Answer Key

Chapter 9

Balance the following chemical equations.

1.
$$SnS_2(s) + O_2(g) \rightarrow SnO_2(s) + SO_2(g)$$

$$SnS_2(s) + 3O_2(g) \rightarrow SnO_2(s) + 2SO_2(g)$$

2.
$$C_2H_6(g) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$$

$$2C_2H_6(g) + 7O_2(g) \rightarrow 4CO_2(g) + 6H_2O(g)$$

3.
$$Al(s) + HCl(aq) \rightarrow AlCl_3(aq) + H_2(g)$$

$$2Al(s) + 6HCl(aq) \rightarrow 2AlCl_3(aq) + 3H_2(g)$$

4.
$$CoCO_3(s) \rightarrow CoO(s) + CO_2(g)$$

$$CoCO_3(s) \rightarrow CoO(s) + CO_2(g)$$

Write a balanced equation for each of the following reactions, substituting symbols and formulas for names. Include the state of each reactant and product. Then identify the reaction type for each. If more than one reaction type applies, list all that apply.

5. When aluminum nitrate and sodium hydroxide solutions are mixed, solid aluminum hydroxide forms. The other product is sodium nitrate.

$$Al(NO_3)_3(aq) + 3NaOH(aq) \rightarrow Al(OH)_3(s) + 3NaNO_3(aq)$$

double-replacement

6. When magnesium is heated in the presence of nitrogen gas, solid magnesium nitride forms.

$$4Mg(s) + 3N_2(g) \rightarrow 2Mg_2N_3(s)$$

synthesis

7. When solid copper(II) oxide and hydrogen react, metallic copper and water form.

$$CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(l)$$

single-replacement

8. Most industrial production of metallic sodium is accomplished by passing an electric current through molten sodium chloride. Chlorine gas also is produced.

$$2NaCl(1) \rightarrow 2Na(s) + Cl_2(g)$$

decomposition

9. Liquid pentane (C₅H₁₂) burns, producing water vapor and carbon dioxide.

$$C_5H_{12}(l) + 8O_2(g) \rightarrow 6H_2O(g) + 5CO_2(g)$$

combustion

10. When chlorine gas is passed through a potassium bromide solution, bromine forms in a potassium chloride solution.

$$Cl_2(g) + 2KBr(aq) \rightarrow Br_2(l) + 2KCl(aq)$$

single-replacement

11. Magnesium burns in air to form magnesium oxide.

$$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$$

synthesis, combustion

Predict the products in each of the following reactions. If no reaction occurs, write NR. You may use Figure 9.13 for the relative activities of common metals and halogens.

12.
$$Rb(s) + CaCl_2(aq)$$

$$RbCl(aq) + Ca(s)$$

13.
$$Pt(s) + MnBr_2(aq)$$

NR

Answer Key (continued)

14.
$$F_2(g) + NaI(aq)$$

$$NaF(aq) + I_2(s)$$

15.
$$Zn(s) + AgNO3(aq)$$

$$Ag(s) + Zn(NO_3)_2(aq)$$

Write a complete ionic equation and a net ionic equation for each of the following double-displacement reactions.

16. Ba(NO₃)₂(aq) + H₂SO₄(aq)
$$\rightarrow$$
 BaSO₄(s) + 2HNO₃(aq)

17.
$$FeCl_3(aq) + (NH_4)_3PO_4(aq) \rightarrow FePO_4(s) + 3NH_4Cl(aq)$$

$$\begin{split} Fe^{3+}(aq) + 3Cl^{-}(aq) + 3NH_{4}^{+}(aq) + PO_{4}^{\ 3-}(aq) \rightarrow \\ FePO_{4}(s) + 3NH_{4}^{-}(aq) + 3Cl^{-}(aq) \\ Fe^{3+}(aq) + PO_{4}^{\ 3-}(aq) \rightarrow FePO_{4}(s) \end{split}$$

18.
$$KCl(aq) + AgC_2H_3O_2(aq) \rightarrow AgCl(s) + KC_2H_3O_2(aq)$$

$$\begin{split} K^{+}(aq) + Cl^{-}(aq) + Ag^{+}(aq) + C_{2}H_{3}O_{2}^{-}(aq) \rightarrow \\ AgCl(s) + K^{+}(aq) + C_{2}H_{3}O_{2}^{-}(aq) \\ Cl^{-}(aq) + Ag^{+}(aq) \rightarrow AgCl(s) \end{split}$$