**CARBOHYDRATE**  1. Carbohydrates are defined as polyhydroxy aldehydes or ketones [molecule with more than one hydroxyl group(-OH) & a carboxyl group(C=O) either at the terminal carbon atom(aldose) or at the 2nd carbon atom (ketose) ]. 2. They are the hydrates (compound formed by the union of water with some other substance) of carbon. 3. They contain carbon, hydrogen and oxygen. 4. Most of them contain hydrogen and oxygen in the ratio of 3:1. 5. It can be represented by a general formula Cn(H2O)n. 6. They are formed in photosynthesis, which plays an important role in the life of plants. 7. The molecules of carbohydrate are utilized in various biochemical and physiological process in the cell. 8. The carbohydrates in a living cell are in constant flux (continuous) participating in living in many enzyme catalysed (to make a chemical reaction faster) reactions. 9. A large number of carbohydrate are isolated from the plants are the components of cell wall, protoplasm and cell sap, while some accumulates as insoluble storage products.

**CLASSIFICATION OF CARBOHYDRATES**  The carbohydrates on hydrolysis gives a number of products. According to the number of products they can be classified into following types :- I. MONOSACCHARIDES II. DISACCHARIDES III. OLIGOSACCHARIDES IV. POLYSACCHARIDES

**I. MONOSACCHARIDES (SIMPLE SUGAR)**

1. These are the simple carbohydrates, which cannot be decomposed by hydrolysis into small sugar components or simple carbohydrates. 2. They have a general formula of Cn(H2O)n. 3. According to the number of carbon atoms, the monosaccharides can be classified into following types :-

NAME GENERAL FORMULA EXAMPLES Trioses C**3**H**6**O**3** Glyceraldehyde, Dihydroxyacetone. Tetroses C**4**H**8**O**4** Erythrose, Erythrulose, Threose. Pentoses C**5**H**10**O**5** Ribose, Xylose, Deoxyribose, Ribulose. Hexoses C**6**H**12**O**6**  Glucose, Fructose, Galactose, Mannose. Heptoses C**7**H**14**O**7** Sedoheptulose, Glucoheptose.

4. The common monosaccharide are, fructose, glucose, galactose etc. having the molecular formula C6H12O6. 5. They are the simple sugars. 6. They are soluble in water and varies in sweetness.

**Fructose (Fruit sugar)** :- i. The main source of fructose are many kinds of fruits as well as honey. ii. It is the sweetest sugar. **Glucose (Blood sugar)** :- i. They are very important in animal physiology, diet and nutrition because it is used by the body for energy. ii. It is present in various forms of vegetation including many ripe fruits as well as onion and beetroot. **Galactose** :- These are present in lactose i.e in mammalian milk. **ROLE OF MONOSACCHARIDE** 1. They carry out a variety of biological functions in living cells. 2. These are the sugar used by organism for energy. 3. They combine with xylem in plants to form woody materials, Such as those that make up trees. 4. They serve as the components of amino acids. 5. These are the vital elements of DNA and RNA, which are the building blocks of life.

**II. DISACCHARIDES** 1. The carbohydrate which on hydrolysis, yields two monosaccharide molecule are called disaccharide. 2. The three most common disaccharides are sucrose, lactose, and maltose. 3. When each one of these disaccharide are hydrolysed with either an acid or an enzyme, they gives two molecules of the same or different monosaccharide. **Sucrose (Table sugar) :-** i. On hydrolysis, the sucrose yields glucose molecule and fructose molecule. ii. They are the common form of sugars obtained from sugarcane or sugarbeet. iii. They are also present in some fruits and vegetables. **Lactose :-** i. On hydrolysis, the lactose yields glucose molecule and galactose molecule. ii. They are present in mammals milk. Hence associated with diary products. iii. It is the source of energy for mammalian infants. **Maltose (Malt sugar) :-** i. On hydrolysis, the maltose yields two molecules of glucose. ii. They are present in cereals. Eg :- Barley. **ROLE OF DISACCHARIDES** 1. They play important role in human diet. 2. The function of sucrose is to sweeten foods for more taste appeal. 3. It is added as a sweetener to candies, cakes, ice-cream, cookies, breads, sauces etc. 4. Lactose is a nutritional source of energy for infants. 5. Lactose makes milk taste sweet and is an ingredient in many processed foods that contain dairy. 6. Maltose is used as a bulk sweetener in powder and syrup and added in many sucrose free and diabetic foods, including chocolates, chewing gum, bakery goods etc.

**III. OLIGOSACCHARIDES** 1. They are consist of a small number of monosaccharide joined together. 2. These types of carbohydrates yield a definite number (3 – 9) of monosaccharide on hydrolysis. 3. According to the number of yield monosaccharide, the carbohydrate can be further classified into the number of products. Such as trisaccharides, tetrasaccharides etc. 4. The three most common oligosaccharides are Fructo-oligosaccharides (FOS), Galacto-oligosaccharides (GOS), Mannan-oligosaccharides (MOS). **Fructo-oligosaccharides (FOS) :-** i. These are chemically composed of short chains of fructose molecule. ii. They are present in some plants. Eg :- Burdock (Lappa a spiny plant), Chicory (Kasni), Onions, Asparagus etc. iii. They can also be synthesized by enzymes by of fungus Aspergillus niger. **Galacto-oligosaccharides (GOS) :-** i. These are chemically consist of short chains of galactose molecule. ii. They are naturally occurring in soyabean and can be synthesized from lactose. **Mannan-oligosaccharides (MOS) :-** i. They are unlike other oligosaccharides. ii. They are not fermentable (metabolic process in which starch or sugar is converted into an alcohol or acid). **ROLE OF OLIGOSACCHARIDE** 1. Fructose-oligosaccharide and Galacto-oligosaccharide can increase the number of friendly bacteria in the colon and reduce the population of harmful bacteria. 2. This participates in the regulation of plant growth, development and survival in different environmental conditions. 3. Some are widely used in animal feed to improve gastro-intestinal health, energy levels etc.

**IV. POLYSACCHARIDES** 1. The polysaccharides are the carbohydrates of high molecular weight. 2. They are consist of polymers of chains, which yield many monosaccharide molecule on hydrolysis. 3. They are tasteless and insoluble in cold water. 4. The five main groups of polysaccharides are Starch, Dextrin, Cellulose, Pectin, Glycogen. **Starch :-** i. These are chemically consist of long chain of glucose molecule. ii. They are formed by the plants during photosynthesis. iii. They are present in many plant based food sources, Such as root vegetables, potatoes, cereals and pulses. **Dextrin :-** i. These are formed when starchy food (bread or potatoes) are baked or toasted. ii. It is formed as the part of dry crust. iii. It is more soluble than starch. **Cellulose :-** i. These are chemically consist of long chains of glucose molecule. ii. It forms the structure of the some plants. iii. It is indigestible by humans. iv. It is valuable in human diet as a source of dietary fibre, which is used to be known as roughage (part of food help stomach to deal with other food). **Pectin :-** i. This is present in the root and fruits of some plants. Eg :- Plums and Apples. ii. The pectin forms a gel in water and has uses for setting jam and making various sweet foods. iii. Sometimes uses as a alternative to gelatin (ingredient taken from animal body part) in the preparation of glazed (shiny) foods because beef (cow flesh) or pork (pig flesh) are the origin of gelatin is not acceptable to some people. **Glycogen :-** i. This is reserve energy stored in the body in form of glucose present in anlmals including humans. **ROLE OF POLYSACCHARIDE** 1. Polysaccharides such as starch, glucose and dextrins stored in animal or human body converted to energy for later use. 2. Some polysaccharides have structural function, For eg :- cellulose is a major component in the structure of plants.

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