Introduction to Stoichiometry

OBJECTIVES

- Define *stoichiometry.*

- Describe the importance of the *mole ratio* in stoichio-metric calculations.

- Write a mole ratio relating two substances in a chemical equation.

M uch of our knowledge of chemistry is based on the careful quantita-tive analysis of substances involved in chemical reactions. **Composition stoichiometry** (which you studied in Chapter 3) *deals with the mass rela-tionships of elements in compounds*. **Reaction stoichiometry** *involves the mass relationships between reactants and products in a chemical reaction.* Reaction stoichiometry is the subject of this chapter and it is based on chemical equations and the law of conservation of mass. All reaction stoichiometry calculations start with a balanced chemical equation. This equation gives the relative numbers of moles of reactants and products.

Reaction Stoichiometry Problems

The reaction stoichiometry problems in this chapter can be classified according to the information *given* in the problem and the information you are expected to find, the *unknown*. The *given* and the *unknown* may both be reactants, they may both be products, or one may be a reactant and the other a product. The masses are generally expressed in grams, but you will encounter both large-scale and microscale problems with other mass units, such as kg or mg. Stoichiometric problems are solved by using ratios from the balanced equation to convert the given quanti-ty using the methods described here.

Problem Type 1: *Given* and *unknown* quantities are amounts in moles.
When you are given the amount of a substance in moles and asked to calculate the amount in moles of another substance in the chemical reaction, the general plan is

$$\text{amount of } \textit{given} \text{ substance (mol)} \longrightarrow \text{amount of } \textit{unknown} \text{ substance (mol)}$$

Problem Type 2: *Given* is an amount in moles and *unknown* is a mass that is often expressed in grams.
When you are given the amount in moles of one substance and asked to calculate the mass of another substance in the chemical reaction, the general plan is

$$\text{amount of } \textit{given} \text{ substance} \longrightarrow \text{amount of } \textit{unknown} \text{ substance} \longrightarrow \text{mass of } \textit{unknown} \text{ substance}$$
$$\text{(mol)} \qquad\qquad \text{(mol)} \qquad\qquad \text{(g)}$$

CHEMISTRY INTERACTIVE TUTOR

Module 5: Equations and Stoichiometry