

Chapter 8 Carbon Chemistry ▪ Section 4 Summary

Life With Carbon

Key Concepts

- What are the four classes of organic compounds required by living things, and how are they used in the body?
- Why do organisms need water, vitamins, minerals, and salts?

Nutrients are the building blocks of all living things. Nutrients are organic compounds. Foods provide organic compounds to living things. **The four classes of organic compounds required by living things are carbohydrates, proteins, lipids, and nucleic acids.**

A **carbohydrate** is an energy-rich organic compound made of the elements carbon, hydrogen, and oxygen. The simplest carbohydrates are sugars. **Glucose** is a sugar found in your body. A **complex carbohydrate** is made of a long chain of simple carbohydrates bonded to each other. Two complex carbohydrates are starch and cellulose, both of which are made of glucose. Plants store energy in the form of the complex carbohydrate **starch**. Starches are found in many foods. The body breaks starch down into glucose, which it uses for energy. **The energy released by breaking down starch allows the body to carry out its life functions.** Plants build strong stems and roots with the complex carbohydrate **cellulose**. The body cannot break down cellulose into glucose molecules. However, undigested cellulose keeps the digestive tract healthy.

Proteins are polymers formed from monomers called amino acids. There are 20 kinds of amino acids found in living things. Different proteins are made when different sequences of amino acids are linked into long chains. Each amino acid molecule has an amino group ($-\text{NH}_2$) and a carboxyl group ($-\text{COOH}$). Good sources of protein include meat, fish, eggs, and milk. **The body uses proteins from food to build and repair body parts and to regulate cell activities.**

Like carbohydrates, **lipids** are energy-rich compounds made of carbon, oxygen and hydrogen. **Gram for gram, lipids release twice as much energy in your body as do carbohydrates.** Lipids include fats, oils, waxes, and cholesterol. Each fat or oil molecule is made of three **fatty acids** and one alcohol. **Cholesterol** is a waxy substance found in all animal cells.

Nucleic acids are very large organic molecules made up of carbon, oxygen, hydrogen, nitrogen, and phosphorus. There are two types of nucleic acids—**DNA** and **RNA**. The building blocks of nucleic acids are called **nucleotides**. The differences among living things depend on the order of nucleotides in their DNA. **When living things reproduce, they pass DNA and the information it carries to the next generation.**

Organisms are made up of large molecules, such as DNA and proteins. **Organisms require water, vitamins, minerals, and salts to support the functioning of large molecules.** Vitamins are organic compounds that serve as helper molecules in a variety of chemical reactions in your body. Minerals are elements in the form of ions needed by your body.

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This section describes the four main classes of polymers in living things.

Use Target Reading Skills

The information in this book is organized with red headings and blue subheadings. Before you read, preview each red heading and blue subheading. Ask a question for each red heading to guide you as you read the topic. Answer the questions as you read.

Life With Carbon		
Heading	Question	Answer
Carbohydrates	What is a carbohydrate?	
Proteins		
Lipids		
Nucleic Acids		
Other Nutrients		

Introduction (pp. 316–317)

1. What are the four classes of polymers found in all living things?

Carbohydrates (pp. 317–318)

2. What is a carbohydrate?

3. The sugar with the molecular formula of $C_6H_{12}O_6$ is called

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4. Why is glucose sometimes called “blood sugar”?

5. A large chainlike molecule made of simple carbohydrates is called a(n) _____.

6. Complete the table about complex carbohydrates.

Complex Carbohydrates		
Type	Description	Contained in These Foods
a. Starch		
b. Cellulose		

Proteins (p. 319)

7. Polymers formed from smaller molecules called amino acids are _____.

8. Is the following sentence true or false? All amino acid molecules contain a carboxyl group (—COOH) and an amino group (—NH₂).

9. How are different proteins made?

10. Circle the letter of each food that is a good source of protein.

- a. fish b. beans c. potatoes d. meat

11. What does the body use proteins for?

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Life With Carbon *(continued)*

Lipids (pp. 320–321)

12. What are lipids?

13. Name four types of lipids.

14. Gram for gram, which stores more energy, lipids or carbohydrates?

15. What is each fat or oil made of?

Nucleic Acids (pp. 321–322)

16. What are nucleic acids?

17. Complete the table about types of nucleic acids.

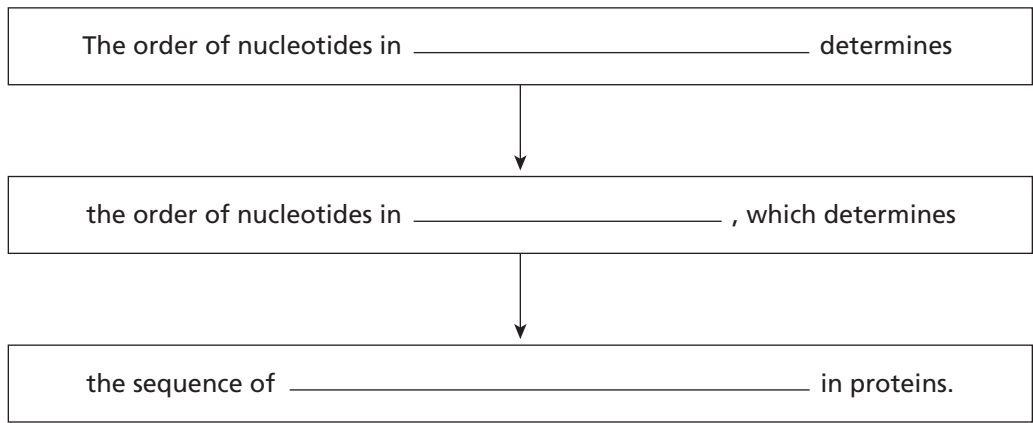
Nucleic Acids		
Common Name	Full Name	Composed of
a.	Deoxyribonucleic acid	Four kinds of
b.	Ribonucleic acid	Four kinds of

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18. The building blocks of nucleic acids are called _____.

19. What do the differences among living things depend on?

20. Complete the flowchart about nucleic acids.



Other Nutrients (pp. 322–323)

21. Complete the table about other compounds in foods.

Vitamins and Minerals		
Nutrient	Definition	Examples
a. Vitamins		
b. Minerals		

22. Is the following sentence true or false? Vitamins and minerals are only needed by your body in small amounts. _____

