

Matter and Organic Compounds

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CONCEPT

1

Matter and Organic Compounds

Lesson 2.1: True or False

Name _____ Class _____ Date _____

Write true if the statement is true or false if the statement is false.

- _____ 1. An atom is smaller than an element.
- _____ 2. Organic compounds are found in living organisms.
- _____ 3. Proteins are made out of amino acids.
- _____ 4. Proteins speed up chemical reactions.
- _____ 5. The DNA code carries instructions for the correct sequence of nucleic acids in a protein
- _____ 6. Sugars and phosphate groups form the middle of a nucleic acid chain.
- _____ 7. DNA (and RNA) is made out of nucleotides.
- _____ 8. A protein consists of one or more polypeptide chains.
- _____ 9. Lipids include fats, oils, and sugars.
- _____ 10. Carbohydrates are the most common type of organic compound.
- _____ 11. Peanut oil is an unsaturated fatty acid.
- _____ 12. Cytosine and adenine are complementary bases in DNA.
- _____ 13. A double helix is like a spiral staircase.
- _____ 14. Phospholipids form cell membranes.
- _____ 15. Carbohydrates are made out of monosaccharides.

Lesson 2.1: Critical Reading

Name _____ Class _____ Date _____

Read these passages from the text and answer the questions that follow.

The Significance of Carbon

A compound found mainly in living things is known as an **organic compound**. Organic compounds make up the cells and other structures of organisms and carry out life processes. Carbon is the main element in organic compounds, so carbon is essential to life on Earth. Without carbon, life as we know it could not exist. Why is carbon so basic to life? The reason is carbon's ability to form stable bonds with many elements, including itself. This property allows carbon to form a huge variety of very large and complex molecules. In fact, there are nearly 10 million carbon-based compounds in living things! However, the millions of organic compounds can be grouped into just four major types: carbohydrates, lipids, proteins, and nucleic acids. You can compare the four types in **Table 1.1**. Each type is also described below.

TABLE 1.1: Types of Organic Compounds

Type of Compound	Examples	Elements	Functions
Carbohydrates	sugars, starches	carbon, hydrogen, oxygen	provides energy to cells, stores energy, forms body structures
Lipids	fats, oils	carbon, hydrogen, oxygen	stores energy, forms cell membranes, carries messages
Proteins	enzymes, antibodies	carbon, hydrogen, oxygen, nitrogen, sulfur	helps cells keep their shape, makes up muscles, speeds up chemical reactions, carries messages and materials
Nucleic Acids	DNA, RNA	carbon, hydrogen, oxygen, nitrogen, phosphorus	contains instructions for proteins, passes instructions from parents to offspring, helps make proteins

Carbohydrates

Carbohydrates are the most common type of organic compound. A **carbohydrate** is an organic compound such as sugar or starch, and is used to store energy. Like most organic compounds, carbohydrates are built of small, repeating units that form bonds with each other to make a larger molecule. In the case of carbohydrates, the small, repeating units are called monosaccharides.

Lipids

A **lipid** is an organic compound such as fat or oil. Organisms use lipids to store energy, but lipids have other important roles as well. Lipids consist of repeating units called fatty acids. There are two types of fatty acids: saturated fatty acids and unsaturated fatty acids.

Proteins

A **protein** is an organic compound made up of small molecules called **amino acids**. There are 20 different amino acids commonly found in the proteins of living things. Small proteins may contain just a few hundred amino acids, whereas large proteins may contain thousands of amino acids.

Nucleic Acids

A **nucleic acid** is an organic compound, such as DNA or RNA, that is built of small units called nucleotides. Many nucleotides bind together to form a chain called a **polynucleotide**. The nucleic acid **DNA** (deoxyribonucleic acid) consists of two polynucleotide chains. The nucleic acid **RNA** (ribonucleic acid) consists of just one polynucleotide chain.

Questions

1. List two functions of organic compounds.

2. Which two categories of organic compounds store energy? Which of these organic compounds is more common?

3. What is a main difference between DNA and RNA?

4. Describe a difference between large and small proteins.

5. Why is carbon considered the essential element of life?

Lesson 2.1: Multiple Choice

Name _____ Class _____ Date _____

Circle the letter of the correct choice.

- a. Water (H_2O) is a(n)
 - a. element.
 - b. atom.
 - c. compound.
 - d. carbohydrate.
- b. A process that changes some chemical substances into others is a
 - a. chemical bond.
 - b. chemical reaction.
 - c. chemical equation.
 - d. chemical formula.
- c. The main difference between saturated and unsaturated fatty acids is
 - a. the amount of energy found in the fatty acid.
 - b. saturated fatty acids are liquids.
 - c. unsaturated fatty acids can be packed together very tightly.
 - d. the number of hydrogen atoms bonded to the carbon atoms.
- d. The function of proteins can include
 - a. helping cells keep their shape.
 - b. helping to destroy foreign substances.
 - c. speeding up biochemical reactions.
 - d. all of the above
- e. The characteristics of DNA includes which of the following?
 - a. DNA is made of nucleotides consisting of a sugar, a phosphate group, and a carbon base.
 - b. DNA is made of a single polynucleotide chain, which winds into a double helix.
 - c. DNA is how inherited characteristics are passed from one generation to the next.
 - d. all of the above
- f. Which category of organic compound is the major component of cell membranes?
 - a. carbohydrate
 - b. lipid
 - c. protein
 - d. nucleic acid
- g. The cell wall of plants is made out of
 - a. starch.
 - b. glycogen.
 - c. cellulose.
 - d. chitin.
- h. The main element of organic compounds is
 - a. hydrogen.
 - b. oxygen.
 - c. nitrogen.
 - d. carbon.

Lesson 2.1: Vocabulary I

Name_____ Class_____ Date_____

Match the vocabulary word with the proper definition.

Definitions

- _____ 1. an organic compound that stores energy, forms cell membranes, carries messages
- _____ 2. an organic compound that contains instructions for proteins
- _____ 3. an organic compound that provides energy to cells, stores energy, forms body structures
- _____ 4. an organic compound that helps cells keep their shape
- _____ 5. a pure substance, like carbon
- _____ 6. may contain just a few simple sugars or thousands
- _____ 7. subunit that make up proteins
- _____ 8. subunit used to make nucleic acids
- _____ 9. lipid in which carbon atoms are bonded to as many hydrogen atoms as possible
- _____ 10. lipid in which carbon atoms are bonded to groups of atoms other than hydrogen
- _____ 11. the major component of cell membranes
- _____ 12. anything that takes up space and has mass

Terms

- a. amino acid
- b. carbohydrate
- c. DNA
- d. element
- e. lipid
- f. matter
- g. nucleotide
- h. phospholipid
- i. polysaccharide
- j. protein
- k. saturated fatty acid
- l. unsaturated fatty acid

Lesson 2.1: Vocabulary II

Name_____ Class_____ Date_____

Fill in the blank with the appropriate term.

1. A substance that consists of two or more elements is a _____.

2. The information in _____ is passed from parents to offspring when organisms reproduce.
3. _____ are proteins which bind to foreign substances such as bacteria and target them for destruction.
4. _____ compounds make up the cells and other structures of organisms and carry out _____ processes.
5. _____ is the monosaccharide used for energy by the cells of most organisms.
6. _____ are the most common type of organic compound.
7. _____ is a protein that binds with oxygen molecules.
8. The shape of DNA is that of a _____.
9. _____ is used by plants to store energy.
10. _____ is used by plants to form rigid walls around cells.
11. DNA contains _____ instructions for proteins, and _____ helps assemble the proteins.
12. Matter is anything that takes up space and has _____.

Lesson 2.1: Critical Writing

Name _____ Class _____ Date _____

Thoroughly answer the question below. Use appropriate academic vocabulary and clear and complete sentences.

Describe the main functions of each of the four classes of organic compounds.