EXPERIMENT 1

Working Safely in the Lab

Goals

Learn the safety rules for working with chemicals and participating in a safe manner when carrying out laboratory procedures.

Lab Questions

1. Why should students know the safety rules for doing experiments in a lab?
2. Why is it important for you to learn where the safety equipment is located in the lab?

Discussion

The chemistry laboratory with its equipment, glassware and chemicals has the potential for accidents. In order to avoid dangerous accidents, or to minimize their damage, precautions must be taken by every student to insure the safety of everyone working in the laboratory. Following the safety rules for handling chemicals and carrying our procedures will help to create a safe environment in the laboratory. Read the rules in the following sections and complete the questions in the laboratory report. Complete the safety quiz and sign and submit the commitment to lab safety.

Laboratory Activities

A. Preparing for Laboratory Work

1. Pre-read Before you begin an experiment, read the discussion and directions for that experiment. If you have been given a laboratory schedule, read the experiment ***before*** you come to the laboratory. Make sure you fully understand the experiment before starting the actual work. If you have a question, ask your instructor to clarify the procedures.

2. Do assigned work only Do only the experiments that have been assigned by your instructor. No unauthorized experiments are to be carried out in the laboratory. Experiments are done at assigned times, unless you have an open lab situation. Any change in procedure must be approved by your instructor. Do not work alone in a laboratory.

3. Wear proper clothing for protection For proper eye protection, safety goggles must be worn at all time in the lab. Wear sensible clothing to the laboratory. Loose sleeves, shorts, or open-toed shoes can be dangerous. A lab coat is useful in protecting clothes and covering arms. Wear shoes that cover the feet to prevent glass cuts and long pants and shirts to protect skin. Long hair should be tied back so it does not fall into chemicals or a flame from a Bunsen burner.

4. Safety awareness Learn the location and use of the emergency eye-wash fountains, the emergency shower, fire blanket, fire extinguishers, and exits. Memorize their locations in the laboratory. Be aware of other students in the lab carrying chemicals to their desk or to a balance. Do not use chipped or cracked glassware.

5. No food allowed *NO FOOD OR DRINK IS ALLOWED IN THE LABORATORY.* Wash your hands before you leave the laboratory. Do not let your friends visit while you are working in the lab; have them wait outside.

6. Prepare your work area Before you begin a lab, clear the lab bench or work area of all your personal items such as backpacks, books, sweaters, and coats. Find a storage place in the lab for them. All you will need is your laboratory manual, calculator, pen or pencil, text, and equipment from your lab drawer.

B. Handling Chemicals Safely

APPROVED EYE PROTECTION IS REQUIRED IN THE LABORATORY AT ALL TIMES

1. Eye injury Safety goggles must be worn all the time that you are in the laboratory. The particular type depends on state law, which usually requires industrial-quality eye protection. Contact lenses may be worn in the lab if needed for therapeutic reasons, provided that **safety goggles** are worn over the contact lenses. Contact lenses alone are dangerous because splashed chemicals make them difficult to remove. If chemicals accumulate under a lens, permanent eye damage can result. If a chemical should splash into your eyes, flood the eyes with water at the eye-wash fountain. Continue to rinse with water for at least ten minutes.

2. Check labels twice Be sure you take the correct chemical. ***DOUBLE CHECK THE LABEL*** on the bottle before you remove a chemical. For example, sodium sulfate could be mistaken for sodium sulfite if not read carefully. To avoid contamination of the chemical reagents, ***never*** insert droppers, pipets or spatulas into the reagent bottles.

3. Use small amounts Pour or transfer a chemical into a small, clean container (beaker, test tube, flask, etc.) taken from your lab drawer. Take only the quantity of chemical you need for the experiment and replace its cover. Do not keep a reagent bottle at your desk; ***return*** it to its proper location in the laboratory. Label the container. Many containers have etched sections on them for pencil. If not, use tape or a marking pencil.

4. Do not return chemicals to the original containers To avoid contamination of chemicals, dispose of used chemicals according to your instructor's instructions. ***Never return unused chemicals to reagent bottles.*** Some liquids and water-soluble compounds may be washed down the sink with plenty of water, but check with your instructor first. Dispose of organic compounds in specially marked containers in the hoods.

5. Do not taste chemicals; smell a chemical cautiously. Never use any equipment in the drawer such as a beaker to drink from. When required to note the odor of a chemical, first take a deep breath of fresh air and hold it while you use your hand to fan some vapors toward your nose and note the odor. Do not inhale the fumes directly. If a compound gives off an irritating vapor, use it in the fume hood to avoid exposure.

6. Do not shake laboratory thermometers Laboratory thermometers respond quickly to the temperature of their environment. Shaking a thermometer is unnecessary and can cause breakage.

7. Liquid spills Spills of water or liquids at your work area or floor should be cleaned up immediately. Small spills of liquid chemicals can be cleaned up with a paper towel. Large chemical spills must be treated with adsorbing material such as cat litter. Place the soaked material in a waste disposal bag and label. If a liquid chemical is spilled on the skin, flood *immediately with water* for at least 15 minutes. Any clothing soaked with a chemical must be removed since absorbed chemical can cause more damage.

8. Mercury spills The cleanup of mercury requires special attention. Notify your instructor immediately of any mercury spills so that special methods can be used to remove the mercury properly. Mercury spills may occur from broken thermometers. Place any free mercury and mercury clean-up material in special containers for mercury only.

9. Laboratory accidents Always notify your instructor of any chemical spill or accident in the laboratory. Broken glass can be swept up with a brush and pan and placed in a specially labeled container for broken glass. Cuts are the most common injuries in a lab. If a cut should occur, wash, elevate, and apply pressure if necessary. Inform your instructor for further medical attention.

10. Clean up Wash glassware as you work. Begin your cleanup 15 minutes before the end of the laboratory session. Return any borrowed equipment to the stockroom. Be sure that you always turn off the gas and water at your work area. Make sure you leave a clean desk. Check the balance you used. Clean up any spills in the area.

C. Heating Chemicals Safely

1. Heat only heat-resistant glassware Glassware marked Pyrex or Kimax can be heated. Other glassware will shatter if heated. To heat solids or liquids in a test tube, hold the tube in a holder at an angle - not upright - over the flame. Move the test tube continuously as you heat the sides and bottom. Never point the open end of the test tube at anyone, or look directly into it. Be careful when you pick up equipment you may just have heated. This might be an iron ring, a clay triangle, a test tube or beaker, or a crucible. A hot piece of iron or glass looks the same as it does as room temperature. Do not place hot objects on a balance. Let the object cool first.

2 . Flammable liquids Never heat a flammable liquid over an open flame. If heating is necessary, your instructor will indicate the use of a steam bath or a hot plate.

3. Never heat a stoppered container When a closed system is heated, it can explode as pressure inside builds.

4. Fire Small fires can be extinguished by covering them with a watch glass. If a larger fire is involved, use a fire extinguisher to douse the flames. *Do not direct a fire extinguisher at other persons in the laboratory.* Shut off gas burners in the laboratory. While working in a lab, long hair should be tied back away from the face. If clothing or hair catch on fire, get the student to the floor and roll into a fire blanket. A student may also be placed under the safety shower to extinguish flames. Cold water or ice can be applied to small burns. Do not use grease or other oil-based compound.

D. Waste Disposal

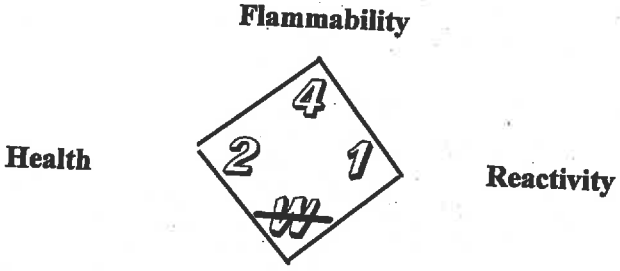
As you work in the laboratory, chemical wastes will be produced. Although we will use small quantities of materials, some waste products are unavoidable. In order to dispose of these chemical wastes safely, you will be informed of the specific disposal requirements by your instructor. Some of the general rules for chemical waste disposal follow.

1. Metals Metals should be placed in a container to be recycled.

2. Nonhazardous chemical wastes Substances such as sodium chloride (NaCl) that are soluble in water and are not hazardous may be emptied into the sink. If the waste is a solid, dissolve it in water before disposal.

3. Hazardous chemical wastes If a substance is hazardous or not soluble in water, it must be placed in a container that is labeled for waste disposal. Your instructor will inform you if chemical wastes are hazardous and identify the proper waste containers. ***If you are not sure about the proper disposal of a substance, ask your instructor.*** The labels on a waste container should indicate if the contents are hazardous, the name of the chemical waste, and the date that the container was placed in the lab.

4. Hazard rating The general hazards of a chemical are presented in a spatial arrangement of numbers with the flammability rating at twelve o'clock, the reactivity rating at the three o'clock position, and the health rating at the nine o'clock position. At the six o'clock position, information may be given on the reactivity of the substance with water. If there is unusual reactivity with water, the symbol W (do not mix with water) is shown. In the laboratory, you may see these ratings in color with blue for health hazard; red for flammability; and yellow for reactivity hazards.



A chemical is assigned a relative hazard rating based from one (little hazard) to four (extreme hazard). The health hazard indicates the likelihood of a material to cause injury due to exposure by contact, inhalation, or ingestion. The flammability hazard indicates the potential for burning. The reactivity hazard indicates the instability of the material by itself or with water with subsequent release of energy. Special hazards may be included such as W for reactivity with water or OX for oxidizing properties.

E. Safety Quiz and Pledge

Complete the safety quiz and check your answers with the key. Sign the commitment to lab safety and give to your instructor.