CHAPTER HIGHLIGHTS

The Nature of Chemical Equilibrium

Vocabulary
reversible reaction
chemical equilibrium
equilibrium constant
chemical equilibrium expression

- A reaction system in which the forward and reverse reactions occur simultaneously and at the same rate is said to be at *equilibrium.* Both reactions continue, but there is no net change in the composition of the system.
- At equilibrium, the ratio of the product of the molar concentrations of substances formed to the product of the molar concentrations of reactants, each raised to the appropriate power, has a definite numerical value, K, which is the equilibrium constant at a given temperature.

Shifting Equilibrium

Vocabulary
common-ion effect

- According to Le Châtelier's principle, when a stress (a change in concentration, pressure, or temperature) is applied to a system at equilibrium, the equilibrium is shifted in the direction that relieves the stress.
- The common-ion effect is recognized when a solution containing ions such as those of a reactant or a product in an equilibrium system is added to the system. Le Châtelier's principle explains the response of the system to the stress.

Equilibria of Acids, Bases, and Salts

Vocabulary
acid ionization constant
buffered solution
hydrolysis

- The equilibrium expression for the ionization constant of the weak acid HA follows.

$$K_a = \frac{[H_3O^+][A^-]}{[HA]}$$

- Salts formed from strong bases and weak acids produce aqueous solutions that are basic because of *anion hydrolysis.*
- Salts formed from strong acids and weak bases produce aqueous solutions that are acidic because of *cation hydrolysis.*
- Salts formed from strong acids and strong bases do not hydrolyze in water, and their solutions are neutral.
- Salts formed from weak acids and weak bases may produce neutral, acidic, or basic solutions, depending on the relative amounts of cation and anion hydrolysis.

Solubility Equilibrium

Vocabulary
solubility product constant

- Ions of salts that are very sparingly soluble form saturated aqueous solutions at low concentrations. The solubility equilibrium expression for such salts yields a constant—the solubility product constant, K_{sp}.