substance. To determine the amount in moles of aluminum that can be produced from 13.0 mol of aluminum oxide, the mole ratio needed is that of Al to Al_2O_3.

$$13.0 \text{ mol } Al_2O_3 \times \frac{4 \text{ mol Al}}{2 \text{ mol } Al_2O_3} = 26.0 \text{ mol Al}$$

Mole ratios are exact, so they do not limit the number of significant figures in a calculation. The number of significant figures in the answer is therefore determined only by the number of significant figures of any measured quantities in a particular problem.

extension

Chemistry in Action

Go to **go.hrw.com** for a full-length article on stoichiometry and air bags.

Keyword: HC6STCX

Molar Mass

Recall from Chapter 7 that the molar mass is the mass, in grams, of one mole of a substance. The molar mass is the conversion factor that relates the mass of a substance to the amount in moles of that substance. To solve reaction stoichiometry problems, you will need to determine molar masses using the periodic table.

Returning to the previous example, the decomposition of aluminum oxide, the rounded masses from the periodic table are the following.

$$1 \text{ mol } Al_2O_3 = 101.96 \text{ g} \qquad 1 \text{ mol Al} = 26.98 \text{ g} \qquad 1 \text{ mol } O_2 = 32.00 \text{ g}$$

These molar masses can be expressed by the following conversion factors.

$$\frac{101.96 \text{ g } Al_2O_3}{1 \text{ mol } Al_2O_3} \text{ or } \frac{1 \text{ mol } Al_2O_3}{101.96 \text{ g } Al_2O_3}$$

$$\frac{26.98 \text{ g Al}}{1 \text{ mol Al}} \text{ or } \frac{1 \text{ mol Al}}{26.98 \text{ g Al}}$$

$$\frac{32.00 \text{ g } O_2}{1 \text{ mol } O_2} \text{ or } \frac{1 \text{ mol } O_2}{32.00 \text{ g } O_2}$$

To find the number of grams of aluminum equivalent to 26.0 mol of aluminum, the calculation would be as follows.

$$26.0 \text{ mol Al} \times \frac{26.98 \text{ g Al}}{1 \text{ mol Al}} = 701 \text{ g Al}$$

SECTION REVIEW

1. What is stoichiometry?
2. For each equation, write all possible mole ratios.
   a. $2HgO(s) \longrightarrow 2Hg(l) + O_2(g)$
   b. $4NH_3(g) + 6NO(g) \longrightarrow 5N_2(g) + 6H_2O(l)$
3. How is a mole ratio used in stoichiometry?

Critical Thinking

4. **RELATING IDEAS** What step must be performed before any stoichiometry problem is solved? Explain.