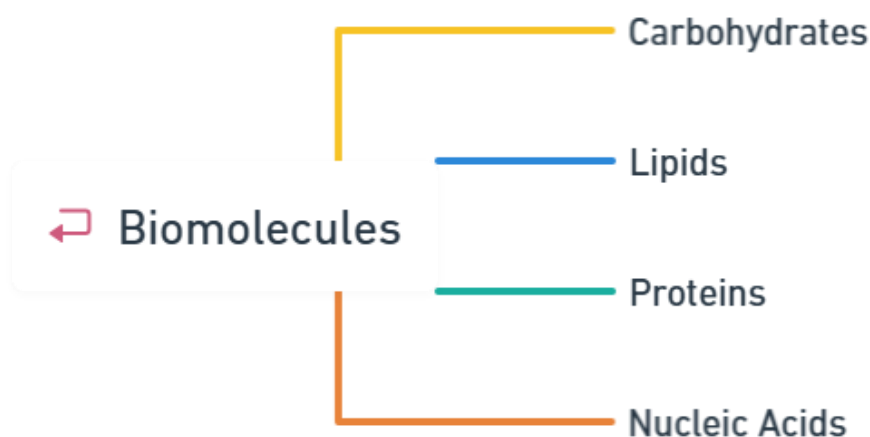


Biomolecules

Introduction of Biomolecules

- Biomolecules are organic molecules produced by living organisms, essential for the structure, function, and regulation of cells, tissues, and organs.
- They sustain biological processes and can be classified into four major categories: **carbohydrates, lipids, proteins, and nucleic acids.**



1. Carbohydrates

Structure:

- Composed of carbon (C), hydrogen (H), and oxygen (O) in a 1:2:1 ratio.
- Includes monosaccharides (simple sugars), disaccharides, and polysaccharides (complex carbohydrates).

Function:

- Primary energy source for cells.
- Serve as structural components (e.g., cellulose in plants, chitin in arthropods).
- Involved in cell recognition and energy storage (glycogen, starch).

2. Lipids

Structure:

- Hydrophobic or amphiphilic molecules including fats, oils, phospholipids, and steroids.
- Non-polar nature allows them to form cell membranes and store energy efficiently.

Function:

- Energy storage (more efficient than carbohydrates).
- Form cell membranes (phospholipids in the lipid bilayer).
- Serve as signaling molecules (steroid hormones like estrogen and testosterone).
- Provide insulation and organ protection.

3. Proteins

Structure:

- Polymers of amino acids linked by peptide bonds.
- Fold into complex three-dimensional shapes to perform specific functions.

Function:

- Catalyze biochemical reactions (enzymes).
- Provide structural support (collagen, keratin).
- Transport molecules (hemoglobin for oxygen transport).
- Facilitate cell signaling (hormones, receptors).
- Defend against pathogens (antibodies).

4. Nucleic Acids

Structure:

- Polymers of nucleotides, each consisting of a nitrogenous base, sugar, and phosphate group.
- Two main types: DNA (deoxyribonucleic acid) and RNA (ribonucleic acid).

Function:

- Store and transmit genetic information (DNA).
- Regulate gene expression and assist in protein synthesis (RNA).
- Some RNA molecules have catalytic functions (ribozymes).

Functions of Biomolecules in Biological Processes

- Biomolecules have essential roles across various biological processes, crucial for the survival and functioning of living organisms:
 - **Carbohydrates:** Provide energy and serve as structural components.
 - **Lipids:** Store energy, form cell membranes, and act as signaling molecules.
 - **Proteins:** Catalyze biochemical reactions, provide structural support, transport molecules, facilitate signaling, and defend against pathogens.
 - **Nucleic Acids:** Store and transmit genetic information, regulate gene expression, and are key to the synthesis of proteins.

Carbohydrate

- Carbohydrates are vital organic molecules composed of carbon, hydrogen, and oxygen atoms, typically in a ratio of **1:2:1**.
- These molecules play a pivotal role as an essential nutrient and primary energy source for most living organisms, besides serving structural functions in some instances.

Classification of Carbohydrates

Carbohydrates are categorized based on their complexity into:



1. Monosaccharides (Simple Sugars):

- **Definition:** Single sugar units, the simplest form of carbohydrates.
- **Examples:** Glucose, Fructose, Galactose.
- **Function:** Immediate energy source, building blocks for more complex carbohydrates.

2. Disaccharides (Two Monosaccharides):

- **Definition:** Formed by the linkage of two monosaccharides through a glycosidic bond.
- **Examples:**
 - **Sucrose** = Glucose + Fructose
 - **Lactose** = Glucose + Galactose
 - **Maltose** = Glucose + Glucose
- **Function:** Serve as energy sources and transportable sugar forms.

3. Polysaccharides (Complex Carbohydrates):

- **Definition:** Long chains of monosaccharides linked by glycosidic bonds.
- **Examples:**
 - **Starch** (plants) – Energy storage
 - **Cellulose** (plants) – Structural support
 - **Glycogen** (animals) – Energy storage
- **Function:** Provide energy storage and structural integrity.

Comparison Table: Carbohydrate Types

Classification	Complexity	Bond Type	Taste	Function	Examples
Monosaccharides	Simple sugars	N/A	Sweet	Energy source, building blocks	Glucose, Fructose, Galactose

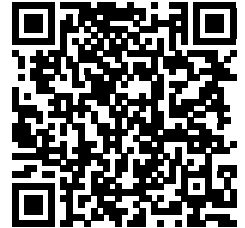


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