

## Safety in the Classroom

### Introduction

Chemistry is exciting! Each day in the laboratory you are given the opportunity to confront the unknown, and to understand it. Each experiment holds many secrets. Look hard and you may see them. Work hard and you can solve them. The word science comes from the Latin word *scire*, which means “to know”. The goal of all science is knowledge.

Chemistry is a laboratory science. To get the most of your laboratory experience, you must be well prepared for each experiment. This means that you must read the experiment thoroughly before coming to the laboratory. Make sure you have a clear idea of what the experiment is about. Be sure that you understand each step of the procedure. If you are unsure of any part of the experiment, ask your teacher for help before the laboratory begins.

### Safety

As part of your laboratory experience you will handle many chemical substances and manipulate specialized laboratory equipment, while some of the laboratory equipment can cause severe injury if used improperly. If you are well prepared for the laboratory, it is much less likely that an accident will occur. Before your being a laboratory experiment note the safety warnings and the general safety precautions described in the safety section of each lab. The most important safety rule to follow at all times is to: **Always wear safety goggles in the laboratory area!**

### Laboratory Hazards

This safety section is intended to acquaint you with the hazards that exist in the laboratory and to indicate how you can avoid these hazards.

**Thermal Burn:** A thermal burn can occur if you touch hot equipment or come too close to an open flame. You can prevent thermal burns by being aware that hot and cold equipment look the same. If a gas burner or hot plate has been used, hold your hand near an item to feel for heat before touching the equipment. Treat a thermal burn by immediately running cold water over the burned area for a few minutes until the pain is reduced. Greases and oils should not be used to treat burns because they tend to trap the heat. Notify your teacher immediately if you are burned!

**Chemical Burn:** A chemical burn occurs when the skin or a mucous membrane is damaged by contact with a substance, like Sulfuric Acid or Nitric Acid. The safety section of each exercise indicates which substances can cause chemical burns. “C” stands for corrosive, which indicates that the chemical can cause severe burns. “I” stands for irritant, which indicates that the chemical can irritate the skin and the membranes of the eye, nose, throat, and lungs. Chemical burns can be severe. Permanent damage to mucous membranes can occur. For example: The estimated time that permanent corneal damage can occur from 1 M NaOH is 30 seconds. The best defense against chemical burns is prevention. Wear safety goggles during all phases of the laboratory experiment even during clean-up.

**Fire:** A fire may occur if chemicals are mixed improperly or if flammable materials come too close to a burner flame or hot plate. Flammable chemicals are designated with the symbol “F”. During laboratory experiments, all long hair needs to be tied back and loose-fitting clothing is not allowed.

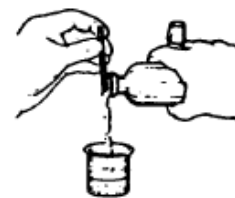
**Poisoning:** Many of the chemicals used in the laboratory are toxic. Toxic chemicals are identified with the symbol “P”. In the laboratory, never eat, chew gum or drink anything. Always wash your hands before leaving the laboratory area.

### Laboratory Techniques

Working in the chemistry laboratory, you will be handling potentially dangerous substances and performing unfamiliar tasks. This section provides you with a guide to the various laboratory techniques, which will be used during the course.

**Pouring Liquids:** Always read the label on a reagent bottle before using its contents. Never pour excess liquid back into the original reagent bottle. Excess liquid should be disposed of in the proper waste container. When you are transferring a liquid to a test tube or measuring cylinder, the container should be held at eye level. Pour the liquid slowly, until the correct volume has been transferred.

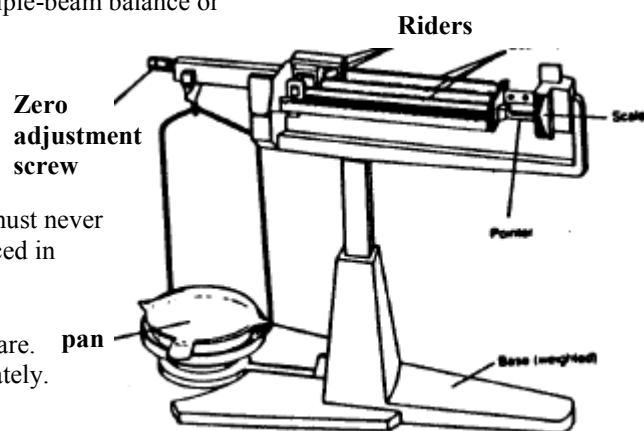
When you are pouring a liquid from a reagent bottle into a beaker, the reagent should be poured slowly down a glass stirring rod. **See picture!**



**Measuring Mass:** An object's mass is determined by measuring it on a triple-beam balance or an electronic balance. The SI unit for mass is the kilogram.

**To operate a triple-beam balance, follow the general rules:**

- The balance pan should be empty, clean and all masses or dials should be set on zero.
- Objects to be weighed directly on the balance pan must be clean, dry and at room temperature. Solid chemicals and liquids must never be put directly on the balance pan. Liquid samples should be placed in beakers or in a sealed container. Solid chemical can be placed in weighing boats.
- The balance is a precision instrument that must be handled with care. If you spill a chemical on or near the balance, clean it up immediately.
- Never attempt to weigh an object with a mass greater than the maximum capacity of the balance.
- When you finish weighing, return all the masses to zero, and make sure the balance pan is clean.

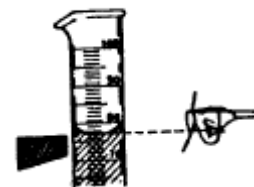


**Filtering a Mixture:** The most common method of separating such a mixture is filtration.

- Fold a filter paper circle in half (1) and then in quarters (2). Open the folded paper to form a cone, with one thickness of paper on one side and three thickness on the other (3).
- Put the paper cone in a filter funnel. Moisten the filter paper with a small volume of distilled water, and gently press the paper against the sides of the funnel to achieve a good fit.
- Place the filter funnel inside a beaker and slowly decant the liquid through the funnel into the beaker.
- When the filtration is complete, wash the solid residue on the filter paper with distilled water to remove traces of solvent. Dry the solid.



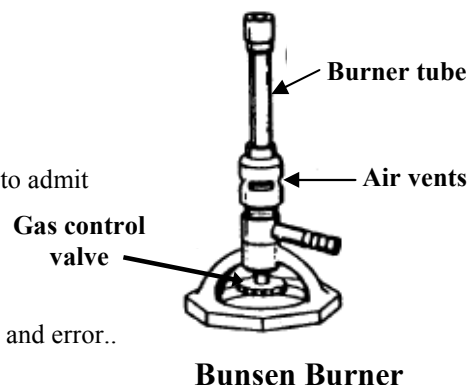
**Measuring Volume:** Most volume measures in the laboratory are made using equipment calibrated in milliliters. Beakers have graduation marks; these marks are designed only for quick, rough estimates of volume. Accurate volumes must be measured with volumetric/graduated pipets, burets or volumetric flasks. A volume measurement, using a graduated cylinder, is always read at the bottom of the meniscus at eye level. To make the meniscus more visible, you can place your finger or a dark piece of paper behind & just below the meniscus while making the reading.



**Using a gas burner:** The two most common models are the Bunsen Burner and the Tirrell Burner.

To operate a gas burner follow the general rules:

- Hold a lighted match at the top of the burner tube and turn on the gas supply.
- Always light the match before you turn on the gas. Open the air vents slowly to admit More air into the flame to produce a light blue cone-shaped flame.
- Adjust the air vents and gas supply to produce the desired size & color of flame. The blue inner cone of the flame should be about 1 inch high and free of yellow color. If you want a smaller flame close the air vent slightly and reduce the gas supply. You will learn how to control the burner flame by trial and error..



**Heating Liquids:** To heat a liquid in a test tube, first grasp the test tube with a test tube holder and then hold the test tube in a slanting position in the flame & gently heat the tube a short distance below the surface of the liquid. Never point the open end of a test tube that you are heating toward yourself or anyone working nearby. Shake the tube gently as it is being heated, until the liquid boils or the desired temperature is reached.

