EXPERIMENT 2

Introduction to Quantitative Measurement: Density and Specific Gravity

The study of chemistry involves not only the observation of changes in matter, but also the measurement of these changes. In fact, most chemical principles cannot be fully understood without obtaining and analyzing some quantitative data. The techniques of data collection, data analysis, and measurement are a very important part of chemistry. In this experiment, you will make a number of measurements and you will use these measurements to determine a physical property: density.

A useful way of comparing two substances is to compare their densities. Weigh carefully an equal volume of each substance. Their densities can be calculated by simply dividing their masses by their volumes.

Careful attention should be given to the degree of uncertainty. Be careful to use only significant digits in your calculations in this experiment and in all of the other quantitative experiments that follow. If you are not familiar with significant digits, look for a discussion of these concepts in your text.

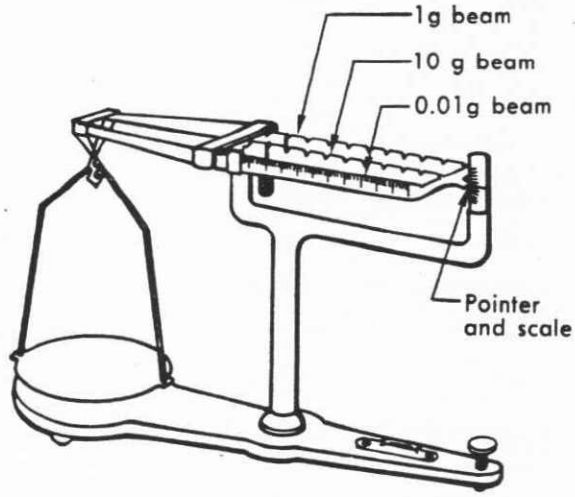

Figure 2-1. Triple-beam balance.

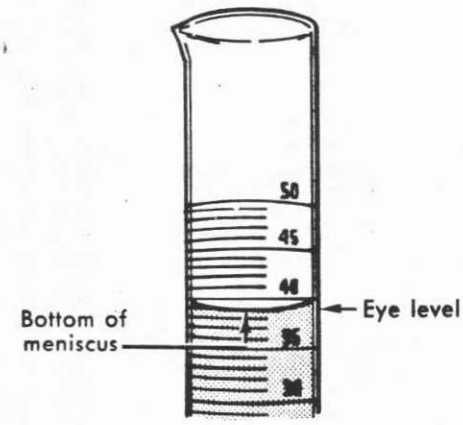

Figure 2-2. Reading the correct volume.

Procedure

A. Density of Water

1. Weigh a 10 ml graduated cylinder carefully to the nearest 0.01 g. Check with teacher if you are in doubt about reading the balance. (See Figure 2-1.)
2. Fill the graduated cylinder to the 10 ml mark with distilled water. Use the dropper pipet to add or subtract a drop or two. Read the bottom of the meniscus as shown in Figure 2-2. Record the volume.

3. Weigh the cylinder containing the 10 ml of water to the nearest 0.01 g and record the mass.

B. Density of an Unknown Liquid

1. Empty the 10 ml graduated cylinder and dry it thoroughly both inside and outside. (Use paper towels to dry the cylinder. Do not heat the cylinder or it will break.)
2. Fill the graduated cylinder to about the 9 ml mark with the unknown liquid and read the volume to the nearest 0.2 ml.
3. Weigh the cylinder and its contents carefully and record.

C. Density of a Solid

1. Obtain a solid object and weigh it to the nearest 0.01 gram.
2. Fill a 100 ml graduated cylinder about one-half full of tap water and read the volume to the nearest 0.5 ml.
3. Carefully immerse the weighed solid in the water in the cylinder and record the new volume to the nearest 0.5 ml.
4. Empty the contents of the graduated cylinder into the sink but retain the solid which can be used for other experiments.