**Chapter Review**

**Chapter 2: Molecules and Membranes**

2.1

Covalent bonds and four types of noncovalent bonds mediate the formation of and interactions between the molecules of cells. Four classes of organic compounds are the unique constituents of biological systems: carbohydrates, lipids, nucleic acids, and proteins. Carbohydrates, including simple sugars and polysaccharides, are the major nutrients of cells and serve as structural components and markers for cell recognition processes. Lipids are the principal components of cell membranes. Nucleic acids are the informational molecules of cells, with hydrogen bonding between complementary bases directing self-replication. Proteins, which are polymers of 20 different amino acids, are the most diverse macromolecules and are responsible for carrying out most cell functions.

2.2

Almost all chemical reactions within cells are catalyzed by enzymes, which function by bringing substrates together, altering their conformations to approach the transition state, and forming bonds with reaction intermediates. Coenzymes are small molecules that function in conjunction with enzymes by carrying chemical groups between substrates. The activities of enzymes are regulated to meet the physiological needs of the cell. Enzymes can be controlled by the binding of small molecules, by interactions with other proteins, and by covalent modifications.

2.3

Phospholipid bilayers are the basic structures of cell membranes, which also contain glycolipids and, in eukaryotic cells, cholesterol or related compounds. Proteins can either be inserted into the lipid bilayer or associated with the membrane indirectly, by protein–protein interactions. Some proteins span the lipid bilayer; others are anchored to one side of the membrane. Lipid bilayers are permeable only to small, uncharged molecules. Ions and most polar molecules are transported across cell membranes by specific transport proteins, the action of which can be coupled to the hydrolysis or synthesis of ATP.