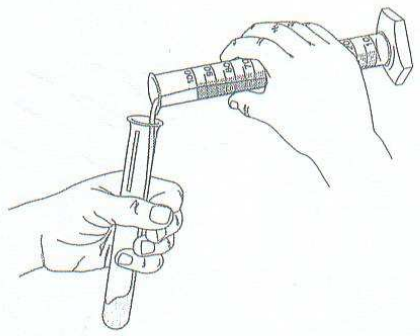

FIGURE A

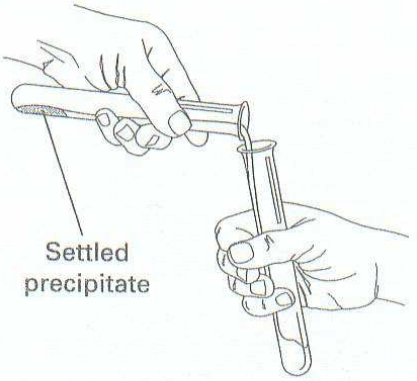

FIGURE B

FIGURE C

DECANTING AND TRANSFERRING LIQUIDS

1. The safest way to transfer a liquid from a graduated cylinder to a test tube is shown in Figure A. The liquid is transferred at arm's length with the elbows slightly bent. This position enables you to see what you are doing and still maintain steady control.
2. Sometimes liquids contain particles of insoluble solids that sink to the bottom of a test tube or beaker. Use one of the methods shown below to separate a supernatant (the clear fluid) from insoluble solids.
   a. Figure B shows the proper method of decanting a supernatant liquid in a test tube.
   b. Figure C shows the proper method of decanting a supernatant liquid in a beaker by using a stirring rod. The rod should touch the wall of the receiving container. Hold the stirring rod against the lip of the beaker containing the supernatant liquid. As you pour, the liquid will run down the rod and fall into the beaker resting below. Using this method, the liquid will not run down the side of the beaker from which you are pouring.

HEATING SUBSTANCES AND EVAPORATING SOLUTIONS

1. Use care in selecting glassware for high-temperature heating. The glassware should be heat resistant.
2. When heating glassware using a gas flame, use a ceramic-centered wire gauze to protect glassware from direct contact with the flame. Wire gauzes can withstand extremely high temperatures and will help prevent glassware from breaking. Figure D shows the proper setup for evaporating a solution over a water bath.

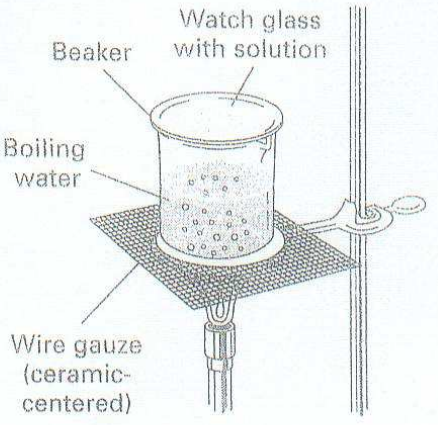

FIGURE D

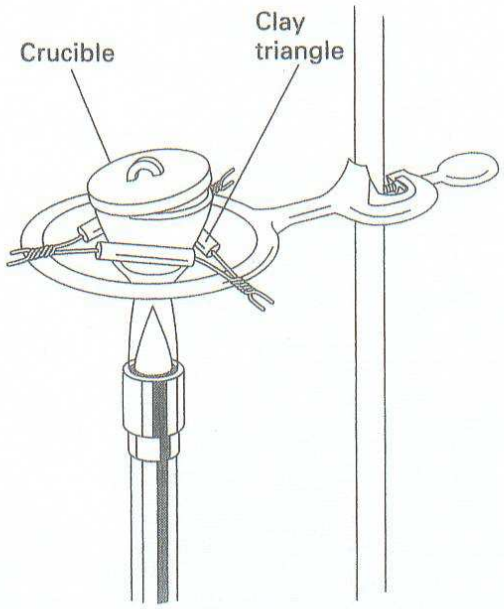

FIGURE E

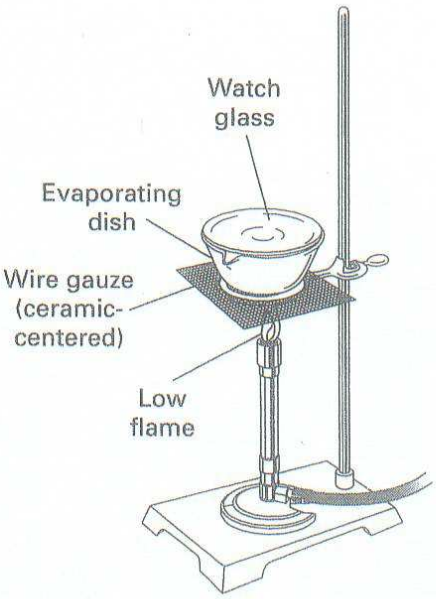

FIGURE F

3. In some experiments you are required to heat a substance to high temperatures in a porcelain crucible. Figure E shows the proper apparatus setup used to accomplish this task.
4. Figure F shows the proper setup for evaporating a solution in a porcelain evaporating dish with a watch glass cover that prevents spattering.
5. Glassware, porcelain, and iron rings that have been heated may *look* cool after they are removed from a heat source, but these items can still burn your skin even after several minutes of cooling. Use tongs, test-tube holders, or heat-resistant mitts and pads whenever you handle this apparatus.
6. You can test the temperature of questionable beakers, ring stands, wire gauzes, or other pieces of apparatus that have been heated by holding the back of your hand close to their surfaces before grasping them. You will be able to feel any heat generated from the hot surfaces. DO NOT TOUCH THE APPARATUS. Allow plenty of time for the apparatus to cool before handling.

HOW TO POUR LIQUID FROM A REAGENT BOTTLE

1. Read the label at least three times before using the contents of a reagent bottle.
2. Never lay the stopper of a reagent bottle on the lab table.
3. When pouring a caustic or corrosive liquid into a beaker use a stirring rod to avoid drips and spills. Hold the stirring rod against the lip of the reagent bottle. Estimate the amount of liquid you need and pour this amount along the rod into the beaker. See Figure G.

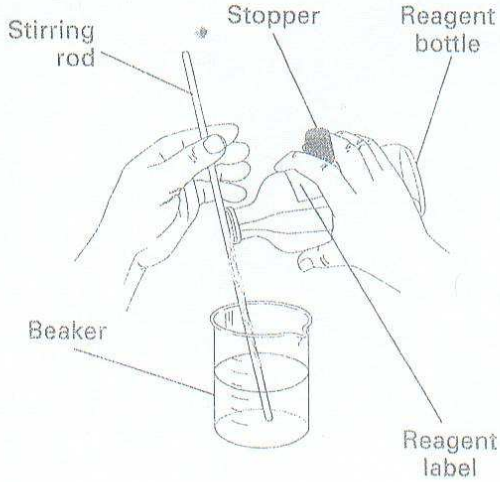

FIGURE G

4. Extra precaution should be taken when handling a bottle of acid. Remember the following important rules: Never add water to any concentrated acid, particularly sulfuric acid, because the mixture can splash and will generate a lot of heat. To dilute any acid, add the acid to water in small quantities, while stirring slowly. Remember the "triple A's"-Always Add Acid to water.
5. Examine the outside of the reagent bottle for any liquid that has dripped down the bottle or spilled on the counter top. Your teacher will show you the proper procedures for cleaning up a chemical spill.
6. Never pour reagents back into stock bottles. At the end of the experiment, your teacher will tell you how to dispose of any excess chemicals.

HOW TO HEAT MATERIAL IN A TEST TUBE

1. Check to see that the test tube is heat-resistant.
2. Always use a test tube holder or clamp when heating a test tube.
3. Never point a heated test tube at anyone, because the liquid may splash out of the test tube.
4. Never look down into the test tube while heating it.
5. Heat the test tube from the upper portions of the tube downward and continuously move the test tube as shown in Figure H. Do not heat any one spot on the test tube. Otherwise a pressure build-up may cause the bottom of the tube to blow out.

HOW TO USE A MORTAR AND PESTLE

1. A mortar and pestle should be used for grinding only one substance at a time. See Figure I.
2. Never use a mortar and pestle for simultaneously mixing different substances.
3. Place the substance to be broken up into the mortar
4. Pound the substance with the pestle and grind to pulverize.
5. Remove the powdered substance with a porcelain spoon.

DETECTING ODORS SAFELY

1. Test for the odor of gases by wafting your hand over the test tube and cautiously sniffing the fumes as shown in Figure J.
2. Do not inhale any fumes directly.
3. Use a fume hood whenever poisonous or irritating fumes are evolved. DO NOT waft and sniff poisonous or irritating fumes.

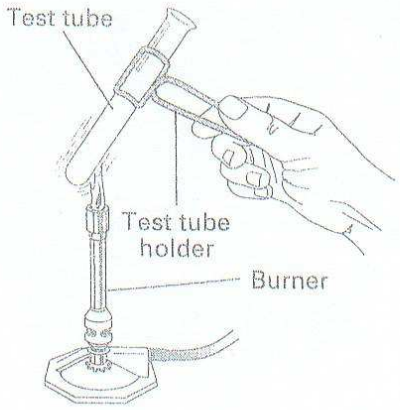

FIGURE H

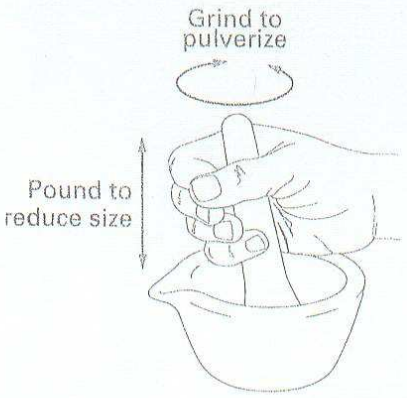

FIGURE I

FIGURE J

Using the Balance

Beam balances are the most common type used in high school laboratories. The two balances shown in Figure 4 are (a) a triple-beam platform balance and (b) a four-beam pan balance.

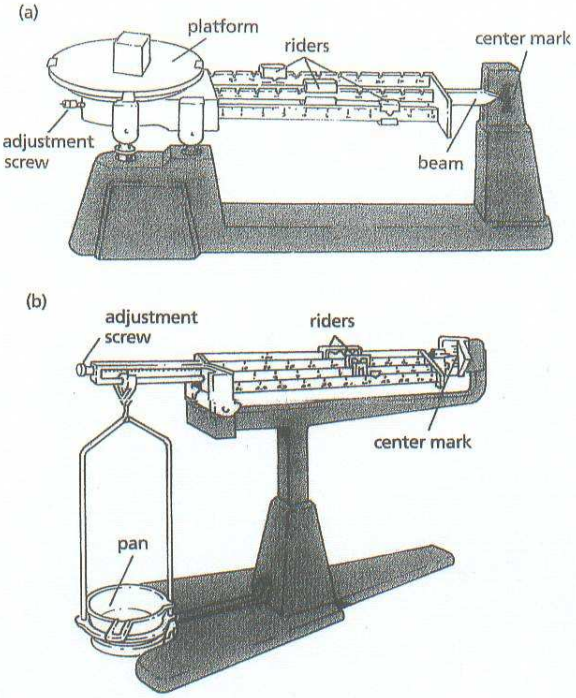

Figure 4 Two types of beam balances.

The proper use of the balance is described in the following steps:

1. Check to see that the balance is properly adjusted, or "zeroed." To do this, set all of the riders at zero and remove all objects from the pan or platform. The pointer should swing an equal distance on each side of the zero point on the scale. If it does not, use the adjustment screw to obtain an equal swing of the pointer.

2. *Never place chemicals directly on the balance pan or platform.* Samples to be measured should be placed on a piece of pre-measured paper or in a pre-measured container. Clean up any spills immediately. Never place hot objects on the balance. Allow samples to cool before measuring their mass.

3. Once the object whose mass is to be determined is on the pan or platform, move the rider of greatest mass along this beam, one notch at a time, until it causes the pointer to drop. Then move the rider *back* one notch. Repeat this procedure with each succeeding rider of smaller mass. If the beams are notched, make sure each rider is securely in its notch. The front beam, which is marked off in the smallest increments, is not notched. Slide the rider on this beam until the pointer swings an equal distance on each side of the zero on the scale.

4. When the pointer is zeroed, sum up the masses shown on the beams. The mass of the object is equal to the sum of the masses shown on the beams *minus the pre-measured mass of the paper or container.*

The precision of a balance depends on the size of the smallest increments on the scale of the front beam. On some triple-beam balances, this scale is divided into 10 1-gram increments. This scale can be read to the nearest ±0.1 gram. On a four-beam balance (and some triple-beam balances), the scale on the front beam is divided into 10 0.1-gram increments. This scale can be read to the nearest ±0.01 gram. Some sample readings of this type of balance are illustrated in Figure 5. The reading on balance (a) is 24.56 grams. The reading on balance (b) is 107.08 grams.