

## CHAPTER 3—BIOCHEMISTRY

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### MULTIPLE CHOICE

1. All organic compounds contain the element

- a. C.
- b. N.
- c. Ca.
- d. Na.

ANS: A                      DIF: 1                      OBJ: 3-1.1

2. Carbon is different from many other elements in that

- a. it has four electrons in its outermost energy level.
- b. it readily bonds with other carbon atoms.
- c. it can form single, double, or triple bonds with other atoms.
- d. All of the above

ANS: D                      DIF: 2                      OBJ: 3-1.2

3. Which of the following is *not* true of alcohols?

- a. They contain a hydroxyl group (–OH).
- b. They are polar molecules.
- c. They can affect processes in living things, either positively or negatively.
- d. They are the only kind of functional group in organic molecules that contains oxygen.

ANS: D                      DIF: 2                      OBJ: 3-1.3

4. The formation of ADP and inorganic phosphate from ATP and water is an example of which kind of reaction?

- a. condensation
- b. polymerization
- c. hydrolysis
- d. oxidation

ANS: C                      DIF: 2                      OBJ: 3-1.4

5. Which of the following is a carbohydrate?

- a. DNA
- b. insulin
- c. wax
- d. sucrose

ANS: D                      DIF: 1                      OBJ: 3-2.1

6. Which organic molecule below is classified as a carbohydrate?

- a. amino acid
- b. CH<sub>2</sub> chain
- c. nucleotide
- d. sugar

ANS: D                      DIF: 1                      OBJ: 3-2.1

7. Animals store glucose in the form of

- a. cellulose.
- b. glycogen.
- c. wax.
- d. lipids.

ANS: B                      DIF: 1                      OBJ: 3-2.1

8. Polysaccharides are
- a. carbohydrates.
  - b. lipids.
  - c. proteins.
  - d. unsaturated fats.

ANS: A                      DIF: 1                      OBJ: 3-2.1

9. All of the following are examples of carbohydrates *except*
- a. sugar.
  - b. cellulose.
  - c. steroids.
  - d. glycogen.

ANS: C                      DIF: 1                      OBJ: 3-2.1

10. Amino acids are monomers of
- a. disaccharides.
  - b. proteins.
  - c. nucleotides.
  - d. steroids.

ANS: B                      DIF: 1                      OBJ: 3-2.2

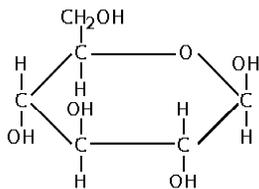
11. Which organic molecule below is most closely related to proteins?
- a. amino acids
  - b. CH<sub>2</sub> chains
  - c. nucleotides
  - d. sugars

ANS: A                      DIF: 1                      OBJ: 3-2.2

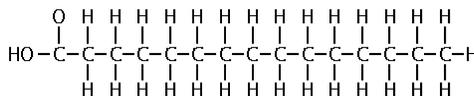
12. Long chains of amino acids are found in
- a. carbohydrates.
  - b. lipids.
  - c. proteins.
  - d. sugars.

ANS: C                      DIF: 1                      OBJ: 3-2.2

13.



**Molecule 1**



**Molecule 2**

Refer to the illustration above. Molecules like molecule 2 are found in

- a. carbohydrates.
- b. lipids.
- c. nucleic acids.
- d. proteins.

ANS: B                      DIF: 2                      OBJ: 3-2.4

14. Lipids are
- a. polar molecules.
  - b. similar to water molecules.
  - c. protein molecules.
  - d. nonpolar molecules.

ANS: D                      DIF: 1                      OBJ: 3-2.4

15. All of the following are examples of lipids *except*
- a. saturated fats.
  - b. starch.
  - c. cholesterol.
  - d. earwax.

ANS: B                      DIF: 1                      OBJ: 3-2.4

16. Saturated fatty acids contain
- a. carbon atoms that are each bonded to four other atoms.
  - b. carbon atoms linked by double bonds.
  - c. no carboxyl (–COOH) groups.
  - d. more than 100 carbon atoms.

ANS: A                      DIF: 2                      OBJ: 3-2.4

17. Lipids are soluble in
- a. water.
  - b. salt water.
  - c. oil.
  - d. All of the above

ANS: C                      DIF: 1                      OBJ: 3-2.4

18. Which organic molecule below is most closely related to lipids?
- a. amino acids
  - b. CH<sub>2</sub> chains
  - c. nucleotides
  - d. sugars

ANS: B                      DIF: 2                      OBJ: 3-2.4

19. Which organic molecule below is most closely related to nucleic acids?
- a. amino acids
  - b. CH<sub>2</sub> chains
  - c. nucleotides
  - d. sugars

ANS: C                      DIF: 1                      OBJ: 3-2.5

20. Nucleic acids include
- a. chlorophyll and retinal.
  - b. DNA and RNA.
  - c. lipids and sugars.
  - d. glucose and glycogen.

ANS: B                      DIF: 1                      OBJ: 3-2.5

21. Energy is released when the bond between
- a. carbon atoms in ATP is broken.
  - b. ribose and adenine in ATP is broken.
  - c. phosphate groups in ATP is broken.
  - d. two ATP molecules is broken.

ANS: C                      DIF: 1                      OBJ: 3-1.5

22. A model of enzyme action is the
- a. induced fit model.
  - b. lipid bilayer model.
  - c. activator action model.
  - d. active site model.

ANS: A                      DIF: 1                      OBJ: 3-2.3

23. All of the following are functional groups *except*
- a. a hydroxyl group.
  - b. an amino group.
  - c. a carboxyl group.
  - d. a carbonate group.

ANS: D                      DIF: 1                      OBJ: 3-1.3

24. A phospholipid molecule contains all of the following *except*
- a. two fatty acids.
  - b. three fatty acids.
  - c. a phosphate group.
  - d. glycerol.

ANS: B                      DIF: 2                      OBJ: 3-1.5

25. Without enzymes, the chemical reactions in the body would
- a. happen too fast.
  - b. occur at much the same rate as they do with enzymes.
  - c. require a different pH.
  - d. occur too slowly to support life processes.

ANS: D                      DIF: 1                      OBJ: 3-2.3

26. Carbon atoms can bond together to form all of the following *except*
- a. ring structures.
  - b. inorganic structures.
  - c. straight chain structures.
  - d. branched structures.

ANS: B                      DIF: 2                      OBJ: 3-1.1

## COMPLETION

1. Because carbon atoms have four electrons in their outermost energy level, they can form up to \_\_\_\_\_ covalent bonds with other atoms.

ANS:  
four  
4

DIF: 1                      OBJ: 3-1.2

2. In the molecule that has the chemical formula  $C_2H_4$ , the carbon atoms are bonded together with a \_\_\_\_\_ bond.

ANS: double

DIF: 3                      OBJ: 3-1.2

3. In a condensation reaction, two molecules become linked together and a molecule of \_\_\_\_\_ is produced.

ANS: water

DIF: 1                      OBJ: 3-1.4

4. The formation of polymers from monomers occurs as a result of \_\_\_\_\_ reactions, and the breakdown of polymers into monomers occurs as a result of \_\_\_\_\_ reactions.

ANS: condensation, hydrolysis

DIF: 1                      OBJ: 3-1.4

5. Lipids are \_\_\_\_\_ molecules because they have no negative and positive poles.

ANS: nonpolar

DIF: 1                      OBJ: 3-2.4

6. A substrate attaches to the \_\_\_\_\_ of an enzyme.

ANS: active site

DIF: 1                      OBJ: 3-2.3

7. In a triple bond, \_\_\_\_\_ pair(s) of electrons is (are) shared between two atoms.

ANS:

three

3

DIF: 1                      OBJ: 3-1.2

8. ATP contains \_\_\_\_\_ phosphate groups.

ANS:

three

3

DIF: 1                      OBJ: 3-1.5

## PROBLEM

1. You are given four test tubes containing purified biological macromolecules. The test tubes are unlabeled except for a number between 1 and 4. You are told that one test tube contains a protein, one contains a lipid, one contains a carbohydrate, and one contains a nucleic acid. You then perform some tests on the macromolecules and collect the following information:
  - 1) Test tubes #2 and #4 contain nitrogen, but the other tubes do not.
  - 2) The contents of test tube #3 are not soluble in water, but the contents of the other test tubes are soluble in water.
  - 3) The contents of test tube #1 can be broken down into subunits that are all exactly identical to each other.
  - 4) The macromolecule in test tube #2 is found to have a globular shape.

What are the identities of the macromolecules present in the four test tubes? Write your answer in the space below.

ANS:

Test tube #1 contains a carbohydrate.

Test tube #2 contains a protein.

Test tube #3 contains a lipid.

Test tube #4 contains a nucleic acid.

DIF: 2

OBJ: 3-2.2