

Laboratory Safety

Safety Instruction Number: 60

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Lab Safety Rules

These concepts may apply in any areas where hazardous chemicals are used or stored.

General

1. Safety takes precedence over all other considerations.
2. When performing dangerous chemical procedures, be sure there is someone in the immediate vicinity you can reach in case of emergency.
3. Know the location of eyewash fountains and emergency showers. Find out how to use them properly.
4. Before beginning a procedure, take a minute to investigate hazards involved; take all necessary safety precautions.
5. Store food products in separate non-lab refrigerators specifically reserved for that use.
6. Eating, drinking, and smoking is not permitted in laboratory areas. Break rooms should be available for that use.
7. Remove unsafe equipment from service. Report unsafe facilities or behavior to your supervisor.
8. Because unattended equipment and reactions are major causes of fire, floods, and explosions, double check utility connections. Anticipate hazards that would result from failure of electrical, water, or gas supply.
9. Use hose keepers on water condenser lines.

Personal Protection, Clothing, and Hair

1. Properly label all containers.
2. Wear approved eye and face protection suitable for the work at hand. Safety glasses or goggles should be worn at all times while working with chemicals at the counter or laboratory hood. A face shield should be worn when working with potentially eruptive substances.
3. Remind all visitors and non-lab staff to observe lab safety rules, including eye protection, while in the laboratory.
4. Wear protective gloves and clothing whenever handling corrosive, toxic, or other hazardous chemicals. Wear closed-toe shoes at all times in the lab.
5. Check that guards are provided on moving parts of mechanical apparatus to prevent hazardous contact.
6. Maintain lab areas reasonably neat and uncluttered.
7. Use the fume hood for all operations involving harmful gases or fumes and for flammable or explosive materials. Check the hood to see that it is operating adequately and has been inspected within the last year.
8. Use a safety shield or barrier to protect against explosion, implosion, and flash fires when performing reactions with large volume of flammable liquids or unstable material.

9. Inspect glassware for cracks, sharp edges, and contamination before using. Broken or chipped glassware should be repaired and polished or discarded.
10. Always use a lubricant (e.g., water, glycerol) when inserting glass tubing into rubber stoppers or grommets. Protect hands in case tubing breaks.
11. Broken glass should be put in impervious containers that are large enough to completely contain the glass. These containers are to be placed into the building trash dumpsters by laboratory personnel.
12. Do not handle radioactive isotopes without oversight from the Radiation Safety Office.

Chemical Handling

1. Transport dangerous or flammable liquids in a safety pail or other adequate secondary containment. Prevent containers from tipping when transporting on a cart.
2. Take extra precautions when working with large quantities of reactants.
3. Use caution when adding anything to a strong acid, caustic, or oxidant. Add slowly.
4. When adding solids (boiling chips, charcoal, etc.) to a liquid, check that it isn't hot.
5. Use a pipet filler - not mouth suction - for all pipet work
6. Keep the mouth of any vessel being heated pointed away from any person (including yourself).
7. When working with biohazardous material, guard against infection by skin contact, inhalation of aerosols, and contamination of food and beverages.
8. Known carcinogens, mutagens, and teratogens should not be used or stored in normal laboratory situations. Such substances require extreme precaution, tight security, limited access, secondary containers, and other safety procedures; see the OSU Carcinogen Safety program.
9. Flammable liquids should only be heated with steam, hot water or a grounded heating mantle. Check the area for possible flames or electrical sparks.
10. All experiments involving volatile flammable liquids (e.g., diethyl ether) should be considered fire or explosive hazards.
11. When not in use, laboratory natural gas lines should be shut off at the line valve rather than at the equipment.
12. Whenever possible, position energized electrical equipment, or other devices that may emit sparks or flame, at least six inches above the floor.
13. Properly ground electrical equipment.
14. Laboratory electrical equipment should have a three-conductor cord that connects to a grounded electrical outlet, unless the equipment is dual-insulated..
15. Electrical wiring for experiments, processes, etc. should be done neatly, and must conform to electrical code requirements.
16. Store strong oxidants (e.g., nitrates, chlorates, perchlorates, peroxides) in a dry area apart from organic materials.
17. Use a specially designed wash-down laboratory hood for open heated perchloric acid digestions.

Chemical Storage

1. Include the word "flammable" on all flammable liquid containers.

2. Whenever possible, store flammable solvents in NFPA-approved flammable liquid storage cabinets or approved solvent storage rooms.
3. If storing more than 10 gallons of flammable liquids in a laboratory, a flammable liquid cabinet MUST be used.
4. Pay careful attention to peroxide-forming compounds. Organic peroxides may detonate by shock, friction, or heat. Compounds with dangerous tendencies to form peroxides by reaction with oxygen (e.g., many ethers and other chemical classes) have a limited shelf life. They should be dated on opening, and should in no case be stored for longer than one year.
5. Keep caustics stored below eye level.
6. Keep glass containers of chemicals off the floor - unless they are inside protective containers or pans that are kick-proof.
7. Inventory chemicals periodically and discard old, no-longer-needed substances through the campus hazardous waste disposal program.
8. Report chemical inventory annually to EH&S for OR-OSHA and State inventory reporting purposes.
9. See Safety Bulletin #30 for more information on chemical storage.

Pressure and Vacuum Systems

1. Plan and provide for the possibility of explosion prior to conducting experiments that develop high pressure or vacuum.
2. Heat reactants only in a system with an approved pressure release.
3. Wait for pressure to be released before opening a pressurized vessel (autoclave, etc.).
4. Secure compressed gas cylinders in an upright position at all times to prevent from falling. Keep protective caps in place when moving or storing gas cylinders.
5. Regulators designed for specific cylinders are not interchangeable.
6. Keep flammable gas cylinders away from exits and oxygen cylinders.
7. When moving cylinders with a lift truck or hand truck, make sure there is an approved rack or securing device.
8. Oxygen is not a substitute for compressed air.
9. Gauges or regulators for oxidizing gases must not use oil as a lubricant. Oxygen under pressure reacts violently with oil or grease.
10. Suitable pressure regulator are required for compressed gas use.
11. FULLY RELEASE pressure adjusting screws on regulators BEFORE attaching the regulator to a cylinder.
12. Always open the valves on cylinders slowly, and do not stand in front of pressure regulator gauge faces when opening cylinder valves.
13. Do not strike valves with tools, or use excessive force in making connections.
14. Avoid mixtures of acetylene with oxygen or air prior to use - except at a standard torch.
15. Cylinders not provided with fixed hand wheel valves shall have keys or handles provided on valve stems at all times when cylinders are in use.
16. Compressed gas cylinders are high-pressure vessels and should be handled accordingly - they should not be dropped, bumped violently, skidded or rolled horizontally.

17. Keep stored cylinders out of direct sun and areas with increased temperature, such as boiler or rooms.

Container Handling

1. Properly label all containers. If unsure, check rule # 10 (above).
2. Before re-using any food container, first remove the original label completely.
3. Chemical transport containers are not to be used for non-compatible chemicals or for food products at any time.
4. All containers should have a lid at all times except during an active experiment.
5. Refrigeration of flammable materials must be done in spark-proof or explosion-proof refrigerators.

Chemical Spills and Waste Disposal

1. Devise a plan to deal with small spills before one occurs. POST the plan in the lab and get appropriate equipment. Quickly and thoroughly clean up any liquid or solid chemical spill in the laboratory or area of operations. If any uncertainty exists, call Environmental Health & Safety (EH&S).
2. For large spills, contact EH&S to activate OSU's chemical spill response team.
3. Dispose of chemical wastes by approved methods only. Unwanted or no-longer-useful chemicals are chemical wastes. Contact EH&S for waste disposal guidelines.
4. Reagent bottles should be thoroughly cleaned of any hazardous material prior to disposal. Clean glass reagent bottles can usually be recycled.
5. Four simple steps to help comply with hazardous waste rules:
 - a. Perform a waste determination on all wastes (EH&S responsibility)
 - b. Label all waste containers with "waste" or "used", plus a chemical description, BEFORE adding waste.
 - c. Keep all waste containers closed except when adding waste.
 - d. Keep the waste in the room where it was generated.