SAMPLE PROBLEM C

For more help, go to the Math Tutor at the end of this chapter.

The reaction of zinc with aqueous hydrochloric acid produces a solution of zinc chloride and hydrogen gas. This reaction is shown at right in Figure 6. Write a balanced chemical equation for the reaction.

FIGURE 6 Solid zinc reacts with hydrochloric acid to form aqueous zinc chloride and hydrogen gas.

SOLUTION

1 ANALYZE *Write the word equation.*

$$\text{zinc} + \text{hydrochloric acid} \longrightarrow \text{zinc chloride} + \text{hydrogen}$$

2 PLAN *Write the formula equation.*

$$Zn(s) + HCl(aq) \longrightarrow ZnCl_2(aq) + H_2(g) \quad \text{(not balanced)}$$

3 COMPUTE *Adjust the coefficients.* Note that chlorine and hydrogen each appear only once on each side of the equation. We balance chlorine first because it is combined on both sides of the equation. Also, recall from the guidelines on the previous page that hydrogen and oxygen are balanced only after all other elements in the reaction are balanced. To balance chlorine, we place the coefficient 2 before HCl. Two molecules of hydrogen chloride also yield the required two hydrogen atoms on the right. Finally, note that there is one zinc atom on each side in the formula equation. Therefore, no further coefficients are needed.

$$Zn(s) + 2HCl(aq) \longrightarrow ZnCl_2(aq) + H_2(g)$$

4 EVALUATE *Count atoms to check balance.*

$$Zn(s) + 2HCl(aq) \longrightarrow ZnCl_2(aq) + H_2(g)$$
$$(1\cancel{Zn}) + (2\cancel{H} + 2\cancel{Cl}) = (1\cancel{Zn} + 2\cancel{Cl}) + (2\cancel{H})$$

The equation is balanced.

PRACTICE

Answers in Appendix E

1. Write word, formula, and balanced chemical equations for each of the following reactions:
   a. Magnesium and hydrochloric acid react to produce magnesium chloride and hydrogen.
   b. Aqueous nitric acid reacts with solid magnesium hydroxide to produce aqueous magnesium nitrate and water.
2. Solid calcium metal reacts with water to form aqueous calcium hydroxide and hydrogen gas. Write a balanced chemical equation for this reaction.

extension

Go to **go.hrw.com** for more practice problems that ask you to write balanced chemical equations.

Keyword: HC6RXNX