USE OF LABORATORY EQUIPEMENT

D. Filtration in the Laboratory

The process of separating suspended insoluble solids from liquids by means of filters is called **filtration.** Insoluble solids, called **precipitates,** are formed during some chemical reactions. In the laboratory these precipitates are generally separated from the solutions by filtering them out on a paper filter. The liquid that passes through the filter paper is the **filtrate;** the solid precipitate remaining on the filter paper is the **residue.**

Filtering a Product.

(a) Fold a circle of filter paper in half. Fold in half again and open out into a cone. Tear off one corner of the outside folded edge. The top edge of the cone which is to touch the glass funnel should not be torn.

(b) Fit the opened cone into a short-stemmed funnel, placing the torn edge next to the glass. Wet with distilled water and press the top edge of the paper against the funnel, forming a seal. Use an iron ring clamp with a clay triangle on top, all attached to a ring stand for supporting the funnel. Then, stir the mixture of products in the small beaker with stirring rod and slowly pour it down the stirring rod into the filter paper in the funnel. Do not overfill the paper filter cone.

(c) *Decantation.* This is the process of separating a liquid from a solid (sediment) by gently pouring the liquid from the solid so as not to disturb the solid.

(d) *Filtration.* This is the process of separating a solid from a liquid by means of a porous substance - a filter - which allows the liquid to pass through but not the solid. Common filter materials are paper, layers of charcoal, and sand. Silt and sand can be removed from our drinking water by this process.

(e) *Extraction.* This is the separation of a substance from a mixture by preferentially dissolving that substance in a suitable solvent. By this process a soluble compound is usually separated from an insoluble compound.

(f) *Sublimation.* This is the process in which a solid passes directly to the gaseous state and back to the solid state without the appearance of the liquid state. Not all substances possess the ability to be sublimed. Iodine, naphthalene, and ammonium chloride (NH_4Cl) are common substances that easily sublime.

F. Qualitative-Analysis Techniques in the Laboratory

MIXING SOLUTIONS AND PRECIPITATION

When one solution is added to another in a small test tube, it is important that the two be thoroughly mixed. Mixing can be accomplished by using a *clean* stirring rod, or it can be achieved by holding the test tube at the top in one hand and tapping or "tickling" it with the fingers of the other hand. When precipitation reagents are added to solutions in the test tube and it is believed that precipitation is complete, centrifuge the sample. Always balance the centrifuge by placing a test tube filled with water to about the same level as your sample test tube directly *across* the centrifuge head from your sample. It usually requires only about 30- 45 sec of centrifugation for the precipitate to settle to the bottom of the test tube. ***Caution: Do not slow down the centrifuge head with your hands. Instead, allow the centrifuge head to come to rest on its own accord.***

DECANTATION AND WASHING OF PRECIPITATES

The liquid above the precipitate is the *supernatant liquid,* or the *decantate*. The best way to remove this liquid without disturbing the precipitate is to withdraw it by means of a capillary pipet. We loosely refer to this operation as *decantation.* Because the precipitate separated from the supernatant liquid by this technique will be wet with decantate, it is necessary to *wash* the precipitate free of contaminating ions. Washing is usually accomplished by adding about 10 drops of distilled water to the precipitate, stirring with a stirring rod, and repeating the centrifuging and decanting.

TESTING ACIDITY

Instructions sometimes require making a solution acidic or basic to litmus by adding acid or base. Always be sure that the solution is thoroughly mixed after adding the acid or base; then, by means of a clean stirring rod, remove a drop of the solution and apply it to litmus paper. Do not dip the litmus paper directly into the solution. Remember, just because you have added acid (or base) to a solution does not ensure that it is acidic (or alkaline).

HEATING SOLUTIONS IN SMALL TEST TUBES

The safest way to heat solutions in small test tubes is by means of a water bath. Two test tube holders wrapped around the test tube serves as a convenient handle for placing the tube into or removing it from the bath.