

CARBOHYDRATE

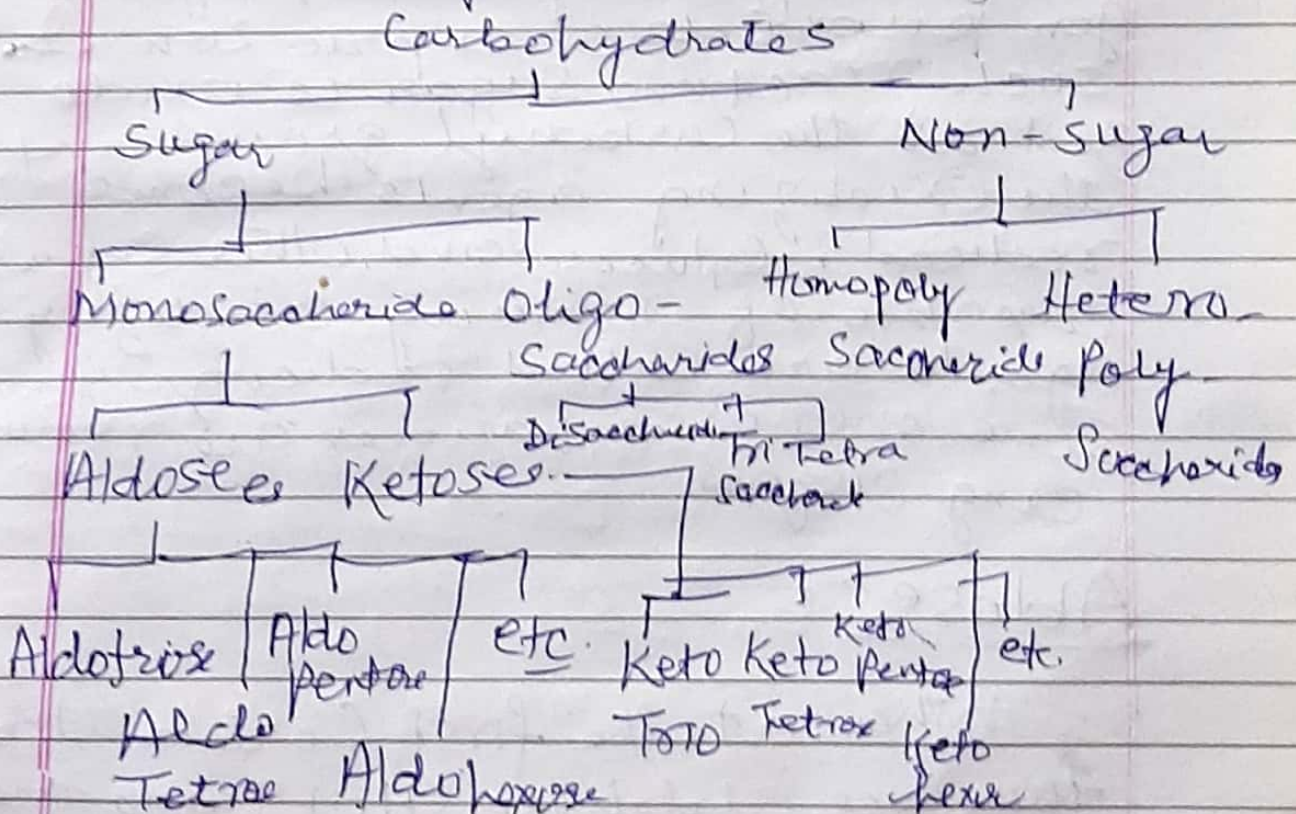
Carbohydrates are optically active polyhydroxy aldehydes or ketones.

Carbohydrates are made up of carbon, hydrogen and oxygen in the ratio of 1:2:1. Oxygen and hydrogen are combined in the same proportion as in water i.e. 2:1.

Carbohydrates provide energy. 1gm of glucose on oxidation yields 4.5 kcal energy. It also forms the structural in some crustacean exoskeleton.

Classification:

Carbohydrates are classified as -



① Monosaccharides:

Monosaccharides are simple sugar. It is optically active, sweet in taste. They are soluble in water. They are crystallised in nature and cannot further hydrolysed.

They contain 3 to 10 carbon atoms, 2 or more hydroxyl (OH) group and one aldehyde (CHO) or one ketone (CO) group.

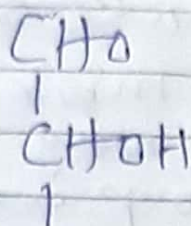
They are represented by the general formula $(\text{CH}_2\text{O})_n$.

The important property of monosaccharides is that they readily reduce oxidizing agents such as ferricyanide, hydrogen peroxide or cupric ion. In such reactions sugar is oxidized at the carbonyl group and the oxidizing agents become reduced. Glucose and other sugars capable of reducing oxidizing agents are called reducing sugar. Some monosaccharides are reducing sugars.

Aldoses:

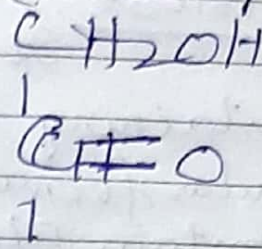
When at the first carbon atom there is aldehyde (CHO) group and last carbon atom has CH_2OH gr. and in between is CHOH is called

aldoses eg. Glyceraldehyde.



Aldoses

~~Dihydroxy~~ (Glyceraldehyde)



Ketose

(Dihydroxy-acetone)

Ketoses :-

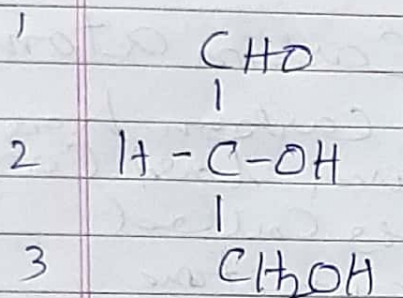
When at the first Carbon atom has CH_2OH ; the second Carbon has C=O gr. and last Carbon atom has CH_2OH is called Ketoses eg. Dihydroxyacetone

The monosaccharides on the basis of C-atom classified as

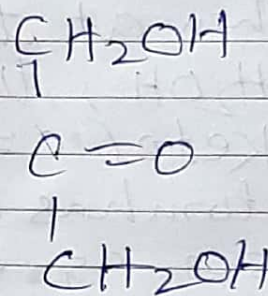
Carbohydrate	No. of C-atom	Aldose	Ketose
1) Triose	3	Glyceraldehyde	Dihydroxyacetone
2) Tetrose	4	Erythrose	Erythrulose
3) Pentose	5	Ribose	Ribulose
4) Hexose	6	Glucose, Galactose, Mannose	Fructose
5) Heptose	7	Glucose, heptose	pseudo-heptulose

① Triose:

It is monosaccharides containing 3 C-atoms. The molecular formula is $C_3H_6O_3$. It may contain aldehyde (CHO) group and called aldatriose, if it contains ketone ($C=O$) group it is called ketotriose. eg. Glyceraldehyde and dihydroxyacetone. They are also found to be precursors of glycerol which is incorporated into various lipids.



Glycrose



Dihydroxyacetone

In addition to aldatriose of glycerol four different atoms or groups are attached to the carbon atom number 2. The four different groups are CHO , CH_2OH , H and OH . Due to different group attached to C-atom so glycrose is an asymmetric compound. The presence of asymmetric carbon atoms in carbohydrate produced isomers.