

## General Science - Learn the key concepts of Biomolecules(Carbohydrates, amino acids)

Hi guys, in present blog we will deal with Biomolecules. So, lets start and explore deeply.

Biomolecules are the organic compounds that form the basis of life, i.e. they build up the living system and are responsible for their growth and maintenance. The sequence that relates biomolecules to living organisms is:

**Biomolecules → Organelles Cells → Tissues → Organs Organ systems → Living organism**

In this lesson, we would understand and learn about these biomolecules in detail.

# Carbohydrates

Optically active polyhydroxy aldehydes (aldoses) or ketones (ketoses) or the compounds which produce these units on hydrolysis are known as carbohydrates. They are also called **saccharides**.

Classification of Carbohydrates:

**(i) Reducing and Non-reducing Sugars:** Based upon reducing and non-reducing properties, carbohydrates are classified as reducing and non-reducing sugars. Carbohydrates that reduce Fehling's reagent or Tollen's reagent are termed as reducing carbohydrates. e.g. All monosaccharides and disaccharides (except sucrose).

**(ii) Sugars and Non-sugars:** On the basis of taste, carbohydrates are classified as sugars and non-sugars. The monosaccharides and oligosaccharides having a sweet taste are collectively known as sugars.

**(iii) Monosaccharides, Oligosaccharides and Polysaccharides:** Depending upon the number of simple molecules produced upon hydrolysis, carbohydrates are classified as, monosaccharides, oligosaccharides and polysaccharides:

**(a) Monosaccharides:**

These cannot be hydrolysed further to simpler molecules and subdivided into tetroses, pentoses or hexoses depending upon the number of carbon atoms. These are also called homopolysaccharides.

- Aldotetroses: Erythrose, Threose
- Aldopentoses: Xylose, Ribose
- Aldohexoses: Glucose, Galactose
- Ketohexoses: Fructose

All naturally occurring monosaccharides belong to D-series, Killiani synthesis is used to convert an aldose into the next higher aldose.

**Glucose:** It is also known as Dextrose. It is present in grape sugar, corn sugar and blood sugar ( $C_6H_{12}O_6$ ).

**Manufacture of Glucose:** By hydrolysis of starch with hot dil mineral acids and by hydrolysis of sucrose. Extra glucose is stored in the liver as glycogen.

**General Science - Learn the key concepts of Biomolecules(Carbohydrates, amino acids)****(b) Oligosaccharides:**

(Greek oligos = few). On hydrolysis, they generally give two to nine monosaccharides (same or different) and are further classified as **disaccharides**, e.g. sucrose, maltose, lactose, trisaccharides and so on.  $C_{12}H_{22}O_{11}$  is a disaccharide as it gives two monosaccharides. The bond formed between two monosaccharides is called a glycosidic bond and normally it is a (1,4) bond. Examples of Disaccharides:

**1. Sucrose ( $C_{12}H_{22}O_{11}$ ):** Sucrose is most abundant in plants and is known as cane sugar or table sugar or invert sugar as an equimolar mixture of glucose and fructose is obtained by hydrolysis of sucrose.

**2. Lactose or Milk sugar :** It is present in milk of mammals and is made up of one glucose and one galactose units. It is reducing sugar. Souring of milk is due to the conversion of lactose to lactic acid.

**3. Maltose or Malt sugar:** It is named because of its occurrence in a malted grain of Barley. Mostly found in germinating seeds and tissue where starch is broken down. It is a reducing sugar and formed by condensation of 2 glucose units.

**Trisaccharides:** Carbohydrates that yield three monosaccharide units on hydrolysis are called trisaccharide e.g; Raffinose ( $C_{18}H_{32}O_{16}$ ).

**c) Polysaccharides:**

These are polymers of monosaccharides. Examples are starch, cellulose, glycogen, etc.

**1. Starch, ( $C_6H_{10}O_5$ )<sub>n</sub> :** Sucrose is most abundant in plants and is known as cane sugar or table sugar or invert sugar as an equimolar mixture of glucose and fructose is obtained by hydrolysis of sucrose.

1. Amylose (20%) an unbranched water soluble polymer.
2. Amylopectin (80%) a branched water insoluble polymer.

Sources of starch are potatoes, wheat, rice, maize, etc.

**2. Cellulose, ( $C_6H_{10}O_5$ )<sub>n</sub> :** It is the most abundant and structural polysaccharide of plants. It is an important foodsource for some animals. It is a polymer of D( ) + b- glucose. The chief sources of cellulose are wood(contains 50% cellulose rest being lignin, resins,etc) and cotton (contains 90% cellulose rest being fats and waxes).

## Amino acids

The compounds containing an amino group ( $-NH_2$ ) and carboxylic group ( $-COOH$ ) are called aminoacids. General formula: R = H, alkyl, or aryl group. Except for glycine ( $H_2N.CH_2COOH$ ), others are optically active in nature.

**Classification of Amino Acids:**

(a)  $\alpha, \beta, \gamma$  - amino acids: Depending upon the position of  $-NH_2$  on the carbon chain wrt  $-COOH$  group.

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(b) Neutral Having one  $-NH_2$  and one  $-COOH$  Example:  $NH_2 \cdot CH_2 \cdot COOH$  (Glycine)

(c) Acidic Having one  $-NH_2$  and two  $-COOH$ , Example: Aspartic acid

(d) Basic Having two or more  $-NH_2$  and one  $-COOH$ , Example: lysine

Hope you learn well through this blog

