

Organic Compounds Worksheet

(adapted from a worksheet published by CK12.org)

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 2.1. Each type is also described below.

Table 2.1: 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?
6. 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.
7. The characteristics of DNA include 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.