32. a. What is an activity series of elements?
b. What is the basis for the ordering of the elements in the activity series?

33. a. What chemical principle is the basis for the activity series of metals?
b. What is the significance of the distance between two metals in the activity series?

PRACTICE PROBLEMS

34. Based on the activity series of metals and halogens, which element within each pair is more likely to replace the other in a compound?
a. K and Na
b. Al and Ni
c. Bi and Cr
d. Cl and F
e. Au and Ag
f. Cl and I
g. Fe and Sr
h. I and F

35. Using the activity series in **Table 3** on page 286, predict whether each of the possible reactions listed below will occur. For the reactions that will occur, write the products and balance the equation.
a. $Ni(s) + CuCl_2(aq) \longrightarrow$ _____
b. $Zn(s) + Pb(NO_3)_2(aq) \longrightarrow$ _____
c. $Cl_2(g) + KI(aq) \longrightarrow$ _____
d. $Cu(s) + FeSO_4(aq) \longrightarrow$ _____
e. $Ba(s) + H_2O(l) \longrightarrow$ _____

36. Use the activity series to predict whether each of the following synthesis reactions will occur, and write the chemical equations for those predicted to occur.
a. $Ca(s) + O_2(g) \longrightarrow$ _____
b. $Ni(s) + O_2(g) \longrightarrow$ _____
c. $Au(s) + O_2(g) \longrightarrow$ _____

MIXED REVIEW

37. Ammonia reacts with oxygen to yield nitrogen and water.
$$4NH_3(g) + 3O_2(g) \longrightarrow 2N_2(g) + 6H_2O(l)$$
Given this chemical equation, as well as the number of moles of the reactant or product indicated below, determine the number of moles of all remaining reactants and products.
a. 3.0 mol O_2
b. 8.0 mol NH_3
c. 1.0 mol N_2
d. 0.40 mol H_2O

38. Complete the following synthesis reactions by writing both the word and chemical equation for each:
a. potassium + chlorine $\longrightarrow$ _____
b. hydrogen + iodine $\longrightarrow$ _____
c. magnesium + oxygen $\longrightarrow$ _____

39. Use the activity series to predict which metal—Sn, Mn, or Pt—would be the best choice as a container for an acid.

40. Aqueous sodium hydroxide is produced commercially by the electrolysis of aqueous sodium chloride. Hydrogen and chlorine gases are also produced. Write the balanced chemical equation for the production of sodium hydroxide. Include the physical states of the reactants and products.

41. Balance each of the following:
a. $Ca(OH)_2 + (NH_4)_2SO_4 \longrightarrow$
$$CaSO_4 + NH_3 + H_2O$$
b. $C_2H_6 + O_2 \longrightarrow CO_2 + H_2O$
c. $Cu_2S + O_2 \longrightarrow Cu_2O + SO_2$
d. $Al + H_2SO_4 \longrightarrow Al_2(SO_4)_3 + H_2$

42. Use the activity series to predict whether each of the following reactions will occur, and write the balanced chemical equations for those predicted to occur.
a. $Al(s) + O_2(g) \longrightarrow$ _____
b. $Pb(s) + ZnCl_2(s) \longrightarrow$ _____

43. Complete and balance the equations for the following reactions, and identify the type of reaction that each equation represents.
a. $(NH_4)_2S(aq) + ZnCl_2(aq) \longrightarrow$
$$\text{_____} + ZnS(s)$$
b. $Al(s) + Pb(NO_3)_2(aq) \longrightarrow$ _____
c. $Ba(s) + H_2O(l) \longrightarrow$ _____
d. $Cl_2(g) + KBr(aq) \longrightarrow$
e. $NH_3(g) + O_2(g) \xrightarrow{Pt} NO(g) + H_2O(l)$
f. $H_2O(l) \longrightarrow H_2(g) + O_2(g)$

44. Write and balance each of the following equations, and then identify each by type.
a. copper + chlorine $\longrightarrow$ copper(II) chloride
b. calcium chlorate $\longrightarrow$
$$\text{calcium chloride + oxygen}$$
c. lithium + water $\longrightarrow$
$$\text{lithium hydroxide + hydrogen}$$
d. lead(II) carbonate $\longrightarrow$
$$\text{lead(II) oxide + carbon dioxide}$$