1 INTRODUCTION TO CHEMISTRY

Practice Problems

In your notebook, solve the following problems.

SECTION 1.1 CHEMISTRY

1. Match the project to the appropriate field of chemistry (inorganic chemistry, organic chemistry, biochemistry, analytical chemistry, or physical chemistry).
   a. Determine the composition of a moon rock sample.
   b. Do research on making a new medicine to treat high blood pressure.
   c. Investigate ways to regulate the rate of gasoline burning in an automobile engine.
   d. Develop a plastic that can be decomposed by bacteria.
   e. Improve the method for extracting iron from iron ore.

2. Classify the following examples as examples of pure chemistry or applied chemistry.
   a. developing a shampoo to be used with dry or damaged hair
   b. determining the conditions required for materials to burn
   c. figuring out the general structure of materials such as cotton and silk
   d. designing a large-scale method for producing nylon
   e. explaining why water expands when it freezes

SECTION 1.2 CHEMISTRY FAR AND WIDE

1. Identify three areas of energy research that scientists are working on today.

2. The following statements are all concerned with the work chemists do. Write T for each *true* statement and F for each *false* statement.
   a. Chemists design materials to meet specific needs.
   b. Oil from the soybean plant is used to make biodiesel.
   c. As the world's population increases, the amount of land available to grow food increases.
   d. Many drugs are effective because they interact in a specific way with chemicals in cells.
   e. The trend in crop protection is toward chemicals that are less specific.
   f. The use of lead paint in houses was banned in 1978.
   g. Chemists are doing research to improve batteries.
   h. To study the universe, chemists gather data from afar and analyze matter that is brought back to Earth.
   i. Chemists have developed a plastic "skin" that can heal itself when it cracks to help patients with burns.

SECTION 1.3 THINKING LIKE A SCIENTIST

1. One cold morning your car does not start. Make two hypotheses about why the car will not start.

2. Suppose you try several experiments with your car. You try a battery jump, which does not work. There seems to be enough gas in the car. You wiggle a wire in the engine, and the car starts on the next try. Explain how these tests help you decide what was wrong with the car.

3. The following is a list of observations from everyday experiences:

Hummingbirds have long beaks.
Moisture forms on the outside of a cold glass.
Ice cubes float.
Oil and water don't mix.
There are fewer fish in a particular creek this year.

   a. Propose one hypothesis for each observation.

   b. Select one of the hypotheses and describe an experiment that you could do to test it.

4. Discuss the statement "No theory is written in stone."

SECTION 1.4 PROBLEM SOLVING IN CHEMISTRY

1. Apples are selling for $1.50 a pound. Each apple weighs, on average, 0.50 pounds. You have $6.00. How many apples can you purchase?

   a. ANALYZE (List the knowns and unknown.)

   Knowns: Unknown:

   cost of apples =   number of apples purchased = ?

   weight of an apple =

   dollars available =

   b. CALCULATE (Solve for the unknown.)
   Use an expression that converts cost per pound to cost per apple.

   cost per apple $= 0.50 \; \cancel{pound} \times \dfrac{\$1.50}{1 \; \cancel{pound}}$

   cost per apple =

   Use an expression that relates cost per apple to dollars available.

   number of apples purchased $= \dfrac{\$6.00}{\$0.75}$

   number of apples purchased =

2. Describe an alternate way to solve Problem 1.