Fundamental Equilibrium Concepts

Section 84 – Chemical Equilibria

1. What does it mean to describe a reaction as "reversible"?
   Solution
   The reaction can proceed in both the forward and reverse directions.

2. When writing an equation, how is a reversible reaction distinguished from a nonreversible reaction?
   Solution
   The two types of reactions are distinguished by the arrow used in the equation: $\rightleftharpoons$ is used for equilibria reactions and $\longrightarrow$ is used for "one-way" reactions.

3. If a reaction is reversible, when can it be said to have reached equilibrium?
   Solution
   When a system has reached equilibrium, no further changes in the reactant and product concentrations occur; the forward and reverse reactions continue to proceed, but at equal rates.

4. Is a system at equilibrium if the rate constants of the forward and reverse reactions are equal?
   Solution
   No, the *rate constants* having the same value does not mean that the *rates* of the reactions are equal, which defines a system being at equilibrium.

5. If the concentrations of products and reactants are equal, is the system at equilibrium?
   Solution
   Not necessarily. A system at equilibrium is characterized by *constant* reactant and product concentrations, but the values of the reactant and product concentrations themselves need not be equal.