

CARBOHYDRATES

Carbohydrates are organic compounds consisting of carbon (C), hydrogen (H), and oxygen (O) atoms, typically in a ratio of 1:2:1. They are essential nutrients that serve as a primary energy source for living organisms and play various roles in biological processes.

Types of carbohydrates, Their Characteristics, and Examples

1. Monosaccharides

• Definition The simplest form of carbohydrates, consisting of single sugar molecules.

• Characteristic

• Chemical formula Typically

$C_6H_{12}O_6$ for hexoses like glucose

Solubility Highly soluble in water.

Taste Generally Sweet.

Energy Source Directly used in cellular respiration

o Examples

Glucose The primary energy source for cells.

Fructose Found in fruits and honey; known for its sweetness.

Galactose A component of lactose, found in milk

2. Disaccharides

o Definition Formed by the combination of two monosaccharides through a glycosidic bond.

o Characteristics

Chemical formula $C_{12}H_{22}O_{11}$

Solubility Soluble in water.

Taste Generally sweet.

Hydrolysis Can be broken down into monosaccharides.

0 Examples

Sucrose Common table sugar composed of glucose and fructose.

Lactose The sugar found in milk, composed of glucose and galactose.

Maltose Formed from (sugar) two glucose molecules; found in malted foods.

3- Polysaccharides

0 Definition Complex carbohydrates composed of long chains of monosaccharide unit

0 Characteristics:

Chemical formula $(C_6H_{10}O_5)_n$
where n is the number of repeating units.

Solubility Generally insoluble or less soluble in water.

Taste Not sweet.

Function Energy storage or structural support.

o Examples

Starch A storage form of glucose in plants, found in foods like potatoes, rice, and corn.

Glycogen A storage form of glucose in animals, stored in the liver and muscles.

Cellulose A structural component of plant cell walls providing rigidity.

Chitin Found in the exoskeletons of arthropods and the cell walls of fungi.

Definition of Proteins

Proteins are large, complex molecules composed of amino acids arranged in a linear

chain and folded into a three-dimensional structure. They are essential macromolecules in all living organisms, playing a crucial role in nearly every biological process.

Types of proteins, Their Characteristics, and Examples

Structural proteins

o Characteristics provide support and shape to cells and tissues.

Example

Collagen found in connective tissues like skin, tendons, and bones, providing strength and elasticity.

Keratin found in hair, nails, and the outer layer of skin, providing protection and structural integrity.

Enzymatic proteins

Characteristic Act as catalysts to accelerate biochemical reactions without being consumed.

o Examples

Amylase Breaks down starch into sugars in the digestive system.

DNA Polymerase Catalyzes the synthesis of DNA during cell replication.

o Transport proteins

o Characteristic Carry substances throughout the body or across cell membranes.

o Examples

Hemoglobin Transports oxygen in the (body) blood from the lungs to tissues

Channel proteins Facilitate the movement of ions and molecules across cell membrane.

o Signaling proteins

o Characteristics involved in communication between cells

and regulation of biological processes.

◦ Examples

◦ Insulin Regulates blood glucose levels by facilitating cellular glucose uptake.

◦ Growth Hormone stimulates growth, cell reproduction, and regeneration.

◦ Defensive proteins

◦ Characteristics Protect the body from pathogens and foreign substance.

◦ Examples

◦ Antibodies Produced by the immune system to identify and neutralize pathogens like bacteria and viruses.

◦ Fibrinogen Plays a role in blood clotting, helping to prevent excessive bleeding.

◦ Storage proteins

◦ Characteristics stores amino acids or other substance for

later use.

◦ Examples

Ferritin Stores iron in the liver and releases it when needed.

Casein A milk protein that supplies essential amino acid to infants.

Definition of Fats

Fats, or lipids are a diverse group of hydrophobic organic compounds made primarily of carbon, hydrogen, and oxygen. They are a major source of energy and are important for cell membrane structure and signaling.

Types of Fats, Their Characteristic and Examples

◦ Saturated Fats

o Characteristics Have no double bonds between carbon atoms, liquid at room temperature, found in vegetable oils, nuts, and fish.

o Monounsaturated Fats One double bond.

o Polyunsaturated Fats More than one double bond.

o Examples:

o Olive oil High in monounsaturated fats.

o Fish Oil Rich in polyunsaturated fats like omega-3 fatty acids.

o Trans Fats

o Characteristics Unsaturated fats that have been hydrogenated to make them more solid associated with negative health effects.

o Examples:

o Margarine Often contains trans fats.

Fried Fast Food. Can be high in trans fats due to hydrogenated oil!

o Essential Fatty Acids.

o Characteristics Required for health but cannot be synthesized by the body, must be obtained from the diet.

o Examples:

Omega-3 Fatty Acids: Found in fish, flaxseeds, and walnuts.

Omega-6 Fatty Acids Found in vegetable oils and nuts.
