

## Study Guide

### Biochemistry

**Vocabulary** (*hint: make your own flashcards or use sets available in Quizlet*)

#### 2.1 Basic Chemistry

- matter
- elements
- atoms
- protons
- neutrons
- electrons
- isotopes

#### 2.2 Molecules & Compounds

- molecule
- compound
- ion
- ionic bond
- covalent bond
- polarity
- hydrogen bond

#### 2.3 Chemistry of Water

- calorie
- solute
- hydrophilic
- hydrophobic
- acid
- base
- pH scale
- buffer

#### 2.4 Organic Molecules

- organic molecule
- functional groups
- monomer
- polymer
- dehydration synthesis
- hydrolysis

#### 2.5 Carbohydrates

- carbohydrate
- monosaccharide
- pentose
- hexose
  - glucose, fructose, galactose
- disaccharide
  - maltose, sucrose, lactose
- polysaccharide
  - starch
  - glycogen
  - cellulose
  - chitin

#### 2.6 Lipids

- lipids
- fats
- oils
- glycerol
- triglyceride
- neutral fat
- emulsification
- saturated fatty acid
- unsaturated fatty acid
- trans-fat
- phospholipid
- steroid
  - cholesterol, testosterone, estrogen

#### 2.7 Proteins

- protein
- amino acid
- amino group (-NH<sub>2</sub>)
- acid group (-COOH)
- R-group
- enzymes
- hormones

- hemoglobin
- dipeptide
- polypeptide
- peptide bond
- primary structure
- secondary structure
- alpha helix
- beta pleated sheet
- tertiary structure
- quaternary structure
- denaturation
- prions

#### 2.8 Nucleic Acid

- nucleic acids
- nucleotide
- nitrogenous base
- phosphate
- pentose sugar
- deoxyribonucleic acid (DNA)
- double helix
- sugar-phosphate backbone
- complementary base pairing
- adenine (A)
- thymine (T)
- cytosine (C)
- guanine (G)
- ribonucleic acid (RNA)
- uracil (U)
- adenosine triphosphate (ATP)
- adenosine diphosphate (ADP)
- endergonic reaction
- exergonic reaction

## Prescribed Learning Outcomes (PLOs) covered in this unit

PLO B2 Describe the characteristics of water and its role in biological systems

PLO B3 Describe the role of acids, bases, and buffers in biological systems in the human body

PLO B4 Analyze the structure & function of biological molecules in living systems, including carbohydrates, lipids, proteins, nucleic acids

## Potential Short Answer Questions *(may also choose from the written textbook review questions)*

1. Distinguish between ionic and covalent bonds.
2. What makes a molecule “organic”?
3. Name three terms to describe a water molecule.
4. Draw and label a water molecule (include atoms and polarity).
5. Use a diagram to show hydrogen bonding between water molecules (include polarity).
6. What type of bond connects water molecules to each other?
7. Distinguish between adhesion and cohesion.
8. Describe three ways that water is important to biological systems.
9. Compare an acid and a base using at least two different criteria.
10. Give an example of a buffer the body uses to regulate blood pH.
  - a. Draw the chemical reaction to show how the buffer is able to maintain blood pH within a specific range.
11. Name two groups of biological molecules that provide energy to an organism.
12. Using a general diagram, show how monomers are joined to form polymers and how polymers are broken down into monomers.
  - a. Name the two processes and show the role of water in each.
13. What is the difference between dehydration synthesis and hydrolysis?
14. For each of the four groups of biological molecules, identify the base unit molecule(s) and name at least one specific function.
15. How can you distinguish between a monosaccharide, disaccharide, and a polysaccharide? Use examples and/or diagrams.
16. Name and describe the three types of polysaccharides in terms of structure and function.
17. How does the use of glucose in a plant differ from its function in an animal?
18. What differences exist between fatty acids from animal tissues and fatty acids from plant tissues?
19. What is the importance of phospholipids to life as we know it?
20. What group of biological molecules do steroids belong to? Give two examples of steroids.
21. What type of bond is a peptide bond? Where can one be found?
22. What are two types of secondary structures in proteins? What causes the formation of these?
23. What level of structure is destroyed when a protein is denatured?
24. Define “denaturation” and give two causes of denaturation.
25. How do different amino acids differ from one another?
26. Contrast the four levels of protein structure in terms of their shape and the bonding that holds the first 3 levels together.
  - a. Give an example of a protein with the 4th level.
27. How is RNA similar to DNA? Use a separate criteria to give a difference between them.
28. What is the function of ATP?
29. Explain the significance of these:
  - a. glycerol
  - b. glucose
  - c. glycogen
  - d. guanine
30. Define and give an example of these:
  - a. buffer
  - b. polypeptide
  - c. helix
  - d. cohesion

## Hands-on Laboratory Knowledge

- Identifying Organic Molecules
  - Which chemical indicators test for: simple sugar? starch? protein?