## Biochemistry Review

**Multiple Choice**
*Identify the choice that best completes the statement or answers the question.*

***Four major groups of organic compounds are particularly important to living things. Most life processes rely on molecules from one or more of these groups.***

____ 1. Refer to the information above. To which group do sugars belong?
a. nucleic acids
b. proteins
c. lipids
d. carbohydrates

____ 2. Refer to the information above. To which group do oils belong?
a. nucleic acids
b. carbohydrates
c. lipids
d. proteins

____ 3. Refer to the information above. To which group do RNA molecules belong?
a. nucleic acids
b. carbohydrates
c. lipids
d. proteins

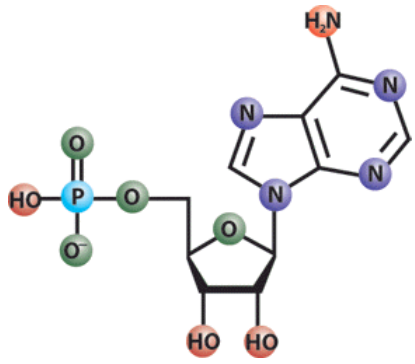
____ 4. Refer to the information above. To which group do enzymes belong?
a. lipids
b. proteins
c. carbohydrates
d. nucleic acids

***Nitrogen (N) is used and reused by various organisms and processes as it cycles through the environment.***

____ 5. Study the statement above. Which of these processes returns nitrogen to the soil in a form plants can use?
a. animal urination
b. decomposition of dead animals
c. decomposition of plant matter
d. nitrogen fixation

____ 6. Certain types of biomolecules are crucial to a variety of life processes and body structures. One of these types of molecules are proteins, which are ____.
a. composed of building blocks called amino acids
b. insoluble in water and are used by the body for energy storage and insulation
c. complex biomolecules that store genetic information
d. organic compounds used by cells to store and release energy

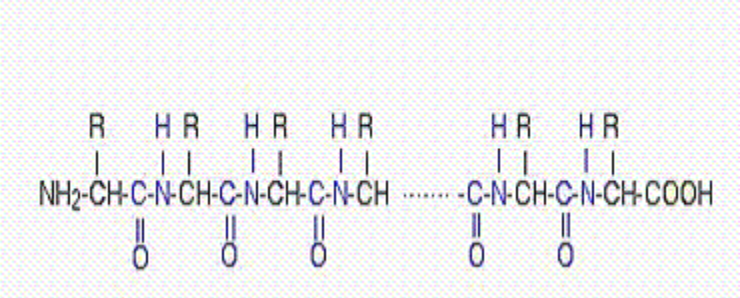
____ 7. Which type of macromolecule is shown below?



a. carbohydrate
b. lipid
c. nucleic acid
d. protein

____ 8. Identify the molecule which contains the instructions used to create an organism's proteins.
a. nicotinamide adenine dinucleotide (NAD+)
b. hemoglobin
c. deoxyribonucleic acid (DNA)
d. glucose

____ 9.

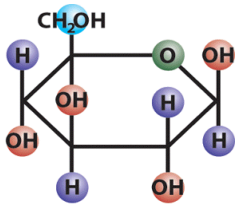


The macromolecule above is which of the following:
a. Carbohydrate
b. Lipid
c. Protein
d. Nucleic Acid

____ 10. Which of the following statements about enzymes is **true**?
a. Amylase¸ a digestive enzyme found in saliva¸ helps break down food molecules.
b. Enzymes do not play a role in metabolic processes of the body.
c. Enzymes are chemically altered during reactions in which they are involved.
d. Enzymes always slow the rate at which a chemical reaction occurs.

____ 11. Organic means
a. it contains carbon
b. it does not contain carbon
c. it contains oxygen
d. it does not contain oxygen

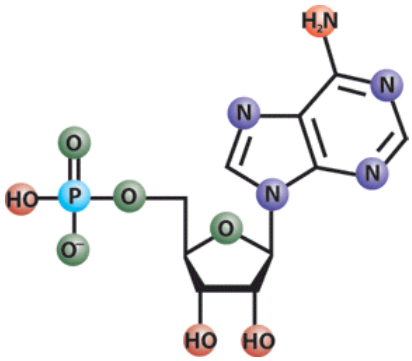
____ 12. What type of macromolecule is shown below?



**Glucose Molecule**

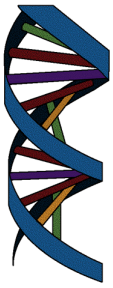
a. lipid
b. protein
c. nucleic acid
d. carbohydrate

____ 13. DNA is a polymer which is made up of subunits called nucleotides. Nucleotides have three basic parts. Which of these is **not** a nucleotide component?



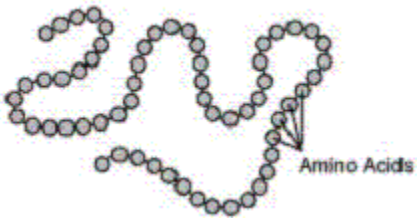

a. deoxyribose sugar
b. phosphate group
c. ribose sugar
d. nitrogenous base

____ 14. In the early 1900s, scientists became interested in the passing of traits throughout generations in a population. By 1950, the general belief in the scientific community was that protein was the genetic material. A critical experiment performed by Alfred Hershey and Martha Chase in 1952, however, showed that another molecule was actually the genetic material. James Watson and Francis Crick built on this finding in 1953 by proposing a structure for this molecule, a diagram of which is shown below. What is the name of this molecule?



a. deoxyribonucleic acid
b. phosphate
c. nitrogenous base
d. ribonucleic acid

____ 15. What is the function of an enzyme?
a. They speed up chemical reactions
b. They slow down chemical reactions
c. They produce lipids
d. They break down glucose




____ 16. The macromolecule above is which of the following:

a. Lipid
b. Carbohydrate
c. Protein
d. Nucleic Acid

____ 17. Enzymes can be affected by:
a. Temperature
b. Concentration
c. pH
d. All of the following

____ 18. Inorganic means
a. it contains carbon
b. it does not contain carbon
c. it contains oxygen
d. it does not contain oxygen

____ 19. What are the reatants of the following equation?
$CH_4 + 2O_2$ -------> $CO_2 + 2H_2O$
a. $CH_4$
b. $2O_2$
c. $CH_4 + 2O_2$
d. $CO_2 + 2H_2O$

____ 20. What are the products of the following equation?
$CH_4 + 2O_2$ -------> $CO_2 + 2H_2O$
a. $CO_2$
b. $2H_2O$
c. $CH_4 + 2O_2$
d. $CO_2 + 2H_2O$

____ 21. Which of the following are enzymes?
a. amylase
b. glucose
c. catalase
d. both a and c

____ 22. Plants store glucose as:
a. glycogen
b. starch
c. cellulose
d. lipids

____ 23. Animals store glucose as
a. glycogen
b. starch
c. cellulose
d. lipids

____ 24. $C_6H_{12}O_6$ is the chemical formula for
a. glycogen
b. cellulose
c. glucose
d. fructose

____ 25. Enzymes are made up of
a. polysaccharides
b. amino acids
c. fatty acids
d. glycerol

____ 26. Amino acids are help together by _____ to make a protein.
a. ionic bonds
b. hydrogen bonds
c. peptide bonds
d. polar bonds

____ 27. The monomer of a Lipid is
a. monosaccharide
b. fatty acid
c. nucleotides
d. amino acids

____ 28. The monomer of a nucleic acid is
a. monosaccharide
b. fatty acid
c. nucleotide
d. amino acid

____ 29. Which of the following is used for short term energy?
a. Lipid
c. Carbohydrate

b. Protein
d. Nucleic Acid

____ 30. These are used to build hair and skin
a. proteins
b. lipids
c. nucleic acids
d. carbohydrates

# Biochemistry Review
# Answer Section

## MULTIPLE CHOICE

1. ANS: D
   Sugars are classified as carbohydrates. Carbohydrates are used by cells to provide energy for cell functions. Glucose and fructose are examples of simple sugars.

| | Feedback |
|---|---|
| A | This type of molecule belongs to a different group of organic compounds. |
| B | Review the structure and composition of organic compounds. |
| C | Think about the structure and composition of organic compounds. |
| D | Correct! |

   PTS: 1 DIF: Bloom's Level: Application REF: Science
   OBJ: Compare and contrast the structure and functions of the following organic molecules, carbohydrates. STA: 9-12: B.2.01.a TOP: Biology
   KEY: organic compounds | biomolecule | carbohydrate | cell
   ID: SC-10-00169-004
2. ANS: C
   Fats, oils, and waxes are classified as lipids. Lipids are nonpolar molecules, and will not dissolve in water. They are the major components of the protective membranes that surround all living cells. Cells also rely on lipids for energy storage and insulation.

| | Feedback |
|---|---|
| A | Think about the structure and composition of organic compounds. |
| B | This type of molecule belongs to a different group of organic compounds. |
| C | Correct! |
| D | Review the structure and composition of organic compounds. |

   PTS: 1 DIF: Bloom's Level: Application REF: Science
   OBJ: Compare and contrast the structure and functions of the following organic molecules, lipids.
   STA: 9-12: B.2.01.c TOP: Biology
   KEY: organic compounds | lipid | biomolecule | cell ID: SC-10-00169-003
3. ANS: A
   Ribonucleic acid (RNA) is a nucleic acid. This biomolecule functions in the cell to make a copy of DNA for use in making proteins.

| | Feedback |
|---|---|
| A | Correct! |
| B | Review the structure and composition of organic compounds. |
| C | This type of molecule belongs to a different group of organic compounds. |
| D | Remember what you have learned about organic compounds. |

   PTS: 1 DIF: Bloom's Level: Application REF: Science
   OBJ: Compare and contrast the structure and functions of the following organic molecules, nucleic acids. STA: 9-12: B.2.01.d TOP: Biology
   KEY: organic compounds | biomolecule | nucleic acid | cell

ID: SC-10-00169-001

4. ANS: B
Proteins, carbohydrates, lipids, and nucleic acids are four major groups of organic compounds. Enzymes are types of proteins. They function to change the rate of chemical reactions within cells. Enzymes are involved in nearly all metabolic processes.

| | Feedback |
|---|---|
| A | This type of molecule belongs to a different group of organic compounds. |
| B | Correct! |
| C | Review the structure and composition of organic compounds. |
| D | Think about the structure and composition of organic compounds. |

PTS: 1 DIF: Bloom's Level: Application REF: Science
OBJ: Investigate and describe the structure and function of enzymes and explain their importance in biological systems. STA: 9-12: B.2.04
TOP: Biology KEY: organic compounds | protein | enzyme | cell | biomolecule
ID: SC-10-00169-002

5. ANS: D
Nitrogen exists in abundance on Earth, accounting for 78% of the atmosphere. However, plants cannot use nitrogen in the form in which it most commonly exists in the environment. Nitrogen-fixing bacteria are present in nodules on the roots of leguminous plants like beans, peas, and peanuts. These bacteria convert diatomic nitrogen ($N_2$) into a form which is usable by plants.

| | Feedback |
|---|---|
| A | Remember what you have learned about the importance of nitrogen to living things and the way it cycles through the environment. |
| B | Remember what you have learned about how nitrogen cycles through the environment, as well as its importance to living organisms. |
| C | Consider what you have learned about how nitrogen cycles through the environment, as well as its importance to living organisms. |
| D | Correct! |

PTS: 1 DIF: Bloom's Level: Application REF: Science
OBJ: Investigate and analyze the interrelationships among organisms, populations, communities, and ecosystems including, abiotic and biotic factors. STA: 9-12: B.5.01.b
TOP: Biology KEY: nitrogen | biomolecule | nitrogen cycle | nitrogen fixation | legumes
ID: SC-10-00128-002

6. ANS: A
Biomolecules differ in composition, structure, and function. Carbohydrates and lipids are carbon-based molecules. Among other functions, they are part of the energy storage mechanism utilized by cells. Proteins, including enzymes, contain nitrogen in addition to carbon, hydrogen, and oxygen. Among other functions, they are important in cell metabolism. Nucleic acids consist of carbon, hydrogen, oxygen, nitrogen, and phosphorus. These biomolecules store cellular information.

| | Feedback |
|---|---|
| A | Correct! |
| B | Think about the characteristics of this biomolecule and how it functions in the body. |
| C | Consider how this type of biomolecule functions in the body. |
| D | Review the function of this type of biomolecule again. |

PTS: 1 DIF: Bloom's Level: Application REF: Science
OBJ: Compare and contrast the structure and functions of the following organic molecules, carbohydrates. STA: 9-12: B.2.01.a TOP: Biology
KEY: biomolecule | lipid | protein | carbohydrate | amino acid | enzyme | nucleic acid
ID: SC-10-00165

7. ANS: C

| | Feedback |
|---|---|
| A | |
| B | |
| C | |
| D | |

PTS: 1 DIF: Bloom's Level: Application REF: Science
OBJ: Analyze the molecular basis of heredity including, DNA replication.
STA: 9-12: B.3.01.a TOP: Biology
KEY: DNA | nucleotide | deoxyribose sugar | phosphate group | nitrogenous base
ID: SC-10-00187

8. ANS: C
Deoxyribonucleic acid (DNA) stores genetic information in the form of a code. DNA is a nucleic acid. Nucleic acids are composed of subunits called nucleotides that consist of carbon, hydrogen, oxygen, nitrogen and phosphorous atoms arranged in three groups - a nitrogenous base, a simple sugar, and a phosphate group.

| | Feedback |
|---|---|
| A | Consider the function of each of these molecules in the body. |
| B | Think about how each of these molecules function in the body. |
| C | Correct! |
| D | Think about the function of this biomolecule in the body. |

PTS: 1 DIF: Bloom's Level: Comprehension REF: Science
OBJ: Compare and contrast the structure and functions of the following organic molecules, nucleic acids. STA: 9-12: B.2.01.d TOP: Biology
KEY: biomolecule | DNA | nucleic acid | cell ID: SC-10-00167-004

9. ANS: C PTS: 1

10. ANS: A
Enzymes are important proteins found within organisms which change the rate at which a chemical reaction takes place. Enzymes take part in nearly all metabolic processes within an organism. Factors including temperature and pH affect the functioning of enzymes.

| | Feedback |
|---|---|
| A | Correct! |
| B | Think about the characteristics and functions of enzymes. |
| C | Review the characteristics and functions of enzymes. |
| D | This is not a characteristic of enzymes. |

PTS: 1 DIF: Bloom's Level: Application REF: Science
OBJ: Investigate and describe the structure and function of enzymes and explain their importance in biological systems. STA: 9-12: B.2.04

TOP: Biology KEY: enzyme ID: SC-10-00168

11. ANS: A PTS: 1

12. ANS: D

| | Feedback |
|---|---|
| A | |
| B | |
| C | |
| D | |

PTS: 1 DIF: Bloom's Level: Analysis REF: Science
OBJ: Investigate and analyze the bioenergetic reactions including, photosynthesis.
STA: 9-12: B.2.05.c TOP: Biology KEY: photosynthesis | glucose
ID: SC-10-00170

13. ANS: C

DNA, or deoxyribonucleic acid, is made up of two chains of nucleotides which are held together by nitrogenous bases. Each nucleotide is composed of a simple sugar called deoxyribose, a phosphate group, and a nitrogenous base. Ribose sugar is the simple sugar found in a molecule of RNA, or ribonucleic acid.

| | Feedback |
|---|---|
| A | Deoxyribose sugar is one of the three main components of a nucleotide. |
| B | A phosphate group is a major component of a nucleotide. |
| C | Correct! |
| D | There are four different nitrogenous bases which can be part of a nucleotide. |

PTS: 1 DIF: Bloom's Level: Application REF: Science
OBJ: Analyze the molecular basis of heredity including, DNA replication.
STA: 9-12: B.3.01.a TOP: Biology
KEY: DNA | nucleotide | deoxyribose sugar | phosphate group | nitrogenous base
ID: SC-10-00187

14. ANS: A

Revealing the identity and characteristics of genetic material resulted from the work of multiple scientists over a period of time. Scientific understanding of DNA continues to change as advances in technology and methodology allow scientists greater understanding of the structure and nature of this complex molecule.

| | Feedback |
|---|---|
| A | Correct! |
| B | A phosphate group is part of each nucleotide, or subunit, which makes up a molecule of deoxyribonucleic acid. |
| C | A nitrogenous base is one important component of the molecule described in this question. |
| D | Ribonucleic acid, or RNA, is a molecule which plays a crucial role in the production of proteins. |

PTS: 1 DIF: Bloom's Level: Comprehension REF: Workplace
OBJ: Analyze the molecular basis of heredity including, DNA replication.
STA: 9-12: B.3.01.a TOP: Biology
KEY: DNA | genetic material | Watson | Crick | Hershey | Chase

ID: SC-10-00338

15. ANS: A PTS: 1
16. ANS: C PTS: 1
17. ANS: D PTS: 1
18. ANS: B PTS: 1
19. ANS: C PTS: 1
20. ANS: D PTS: 1
21. ANS: D PTS: 1
22. ANS: B PTS: 1
23. ANS: A PTS: 1
24. ANS: C PTS: 1
25. ANS: B PTS: 1
26. ANS: C PTS: 1
27. ANS: B PTS: 1
28. ANS: C PTS: 1
29. ANS: C PTS: 1
30. ANS: A PTS: 1