the area with a detergent.
5. Spray the area with a 10% bleach solution and allow to air dry for 15 minutes.
6. Wipe the area with disinfectant soaked paper towels.
7. Place all contaminated items in a biohazard bag, autoclave, and dispose of according to UAH guidelines.

Ethidium Bromide Spill Clean-up and Disposal:

Ethidium bromide (EtBr) is a potent carcinogen. When handling ethidium bromide it is imperative that no skin contact occurs and thorough hand washing is performed after handling. In case of a small spill:

1. Absorb freestanding liquid with a compatible absorbent material.
2. Use ultraviolet light to determine the location of the spill material.
3. Prepare decontamination solution by mixing 4.2 grams of sodium nitrite and 20 mL of hypophosphorous acid (50%) in 300 mL of water.
4. Wash the spill area with a paper towel soaked in the decontamination solution. Wash the spill area five more times with paper towels that have been soaked in the decontamination solution (using fresh paper towels each time).
5. After cleaning put all the used towels in the decontamination solution for 1 hour.
6. Check the completeness of decontamination using an ultraviolet light.
7. When the decontamination procedure is complete, transfer all the decontamination solution to an appropriately labeled waste container. Then submit a waste pickup request through Chematix.

To clean **contaminated equipment**: Laboratory equipment (e.g. transilluminators, laboratory floors and counters, etc.) contaminated with aqueous solutions of more than 10 mg/L (0.01 %) EtBr should be decontaminated using the spill clean-up procedures listed above.

10. Spill Procedures by Biological Safety Level

Biosafety Level 1 (BL1) Spill

Biosafety Level 1 is the classification that applies to agents that are not known to cause disease in healthy adults.

1. Notify other laboratory occupants.
2. Remove contaminated clothing. If necessary, use the safety shower or emergency eyewash. Wash affected area with a disinfectant.
3. Wear at least the required laboratory personal protective equipment.
4. Cover the spill with paper towels. Pour disinfectant around the outside of the spill area and then add disinfectant over the spill area until the spill area has been completely covered. Allow the disinfectant at least 15 minutes to work. To clean splashed material spray with disinfectant solution and wipe clean or saturate a paper towel with disinfectant solution and wipe clean.
5. Pick up any pieces of broken glass with forceps and discard in a broken glass container.
6. All cleanup materials must be placed in a biohazard bag, autoclaved and appropriately disposed.
7. Wash hands thoroughly with soap and a handwashing disinfectant.

Biosafety Level 2 (BL2) Spill

Biosafety Level 2 is the classification that applies to agents that are associated with human disease, which is rarely serious, and for which preventative or therapeutic intervention is often available.

1. Immediately notify all other persons in the laboratory, hold your breath, and evacuate.
2. Remove all personal protective equipment and turn inwards to decrease the spread of contamination.
3. Wash hands and any other potentially exposed area with soap and water for a minimum of 15 minutes.
4. Post a Do Not Enter sign and do not reenter the lab for at least 30 minutes.
5. Notify the laboratory supervisor and contact the UAHPD.
6. Immediately seek medical assistance if exposure has occurred.
8. After allowing the aerosols to settle for 30 minutes, put on protective clothing. Only trained individuals may utilize respirators. Contact the OEHS if cleanup requires the use of a respirator.
9. Cover the spill with paper towels. Pour disinfectant around the outside of the spill area and then add disinfectant over the spill area until the spill area has been completely covered. Allow the disinfectant at least 20 minutes to work. To clean splashed material spray with disinfectant solution and wipe clean or saturate a paper towel with disinfectant solution and wipe clean.
10. Pick up any pieces of broken glass with forceps and discard in a broken glass container.

11. Spray the area with a 10% bleach solution and allow to air dry. Alternatively, spray the area with the bleach solution, allow 10 minutes for disinfection, and then wipe the area down.
12. All clean up materials and contaminated protective clothing must be placed in a biohazard bag, autoclaved and appropriately disposed.
13. Wash hands and potentially contaminated skin areas with a handwashing disinfectant or antiseptic soap and water.

Biosafety Level 3 (BL3) Spill

UAH does not presently have any BSL 3 research, and does not have appropriate facilities. If you plan to initiate BSL3 research, contact the Biosafety Officer immediately at 256-824-2170.

B. Fires

All students must be informed at the beginning of each semester of building evacuation routes. It is the laboratory supervisor's responsibility to provide this information. In the event of a fire, immediate evacuation is essential. On the way out of the building, remember these safety precautions:

- Never enter a room containing a fire.
- Never enter a room that is smoke filled.
- Never enter a room in which the top half of the door is hot to the touch.

Small Fires

1. Pull the fire alarm and call the UAHPD at (256) 824-6911.
2. Alert people in the area to evacuate. Assist those individuals with disabilities.
3. Turn off gas main.
4. If you have been trained to use a fire extinguisher, do so while maintaining a clear exit path behind you.
5. Operate the extinguisher using the P-A-S-S method:
    - **P – Pull the pin** located on the extinguishers handle.
    - **A – Aim** the nozzle at the base of the fire.
    - **S – Squeeze** or press the handles together.
    - **S – Sweep** from side to side at the base of the fire until it is out.

Large Fires

1. Pull the fire alarm, when in a safe area, call the UAHPD at (256) 824-6911.
2. Alert people in the area to evacuate. Assist those individuals with disabilities.
3. Turn off gas mains, only if time permits.
4. Close the doors to confine the fire.
5. Move to a designated assembly area away from and upwind from the building.
6. Persons having knowledge about the incident and location must provide this information to emergency response personnel.

C. Weather Alerts

1. When a weather alert is received through Campus Notification Methods, immediately request all persons in the laboratory to turn off any gases, hotplates, and pressure reactive experiments.

2. Immediately leave the area in an orderly manner. Use the innermost stairway and take cover in the lowest internal compartment of the building.

D. Responding to Injuries and Inhalation Exposures

The first line of defense for any person working or performing research in a laboratory is knowledge. Always be aware of what you and others in the surrounding area are working with and the associated hazards. This information is available on the SDS. SDS must be available for review by faculty, staff, researchers and students prior to utilizing any new chemical product or procedure involving the chemical product. Lab specific Emergency Procedures developed by the PI are posted in each laboratory.

Emergency responders also must have chemical information readily available. A safe laboratory will have an inventory uploaded into US SDS. To ensure emergency response preparedness the laboratory supervisor must submit the chemical inventory to the OEHS on an annual basis.

Following an injury, please refer to the Risk Management website at https://www.uah.edu/rmi/injuries for current injury reporting guidance.

1. First Aid Kits

First aid kits are available in all undergraduate chemistry laboratories and the chemistry stockroom in the Shelby Center. The Automated External Defibrillator (AED) boxes also contain a first aid kit. It is recommended for each department to provide and maintain first aid kits in a centralized location. Upon each use, immediately replenish the first aid kit items.

2. Inhalation of a Biological Material

When a biological material has been spilled, take care to minimize aerosolization of the material.

Take the following steps if the spill has resulted in aerosolization:

1. Immediately notify all other persons in the laboratory, hold your breath, and evacuate.
2. Remove all personal protective equipment by turning it inwards to decrease the spread of contamination.
3. Wash hands and any other potentially exposed area with soap and water for a minimum of 15 minutes.
4. Post a spill sign and do not reenter the lab for at least 30 minutes.
5. Notify the laboratory supervisor and the UAHPD at 6911.
6. Immediately seek medical assistance.

3. Needle sticks and Puncture Wounds

1. Wash well with disinfectant or antiseptic soap (preferably a type with iodine) and water for 15 minutes.
2. Squeeze around affected area to encourage bleeding.
3. Notify the laboratory supervisor.
4. Seek medical assistance immediately.

4. Chemical Injury or Exposure Response

When an injury has occurred, general response guidelines are as follows:

1. Protect yourself from exposure and stabilize the injured person. When possible wash your hands prior to and after giving first aid. Use gloves whenever possible.
2. Call (256) 824-6911 when emergency medical attention is required or when not sure how to respond.
3. Utilize the safety shower available in the laboratory when appropriate. Clothing must be removed to prevent prolonged chemical contact with the skin. Rinse the exposed area for at least 15 minutes.
4. Use the emergency eyewash stations to rinse harmful chemicals from the eyes when appropriate. Eyes must be rinsed for a minimum of 15 minutes.
5. Offer the injured person medical attention. Contact (256) 824-6911 immediately if he or she desires medical attention by an emergency room physician. Contact a family member to transport the injured person during non-emergency situations.
6. Contact UAHPD at (256) 824-6911 to report all injuries and complete an accident report. An accident report must be completed within 24 hours of the incident.
7. Report all accidents involving injuries to the Office of Risk Management within 24 hours of the incident.

5. Wounds

Small Cuts and Scratches

1. Clean the area with soap and water.
2. Apply a clean dressing over the wounded area.

Significant Bleeding

1. Immediately call the UAHPD at (256) 824-6911.
2. Reassure the injured person.
3. Lay the injured person down.
4. **Do not** remove any objects that may have impaled the person.
5. Place direct pressure on the wound with a clean cloth or sterile bandage. Do not apply a tourniquet.
6. If the pressure does not slow the bleeding, elevate the wound above the heart.
7. If the bleeding is severe, elevate the person's legs approximately 12 inches.

Thermal Burns

First-degree burns are characterized by pain, redness and swelling.

1. Run cool water over the burn or soak it for a minimum of 10 to 15 minutes.
2. Cover the burn with a sterile bandage or clean cloth.
3. Do not apply any ointments, salves, or sprays.

Second and third degree burns are characterized by red mottled skin and blisters. White or charred skin is indicative of a third degree burn.

1. Call the UAHPD at (256) 824-6911.
2. Do not remove any burnt clothing.
3. Cover the burns with dry sterile or clean bandages.

4. Do not apply ointments, salves, or sprays.

Chemical Burns

When necessary, use the eyewash or safety shower as instructed in the procedures below. Ensure your own safety by wearing the appropriate personal protective equipment.

Chemical Burns to the Skin

1. Remove the victim's clothes, including his/her shoes.
2. Rinse the area for a minimum of 15 minutes.
3. Do not apply burn ointments to injured areas.
4. Call the UAHPD at (256) 824-6911, when the burn is large.

Chemical Burns to the Eyes

1. Forcibly open the eyelids to ensure all of the chemical is removed.
2. Wash from the nose to the ear to ensure the chemical does not wash back into the eye.
3. The wash must continue for a minimum of 15 minutes.
4. Cover the injured person's eyes with a clean or sterile gauze.
5. Call the UAHPD at (256) 824-6911.

Responding to Hydrofluoric Acid Burns

UAH requires persons having responsibility for laboratories that use or store hydrofluoric acid (HF) to maintain a commercially prepared gel of calcium gluconate in the laboratory area. The gel is used for immediate treatment of skin exposures to HF. HF causes serious damage to tissues and bones. The faster the treatment the smaller the chance of serious injury. In the event of a burn caused from HF, the following steps must be immediately taken:

1. The skin must be copiously washed, beginning immediately after exposure.
2. Apply a bulky dressing soaked in a commercially prepared quaternary ammonia compound, calcium gluconate or magnesium oxide topical ointment. Always follow the manufacturer's directions supplied with the HF burn ointment/solution if they differ from these.
3. Seek immediate medical attention.

Further information can be found in the Safe Use of Hydrofluoric Acid Policy.

6. Ingestion of Chemicals

1. Immediately call the UAHPD at (256) 824-6911.
2. Refer to the SDS to effectively treat the injured person.
3. If the injured person is unconscious, turn his/her head or entire body onto the left side. Be cautious about performing CPR. This could potentially poison you from the mouth-to-mouth contact. If available, use a mouth-to-mouth resuscitator.

7. Inhalation of Chemicals

1. Evacuate the area and move the victim to fresh air.

2. Immediately call the UAHPD at (256) 824-6911.
3. When the victim is not breathing, perform CPR. Be cautious as the mouth-to-mouth contact can result in the responder becoming poisoned. Where available use a mouth-to-mouth resuscitator.
4. When the victim is breathing, loosen his/her clothing and maintain the airway.
5. Place one hand under the injured person's neck and gently lift.
6. Rotate the injured person's head back to obtain maximum extension of the neck by pressing down on his/her forehead with your free hand.
7. If additional airway extension is necessary, pull the injured person's lower jaw into a jutting-out position.
8. Treat the person for chemical burns of the eyes and skin.

E. Reporting Injuries

Report all accidents involving injuries to the Office of Risk Management within 24 hours of the incident. Forms are available at Risk Management's website.

III. University Environmental Health & Safety Committees

A. University Environmental Health and Safety Committee

The President of the University appoints the Environmental Health and Safety Committee membership. This committee meets biannually and ensures campus-wide compliance with the applicable federal and state environmental health and safety requirements. This committee addresses environmental health and safety issues and concerns affecting UAH faculty, staff, and students. The Committee provides recommendations to address deficiencies and reports the results to the President. The Committee implements and/or monitors recommendations as directed by the President, and is responsible for any other tasks relating to environmental health and safety as may be assigned to it by the President.

B. Laboratory Safety Subcommittee

When lab safety issues arise that cannot be addressed by the EHS Committee, a lab safety subcommittee will be appointed by the EHS Committee to address the issue. The role of the Laboratory Safety Committee is to assess and review potential hazards related to the handling, use, and management of hazardous chemicals, materials, and operations on UAH properties. Committee recommendations are submitted to the OEHS and to the University Environmental Health and Safety Committee.

The EHS Committee chairperson will appoint the members of the Laboratory Safety Subcommittee. The members are faculty and staff from areas of teaching and research that most often utilize hazardous materials, chemicals, and or conduct hazardous operations.

C. Radiation Safety Committee

The Radiation Safety Committee is responsible for ensuring University compliance with all state and federal regulations pertaining to the use of ionizing radiation sources. The Radiation Safety Committee meets twice per year and as required.

IV. Identification of Chemical Hazards

A. Project Registration

A project registration form or New Lab Startup Form must be completed prior to conducting new research in which hazards can be expected. This provides information that allows the OEHS to assist researchers in maintaining regulatory compliance when using hazardous materials. The form can be found on the OEHS website at New Lab Startup Procedures . The project registration form is distributed through the Office of Sponsored Programs upon award of research funding. Principal Investigators receiving external funding must also submit this form to the OEHS prior to the receipt of funding. Labs that do not receive external funding must submit the New Lab Startup Form.

B. Right-To-Know & Safety Data Sheets

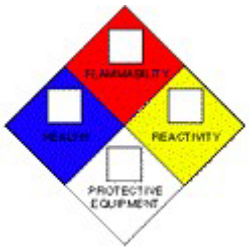
OSHA mandates that users of hazardous chemicals be informed of the hazards of the material they are working with prior to use of the material. This is commonly called Right-to-Know. To accomplish this, safety data sheets (SDS) must be provided to the user. It is the responsibility of the person requesting the purchase of the chemical to ensure that the SDS have been added to the UAH SDS database, found at US SDS.

Chemical manufacturers supply SDS to purchasing parties. Unless it is written on the purchase order, the SDS is sent to the accounts payable office. The accounts payable office forwards the SDS to the OEHS. The OEHS will make every effort to relinquish the SDS to the appropriate user. If you have not received an SDS prior to initial use of a chemical, the following sources can be used to locate one:

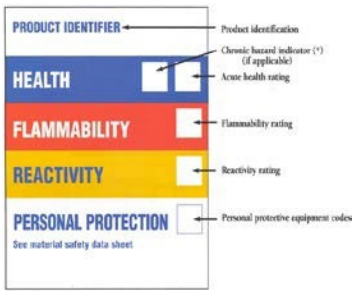
- US SDS
- Chemical manufacturer

C. Product Labels

The product label is likely to have useful information concerning the hazardous properties of the product. Manufacturers may place the primary hazard code on the container in the form of a pictograph, e.g. a skull and crossbones denoting poisons, a flame for flammable, etc. Some manufacturers will include a fire, diamond or bar graph on hazardous materials containers. The fire diamond and bar type hazard indicators on hazardous material labels provide the same information in different formats. They each have four squares, and in the case of the fire diamond it is a square on point. Each square is indicative of either flammability, health effects, reactivity, or special hazard conditions.



Fire Diamond



Bar Type Hazard Indicator

Each square will have a number from zero to four. The following information explains these numbers.

The health indicator is normally blue in color. It indicates the short-term degree of hazard.

0 = represents ordinary combustible hazards in a fire
1 = slightly hazardous
2 = hazardous
3 = extreme danger
4 = deadly

The flammability rating is red, and indicates the propensity of the material to burn. 0 = will not burn

1 = will ignite if preheated
2 = will ignite if moderately heated
3 = will ignite at normal room temperature; will burn quickly
4 = will burn easily and rapidly at room temperature/pressure; or will ignite spontaneously when exposed to air

The reactivity rating indicates the reactive nature (instability) of the material and the energy released if the material is burned, decomposed, or mixed. It is denoted with a yellow color. 0 = stable and not reactive with water

1 = unstable if heated; changes or decomposes on exposure to air, light or moisture
2 = violent chemical change; reacts violently with water or forms potentially explosive mixtures with water
3 = shock and heat may detonate; reacts explosively with water without heating or confinement
4 = may detonate

The white indicator contains special hazard symbols.

OX = oxidizer = may not burn itself but, may ignite and intensify burning of combustible materials.

A W with a line drawn horizontally through the center = Use no water. The material reacts with water; may become explosive, may produce a flammable or poisonous material, may produce excessive heat.

V. Chemical Inventories and Labeling

A. Inventories

A dated inventory of incoming chemicals and their quantities must be uploaded to US SDS, or submitted to the Chemical Hygiene Officer by December 31st of each year. Upon complete use of the material or transfer to another lab, the material must be removed from the list. The OEHS copy is used in creating a master list of hazardous chemicals required for maintaining compliance with the Emergency Planning and Community Right to Know Act (EPCRA).

B. Labeling

All chemical containers (including laboratory solutions and mixtures) used in the laboratory must have labels indicating what they are. Labels must indicate the components, their quantities, and the general

hazard information that conveys the physical and health hazards of the material. Containers without appropriate labeling will be treated as an unknown chemical. Unknown chemicals and wastes present safety, environmental, regulatory, and monetary concerns. Therefore, it is of utmost importance that all chemical containers are appropriately labeled. Chemical waste labeling is discussed later in this manual.

VI. Personal Safety

A. Training

The Office of Environmental Health and Safety has the responsibility for making training available to faculty and staff. Training courses are offered online and upon request. The training provides an overview of federal, local, and state guidelines and University policy related to laboratory safety and environmental hygiene. Persons with primary responsibility for laboratories are responsible for training students in the safe handling of hazardous materials and laboratory technique. Appendix B includes a list of mandatory laboratory safety rules. Each year each student must sign a safety contract stating that he/she understands and will abide by the rules. Laboratory Supervisors should retain the student safety contract on file.

B.SDS Availability

Safety data sheets (SDS) must be readily available for each laboratory. These can be found on US SDS. SDS must be available at all times and near the hazard source. Prior to the use of a new chemical, the SDS must be provided for review to the chemical user and those persons in the lab.

C. Safe Use of Laboratory Equipment

Laboratory equipment must be used according to manufacturer guidelines. All best practices and procedures to minimize exposure must be followed. Appropriate training is the responsibility of the department in charge of the lab. Facilities and Operations, Maintenance Department is responsible for the maintenance of equipment installed by the University as part of the facility, e.g., fume hoods, safety showers, eyewashes, sinks, etc. Maintenance of equipment installed to support research is the responsibility of the PI or Department managing the lab.

D. Equipment Inspection

All equipment must be inspected prior to use to ensure, electrical cords are not damaged, safety interlocks have not been compromised, and no chemicals have been spilled in the chambers of the equipment.

E. Laboratory Doors

Laboratory doors must remain closed to ensure that any hazardous materials spills will be isolated to that laboratory/area. The last person out should follow a laboratory shutdown checklist and lock the door on his/her way out. The safety checklist should include items such as: turn off gas and heat sources, turn off water supply and equipment, ensure signage is posted on unattended experiments, return all chemicals to appropriate storage, ensure all chemicals and solutions or mixtures are labeled, turn off lights and lock the door(s).

F. Personal Protective Equipment (PPE)

PPE is required in all laboratories with chemical hazards. The minimal PPE is chemical resistant gloves or gloves appropriate to the hazard, lab jacket or apron, goggles, and closed-toed shoes. The use of respiratory protection must be cleared through the OEHS. Always check the SDS to verify that the correct PPE is being used.

G. Eating in the Lab and Food Storage

Eating, drinking, gum chewing, the use of tobacco, and the application of cosmetics is not allowed in laboratories. These actions may cause contamination of individuals partaking in them. Food storage is not allowed in laboratories. Other actions that may result in contamination that should be noticed and avoided are pencil chewing, touching the face, adjusting eyeglasses, scratching, etc. Lab jackets must not be worn into eating and food preparation areas.

H.Hair

Long hair must be tied back to prevent possible contamination and injury.

I. Pipetting

Pipetting by mouth is not allowed. Use mechanical pipetting devices only.

J. Laundry

Lab jackets and potentially contaminated clothing must be washed separate from other laundry items.

K. Hand Washing

Hands and forearms must be washed prior to leaving the laboratory.

L. Experiment Identification

Identification must be posted on unattended experiments. The identification must provide a point of contact, what the hazard is and in what quantity, and when the experiment will be discontinued, and any instrument settings that must be maintained.

M. Lockout Tagout

Ensure instrumentation that requires repair is not usable by disconnecting critical operating points and switches and labeling as broken.

VII. Housekeeping

Working laboratories often become cluttered with empty and partially full containers, glassware, and other apparatus. Floors and counters can also become contaminated due to unattended spills. It is important for the safety of those persons utilizing and maintaining UAH facilities that the laboratory is not contaminated or present a fire hazard. Maintaining a good state of order in laboratory facilities will significantly decrease risk.

A. Elements of Good Housekeeping

Chemical Storage

The failure to store chemicals according to their properties poses a risk to personnel, to property, and possibly to intellectual value of accumulated research data files. For these reasons, hazardous chemicals must be stored according to compatibility and in chemical safety cabinets or in the ventilated base cabinet of the fume hood. Fisher and Mallinckrodt chemicals are color coded for ease of segregation. Non-hazardous chemicals may be kept on lab benches.

The following general suggestions for safe storage of chemicals in the laboratory should be implemented.

- The quantities of chemicals that are stored within a laboratory should be minimized, as specified by NFPA 45 and OSHA.
- Bulk quantities of chemicals (i.e., larger than one gallon) must be stored in a separate storage area. Transfer of flammable liquid from five-gallon or larger metal containers may not be done in the laboratory.
- Chemicals must be stored at an appropriate temperature and humidity level. This can be especially problematic in hot, humid climates. As a rule, chemicals should not be stored near heat sources, such as steam pipes or laboratory ovens. Chemicals should never be stored in direct sunlight.
- Chemicals should be dated when received and when opened. If the chemical is one that degrades in quality or becomes unsafe after prolonged storage, the shelf-life expiration date should also be included.
- Visual inspection of the material and its container should be conducted routinely.

Indications for disposal include:

- Cloudiness in liquids
- Material changing color
- Evidence of liquids in solids or solids in liquids
- “Puddling” of material around outside of container
- Pressure build-up within bottle
- Obvious deterioration of container
- Chemicals should not be routinely stored on the bench top. In such locations, they are unprotected from exposure and in a fire situation are more readily knocked over. Each chemical should have a specific storage area and be returned there after use. Large quantities of flammable materials should not be stored in the laboratory. Only the amounts needed should be kept on bench top, the remainder should be kept in flammable storage cabinets.
- Laboratory shelves should have a raised lip along the outer edge to prevent containers from falling. Never allow the container to hang off the edge of the shelf. Liquid or corrosive chemicals should never be stored on shelves above eye-level. Glass containers should not touch each other on the shelves. Secondary containers or trays should be used for chemical storage whenever possible to minimize the flow of material should a spill or rupture occur. Round bottom flasks should always be supported properly in cork rings or by other means to keep them from tipping.

- Adequate security must be provided so that unauthorized personnel do not have access to hazardous materials.
- Chemicals must never be stored on the floor, not even temporarily.
- Chemicals that are no longer to be used for research purposes should be properly disposed of or given to another research group that has a use for it.
- Flammable materials must never be stored in domestic type refrigerators. Only explosion-proof or flammable material refrigerators should be used for storage of these chemicals within a laboratory environment.
- All containers stored within the refrigerator should be tightly capped to keep vapors from interacting with each other and to alleviate "smell" problems. Flasks with cork, rubber or glass stoppers should be avoided because of the potential for leaking. All containers stored in the refrigerator must be properly labeled.
- Inventory the materials in your refrigerator frequently to avoid overcrowding with materials that have long since been forgotten. Also, make it a point to defrost your refrigerator occasionally so that chemicals do not become trapped in unique ice formations!
- Before flammable materials are stored in a refrigerator, it should be determined if keeping the material chilled will serve any purpose. No benefit is derived from refrigerating a chemical that has a flash point below the temperature of the refrigerator.
- Fume hoods should not be used as general storage area for chemicals. This may seriously impair the ventilating capacity of the hood.
- Gas cylinders must be securely strapped to a permanent structure (wall, lab bench, etc.). When they are not in use, they should be capped off. When they are empty, they must be labeled as such.
- Upon termination, graduation or transfer of any laboratory personnel, all hazardous materials must be properly disposed of through the OEHS, or arrangements made to transfer them to the laboratory supervisor.

Storing peroxide-formers:

Peroxide-forming materials are chemicals that react with air, moisture, or impurities to form peroxides. The tendency to form peroxides by most of these materials is greatly increased by evaporation or distillation. Organic peroxides are extremely sensitive to shock, sparks, heat, friction, impact, and light. The friction from unscrewing the cap of a container of an ether that has peroxides in it can provide enough energy to cause a severe explosion.

- Do not open the chemical container if peroxide formation is suspected. The act of opening the container could be sufficient to cause a severe explosion. Visually inspect liquid peroxide-forming materials for crystals or unusual viscosity before opening. Pay special attention to the area around the cap. Peroxides usually form upon evaporation, so they will most likely be formed on the threads under the cap. If it is deemed safe to open the container, peroxide papers may be used for a quick determination of peroxide concentration. Peroxide papers are commercially available from laboratory supply companies.
- Date all peroxide forming materials with the date received and the last test date. Chemicals such as diisopropyl ether, divinyl acetylene, sodium amide, and vinylidene chloride should be discarded after three months. Chemicals such as dioxane, diethyl ether, and tetrahydrofuran should be disposed after one year.

- Store all peroxide-forming materials away from heat, sunlight, and sources of ignition. Sunlight accelerates the formation of peroxides.
- Secure the lids and caps on these containers to discourage the evaporation and concentration of these chemicals.
- Friction and grinding of the screw cap lid must be avoided. Also, never store these chemicals in a clear glass bottle where they would be exposed to light.
- Contamination of an ether by peroxides or hydroperoxides can be detected through the use of peroxide test strips. If you cannot verify the date of the last peroxide test of a container or you suspect peroxides could be present, call the OEHS for disposal. If you notice crystal formation in the container or around the cap, do not attempt to open or move the container. Call the OEHS for proper disposal.
- Never distill an ether unless it is known to be free of peroxides.

Segregation Based on Hazard Classes

As a minimum, laboratories should separate chemicals according to similar hazards, such as flammability, corrosivity, sensitivity to water or air, and toxicity. Segregation of the following major categories of chemicals, each of which will be discussed in detail, is strongly recommended:

- Flammables
- Oxidizers
- Corrosives
- Highly Reactives
- Extremely Toxic (Acutely Hazardous)
- Other Regulated Materials
- Low Hazard

Some potential problems that arise with the general segregation of chemicals.

Identification of Hazards

Recent legislation has made this task somewhat easier since all chemical manufacturers are now required to list all hazards on outgoing chemical containers and each chemical must be accompanied by a Safety Data Sheet (SDS). The chemical label thus furnishes a quick method of determining whether the material is a fire hazard, health hazard, or reactivity hazard. The SDS furnishes more detailed information regarding toxicity exposure levels, flashpoints, required safety equipment and recommended procedures for spill containment.

Chemicals with Multiple Hazards

Most chemicals have multiple hazards and a decision must be made as to which storage area would be most appropriate for each specific chemical. Determine the priority of each hazard and which provides the highest risk.

1. If a material is an ether, make sure it is stored separately from other materials.
2. When establishing a storage scheme, the number one consideration should be the flammability characteristics of the material. If the material is flammable, it should be stored in a flammable cabinet.
3. If the material will contribute significantly to a fire (i.e., oxidizers), it should be isolated from the flammables. If a fire occurs in the lab and response to the fire

with water would exaggerate the situation, isolate the water reactive material away from contact with water.

4. Next look at the corrosivity of the material, and store accordingly and in secondary containers.
5. Finally, consider the toxicity of the material, with particular attention paid to regulated materials. In some cases, this may mean that certain chemicals will be isolated within a storage area, for instance, a material that is an extreme poison but is also flammable, should be locked away in the flammable storage area to protect it against accidental release. There will always be some chemicals that will not fit neatly in one category or another, but with careful consideration of the hazards involved, most of these cases can be handled in a reasonable fashion. For the safety of all personnel and to protect the integrity of the facilities, hazardous materials must be segregated.

EPA Compatibility Table

To use the table, choose the group that the chemical belongs. Group A and B on the same row are not compatible with each other. The third column provides information on the hazard of mixing Groups A and B of the same row.

Group 1-A	Group 1-B	*Potential Consequences*
Acetylene sludge Alkaline caustic liquids Alkaline cleaner Alkaline corrosive liquids Alkaline corrosive battery fluid Caustic wastewater Lime sludge & other corrosive alkalis Lime wastewater Lime and water Spent caustic	Acid sludge Acid and water Battery acid Chemical cleaners Electrolyte, acid Etching acid liquid or solvent Pickling liquor & other corrosive acids Acid, including mixtures of acids and sulfuric acid	Heat generation; violent reaction
Group 2-A	*Group 2-B*	*Potential Consequences*
Aluminum Beryllium Calcium Lithium Magnesium Potassium Sodium Zinc powder Other reactive metals and metal hydrides	Any Group 1-A or 1-B	Fire or explosion; generation of flammable hydrogen gas
Group 3-A	*Group 3-B*	*Potential Consequences*

Alcohols Water	Any concentrated item from Groups 1-A or 1-B Calcium Lithium Metal hydrides Potassium SO_2Cl_2, $SOCl_2$, PCl_3, CH_3SiCl_3 Other water-reactives	Fire, explosion, or heat generation; generation of flammable or toxic gases
Group 4-A	*Group 4-B*	*Potential Consequences*
Alcohols Aldehydes Halogenated hydrocarbons Nitrated hydrocarbons Unsaturated hydrocarbons Other reactive organic compounds and solvents	Concentrated Group 1-A or 1-B Group 2-A	Fire, explosion, or violent reaction
Group 5-A	*Group 5-B*	*Potential Consequences*
Cyanide and sulfide solutions	Group 1-B	Generation of toxic hydrogen cyanide or sulfide gas
Group 6-A	*Group 6-B*	*Potential Consequences*
Chlorates	Acetic acid and other organic acids	Fire, explosion, or violent reaction
Chlorine Chlorites Chromic acid Hypochlorites Nitrates Nitric acid, fuming Perchlorates Permanganates Peroxides Other strong oxidizers	Concentrated mineral acids Group 2-A Group 4-A Other flammable and combustible waste	

B. Glassware Cleansing

It is highly recommended that detergents be used to clean glassware rather than chromate and sulfuric acid. Hexavalent chromium is a carcinogen and chromic acid mixtures are expensive to dispose of as hazardous waste.

C. Work Surfaces and Floors

Dry sweeping laboratories must be avoided. Floors can be cleaned with a vacuum equipped with a high efficiency particulate air (HEPA) filter or by wet mopping. Protect work surfaces with disposable bench paper. Change the bench paper regularly and dispose of immediately after a spill. It is a good practice to decontaminate glassware prior to washing. Fume hood surfaces may be wiped down with dilute detergent and water solution, after all spills have been appropriately cleaned.

D. Laboratory Clean Out

All laboratories must perform an annual review of the inventory to inspect the conditions of chemical containers and to dispose of any unwanted, unusable, and or expired chemicals. This is called a Laboratory Clean Out. Dispose of the chemicals that are outdated and no longer useable or desired through Chematix. On the label, identify this as a lab clean out.

E. Laboratory Close Out

The following are guidelines for use when faculty and staff members responsible for laboratory facilities are leaving the University or transferring to a new laboratory.

Close Out Procedures for Hazardous Material Labs

Chemicals

1. All containers of chemicals must be securely closed and appropriately labeled. All laboratory glassware containing residues or chemicals must be emptied and disposed of appropriately. Please remember that UAH has a "No Drain" policy for chemical wastes. Ensure all areas of the lab have been inspected for chemical wastes. Wastes must be segregated, prepared and labeled according to the Lab Safety Manual and the Hazardous Waste Management Plan. A chemical waste pick-up request must be completed and submitted through Chematix.
2. Chemicals that will be transferred to other laboratories must be segregated. The chemicals must be packed according to compatibility and safe-handling techniques must be utilized. Contact the OEHS staff for more information. The laboratory supervisor receiving the chemicals must provide an updated chemical inventory to the OEHS.
3. Fume hoods and countertops must be washed.

Gas Cylinders

1. Cylinders must be disconnected; their valve caps replaced and must be returned to suppliers.
2. Non-returnable cylinders must be inventoried for submission to the OEHS as hazardous waste. When empty, it is imperative to label all non-returnable cylinders as empty.

Animal and Human Tissue

1. Animal tissue must be separated from liquid. The liquid must be inventoried and submitted to the OEHS.
2. All waste must be placed in appropriate biohazard bags and containers.

Microorganisms and Cultures

1. Inventory the area and decontaminate non-regulated microorganisms.
2. If samples must be saved, notify your department head and ensure that another faculty or staff member takes responsibility for the samples.
3. Decontaminate any samples as required.
4. Contact the OEHS for disposal of any biohazardous waste.

Radioactive Materials

1. The close-out of laboratories containing radioactive materials must be completed in collaboration with the RSO. Transfer of radioactive materials must be approved by the RSO.
2. Requests for removal of radioactive materials and wastes must be directed to the RSO.
3. The area must have a complete survey upon removal of radioactive materials. All equipment including items for surplus must be surveyed, when necessary additional decontamination procedures must be completed until the survey proves the instrumentation/equipment has no activity more than two times background activity. Survey records must be submitted to and maintained by the RSO.

Equipment

1. All lab equipment must be cleaned and decontaminated when necessary. Contact Facilities and Operations when ventilation systems have been utilized with highly hazardous substances or organisms.
2. Mercury and mercury containing devices or equipment must be transferred or turned into the OEHS.
3. Lasers must be locked out and transferred to either surplus, a new user, or securely stored. The transfer of lasers to new users requires a project registration and the submission of a laser safety plan.

VIII. Standard Laboratory Containment Equipment

Areas utilized at UAH for chemical laboratories must minimally be equipped with a drench hose, safety shower and/or eyewash; and if chemicals having a primary or secondary hazard of flammability, combustibility or toxic, a fume hood must be available. It is strongly recommended to perform all chemical manipulations in a fume hood. Additionally, all laboratories are equipped with a fire extinguisher and most are equipped with telephones. Fire/Emergency pull stations are located in each building and conform to applicable codes.

A. Fume Hoods

A fume hood prevents the inhalation of potentially harmful substances, deters uncontrolled splashes and spills from entering the lab environment, and removes flammable vapors from the indoor atmosphere.

When to Use a Chemical Fume Hood

A chemical fume hood is a necessary part of your laboratory procedure when:

- Working with hazardous or suspect hazardous chemicals
- Working with chemicals having unknown properties
- Pouring, mixing, weighing, and dispensing chemicals

Fume Hood Safety Practices

The fume hood should be used in conjunction with other safety equipment when toxic chemicals are being utilized. Laboratory supervisors may require more stringent safety

precautions based on the hazards of the work. The following list is mandatory laboratory safety practices.

1. Keep all apparatus at least 6 inches from the face of the hood.
2. Do not put your head in the hood when contaminants are being generated.
3. Do not use the hood to evacuate containers of volatile waste chemicals.
4. Minimize the quantity of chemicals and apparatus being used in the hood. Excessive storage of items in the fume hood will impair its performance.
5. All operations that may generate air contaminants above their exposure limits must be conducted inside a fume hood.
6. Do not use a fume hood if it is not working appropriately. Test the airflow periodically. If a flow meter is not available, a kimwipe placed at the base of the hood will be gently lifted when appropriate airflow is provided. The kimwipe should not be pulled into the exhaust. This indicates the airflow is too high.
7. Maintain the slots in the hood baffle free from obstructions.
8. Minimize traffic in front of the hood while in use.
9. Keep laboratory doors and windows closed unless specifically designed for opened doors.
10. Do not remove the hood sash, panels or sensors. Keep all wiring between hood electronics and sensors intact.
11. The laboratory supervisor must approve the use of hazardous solids (powders). (Many potential problems arise when the solid is fine enough to become airborne.)
12. Do not place receptacles or other sources of sparks inside the hood when flammable liquids or gases are present.
13. Use an appropriate barricade if an explosion or other violent reaction is possible.
14. Do not remove hood labels that indicate the maximum safe operating level of the sash.
15. Use only specially designed fume hoods for operations that heat perchloric acid above ambient temperature.
16. Ensure all fume hoods have a spill protection lip.

B. Biological Safety Cabinets

Biological safety cabinets should be used during handling of biological organisms. Consult the Biological Safety Manual for more information in the requirements to use the different classes of biological safety cabinets.

C. Laminar Flow Hoods

The differentiating feature of laminar-flow vs. fume hood is that there is no contaminated positive air plenum. Work with organic solvents, concentrated carcinogens, and with toxic or corrosive contaminants should be performed in a fume hood.

D. Snorkel Hoods

Snorkel hoods must be used with equipment generating fumes during operation. Most snorkels are equipped with a turnkey that opens and closes a valve allowing or disallowing air flow. Check equipment manufacturer guidelines when determining the correct airflow for laboratory instrumentation.

E. Hood/Cabinet Maintenance and Repairs

It is highly recommended that all hood/cabinet flows be checked monthly by the person utilizing the laboratory. An anemometer or magnehelic gauge will verify the hood has negative pressure. Typically, chemical fume hoods should operate at a flow of 80 – 120 feet per minute for user safety. OEHS checks each fume hood annually to verify optimum flow rate. Inner surfaces of fume hoods may be cleansed using a dilute solution of soapy water, provided all spills have been cleaned appropriately. Minimally, gloves, goggles, and a lab coat must be worn during cleaning procedures. All fume hood repairs must be completed or approved by the UAH Facilities and Operations Department. Immediately report fume hood malfunctions to (256) 824-6490. Questions or requests for assistance in the evaluation of fume hoods may be directed to Environmental Health & Safety at (256) 824-6053.

IX. Emergency Equipment

A. Eyewashes and Safety Showers

Emergency eyewashes are mandatory for chemical laboratories. Laboratory facilities at UAH should be equipped with an eyewash station or drench hose. Safety showers must be within 10 seconds of hazardous chemical areas. Facilities & Operations Maintenance must be contacted to install eyewash stations and safety showers when necessary. Optionally, portable eyewash station and showers may be purchased.

Campus safety showers and emergency eyewash stations should be checked annually to verify that they function appropriately. Those persons responsible for laboratory areas are responsible for ensuring eyewashes are flushed weekly and showers are flushed monthly. This will effectively flush the lines of any debris and potential microbial growth. Due to the nature of the work conducted in biological laboratories, a periodic wipe down of the safety shower with a commercially available disinfectant or a one-part bleach to ten-part water solution is highly recommended.

X. Fire Prevention

Preventing fires in the lab can be largely achieved by close adherence to: the National Fire Protection Association (NFPA) guidelines for storage of flammable materials, attention to chemical incompatibilities, care in the use of flammable materials and chemical reactions, appropriate maintenance of equipment, and good housekeeping. All fires require a fuel source, an ignition source, and oxygen to burn. Minimizing any one of these will decrease the risk of fire.

A. Common Laboratory Ignition and Fuel Sources

Ignition sources must be located away from flammable and combustible materials. Always use heating apparatus, bunsen burners, and flammable and combustible chemicals in the fume hood. There are many potential ignition and fuel sources in laboratories. The most common are:

- Bunsen burners
- Hot plates and heating mantles
- Peroxides and peroxide formers
- Damaged electrical cords and extension cords
- Class III and IV lasers

- Flammable and combustible chemicals

B. Fire Safety Equipment

Fire extinguishers must be available in all chemical laboratories. Fire extinguishers must be checked by lab personnel monthly to ensure they are adequately charged. Contact the Facilities & Operations Work Order Desk at (256) 824-6490 for any information concerning fire extinguishers, or to request a repair or recharge.

C. Fire Risk Minimization

Minimize the risk of fire in laboratories by utilizing the following practices.

- Purchase small amounts of flammables
- Store flammable materials in flammable chemical storage cabinets and segregate from incompatible materials. Adhere to the guidelines for storage of flammable materials as found in NFPA 45 and 30. These guidelines are provided below.
- Ethers must be inhibited. Use ethers before they expire. Contact the OEHS immediately upon discovery of expired ethers.
- Electrical and extension cords must be double insulated or grounded. Extension cords must not be used as permanent wiring and must be suitable for the environment in which they are used.

D. NFPA 45 – (Standard on Fire Protection for Laboratories Using Chemicals)

Laboratory Unit Fire Hazard Classification

Class A: High fire hazard
Class B: Moderate fire hazard
Class C: Low fire hazard
Class D: Minimal fire hazard

Flammable Liquids

Any liquid that has a closed-cup flash point below 100°F. Flammable liquids are classified as Class I liquids as follows:

Class I Liquid – any liquid that has a closed cup flash point below 100°F and a Reid vapor pressure not exceeding 40 psia at 100°F.

Class IA Liquids – those liquids that have flash points below 73°F and boiling points below 100°F.

Class IB Liquids – those liquids that have flash points below 73°F and boiling points at or above 100°F.

Class IC Liquids – those liquids that have a flash point at or above 73°F but below 100°F.

Combustible Liquids

Any liquid that has a closed-cup flash point at or above 100°F. Combustible liquids are further classified as follows:

Class II Liquids – any liquid that has a flash point at or above 100°F and below 140°F.

Class IIIA Liquids – any liquid that has a flash point at or above 140°F but below 200°F.

Class IIIB Liquids – any liquid that has a flash point at or above 200°F.

Maximum Allowable Quantities of Flammable and Combustible Liquids and Liquified Flammable Gases in *Sprinklered* Laboratory Units Outside of Approved Storage Cabinets (Table 1)

		Excluding Quantities in Storage Cabinets or Safety Cans				Including Quantities in Storage Cabinets or Safety Cans			
Lab Unit Fire Haz	Flammable Combustible	Max. Quant. per 100 ft² of Lab Unit		Max Quant per Lab Unit		Max Quant. per 100 ft² of Lab Unit		Max. Quant per Lab Unit	
Class	Liq. Class	L	gal	L	gal	L	gal	L	gal
A	I#	38	10	1820	480	76	20	1820	480
	I#, II, IIIA	76	20	3028	800	150	40	6060	1600
B	I#	20	5	1136	300	38	10	1820	480
	I#, II, IIIA	38	10	1515	400	76	20	3028	800
C	I#	7.5	2	570	150	15	4	1136	300
	I#, II, IIIA	15	4	757	200	30	8	1515	400
D	I#	4	1.1	284	75	7.5	2	570	150
	I#, II, IIIA	4	1.1	284	75	7.5	2	570	150

Maximum Allowable Quantities of Flammable and Combustible Liquids and Liquified Flammable Gases in *NonSprinklered* Laboratory Units Outside of Approved Storage Cabinets (Table 2)

		Excluding Quantities in Storage Cabinets or Safety Cans				Including Quantities in Storage Cabinets or Safety Cans			
Lab Unit Fire Haz	Flammable Combustible	Max. Quant. per 100 ft² of Lab Unit		Max Quant per Lab Unit		Max Quant. per 100 ft² of Lab Unit		Max. Quant per Lab Unit	
Class	Liq. Class	L	gal	L	gal	L	gal	L	gal
A	I#	*Not Permitted*		*Not Permitted*		*Not Permitted*		*Not Permitted*	
	I#, II, IIIA	*Not Permitted*		*Not Permitted*		*Not Permitted*		*Not Permitted*	
B	I#	*Not Permitted*		*Not Permitted*		*Not Permitted*		*Not Permitted*	
	I#, II, IIIA	*Not Permitted*		*Not Permitted*		*Not Permitted*		*Not Permitted*	

C	I[#]	7.5	2	284	75	15	4	570	150
	I[#], II, IIIA	15	4	380	100	30	8	760	200
D	I[#]	4	1.1	140	37	7.5	2	284	75
	I[#], II, IIIA	4	1.1	140	37	7.5	2	284	75

[†]**This category includes Class I flammable liquids and liquified flammable gases.**

XI. Chemical and Hazardous Waste Identification and Disposal

For a complete guide to handling hazardous waste refer to The UAH Hazardous Waste Management Plan.

A. Chemical Waste Minimization

The U.S. Congress has made waste minimization a national policy and it must be incorporated as a goal of each chemical waste generator. As a generator of chemical waste, you have the responsibility to minimize the waste you generate. Waste minimization has benefits such as decreasing your exposure to hazardous substances, protection of the environment, and decreasing the cost of purchase and disposal. Waste minimization should be considered at all times. Waste minimization begins in the research and education planning stages. The following are suggestions for minimizing waste.

- Purchase only the quantity of chemical that you need. Hazardous waste often is a result of outdated and or unused chemicals. Hazardous waste costs much more to dispose of than the cost of purchasing smaller quantities of chemicals.
- Substitute less or non-hazardous materials for hazardous materials.
- Use dilute rather than concentrated solutions.
- Use micro or semi-micro techniques.

B. Chemical Waste Identification

UAH laboratories fall under the federal regulations outlined in the Resource Conservation and Recovery Act (RCRA), and at the state level as outlined in the Alabama Department of Environmental Management (ADEM) Division 14 regulations. Both specify the requirements for handling hazardous materials from “cradle to grave”. Complete guidelines for chemical waste are available in the UAH Hazardous Waste Management Plan found on the OEHS web site. Appropriate labeling of all chemicals will assist in accomplishing University goals of maintaining safety within laboratories, protecting the environment, and supporting regulatory compliance.

UAH has a strict “NO DRAIN” policy that disallows pouring chemicals down drains in UAH facilities. Pouring chemicals into the sanitary sewer system requires a permit and continuous monitoring. Failure to follow the “NO DRAIN” policy could result in injury to human health and environmental degradation.

Protective measures are outlined on most material safety data sheets and should be taken when handling chemicals. Call the Office of Environmental Health & Safety at (256) 824-6053 for guidance when unsure of the hazard status or handling procedures for chemicals and wastes.

C. Unknown Chemicals

The generation of unknown chemicals can be eliminated by ensuring proper labeling. Laboratory materials that cannot be identified are subject to a hazard characterization procedure prior to disposal. When properly managed and labeled the cost of disposal of chemicals is absorbed by OEHS. Additional costs for disposal of unknown chemicals due to hazard characterization fees are the responsibility of the managing PI or Department. The characterization is used to determine how to handle and properly dispose of the waste.

Please note that there is danger involved with handling chemical unknowns. If the sample displays physical characteristics indicative of potentially reactive or peroxide forming chemicals (as listed below), or is suspected to be radioactive, contain biological materials, or pose any other unreasonable risk contact the OEHS immediately. Specialized equipment and handling practices may be required.

Potentially reactive chemical characteristics

1. solid materials under liquids
2. bi-layered or multi-layered
3. bulging, pressurized, or leaking containers
4. corroded, rusted, or deteriorating caps

Peroxide forming compound characteristics

1. cloudy liquid
2. crystals forming in bottles and around lids of partially or completely evaporated liquids

Note: Potential peroxide containing compounds must be labeled as “Possible Peroxide”.

Minimal precautionary measures to be taken while handling all unknowns

- Do not work alone.
- Handle the sample under a functioning fume hood with the sash pulled to the lowest level possible.
- Wear chemical resistant gloves, lab jacket or apron, goggles, and a face shield.
- Ensure that a safety shower and eyewash station is within reasonable distance.
- Ensure an ABC fire extinguisher is readily available.

Unknown chemical procedures:

1. Contact OEHS immediately to inform about the existence of the material.
2. Gather as much information as possible about the waste and how it was generated.
3. Contact people who may have information about the material including those who left the university is recommended.
4. Do not move the material from your laboratory or work area. OEHS or the waste contractor will remove the material from your laboratory.

DO NOT

- dump unknown chemicals down the drain
- mix unknown chemicals with any other chemicals for consolidation
- submit unknown chemicals for waste pickup through Chematix

Avoid generating unknown chemicals by following these basic rules:

1. Label all chemicals and secondary containers the moment it comes to the lab.
2. Do not use abbreviations.
3. Dispose of unwanted and unusable chemicals promptly.

D. Labeling Chemical Waste

The UAH guidelines for labeling chemical waste are derived from EPA regulations. Chemical waste labels are generated through Chematix. These labels should be created as soon as the item is determined to be waste and placed into the satellite accumulation area.

E. Requesting a Chemical Waste Pick-up

Chemical waste pick-ups are requested through Chematix. Any questions about using Chematix can be directed to (256) 824-6053 or emailed to oehs@uah.edu.

XII. OEHS Safety Audits

The Chemical Hygiene Officer conducts annual safety audits of laboratories containing chemical materials and lasers to offer guidance and information in maintaining safer laboratory facilities and regulatory compliance. The Chemical Hygiene Officer will identify safety issues that may affect personal safety, indoor air quality, building safety, and environmental degradation.

These inspections include:

1. Lab EHS Audit
2. Machine Shop Audit
3. Electronics/Computer Lab Audit
4. Biosafety Lab Audit
5. Life Safety Audit
6. Satellite Accumulation Area Checks
7. Other inspections as needed.

Lab inspections are managed in https://uah.chematix.com/Chematix/

A. OEHS Safety Audit Schedule

The most current safety audit schedule can be reviewed on the OEHS web site.

B. Optional Self Audits

Departments have the option and are encouraged to conduct internal audits of their laboratory facilities. OEHS audit forms are available for this purpose. Alternatively, departmental audit forms can be developed. Departments choosing this option must have a departmental person designated as safety officer. The departmental procedures must be at least as stringent as the OEHS guidelines and copies of the audits must be remitted to the OEHS. Departmental audits are subject to review by the OEHS.

XIII. Miscellaneous

A. Nuclear Magnetic Resonance (NMR)

The NMR facility is adjacent to the Materials Science and Optics Building Connector. NMR uses a powerful electromagnet in the identification process of chemical compounds. Due to the strong magnetic field, certain precautions must be taken. Persons with pacemakers must not enter the NMR facility. The following are guidelines for safely working in and with the NMR.

- Permission to enter the facility is required. To obtain permission, contact the Director of the NMR facility. The Director will brief persons obtaining permission to enter the NMR facility on the appropriate safety precautions.
- The 10-gauss perimeter must be demarcated in the facility. Persons with implanted or attached medical devices such as prosthetic parts and stints must remain outside of the 10-gauss perimeter from the centerline of the magnet.
- All metal objects (e.g., ordinary tools, electronic equipment, compressed gas cylinders, steel chairs, and steel carts) must be outside the 10-gauss perimeter from the centerline of the magnet. These objects can suddenly fly towards the magnet, possibly causing injury or damage to the equipment and facility.
- Cards with magnetic strips (credit, check, Charger cards) will be erased of information under the presence of the magnetic field. These types of cards must not be taken within the 10-gauss perimeter from the centerline of the magnet.
- Computer monitors and TV screens may be distorted by fringe magnetic field. Appropriate shielding is necessary.
- Only qualified maintenance personnel shall remove equipment covers or make internal adjustments. Dangerous high voltages that can kill or injure exist inside the instrument. Before working inside the cabinet, turn off the main power switch located on the back of the console, then disconnect the AC power cord.
- Do not substitute parts or modify the instrument. Any unauthorized modification could injure personnel or damage equipment.
- Do not operate in the presence of flammable gases or fumes. Operation with flammable gases or fumes present creates the risk of injury or death from toxic fumes, explosion, or fire.
- Leave the area immediately in the event of a magnet quench (sudden appearance of gases from the top of the dewar). This could result in an oxygen deficient atmosphere.
- Avoid liquid helium or nitrogen contact with any part of the body. The cause damage similar to a burn.
- Do not look down the upper barrel. Unless the probe is removed from the magnet, never look down the upper barrel as it is pnuematically driven and may cause injury as the sample is ejected.

B. Children in labs

Special guidelines apply to some individuals under the age of 18 who may be involved with utilizing laboratories in UAH or under the control of UAH faculty. Refer to the UAH Child Protection Policy for further details.

C. After Hours Experiments

After hours, experiments must be approved through department chairpersons. Individual departments must implement policies concerning after hours experiments and laboratory access. A phone must be accessible to all after hours non-supervised laboratory users. Additionally, students are not allowed to work alone in the laboratory.

References

1. http://www.healthsafe.uab.edu
2. http://www.yale.edu/oehs
3. http:www-vcba.ucsd.edu/EHS/home.htm
4. http://www.ehs.neu.edu/
5. http://htf-curricula.mit.edu/bccourse/fumehood/survey-program.htm
6. http://www.hazard.com/MSDS
7. Prudent Practices for Handling Hazardous Chemicals in Laboratories, National Academic Press.
8. American National Standards Institute Z358.1 Compliance Checklist. Guardian Equipment, Emergency Eye wash and Shower Equipment, 1999.
9. SafeAire Laboratory Fume Hoods. Fisher Hamilton Product Specification Catalog, 2000.
10. American National Standard for Laboratory Ventilation Institute Z9.5. American National Standards Institute, 2001.
11. Phoenix Controls, Operations and Maintenance Manual. Revision A. Phoenix Controls Corporation, 1991.
12. Genium's Handbook of Safety, Health, and Environmental Data for Common Hazardous Substances, Genium Publishing Corporation, McGraw Hill 1999.
13. INOVA Installation Planning Manual.

Appendix A

Emergency Information Door Sign

Link to download

Appendix B

THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

UAH STUDENT - LAB SAFETY AGREEMENT

Student Name:	
Instructor Name:	
Dept:	Course No:

This safety contract states the lab-safety rules that are to be executed by everyone involved in order to ensure the safety of work place for everyone (TA's, students, faculty and staff). Two copies should be signed and one returned to the TA, the other to be used by the student as a safety guide and should be present in the lab notebook at all times.

GENERAL RULES

1. Students are required to practice disciplined and responsible conduct at all times when present in the laboratory. (Playing around in the laboratory, sitting or leaning on the lab benches, disorderly behaviors are not permitted at all times. Be alert and proceed with caution at all times in the lab).
2. Pre-lab reading assignments are to be completed prior to entering the laboratory. Thoroughly read all experimental procedures prior to entering the laboratory.
3. Use of food/drink (beverages, chewing gum, tobacco, etc.) and cosmetics in the laboratory is prohibited.
4. Use of cell phones, radios, MP3 players, or headphones is prohibited in the lab. Store these with your personal items in designated areas.
5. Observe good housekeeping practices. Work areas should be kept clean and tidy at all times. Bring only your lab manual, lab book and other necessary materials to the work area. All backpacks, coats, and other personal items must be stored away from benches, fume hoods, all chemicals, and out of aisles. Keep aisles clear.
6. All written and verbal instructions are to be followed carefully. If you do not understand a direction or part of a procedure, ask the TA or the supervising figure before proceeding.
7. Unsupervised presence of students in the lab is prohibited. Persons not participating in the course are not allowed in the lab without approval.
8. Execution of experiments authorized by the course instructor and supervised by the TA are the only experiments permitted.
9. Chemicals and equipment may NOT be removed from the laboratory under any circumstance. Authorization / supervision by the Principal Investigator or Professor responsible for the lab is required to remove any item from the lab.
10. Fume hood sashes must be closed when not in use. Fume hood sashes are not to be opened beyond the 18'' mark when in use. Never stick your head into the fume hood.
11. Each student must execute experiments only in the work space designated to them and personally monitor their experiments in progress. Do not move the equipment/glassware for personal preference unless approved.
12. Hands and pens/pencils are to be kept away from face, eyes, and mouth while using chemicals or equipment. Hands are to be washed with soap and water after performing all experiments, especially before going to the restroom or leaving the lab for any reason.

13. All work surfaces and apparatus are to be cleaned each day by the student at the end of the experiment. Inventory and return of all equipment/glassware (clean and in working order) to the proper location is required. Broken or missing items must be replaced through the Stockroom with a replacement piece.
14. Proper disposal of all chemical waste is a must. Check the label on the waste container thoroughly before adding chemical waste to the container. Waste containers are not to be over filled. When the container is 85% full notify the supervisor.
15. Sinks are to be used only for water and solutions that are permitted by the TA. Mixing of chemicals in sinks is not allowed. Solid chemicals, metals, matches, filter paper, and all other insoluble materials are to be disposed of in their proper waste containers (not in the sink).
16. Do not attempt lab work if you are on a new medicine that could interfere with your ability to function safely in the lab.

PERSONAL PROTECTIVE EQUIPMENT

17. Approved chemical splash goggles MUST be worn at all times when in the lab. The goggles must seal around the face and have no open holes. NO EXCEPTIONS.
18. Contact lenses *should* be replaced with prescription glasses.
19. Dress properly for lab. Clothing must cover the body from the shoulders down to toes. Lab coats are mandatory when the experiment requires them.
    a. NO bare midriffs or ankles
    b. NO tank tops or low-cut tops.
    c. NO shorts, skirts, or cropped pants
    d. SHOES must be closed-toed and completely cover the heel and top of the foot. NO sandals.
20. Long hair, hanging items (jewelry, hoodie strings, etc.), and loose or baggy clothes must be secured.
21. Gloves are available for use when needed and must be removed before leaving lab. Do not handle personal items such as pens with the gloves on.

HANDLING CHEMICALS

22. All chemicals in the lab are to be considered dangerous and used with caution. Chemicals are not to be touched, tasted, or smelled. Only "wafting" method of smelling chemicals should be practiced (if needed) after undergoing proper demonstration by the TA.
23. Label on the reagent/chemical bottles must be checked thoroughly prior to use or transfer.
24. Only directed amount should be used /transferred. Unused chemicals must not be returned to their original container.
25. Proper disposal in the waste containers must be practiced.
26. All reagent bottles and waste containers must be capped when not in use. Reagent bottles must not be removed from their designated dispensing area.
27. Flammable solvents must not be used anywhere near flame.
28. Acids must be handled with care and as per directed by the TA. Always add acid to water, not water to acid.
29. Secured and careful transport of acids and other chemicals from one part of the lab to another must be practiced.
30. Any spills must be promptly notified to the TA or any supervising figure present. As directed by the supervising authority,
    Clean-up of small spills should be performed immediately.

HANDLING GLASSWARE AND EQUIPMENT

31. Never handle broken glass with your bare hands. Use the dust pan and broom provided to clean up the broken glass. Place the broken glass in the containers marked "broken glass". Go to the stockroom and replace the piece of glassware.
32. Examine glassware before each use. Never use chipped or cracked glassware. Never use dirty glassware.
33. Fill wash bottles ONLY with distilled water and use it only as intended, e.g., rinsing glassware and equipment, or adding water to a container. Indicate contents of wash bottles with labels.
34. Unplug hotplates when not in use. When removing an electrical plug from its socket, grasp the plug, not the electrical cord.
35. Hands must be completely dry before touching the plug or switch.
36. Report damaged electrical equipment immediately. Look for things such as frayed cords, exposed wires, and loose connections. Do not use damaged electrical equipment.
37. Do not use a piece of equipment until its proper use is demonstrated by the TA.

ACCIDENTS and INJURIES

38. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the TA immediately, no matter how trivial.
39. Report fires to the TA immediately.
40. If a chemical splashes in your eye(s) or on your skin, immediately flush with running water from the eyewash station or safety shower for at least 15 minutes. Notify the TA immediately.
41. Know the location of the following safety equipment:
    a. Fire extinguisher
    b. Safety shower
    c. Eye wash
    d. First aid kit
    e. Chemical spill kit

EMERGENCY PROCEDURES

In the event of a fire alarm while you are working in the laboratory, immediately turn off any Bunsen burners or hotplates you are using and leave the building by the shortest route as designated by your TA. DO NOT use the elevators. Proceed to the assembly area with your TA. You must remain with your TA until you have been dismissed by supervising personnel.

In the event of a serious injury or someone becomes ill, immediately turn off any burners or hotplates and evacuate to the hallway until supervising personnel give you additional instructions. DO NOT leave until you have been dismissed by supervising personnel.

STATEMENT OF AGREEMENT

I have read and agree to the safety rules set forth in the chemistry lab safety contract. I realize that I must obey these rules in order to ensure my own safety, as well as the safety of others. I am aware that any violations of the contract can result in my removal from the laboratory and loss of credit for the experiment. I also understand that I can be held financially responsible for the laboratory equipment used in this course if I break or destroy an item due to carelessness, neglect, or misuse.

STUDENT SIGNATURE: _____ **DATE:** _____