

Chapter 2 Chemistry of Life

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Chapter 2 Section 2 Energy

Objectives

- Describe the role of reactants and products in chemical reactions.
- Explain the relationship between enzymes and activation energy.

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Chapter 2 Section 2 Energy

Energy and Chemical Reactions

- Reactants are substances that enter chemical reactions.
- Products are substances produced by chemical reactions.

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Chapter 2 Section 2 Energy

Energy and Chemical Reactions

The image contains two side-by-side energy diagrams. The left diagram is titled "Energy-Releasing Reaction". The vertical axis is labeled "Energy" and the horizontal axis is "Reaction progress". A red curve starts at a point labeled "Reactants" and ends at a lower point labeled "Products". A downward-pointing arrow between the two levels is labeled "Energy released". The right diagram is titled "Energy-Absorbing Reaction". The vertical axis is labeled "Energy" and the horizontal axis is "Reaction progress". A red curve starts at a point labeled "Reactants" and ends at a higher point labeled "Products". An upward-pointing arrow between the two levels is labeled "Energy absorbed".

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Chapter 2 Section 2 Energy

Energy and Chemical Reactions, *continued*

- **Activation Energy**
 - Enzymes lower the amount of **activation energy** necessary for a reaction to begin in living systems.

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Chapter 2 Section 3 Water and Solutions

Objectives

- **Describe** the structure of a water molecule.
- **Explain** how water's polar nature affects its ability to dissolve substances.
- **Outline** the relationship between hydrogen bonding and the different properties of water.
- **Identify** the roles of solutes and solvents in solutions.
- **Differentiate** between acids and bases.

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Chapter 2 Section 3 Water and Solutions

Polarity

- Water is considered to be a **polar** molecule due to an uneven distribution of charge.
- The electrons in a water molecule are shared unevenly between hydrogen and oxygen.

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Chapter 2 Section 3 Water and Solutions

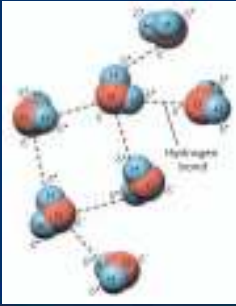
Polarity, *continued*

- **Solubility of Water**
 - The polarity of water makes it effective at dissolving other polar substances such as sugars, ionic compounds, and some proteins.

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Hydrogen Bonding



- A **hydrogen bond** is the force of attraction between a hydrogen molecule with a partial positive charge and another atom or molecule with a partial or full negative charge.

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Hydrogen Bonding, *continued*

- **Cohesion and Adhesion**
 - **Cohesion** is an attractive force that holds molecules of a single substance together, such as water molecules.
 - **Adhesion** is the attractive force between two particles of different substances, such as water molecules and glass molecules.

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Hydrogen Bonding, *continued*

- **Temperature Moderation**
 - Water has the ability to absorb a relatively large amount of energy as heat and the ability to cool surfaces through *evaporation*.

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Hydrogen Bonding, *continued*

- **Density of Ice**
 - Solid water is less dense than liquid water due to the shape of the water molecule and hydrogen bonding.

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Chapter 2 Section 3 Water and Solutions

Solutions

- A **solution** consists of a **solute** dissolved in a **solvent**.

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Chapter 2 Section 3 Water and Solutions

Acids and Bases

- **Ionization of Water**
 - Water ionizes into **hydronium ions** (H_3O^+) and **hydroxide ions** (OH^-).

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Acids and Bases, *continued*

- **Acids**
 - **Acidic solutions** contain more hydronium ions than hydroxide ions.

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Chapter 2 Section 3 Water and Solutions

Acids and Bases, *continued*

- **Bases**
 - **Basic solutions** contain more hydroxide ions than hydronium ions.

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Acids and Bases, *continued*

• pH

- Scientists have developed a scale for comparing the relative concentrations of hydronium ions and hydroxide ions in a solution. This scale is called the **pH scale**, and it ranges from 0 to 14.

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The pH Scale



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Acids and Bases, *continued*

• Buffers

- **Buffers** are chemicals that neutralize the effects of adding small amounts of either an acid or a base to a solution.

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