with liquids, and is also used to filter gases and remove entrained solid particles.

CONTROL OF GASES EVOLVED IN A REACTION

In many reactions, noxious or corrosive gases are evolved in a chemical reaction. They should not be allowed to escape in the laboratory because of health reasons and because the gases will corrode the equipment. Such reactions should be performed in a well-ventilated hood.

Precautions

1. Always use a hood when working with toxic or irritating chemicals.

2. The major source of accidents is spillage of corrosive chemicals on the clothing and skin. Immediately flood with excessive amounts of water and then consult the medical service.

3. Anything or any operation that must be forced should be examined very carefully. The application of excessive force to make something work can lead to accidents and broken equipment. *Always think! Always be on guard!*

Alternative Methods

Method 1

When a hood is not available and noxious or corrosive fumes are emitted from a reaction flask or from a concentration-solution evaporation, an *emergency hood* composed of a glass funnel, rubber tubing, an aspirator, and a water pump should be assembled as shown in Fig. 4-20.

Method 2

Pass the gases through a gas-washing bottle which contains an absorbent for the gases. Use a basic absorbent (NaOH or NH_4OH solution) for acid gases. Use an acid absorbent (dilute HCl or H_2SO_4) for basic gases.

Method 3

Aspirate the opening from which the gases are exiting the reaction assembly with a T or Y tube which is attached to a water aspirator (Fig. 4-21). One end should be open to the atmosphere to maintain atmospheric pressure in the assembly.

Method 4

Pass the gas over an absorbing solution (Fig. 4-22). Gaseous HCl is very soluble in water. Suspend a funnel just over the surface of a container of water. When absorbing gases that are very soluble in water, do not immerse the funnel because there may be so much gas absorbed or dissolved that the water may be drawn back into the reaction assembly.

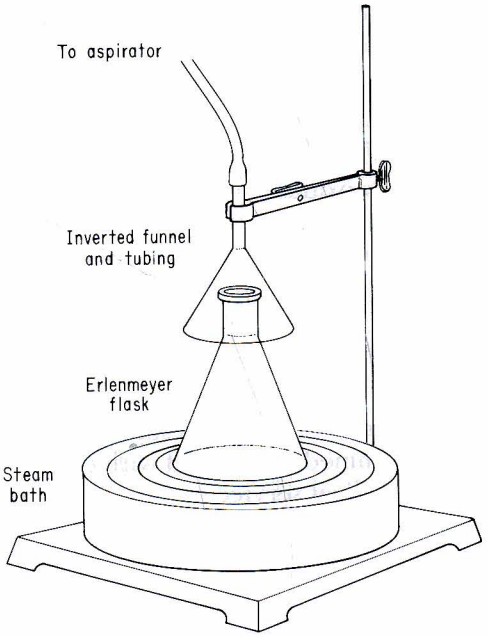

FIGURE 4-20
Temporary hood (not recommended for potentially hazardous fumes or vapors).

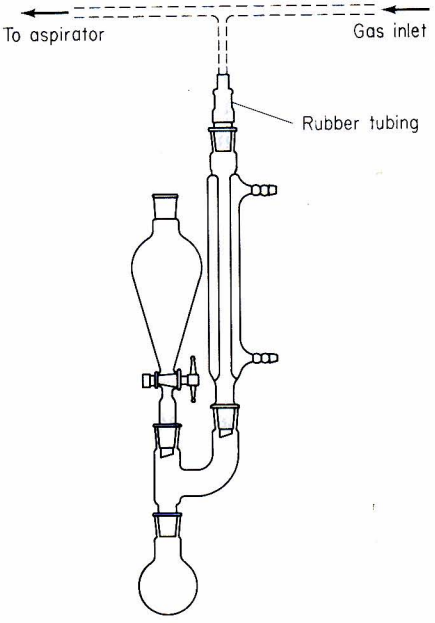

FIGURE 4-21
Aspirating gas from a reaction assembly.

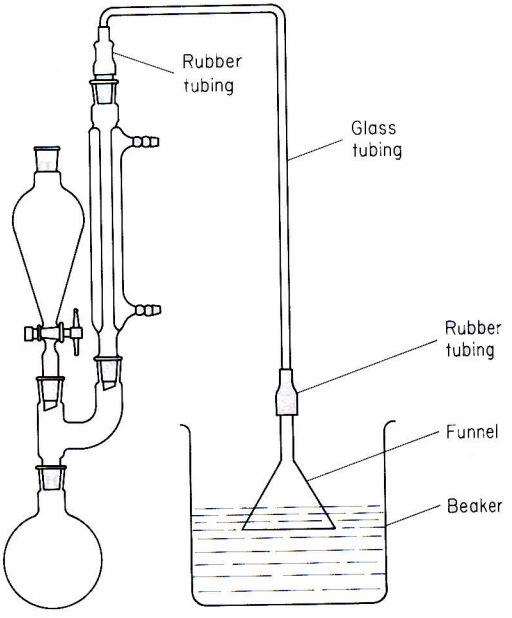

FIGURE 4-22
Trapping evolved gases.

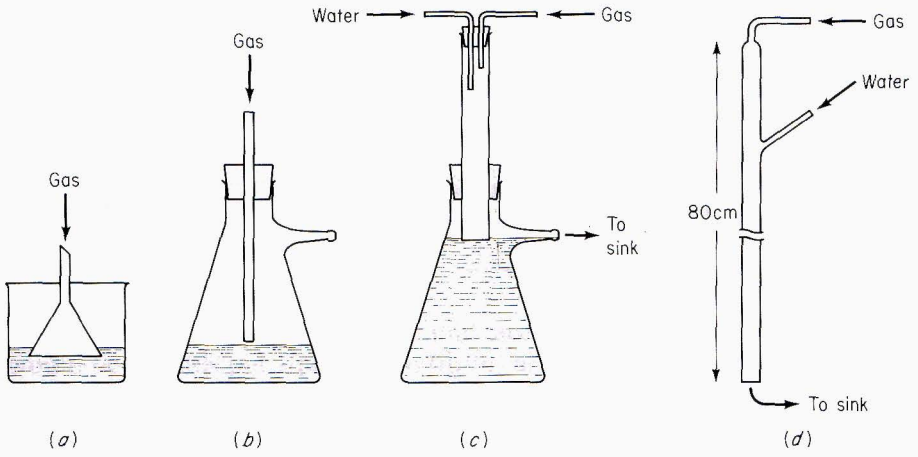

FIGURE 4-23
Alternate setups to absorb gases.

Alternative setups for absorbing gases are shown in Fig. 4-23.

To absorb a gas which is not vigorously soluble in water, the funnel may be immersed beneath the liquid surface (Fig. 4-23*a*).

To absorb a moderately soluble gas, the setup shown in Fig. 4-23*b* may be used, with the tube ending *above* the liquid.

To absorb very large volumes of gas, or rapidly evolved gas, the setups shown in Fig. 4-23*c* and *d* may be used. In the former, the constant input of water overflows at a constant level from the outlet of the suction flask. Water level is above lower end of a large-bore tube to prevent escape of the gas into the atmosphere. In the latter, the flowing water absorbs the gas, exiting to the drain. A tube about 80 cm long and about 25 mm in diameter is generally a convenient size to use in this setup.