

Chapter 3 Biochemistry

## Table of Contents

Section 1 Carbon Compounds

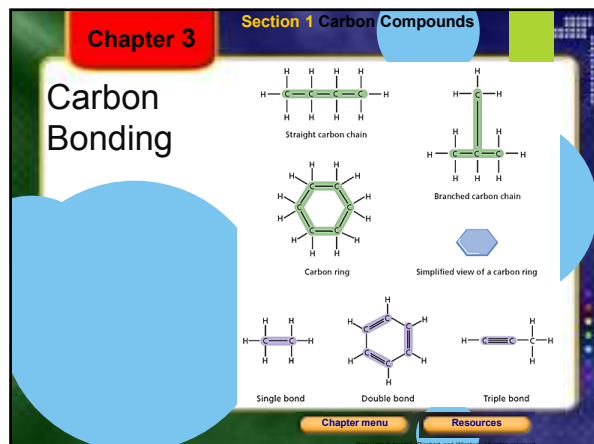
Section 2 Molecules of Life

Chapter menu Resources

- Chapter 3 Section 1 Carbon Compounds
- ## Objectives
- ▶ Distinguish between organic and inorganic compounds.
  - ▶ Explain the importance of carbon bonding in biological molecules.
  - ▶ Identify functional groups in biological molecules.
  - ▶ Summarize how large carbon molecules are synthesized and broken down.
  - ▶ Describe how the breaking down of ATP supplies energy to drive chemical reactions.
- Chapter menu Resources

- Chapter 3 Section 1 Carbon Compounds
- ## Carbon Bonding
- ▶ Organic compounds contain carbon atoms and are found in living things.
  - ▶ Most *inorganic compounds* do not contain carbon atoms.
- Chapter menu Resources

- Chapter 3 Section 1 Carbon Compounds
- ## Carbon Bonding, *continued*
- ▶ Carbon atoms can readily form four covalent bonds with other atoms including other carbon atoms. The carbon bonds allow the carbon atoms to form a wide variety of simple and complex organic compounds.
- Chapter menu Resources



- Chapter 3 Section 1 Carbon Compounds
- ## Large Carbon Molecules
- **Condensation reactions** join **monomers** (small simple molecules) to form **polymers**. A condensation reaction releases water as a by-product.
  - In a **hydrolysis reaction**, water is used to split polymers into monomers.
- Chapter menu Resources

Section 1 Carbon Compounds

## Chapter 3

### Energy Currency

- **Adenosine triphosphate (ATP)** stores and releases energy during cell processes, enabling organisms to function.

Adenosine triphosphate (ATP)

Adenine

Phosphates

Ribose

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## Chapter 3

### Objectives

- **Distinguish** between monosaccharides, disaccharides, and polysaccharides.
- **Explain** the relationship between amino acids and protein structure.
- **Describe** the induced fit model of enzyme action.
- **Compare** the structure and function of each of the different types of lipids.
- **Compare** the nucleic acids DNA and RNA.

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## Chapter 3

### Carbohydrates

- **Carbohydrates** are organic compounds composed of carbon, hydrogen, and oxygen in a ratio of about one carbon to two hydrogen atoms to one oxygen atom.
- Carbohydrates are a source of energy and are used as structural materials in organisms.

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## Chapter 3

### Carbohydrates, *continued*

- **Monosaccharides**
  - **Carbohydrates** are made up of monomers called **monosaccharides**.

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## Chapter 3

### Carbohydrates, *continued*

- **Disaccharides and Polysaccharides**
  - Two monosaccharides join to form a double sugar called a **disaccharide**.
  - A complex sugar, or **polysaccharide**, is made of three or more monosaccharides.

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## Chapter 3

### Proteins

- **Proteins** are organic compounds composed mainly of carbon, hydrogen, oxygen, and nitrogen.
- Proteins have many functions including structural, defensive, and catalytic roles.

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### Proteins, continued

- **Amino Acids**
  - Proteins are made up of monomers called **amino acids**. The sequence of amino acids determines a protein's shape and function.

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### Proteins, continued


- **Dipeptides and Polypeptides**
  - Two amino acids are joined by **peptide bonds** to form a **dipeptide**.
  - A long chain of amino acids is called a **polypeptide**.

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### Structure of Proteins

Proteins are chains of amino acids folded into compact shapes.



Linked amino acids

Globular protein

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### Proteins, continued

- **Enzymes**
  - **Enzymes** speed up chemical reactions and bind to specific substrates.
  - The binding of a substrate with an enzyme causes a change in the enzyme's shape and reduces the activation energy of the reaction.

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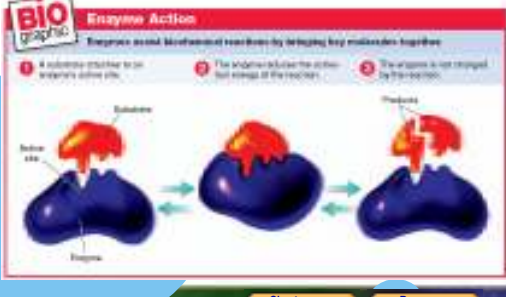
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### Enzyme Activity

**BIO** Enzyme Action

Enzymes speed biochemical reactions by bringing key molecules together.

1. A substrate molecule fits on an enzyme's active site.
2. The substrate undergoes the chemical change of the reaction.
3. The product is released, and the enzyme is not changed by the reaction.



Substrate

Enzyme

Product

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### Lipids

- **Lipids** are nonpolar molecules that store energy and are an important part of cell membranes.

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Fats



Fats: Energy-producing nutrients.

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Lipids, continued

- **Fatty Acids**
  - Most lipids contain **fatty acids**, unbranched carbon molecules that have a hydrophilic end and a hydrophobic end.

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Lipids, continued

- **Triglycerides**
  - **Triglycerides** consist of three fatty acids and one molecule of glycerol.

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Lipids, continued

- **Phospholipids**
  - **Phospholipids**, which make up cell membranes, consist of two fatty acids and one glycerol molecule.

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Lipids, continued

- **Waxes**
  - A **wax** is made of one long fatty acid chain joined to one long alcohol.
- **Steroids**
  - A **steroid** is composed of four fused carbon rings.

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Nucleic Acids

- A **nucleic acid** is a large and complex organic molecule that stores and transports information.

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## Structure of Nucleic Acids

DNA is made of two strands of multiple, linked nucleotides.

Phosphate group  
Sugar  
Nucleotide

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Chapter 3 Section 2 Molecules of Life

## Nucleic Acids, continued

- The nucleic acid **deoxyribonucleic acid (DNA)** contains genetic information for cell activities.
- Ribonucleic acid (RNA)** molecules play many key roles in building of proteins and can act as enzymes.

Chapter menu Resources

Chapter 3 Section 2 Molecules of Life

## DNA Overview

Chapter menu Resources

Chapter 3 Section 2 Molecules of Life

## Ribonucleic Acid (RNA)

Chapter menu Resources

