

Prof ANIL KUMAR
B.Sc HONS Part-III Paper II

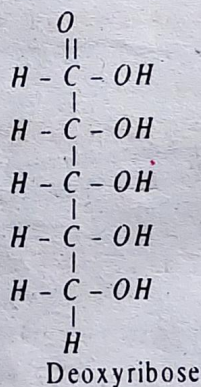
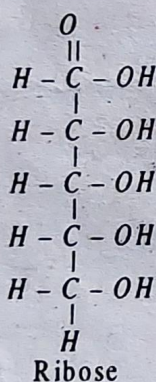
Topic: structure, classification and function
of carbohydrate

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Q. Give an account of structure, classification and functions of carbohydrate.

Ans. Structure : Carbohydrates are the cheapest sources of energy in the animal food. Carbohydrates are hydrates of carbon with an empirical formula in (H_2O). Hydrogen and oxygen are combined in the same ratio as in water (H_2O). Hence they were named carbohydrates. But a number of carbohydrates, discovered later do not have H and O in the above proportion. Again some carbohydrates contain N and S. Still the unsuitable name, carbohydrates is retained. Carbohydrate is defined as an organic compound that contains carbonyl group, namely aldehyde or ketone in addition to two or more alcohol groups or that yields such compounds on hydrolysis.



Classification : Carbohydrates are classified into two main groups, namely sugars and non-sugars (polysaccharides).

1. Sugars :

Sugars are sweet, crystalline, water soluble substances. They are divided into categories. They are monosaccharides and oligosaccharides.

(a) Monosaccharide : Monosaccharides are polyhydroxy aldehydes or ketones which cannot be hydrolysed to simple sugars. They are the simple sugars. They form the basic units of other carbohydrates. The monosaccharides are further classified in two ways. First of all, they are classified into two groups according to the type of carbonyl group. They are aldoses containing aldehyde group and ketones containing ketone group.

Secondly, monosaccharides are classified into many groups according to the number of carbon atoms present. They are—

Trioses with 3 Carbon atoms $C_3H_6O_3$

Tetroses with 4 Carbon atoms $C_4H_8O_4$

Pentoses with 5 Carbon atoms $C_5H_{10}O_6$

Hexoses with 6 Carbon atoms $C_6H_{14}O_7$

Heptoses with 7 Carbon atoms $C_7H_{14}O_7$

Octoses with 8 carbon atoms $C_8H_{16}O_8$

Nanoses with 9 Carbon atoms $C_9H_{18}O_9$

Of these, pentoses and hexoses are biologically important. The important pentoses are ribose sugars present in RNA and DNA. The important hexoses are glucose, fructose, galactose and mannose.

(b) Oligosaccharides : There are sugars which on hydrolysis yield two or the monosaccharide molecules. These are classified into sub-groups based on the number of monosaccharide molecules formed on hydrolysis. They are disaccharides, trisaccharides, tetrasaccharides etc. of these disaccharides are biologically important.

Disaccharides : Disaccharides are formed of two molecules of monosaccharides. During the combination of two monosaccharides the OH group of one monosaccharide is joined to the H of the OH group of another monosaccharide to form water. This water molecule is eliminated. The remaining bond forms between the two monosaccharides. The important disaccharides are maltose, lactose and sucrose.

2. Non-Sugar of Polysaccharides : Polysaccharides are complex carbohydrates and each polysaccharide is formed of a monosaccharides.

Example : Starch, glycogen, cellulose, inulin, chitin etc.

A polysaccharide may be formed of only type of monosaccharide unit or of two or more types of monosaccharide unit when a polysaccharide is formed of only one type of monosaccharide unit, it is called homopolysaccharide, eg., Starch, glycogen, cellulose, dextrin, inulin, etc. when a polysaccharide has two or more types of monosaccharide units the polysaccharide is called heteropolysaccharide, e.g., glucosamine, galactosamine etc. The following are the polysaccharides starch, glycogen, cellulose, chitin, inulin etc.

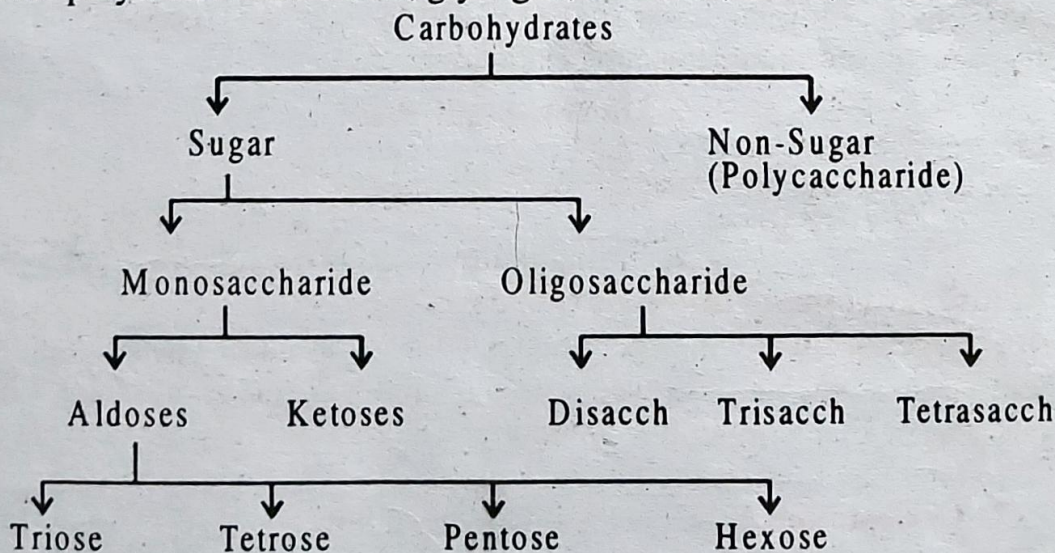


Table : —1. Outline classification of carbohydrates.

Functions of Carbohydrate :

Carbohydrate has the following functions : 1. It is the main source of energy. Energy is essential for day activities.

2. It plays main role in metabolism.

3. It provides roughage. Roughage is the undigestible part of carbohydrate diet e.g. cellulose diet. It gives bulk to the diet and hence it helps to satisfy the appetite.