

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. Compare and contrast the structures, functions, and locations of starch, glycogen, cellulose and chitin.

Lipids are a Diverse Group of Hydrophobic Molecules

10. Describe the building-block molecules, structure, and biological importance of fats, phospholipids, and steroids. Discuss the primary functions of each type of lipid.
11. Identify an ester linkage and describe how it is formed.
12. Distinguish between saturated and unsaturated fats.
13. Describe the process that results in the production of *trans* fat molecules.
14. Discuss the role of saturated fats and trans fats in the potential development of atherosclerosis.

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

15. Distinguish between a protein and a polypeptide.
16. Explain how a peptide bond forms between two amino acids.
17. Name the two ends of a protein and explain the reason for their names.
18. 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.
19. Explain what determines protein structure and why it is important.
20. Explain how the primary structure of a protein is determined.
21. Name two types of secondary protein structure. Explain the role of hydrogen bonds in maintaining secondary structure.
22. Explain how weak interactions and disulfide bridges contribute to tertiary protein structure.

23. List three conditions under which proteins may be denatured.
24. Explain how chaperonins may assist in proper folding of proteins.
25. Explain how a single nucleotide change in the beta-globin gene can lead to sickle cell anemia disease.

Nucleic Acids Store and Transmit Hereditary Information

26. List the major components of a nucleotide, and describe how these monomers are linked to form a nucleic acid. Name the type of bond that holds two nucleotides together.
27. Distinguish between:
 - a. pyrimidine and purine
 - b. nucleotide and nucleoside
 - c. ribose and deoxyribose
 - d. 5' end and 3' end of a nucleotide
28. Briefly describe the three-dimensional structure of DNA.
29. Compare and contrast DNA and RNA.
30. Explain how DNA or protein comparisons may allow us to assess evolutionary relationships between species.
31. Briefly discuss the flow of genetic information (from DNA to RNA to protein).