CHAPTER HIGHLIGHTS

Oxidation and Reduction

Vocabulary
oxidation
oxidized
reduction
reduced
oxidation-reduction reaction
redox reaction
half-reaction

- Oxidation numbers are assigned by the set of rules listed in **Table 1.** Oxidation numbers are based on the distribution of electrons in a molecule.
- Oxidation-reduction reactions consist of two half-reactions that must occur simultaneously.
- Oxidation-reduction reactions are identified by examining the changes in the oxidation numbers of atoms in the reactants and products.
- Oxidation involves the loss of electrons, and reduction involves the gain of electrons.
- A species whose oxidation number increases is oxidized. A species whose oxidation number decreases is reduced.

Balancing Redox Equations

- Charge and mass are conserved in a balanced redox equation.
- In the half-reaction method for balancing equations, the atoms and charge of oxidation and reduction equations are balanced separately. Then, they are combined to give a complete balanced equation.
- In a half-reaction, the charge on the reactant side must equal the charge on the product side, but these charges do not need to be zero.
- For the half-reaction method, the atoms in each half-reaction are balanced by adding H^+ ions and H_2O molecules in acidic solutions. If the solution is basic, OH^- ions and H_2O molecules are added to balance the atoms in each half-reaction.
- The number of electrons lost in the oxidation half-reaction must equal the number of electrons gained in the reduction half-reaction. The two half-reactions must be multiplied by appropriate factors to ensure that the same number of electrons are transferred.

Oxidizing and Reducing Agents

Vocabulary
reducing agent
oxidizing agent
disproportionation

- The substance that is *reduced* in redox reactions is the *oxidizing agent* because it *acquires* electrons from the substance that is oxidized.
- The substance that is *oxidized* in a redox reaction is the *reducing agent* because it *supplies* the electrons to the substance that is reduced.
- Strong reducing agents are substances that easily give up electrons.
- Disproportionation is a process in which a substance is both an oxidizing agent and a reducing agent.