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The Chemical Composition of Cells

Every living cell is like a tiny, complex factory. Just like any factory, it is built from specific materials. These materials can be grouped into two main categories: inorganic substances and organic substances.

1. Inorganic Substances

Inorganic substances are simple molecules that generally do not contain carbon-hydrogen (C–H) bonds. Despite their simplicity, they are essential for life.

Water (H_2O)

- Makes up about 70% of a cell's mass.
- Serves as a solvent, dissolving substances so chemical reactions can occur.
- Important for transporting nutrients and waste products within the cell.
- Helps regulate cell temperature, protecting the cell from sudden changes in the environment.

Mineral Salts

- Present in cells as **ions (charged particles).**
- Examples: **Na^+ (sodium), Ca^{2+} (calcium), Mg^{2+} (magnesium).**
- Functions:
    - Regulate nerve function and muscle contraction.
    - Act as cofactors that help **enzymes** work properly.

2. Organic Substances

Organic substances are carbon-based molecules and are generally larger and more complex than inorganic ones. They are the building blocks and machinery of the cell.

Carbohydrates (Sugars)

- Provide the primary source of quick energy.
- Examples of carbohydrates include: **glucose**, **fructose**, and **sucrose**.

Proteins

- Highly versatile molecules with many roles:

    - Structural proteins: form cell structures such as cell walls or muscle fibers.
    - Enzymes: special proteins that speed up chemical reactions.

Lipids (Fats and Oils)

- Used for long-term energy storage.
- Form important components of cell membranes.

Example: **cholesterol**, which contributes to cell structure and helps in hormone production.

Nucleic Acids

- Molecules responsible for storing and transmitting genetic information.
- Two main types:
    - **DNA (deoxyribonucleic acid):** contains instructions for building and maintaining the cell.
    - **RNA (ribonucleic acid)**: carries out DNA's instructions by helping synthesize proteins.

Summary:

- Inorganic substances (water, mineral salts) are essential for basic life processes like reactions, transport, and regulation.
- Organic substances (carbohydrates, proteins, lipids, nucleic acids) form the cell's structure, provide energy, and carry genetic information.