

# CARBOHYDRATE

## Introduction

- Consisting of oxygen (O), carbon (C), and hydrogen (H), carbohydrate is a biological molecule.
- Carbohydrate is one of the essential elements for the living organisms, as it plays various important roles.
- Carbohydrate is the main source of energy, as about two-third energy requirement of living beings is fulfilled by it.
- Glucose, sugar, and starch are the important examples of carbohydrate.

## Source of Carbohydrate

- Carbohydrates naturally are occurring in wide variety of foods, such as –
  - **Wheat**
  - **Maize**
  - **Rice**
  - **Potatoes**
  - **Sugarcane**
  - **Fruits**
  - **Table sugar**
  - **Bread**
  - **Milk**
- Sugar that we eat in our everyday life is mainly sucrose (table sugar).
- Sucrose is added in many food items while preparing, e.g. jam, biscuits, cakes, energy drinks, etc.
- Further, many fruits naturally contain glucose and fructose.
- Glycogen is another type of carbohydrate that found in the liver and muscle.
- Cellulose found in the cell wall of plant cells is carbohydrate.

## Types of Carbohydrate

- The following table illustrates major categories and sub-categories of carbohydrate –

<b>Class</b>	<b>Subgroup</b>	<b>Components</b>
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Sugar	Monosaccharides	Glucose, fructose, xylose, galactose
	Disaccharides	Sucrose, lactose, maltose, trehalose
	Polyols	Sorbitol, mannitol
Oligosaccharides	Malto-oligosaccharides	Maltodextrins
	Other oligosaccharides	Raffinose, stachyose, fructo-oligosaccharides
Polysaccharides	Starch	Amylose, amylopectin, modified starches
	Non-starch polysaccharides	Cellulose, hemicellulose, pectins, hydrocolloids

### Functions of Carbohydrate

- Following are the major functions of carbohydrates –
  - Carbohydrates provide energy required for the proper function of the body.
  - Carbohydrates also store food in the body for the contingency period.
  - Carbohydrates form nucleic acids.
  - Carbohydrates also support skeleton system of animals.
  - Carbohydrates provide sweetness and flavor.
  - Carbohydrates break down the fatty acid.

## PROTEIN

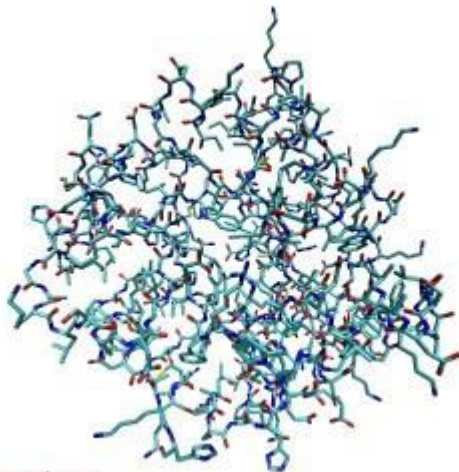
### Introduction

- Proteins, which are basically biomolecules, play wide range of functions in the body of a living organism.
- Proteins are made up of tiny elements of different types of amino acids.
- A sequence of amino acid residues in a protein is known particularly by the sequence of a gene; gene is encoded in the genetic code.

- After formation, proteins exist for a fixed period of time and are then degraded and recycled.
- The proteins get recycled by the cell's machinery by the process of protein turnover.
- Most of the proteins contain linear polymers made up of series of up to 20 different L- $\alpha$ -amino acids.
- The amino acids in a polypeptide chain are connected by peptide bonds (see the image given below).
- The peptide bond, usually, has two resonance forms, which contribute some double-bond characters.

### Protein Structure

- Most of the proteins illustrate unique 3-dimensional structures (see image given below).



*Protein Structure*

- However, proteins have not a rigid structure, but rather, proteins may vary between several related structures especially when they perform their functions.

### Functions of Proteins

- Following are the major functions of proteins –
  - In the cell, proteins are the chief actors that carry out the duties defined by the information encoded in genes.
  - Proteins are essential for the overall body growth.
  - Proteins play a role of bio-catalyst and biotic regulator.
  - Proteins provide instant energy especially during the emergency period.
  - Proteins help in catalyzing the metabolic reactions.
  - Proteins are the essential elements in DNA replication.

- Proteins actively help in transporting molecules from one location to another in the body.

## Types of Protein

- Following are the major types of protein –
  - **Enzymes** – enzymes play important role especially during the breakdown of molecules. Enzymes are also required for the digestion and growth of the cell.
  - **Structural Proteins** – such type of proteins provide strength to cells, tissues, and organs.
  - **Signaling Proteins** – Such proteins facilitate cells to communicate with each other by providing signals.
  - **Defensive Proteins** – Such proteins help organisms to fight with infection and support damaged tissue in healing fast.
  - **Hormone** – Some hormones are proteins that help in metabolic activities.

## FAT

### Introduction

- Fat is a significant foodstuff for many forms of life.
- Fats serve structural as well as metabolic functions.
- The fats are molecules made up of glycerol and fatty acid.
- Fat is an organic compound of hydrogen, carbon, oxygen.
- Based on the number and bonding of the carbon atoms, fats and oils, are categorized in the aliphatic chain.

### Functions of Fats

- Following are the major functions of Fats –
  - Fat is a vital dietary requirement.
  - The fat is usually the stored source of energy in the body that remained store beneath the skin.
  - Fat acts a protective layer especially in the human body and provide protection.
  - Some of the vitamins such as vitamin A, vitamin D, vitamin E, and vitamin K are fat-soluble, which means they can only be absorbed, digested, and transported in conjunction with the fats.
  - Fats actively help in maintaining the healthy skin and hair.

- Fats insulate body organs against external shock.
- Fats also maintain body temperature.
- Fats promote healthy cell function.

## Types of Fats

- Following are the major types of Fats –

### Unsaturated Fats

- The fats that remain in the liquid form at room temperature are known as unsaturated fats.
- Unsaturated fats are beneficial for health, as it improves blood cholesterol levels, stabilize heart beats, etc.
- Unsaturated fats are commonly found in vegetable oils, nuts, and many seeds.

### Saturated Fats

- Saturated fats have no double bonds between the carbons found in its chain.
- Saturated fats can easily solidify and typically found in solid form at room temperature.
- Saturated fats are found in animals' meat, cheese, ice cream, etc.