

Section 6.3

Life Substances

North Carolina Objectives Objective 2.01 Compare and contrast the structure and functions of the following organic molecules: Carbohydrates; Proteins; Lipids; Nucleic acids

► Before You Read

This section explains the chemical construction of many of the substances that make up our bodies and the bodies of other living organisms. What do you think your body is made of? On the lines below, list substances that you think make up your body.

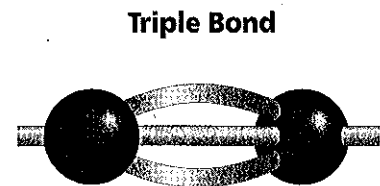
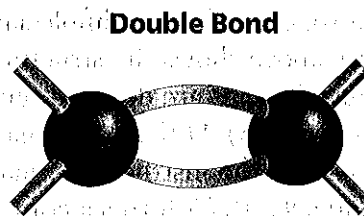
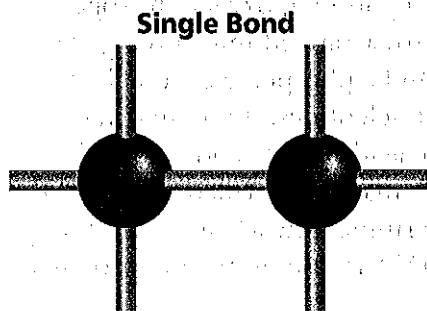
► Read to Learn

The Role of Carbon in Organisms

Carbon is one of the substances found in living organisms. Carbon atoms can form covalent bonds with other carbon atoms and with many other elements. When a carbon atom bonds by sharing one electron, it forms a single bond. When it bonds by sharing two electrons, it forms a double bond. When a carbon atom bonds by sharing three electrons, it forms a triple bond. The figure below illustrates the three types of bonds.

Molecular Chains As one carbon atom bonds to another and then that one bonds to another, they form straight chains, branched chains, or rings. These chains and rings can contain almost any number of carbon atoms and can include atoms of other elements as well. The chains and rings are called carbon compounds.

Carbon compounds sometimes contain only one or two carbon atoms. But some carbon compounds contain tens, hundreds, or thousands of carbon atoms. These large compounds are called biomolecules.



STUDY COACH

State the Main Ideas As you read this section, stop after every few paragraphs and put what you have just read into your own words.

Mark the Text Highlight the main idea in each paragraph.

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Life Substances, *continued* Reading Check

1. What three elements are carbohydrates made of?

**Think it Over**

2. Analyze DNA is an example of a (Circle your choice.)
- nucleic acid.
 - biomolecule.
 - carbon compound.
 - all of the above.

What are examples of biomolecules?

Carbohydrates are one type of biomolecule. **Carbohydrates** are organic compounds made of carbon, hydrogen, and oxygen. They are used by cells to store and release energy. Starch and sugars are examples of carbohydrates. 

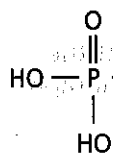
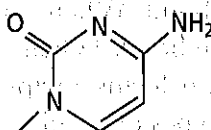
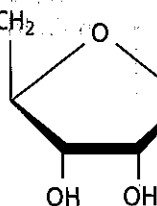
Lipids are another type of biomolecule. **Lipids** are large and are made mostly of carbon and hydrogen, with a small amount of oxygen. Fats, oils, waxes, and steroids are all lipids. Lipids do not dissolve in water because their molecules are not attracted by water molecules. Water molecules do not attract lipids because lipids are nonpolar molecules. Lipids are used by cells for energy storage, insulation, and protective coatings, such as in membranes.

Another type of biomolecule is protein. **Proteins** are necessary for all life because they provide structure for tissues and organs and carry out cell metabolism (you learned in Section 6.1 that metabolism is all of the chemical reactions that occur within an organism). They provide the body with the ability to move muscles. They also are needed to transport oxygen in the bloodstream. Proteins are large and complex and are made up of carbon, hydrogen, oxygen, nitrogen, and sometimes sulfur.

Enzymes are a particular type of protein. **Enzymes** change the speed of chemical reactions within the body. In some cases, enzymes speed up a reaction that would ordinarily take more time. For example, enzymes speed up the digestion of food.

A **nucleic** (noo KLAY ihk) acid is a biomolecule that stores cellular information in the form of a code. Nucleic acids are important compounds necessary for life. They are made of smaller units called nucleotides.

Nucleotides consist of carbon, hydrogen, oxygen, nitrogen, and phosphorus atoms. These atoms are arranged into three groups: a nitrogenous base, a simple sugar, and a phosphate group. The figure above shows the structure of nucleotides. Two important nucleic acids are deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). DNA is an organism's master information code. DNA includes the instructions that determine how an organism looks and acts. RNA forms a copy of DNA to use in making proteins.

Phosphate**Sugar****Nitrogenous base**

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Life Substances, *continued*

After You Read

Mini Glossary

carbohydrates: organic compounds used by cells to store and release energy; composed of carbon, hydrogen, and oxygen

enzyme: type of protein found in all living things that changes the speed of chemical reactions

lipids: large organic compounds made mostly of carbon and hydrogen with a small amount of oxygen; examples are fats, oils, waxes, and steroids; are insoluble in water and used by cells for energy storage, insulation, and protective coatings, such as in membranes

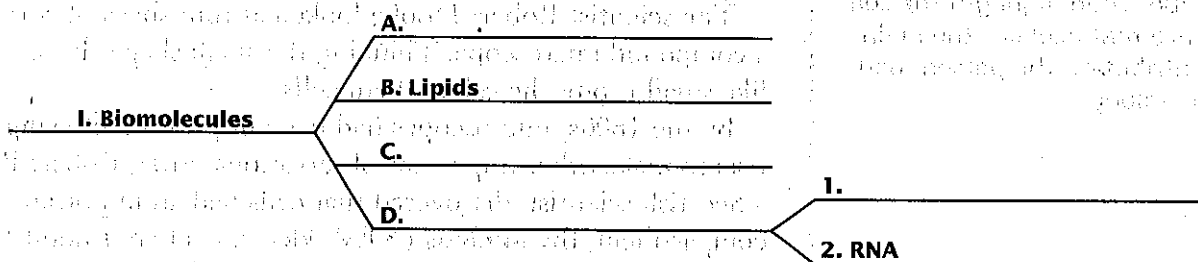
nucleic (noo KLAY ihk) acid: complex biomolecules, such as RNA and DNA, that store cellular information in cells in the form of a code

nucleotides: subunits of nucleic acid formed from a simple sugar, a phosphate group, and a nitrogenous base

proteins: large, complex biomolecules essential to all life composed of carbon, hydrogen, oxygen, nitrogen, and sometimes sulfur; provide structure for tissues and organs and help carry out cell metabolism

1. Review the terms and their definitions in the Mini Glossary above. Choose two terms that are related to each other. On the lines below, tell how these terms are related.

2. Complete the diagram with information you learned from reading the section.



Visit the Glencoe Science Web site at science.glencoe.com to find your biology book and learn more about life substances.