

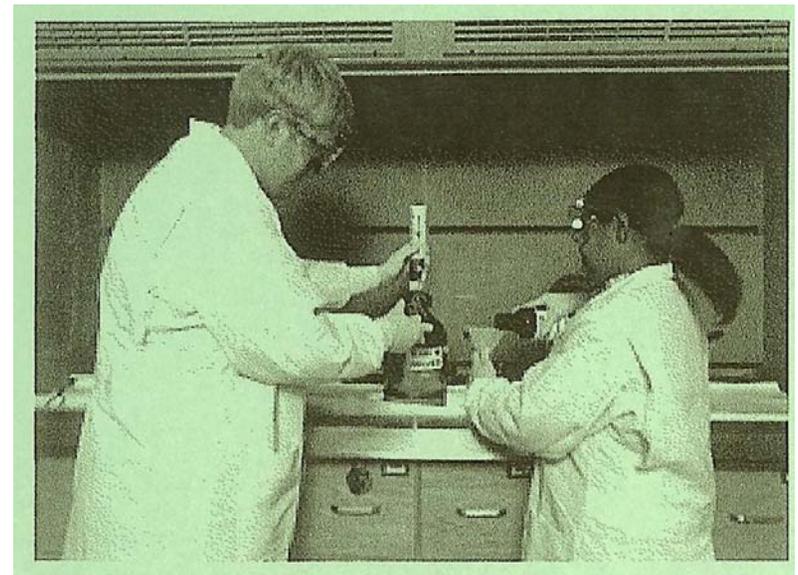
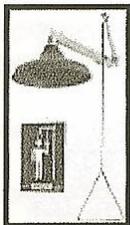
# Laboratory Safety

WHAT YOU NEED TO KNOW ABOUT

Laboratory Safety

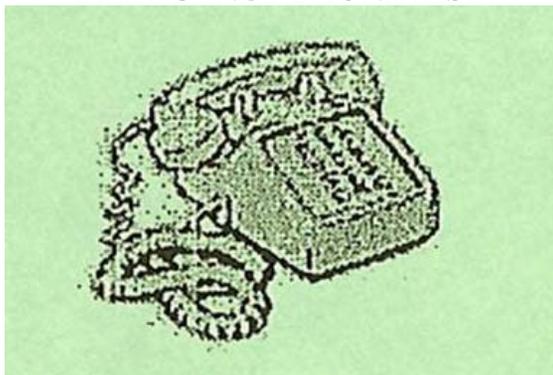
at

Lehigh University



Department of Mechanical Engineering and Mechanics  
P.C. Rossin College of Engineering and Applied Science  
Lehigh University, Bethlehem, PA 18015

## EMERGENCY PHONE LIST



### Lehigh University

University Police  
Univ. Phone X84200  
Public Phone: (610)758-4200

Environmental Health & Safety  
616 Brodhead Avenue  
X83870

City of Bethlehem  
Bethlehem Ambulance  
Department  
911  
or (610)865-7171  
or (610)865-7187

Bethlehem Fire  
911  
or (610)-865-7171  
or (610)865-7187

Bethlehem Police  
911  
or (610)865-7171  
or (610)865-7187

St. Luke's Hospital  
St. Luke's Emergency  
Room  
(610)954-4500

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## Your Health and Safety

The purpose of this safety manual is to provide general safety rules and guidelines to ensure safe working laboratory conditions for all members of the Lehigh community and their visitors. The contents of this manual are not necessarily comprehensive; therefore, supplemental safety procedures may be required as each situation warrants.

Safe laboratory practice is an attitude, a knowledge, and an awareness of potential hazards. Safety is a mutual responsibility and requires the full cooperation of everyone in the laboratory. This cooperation means that each student, instructor, and researcher must observe safety precautions and procedures and should:

1. **Follow all instructions carefully.**
2. **Become thoroughly acquainted** with the location and use of safety facilities such as fire extinguishers, showers, exits, and eyewash stations.
3. **Become familiar with safety precautions** and emergency procedures before undertaking any laboratory work.
4. **Become familiar** with the method of operations and all **potential hazards** involved before beginning an experiment.
5. **Become familiar** with Lehigh University's **waste guidelines** and other programs developed by Environmental Health and Safety.

any accidents can result from an indifferent attitude, failure to use common sense, and failure to follow instructions. Be aware of what your neighbors are doing, since you may be a victim of their mistakes. Do not hesitate to comment to a neighbor engaging in an unsafe practice or operations.

**REMEMBER:  
TREAT MECHANICAL EQUIPMENT, FUELS,  
LUBRICANTS, CHEMICALS, RADIOLOGICAL AGENTS,  
BIOLOGICAL AGENTS AND LAB EQUIPMENT WITH  
CAUTION AND RESPECT.**

## General Laboratory Practices



**DO:**

- **Know what to do in an emergency.**
- Perform lab work in the designated lab area, not in other areas (such as storage, hallway, etc.).
- Store fuels, combustible and toxic substances in compatible, safe containers. Keep them in a clearly marked, ventilated area.
- Protect any breakable containers with appropriate protection with (wrapping) to protect against breakage and explosion.
- Check stored fuels, chemicals regularly for deterioration and broken containers.
- Store breakable containers in chemically-resistant trays or overwrap containers.
- Dispose of chemicals, broken glass, and other waste in containers specifically approved for that use.
- Clean up spills and broken glass immediately. If the spill requires any breathing precautions follow that.
- Post signs to warn others of all dangerous materials such as fuels, lubricants cleaners, toxic or radioactive hazards in the lab.
- Keep only the amount of dangerous substance and chemical you need for the immediate job in the lab.

**Keep the lab clean and neat.**

- Learn how to dispose of materials safely and legally.
- Practice good personal hygiene in the lab. Always wear full length protective clothing, secure any loose clothing and hair.



## DON'T

- **Don't use damaged equipment.**
- Don't store fuels, chemicals near heat or sunlight, or near other substances with which they might react dangerously.
- Don't carry materials between lab and storeroom by hand. Use appropriate carriers, trays, racks, and carts.
- Don't store chemicals in unapproved places.
- Don't store or leave materials on floors or other places where people could trip over them.
- Don't keep chemicals that are no longer needed.
- Don't leave equipment unattended when it's operating.
- Don't leave fuels and chemicals out at night – put them back into storage areas.
- Don't fool around in the lab.
- Don't put staff members and fellow workers in danger – store and dispose of dangerous items like chemicals, biologicals and sharp tools, syringes according to procedures.

## Instructor and Laboratory Supervisor Responsibilities

The laboratory instructor/supervisor is responsible for advising students of the safety requirements at the beginning of each course of study. The instructor/supervisor will point out particular hazards which may be encountered, rules and procedures to prevent or minimize the hazards, and the need for wearing safety glasses, ear protection, lab. apparel and other accessories.

The instructor/supervisor will advise students of fire and accident procedures, including the location and use of fire extinguishers, safety showers, and eyewash stations.

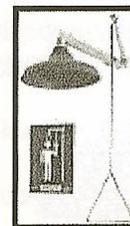
The instructor/supervisor will inform students as to the shortest exit routes from the building in case of an emergency.

Laboratory instructors/supervisors should be satisfied their students understand experimental hazards before they permit the students to participate in or conduct their own experiments.

## Facility Safety

All laboratories should have fire extinguishers and access to safety showers, eyewash stations, fume hoods, laboratory sinks as necessary, and an effective procedure for evacuating the laboratory through well-maintained and unimpeded exits.

All safety equipment such as fire extinguishers, safety showers and the nearest, unrestricted telephone should be readily available, operable, and known to all persons in the laboratory. Laboratory personnel should **always** have access to properly-functioning, adequately-designed facilities.



## Personal Safety

1. Safety glasses must be worn in the laboratory when working with hazardous equipment. If you are found not wearing eye protection in the lab, you will be subject to disciplinary action.
2. If the environment does not permit it, contact lenses should not be worn in or about the laboratory.
3. Never work in the laboratory alone. If a student is required to make-up a lab due to absence during their regular lab hours, then the student must make arrangements not to be alone in the lab.
4. Eating, drinking, and smoking are not allowed in the laboratory.
5. Appropriate clothing must be worn in the lab., e.g., slacks, jeans, shirt, T-shirt. Shorts and open-toe shoes are not allowed. All loose clothing and hair must be secured.
6. No equipment or materials may be removed from the lab.
7. Familiarize yourself with the location of safety equipment (such as fire extinguishers, safety showers, eyewash stations, and first aid kits), evacuation routes, and other safety practices of the lab.
8. Wash your hands often if your hand gets contaminated during the laboratory period, and wash them thoroughly before leaving the lab.
9. In case of an injury:
  - a. Notify your supervisor/lab instructor immediately. All injuries, no matter how small, must be reported.
  - b. Burning of the eyes should be treated by flushing with copious amounts of water for at least 15 minutes. Burning of the skin is usually treated by excessive washing with water. Seek medical attention promptly.



- c. If you get a burning sensation on your skin or in your eyes after lab hours, report to the Student Health Center located in Johnson Hall and explain your symptoms, as well as their possible connection to the lab.
- d. All fuel, oil or chemical spills, glassware breakage, and fires must be reported to your instructor/lab supervisor.
- e. If there is an extensive fuel, oil or chemical spill on a person, use the safety shower. Remove all contaminated clothing. There is no room for embarrassment in emergency situations. It could be the difference between life and death.
- f. If your clothes are on fire, roll on the floor. Don't run to the fire blanket or the shower. Attending laboratory personnel should douse you with water or wrap you in the fire blanket. Get medical attention promptly.

## Prevention of Chemical Injuries

1. Obtain and thoroughly review all Material Safety Data Sheets (MSDSs) for the chemicals you will use.
2. Be aware of what your lab. partner/neighbor is doing. If their actions indicate confusion or ignorance, or danger inform your instructor/supervisor.
3. Never leave an on going experiment unattended.

4. Flammable liquids (ether, acetone, etc.) must not be heated in an open container or used in a room where an open flame is burning.
5. Never heat a closed system. It may explode.
6. Know the properties of the fluid in use. Check it TWICE! Make sure you have selected the equipment and materials.
7. Place waste fluids in the appropriate waste bins/locations.
8. Clean up your work area completely when finished.
9. Do not smell or taste any fluids/chemicals.

### **Chemical Storage and Disposal**

1. All potentially dangerous chemicals should be properly labeled, stored, and handled.
2. All waste material (chemical, radioactive, biohazard, etc.) should be labeled and/or disposed of according to established Lehigh University procedures so as to minimize any safety hazards.
3. All radioactive materials should be handled in compliance with the Lehigh University Radiation Safety Program.
4. All broken or cracked glass should be disposed of in well-marked and sealed containers (e.g., cardboard boxes) separate from solid waste containers to prevent injury.

### **Fire Safety**

In case of the building fire alarm sounds:

1. EVACUATE IMMEDIATELY, checking your immediate area to ensure everyone leaves the building. Close doors when leaving.
2. USE THE STAIRWAYS, NOT THE ELEVATORS!

3. Touch closed doors with your hand before opening to check for heat that may indicate a fire on the other side. Look through the window for signs of smoke.
4. If you need to travel through smoke, stay low and breathe through a wet cloth, if possible.
5. Do not enter the building until safety personnel give an all-clear signal.
6. Locate all the fire safety equipment near your laboratory and office. Memorize your escape routes including how many flights of stairs are associated with each one.

### **Miscellaneous**

1. Any medical conditions, such as epilepsy, should be reported to the instructor/supervisor. This information can be helpful in an emergency.
2. Every individual at Lehigh University has a right to know about the hazards of the chemicals they are working with and the measures they can take to protect themselves. The University has established training sessions which deal with the Employee Right-to-Know Program and other aspects of the OSHA Hazard Communication Standard. Any student interested in attending one or more of these sessions can obtain a complete list of training sessions from Environmental Health and Safety.

### **Hazard Communication Program Availability**

If you would like to review Lehigh's Hazard Communication Program, contact your instructor or laboratory supervisor. Copies of this written program and lists of hazardous chemicals known to be present in the workplace are maintained at the Environmental Health and Safety office.

## Material Safety Data Sheets

Material Safety Data Sheets (MSDSs) are now accessible on the World Wide Web (WWW). The EH&S office has a license with Sigma-Aldrich which allows them to access to Sigma's database.

MSDSs are informational sheets which contain facts on a specific chemical. This information includes: hazardous ingredients, physical data, fire and explosion data, health hazards, etc. Chemical manufacturers are required by law to produce and distribute MSDSs to their customers. Every laboratory/work area on Campus should have an MSDS for each chemical in use.

Some of the WWW sites which offer chemical information are:

1. <http://hazard.com/msds/> - SIRI MSDS Index
2. <http://msds.dhs.cornell.edu/> - Cornell University
3. <http://ull.chemistry.uakron.edu/erd/> - University of Akron

Please call EY&S at x84251 if you need help accessing these databases or if your search does not find the MSDS you need.

## GLOSSARY OF TERMS

**Absorption** - A mode of entry of a toxic substance into the body in which the substance enters through unbroken skin.

**ACGIH** - American Conference of Governmental Industrial Hygienists

**Acute** - A health effect that is the result of a short time exposure to a high concentration of a toxic material. The effect is usually immediately seen, not more than several hours after the exposure.

**Carcinogen** - A material capable of causing cancer.

**Chronic** - A toxic effect that occurs only after exposure to a material for a long period of time, usually months or years. The amount of exposure is usually very low, and often symptoms are not immediately noticeable.

**Concentration** - The amount of a material in the air, for example 50 parts per million (50 PPM). May also refer to the amount of a substance in a mixture, for example; 10 percent ammonia in water.

**Dose** - The amount of a substance that enters the body. The amount depends on the rate at which the substance enters the body and the length of time the substance continues to enter the body. For example, a worker may inhale 10 milligrams of dust per day for 10 days. The total dose is 100 milligrams. Not all of the substance may remain in the body; some are eliminated, possibly as fast they enter.

**Exposure** - Similar to dose. The combination of concentration of a substance in the air and the amount of time a worker is exposed to that concentration gives the total exposure or dose.

**Flammable** - The range of concentrations in air of flammable vapors of a substance Limits between which the vapors will ignite and continue to burn, possibly resulting in an explosion. The lower limit is the Lower Flammable (or Explosive) Limit (LFL), and the upper limit is the Upper Flammable (or Explosive) Limit (UFL). Below the LFL, there is not enough vapor to support combustion. Above the UFL, there is too much vapor, the mixture is too rich to burn. NOTE: The MSDS uses Explosive Limit, but the preferred term is Flammable Limit. These terms are synonymous.

**Flash Point** - The temperature at which enough vapor is produced from a flammable liquid to reach a concentration equal to the LFL (see Flammable Limits). A substance with a high flash point is less hazardous than one with a low flash point.

**LFL or LEL** - Lower Flammable Limit or Lower Explosive Limit.

**MSDS** - Material Safety Data Sheet

**OSHA** - Occupational Safety and Health Administration. This Federal agency is responsible for promulgating standards to provide a safe and healthy work environment.

Permissible OSHA's number that tells the concentration of a chemical in air that a worker may breathe for a given period of time without experiencing Limit adverse effects. See TLV. (PEL)

**Threshold** - A number that tells the concentration of a chemical in air that a worker Limit may breathe for a given period of time (dose) without experiencing Value adverse effects. ACGIH publishes TLVs for about 500 substances. (TLV) OSHA uses similar limits called Permissible, Exposure Limits (PELs).

**Toxic** - Poisonous and capable of causing damage to the body. A substance is more toxic if a small amount can cause the damage. The degree of hazard of a substance depends partly on how toxic it is.

**UFL or UEL** - Upper Flammable Limit or Upper Explosive Limit.

