

## CHAPTER 5

### THE STRUCTURE AND FUNCTION OF LARGE BIOLOGICAL MACROMOLECULES

#### Learning objectives

#### The Molecules of Life

1. List the four major classes of macromolecules.
2. Distinguish between monomers and polymers.
3. Draw diagrams to illustrate condensation and hydrolysis reactions.

#### Carbohydrates Serve as Fuel and Building Material

4. Distinguish between monosaccharides, disaccharides, and polysaccharides.
5. Describe the formation of a glycosidic linkage.
6. Distinguish between the glycosidic linkages found in starch and cellulose. Explain why the difference is biologically important.
7. Describe the role of symbiosis in cellulose digestion by animals.

#### Lipids are a Diverse Group of Hydrophobic Molecules

8. Describe the building-block molecules, structure, and biological importance of fats, phospholipids, and steroids.
9. Identify an ester linkage and describe how it is formed.
10. Distinguish between saturated and unsaturated fats.
11. Distinguish between *cis* and *trans* fat molecules.
12. Name the principal energy storage molecules of plants and animals.

#### Proteins have Many Structures, Resulting in a Wide Range of Functions

13. Distinguish between a protein and a polypeptide.
14. Explain how a peptide bond forms between two amino acids.
15. List and describe the four major components of an amino acid. Explain how amino acids may be grouped according to the physical and chemical properties of the R group.
16. Explain what determines protein structure and why it is important.
17. Explain how the primary structure of a protein is determined.
18. Name two types of secondary protein structure. Explain the role of hydrogen bonds in maintaining secondary structure.
19. Explain how weak interactions and disulfide bridges contribute to tertiary protein structure.
20. List four conditions under which proteins may be denatured.
21. Explain how chaperonins may assist in proper folding of proteins.
22. List and briefly describe three complementary approaches to determining protein structure.

#### Nucleic Acids Store and Transmit Hereditary Information

23. List the major components of a nucleotide, and describe how these monomers are linked to form a nucleic acid.
24. Distinguish between:
  - a. pyrimidine and purine
  - b. nucleotide and nucleoside
  - c. ribose and deoxyribose
  - d. 5' end and 3' end of a nucleotide
25. Briefly describe the three-dimensional structure of DNA.
26. Explain how DNA or protein comparisons may allow us to assess evolutionary relationships between species.