Learning Objectives

Chapter 4

1. Explain how carbon's electron configuration explains its ability to form large, complex, diverse organic molecules
2. Describe how carbon skeletons may vary and explain how this variation contributes to the diversity and complexity of organic molecules
3. Distinguish among the three types of isomers: structural, geometric, and enantiomer
4. Name the major functional groups found in organic molecules; describe the basic structure of each functional group and outline the chemical properties of the organic molecules in which they occur
5. Explain how ATP functions as the primary energy transfer molecule in living cells

Chapter 5

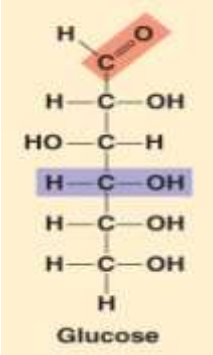
1. List and describe the four major classes of molecules
2. Describe the formation of a glycosidic linkage and distinguish between monosaccharides, disaccharides, and polysaccharides
3. Distinguish between saturated and unsaturated fats and between *cis* and *trans* fat molecules
4. Describe the four levels of protein structure
5. Distinguish between the following pairs: pyrimidine and purine, nucleotide and nucleoside, ribose and deoxyribose, the 5′ end and 3′ end of a nucleotide

Ask Yourself

Chapter 4

6. Based on carbon's valence (4), how many different molecular shapes can be made from 6 carbons?
7. How many isomers can you make from the molecular formula C6H12O6?

8. Is this molecule soluble in water? Why or why not?



Chapter 5

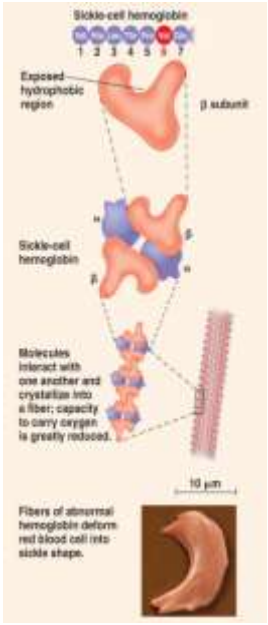
9. What are the following polymers made up of from a chemical standpoint? DNA, RNA, polysaccharides, polypeptides, fatty acids. You should be able to draw and distinguish each type of polymer.

10. If actively growing cells are fed 14C-labeled glucose, what macromolecules will become radioactive first?

11. If an actively growing cells are fed tritiated (H3)thymidine, what macromoles will be radioactive? H3-uracil? Radioactive phosphorus? Radioactive sulfur?

12. Sickle cell anemia is caused by a mutation in the beta-hemoglobin gene that changes a charged amino acid, glutamic acid, to valine, a hydrophobic amino acid. Where in the protein would you expect to find glutamic acid?

13. The sickle cell hemoglobin mutation alters what level(s) of protein structure?



Key Terms (as an exercise fill these in yourself or make flash-cards)

amino group
ammonia
carbonyl group
carboxyl group
enantiomer
functional group
geometric isomer
hydrocarbon
hydroxyl group
Isomer
methyl group
organic chemistry
phosphate group
sulfhydryl group
urea

alpha (a) helix
amino acid
antiparallel
atherosclerosis
beta (ß) pleated sheet
bioinformatics
carbohydrate
catalyst
cellulose
chaperonin
chitin
cholesterol
collagen
condensation reaction
dehydration reaction
deoxyribonucleic acid (DNA)
deoxyribose
disaccharide
disulfide bridge
double helix
emergent properties
endorphin
enzyme
fat
fatty acid
gene
glycosidic linkage
hydrolysis
hydrophobic interaction
insulin
lipid
messenger RNA (mRNA)
monomer
monosaccharide
nucleic acid
nucleotide
peptide bond

phospholipid
polymer
polynucleotide
polypeptide
polysaccharide
primary structure
protein
protein kinase
purine
pyrimidine
quaternary structure
ribonucleic acid (RNA)
ribose
saturated fatty acid
secondary structure
starch
steroid
tertiary structure
trans fat
Triacylglycerol
unsaturated fatty acid
X-ray crystallography

Word Roots

The word roots listed below are for your reference in learning the vocabulary necessary to understand these chapters. You will be tested on concepts which use the words from the chapter.

hydro- = water (*hydrocarbon:* an organic molecule consisting only of carbon and hydrogen)

iso- = equal (*isomer:* one of several organic compounds with the same molecular formula but different structures and, therefore, different properties)

enanti- = opposite (*enantiomer:* molecules that are mirror images of each other)

carb- = coal (*carboxyl group:* a functional group present in organic acids, consisting of a carbon atom double-bonded to an oxygen atom and a hydroxyl group)

sulf- = sulfur (*sulfhydryl group:* a functional group that consists of a sulfur atom bonded to an atom of hydrogen)

thio- = sulfur (*thiol:* organic compounds containing sulfhydryl groups)

con- = together (*condensation reaction*: a reaction in which two molecules become covalently bonded to each other through the loss of a small molecule, usually water)

di- = two (*disaccharide*: two monosaccharides joined

glyco- = sweet (*glycogen*: a polysaccharide sugar used to store energy in animals)

hydro- = water; **-lyse** = break (*hydrolysis*: breaking chemical bonds by adding water)

macro- = large (*macromolecule*: a large molecule) **meros-** = part (*polymer*: a chain made from smaller organic molecules)

mono- = single; **-sacchar** = sugar (*monosaccharide*: simplest type of sugar)

poly- = many (*polysaccharide*: many monosaccharides joined together)

tri- = three (*triacylglycerol*: three fatty acids linked to one glycerol molecule)

**Some of the information in this study guide was supplied by Pearson from the Textbook Biology, 8th edition Campbell and Reece. The instructor has modified materials and added materials as she saw fit to enhance student learning.