

Using Lab Techniques

Use the "Safety Lab Techniques" handout for reference when doing the following activities. This lab is designed to help you learn proper lab techniques and familiarize you with the location of the equipment.

1. Add 5 ml of water (distilled) to a test tube. Add a pea-size sample of NaCl and shake until the solid is dissolved. Add 10 drops of AgNO₃ to the solution in the test tube. Describe the results. (NOTE: Do not get AgNO₃ on your hands! It will turn black when exposed to light. If you do spill some on yourself, wash it off immediately with soap and water.)
2. Filter the solution from step #1. The solid collected on the filter paper is called the precipitate. The liquid collected in the beaker under the funnel is called the filtrate. The filtrate should be clear. If it isn't, set up a clean filtration system and repeat the process.
3. Pour the filtrate into a PYREX test tube. Heat the liquid to boiling. Carefully insert a thermometer and note the temperature of the liquid. Record the temperature
4. Cut a 20 cm piece of glass tubing. Fire polish both ends. Using a Bunsen burner, make a right-angle bend in the glass.
5. Once the glass tubing has cooled, insert one end into a one-holed stopper. Make sure to use glycerol! Once you have shown this to your instructor, remove the glass tube from the stopper. Return the stopper but keep the glass tubing in your lab drawer.
6. Weigh out 0.50 grams of powdered soap. Afterwards, you may use it to clean glassware.

Safe Laboratory Techniques

Pouring Liquids

- Always read the label on a reagent bottle before using its contents.
- Always wear safety goggles when handling chemicals.
- Never touch chemicals with your hands.
- Never return unused chemicals to their original containers. To avoid waste, do not take excessive amounts of reagents.

Follow this procedure when pouring liquids.

1. Use the back of your fingers to remove the stopper from a reagent bottle. Hold the stopper between your fingers until the transfer of liquid is complete. Do not place the stopper on your workbench.
2. Grasp the container from which you are pouring with the palm of your hand covering the label.
- 3a. 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.
- 3b. When you are pouring a liquid from a reagent bottle into a beaker, the reagent should be poured slowly down a glass stirring rod (Figure 1). When you are transferring a liquid from one beaker to another, you can hold the stirring rod and beaker in one hand.

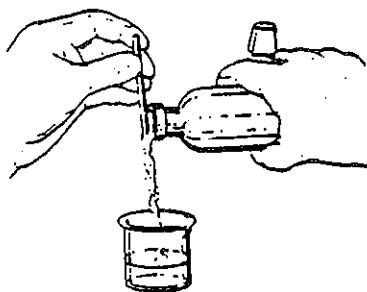


Figure 1. Pouring from a reagent bottle into a beaker.

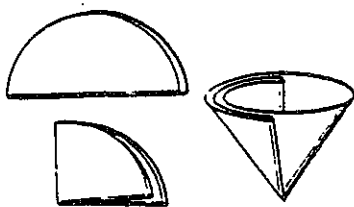


Figure 2. Folding the filter paper.

Filtering a Mixture

Sometimes it is necessary to separate a solid (for example, a precipitate) from a liquid. The most common method of separating such a mixture is filtration.

1. Fold a filter paper circle in half and then quarters. Open the folded paper to form a cone with one thickness of paper on one side and three thicknesses on the other (Figure 2).
2. Put the paper cone in a filter funnel. Place the funnel in an iron ring clamped to a ring stand. Moisten the filter paper with a small volume of distilled water, and gently press the paper against the sides of the funnel to give a good fit. (If the correct size of filter paper has been used, the top edge of the cone will be just below the rim of the filter funnel.)
3. Place a beaker beneath the funnel to collect the filtrate. The tip of the funnel should touch the inside surface of the beaker and extend about one inch below the rim (Figure 3).
4. Decant the liquid from the solid (precipitate) by pouring it down a glass stirring rod into the funnel. Be careful to keep the liquid below the top edge of the cone of filter paper at all times; the liquid must not overflow. Finally, use a jet of distilled water from a wash bottle to wash the solid (precipitate) into the filter.
5. When the filtration is complete, wash the solid residue on the filter paper with distilled water to remove traces of solvent. Dry the solid.
6. If the filtrate contains a dissolved salt it may be recovered by evaporation if desired.

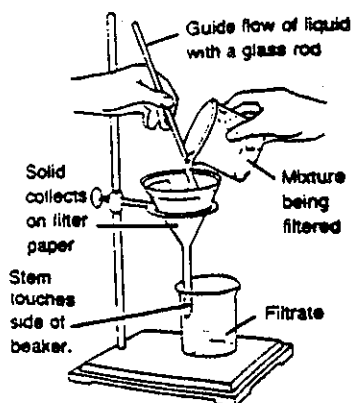


Figure 3. Filtration assembly.

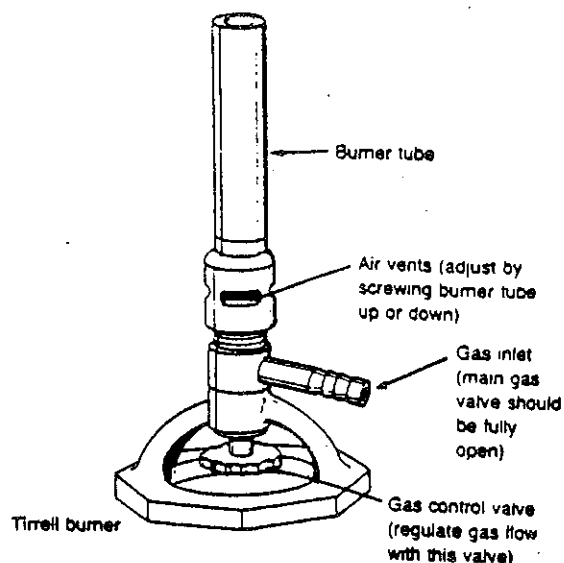
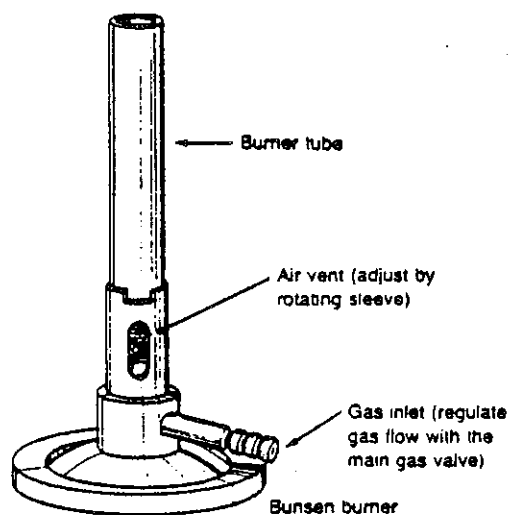
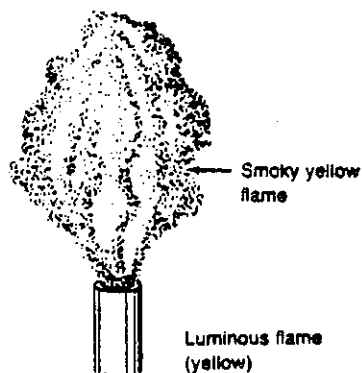


Figure 4. Laboratory gas burners.

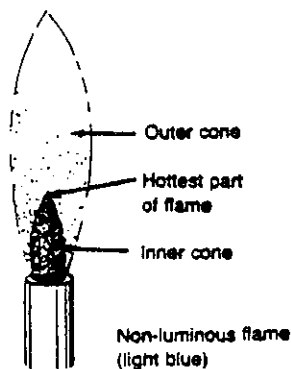
Using a Gas Burner

Laboratory gas burners produce various kinds of flames when different mixtures of gas and air are burned. The two most common models are the Bunsen burner and the Tirrell burner. Both have adjustable air vents; the Tirrell burner also has a gas control valve in its base (Figure 4).

1. Examine your laboratory burner. Determine which model you have.
2. Connect the burner to the gas supply with rubber tubing.
3. Close the air vents. If your model is a Tirrell burner also close the gas control valve at the base of the burner.
4. Hold a lighted match at the top of the burner tube and turn on the gas supply. You should get a yellow or luminous flame (Figure 5). When a Tirrell burner is used, the main gas supply valve should be opened fully and the gas flow regulated by the gas control valve at the base of the burner. Gas supply to a Bunsen burner is controlled by the main gas valve.
5. Open the air vents slowly, to admit more air into the flame, to produce a light blue (nonluminous) cone-shaped flame. If the flame "blows out" after lighting, the gas supply should be reduced.
6. Adjust the air vents and gas supply to produce the desired size of flame. For most laboratory work the blue inner cone of the flame should be about one 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.
7. Turn the burner off at the main gas supply valve as soon as you have finished.



a. air vents closed



b. air vents open

Figure 5. Burner flame characteristics.

Caution: Confine long hair and loose clothing when using a gas burner. Do not reach over a burner. Ensure that flammables are not being used when a burner is lit. Never leave a lit burner unattended. Know the location of fire extinguishers, the fire blanket, and safety shower.

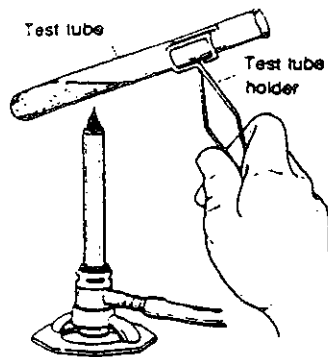


Figure 6. Heating a liquid in a test tube.

Heating Liquids

Heating a liquid in a test tube. The correct procedure for heating liquids in the laboratory is important to laboratory safety.

1. Adjust your gas burner to give a gentle blue flame.
2. Fill a test tube one-third full with the liquid to be heated.
3. Grasp the test tube with a test tube holder near the upper end of the tube.
4. Hold the test tube in a slanting position in the flame, and gently heat the tube a short distance below the surface of the liquid (Figure 6).
5. Shake the tube gently as it is being heated, until the liquid boils or reaches the desired temperature.

Caution: *Never point the open end of a test tube you are heating either toward yourself or anyone working nearby. Never heat the bottom of the test tube.*

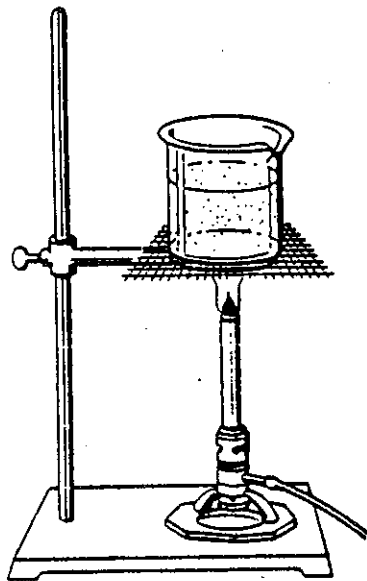


Figure 7. Heating a liquid in a beaker.

Heating a liquid in a beaker. Many laboratory experiments require the use of a hot-water or boiling-water bath. This procedure describes how to assemble a water bath.

1. Fasten an iron ring securely to a ring stand so that it is about two to four centimeters above the top of a gas burner placed on the ring stand base.
2. Place a 250-mL beaker one-half filled with water on a wire gauze resting on the iron ring (Figure 7).
3. Light your gas burner and adjust it to give a hot flame.
4. Place the burner beneath the wire gauze. For a slower rate of heating, reduce the intensity of the burner flame.

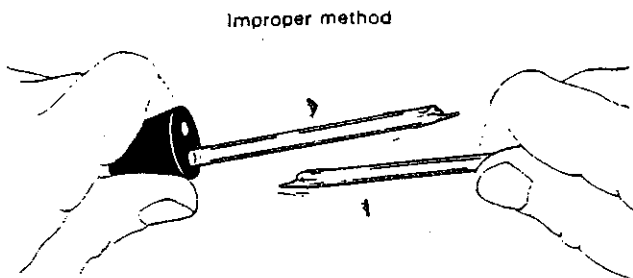
Caution: *Never heat plastic beakers or graduated glassware in a burner flame. Never let a boiling water bath boil dry; add water to it as necessary.*

Inserting Glass Tubing into a Rubber Stopper

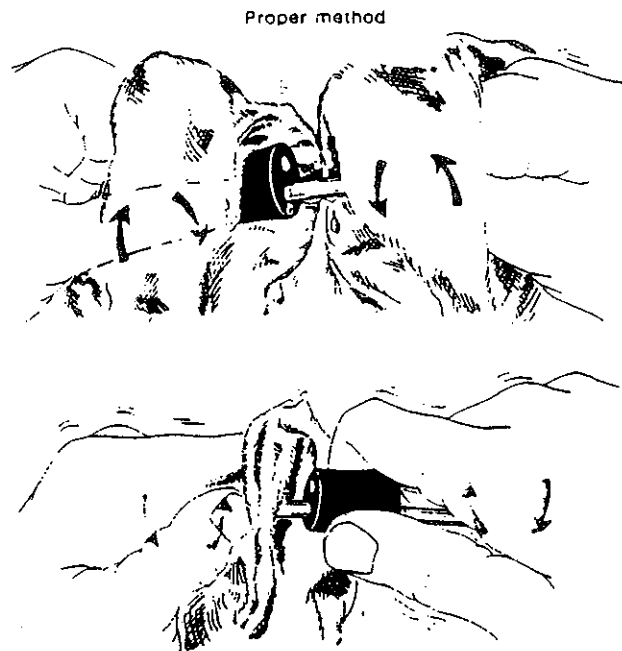
Before attempting to insert glass tubing or a thermometer into a rubber stopper, be sure that the hole in the stopper is large enough so it will stretch easily to accommodate the tubing (See diagram on next page).

1. Place a drop of glycerine or some water in the hole of the stopper or on the tip of the glass to serve as a lubricant.
2. Protect your hands by wrapping the glass with a piece of cloth or towel.
3. Hold the glass near the stopper and push with a gentle twisting motion. Do not use excessive force to insert the glass tubing or thermometer. Be very careful. If you experience any difficulty, consult your teacher.

Figure 19 Inserting glass tubing into a stopper



Improper method



Proper method

WORKING WITH GLASS TUBING

The glass tubing most commonly used in the laboratory is made of a "soft" type of glass that is easily cut and shaped. To cut a piece of tubing, place it on a flat surface. Place one edge of a triangular file on the tubing at the spot where you wish to make your cut. While holding the tubing with one hand, press down firmly with the file and make one firm stroke away from you. Pick up the tubing and place your thumbs on opposite sides of the scratch, as shown in Figure 13A. Holding your thumbs firmly against the glass, snap the tubing at the scratch, as shown in Figure 13B.

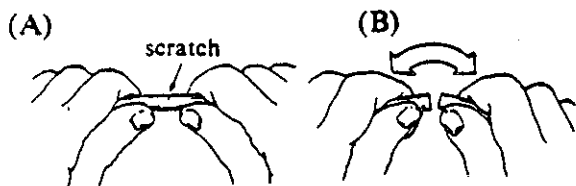


Figure 13. Cutting glass tubing.

After a piece of tubing has been cut, the cut edges are very sharp and should be polished. To do this, place the cut end of the tubing into the hottest part of a burner flame. Rotate the glass as you heat it (Figure 14), and continue heating it until the flame becomes a bright yellow. If you examine the cut end, you will see that the sharp edges have become smooth.

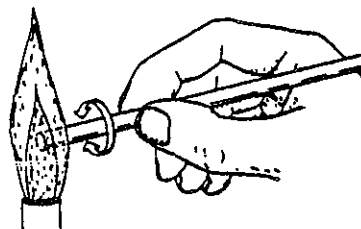


Figure 14. Fire-polishing glass tubing.

Place the tubing on an insulated pad to cool. **DO NOT TOUCH THE HOT GLASS.**

If you wish to bend a piece of glass tubing, first place a flame spreader, or "wing tip," on the burner. Light the burner and rotate the glass in the flame, as shown in Figure 15.

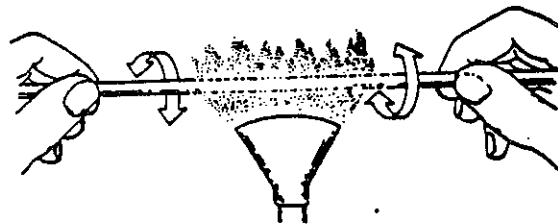


Figure 15. Heating glass tubing prior to bending.

As the glass heats, the flame will become yellow and the glass will soften. Remove the glass from the flame and lift the ends of the tubing with a smooth, even motion. When the glass has been bent to the desired angle, place it on an insulated pad to cool.

