Carbohydrates

Carbon + H_2O (water)

Main points

⇒ Carbohydrates means hydrates of carbon.

⇒ General formula is $C_n(H_2O)_n$

⇒ It contains carbon, Hydrogen and oxygen. Ratio of C : H : O will be mostly 1 : 2 : 1

⇒ Basic structure is a carbon skelton containg multible hydroxyl group (–OH) and a Keton. (>C=O) or Aldehyde (–CHO) group.

⇒ Carbohydrates are also known as saccharide The word saccharide comes from Greek word SAKKharon which means Sugar.

⇒ Carbohydrates are good source of energy.

Identifying character :-

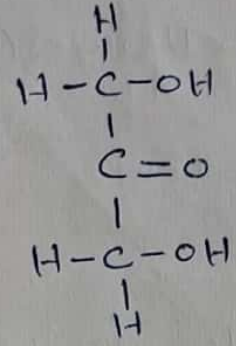
Carbohydrates ≈ Polyhydroxy, Ketone or Aldehyde

Polyhydroxy → multible Hydroxyl group

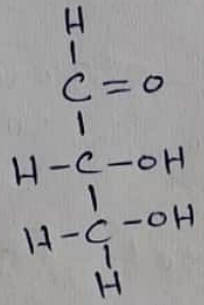
Ketone → >C=O → Ketose

Aldehyde → –CHO → Aldose

Ex :-



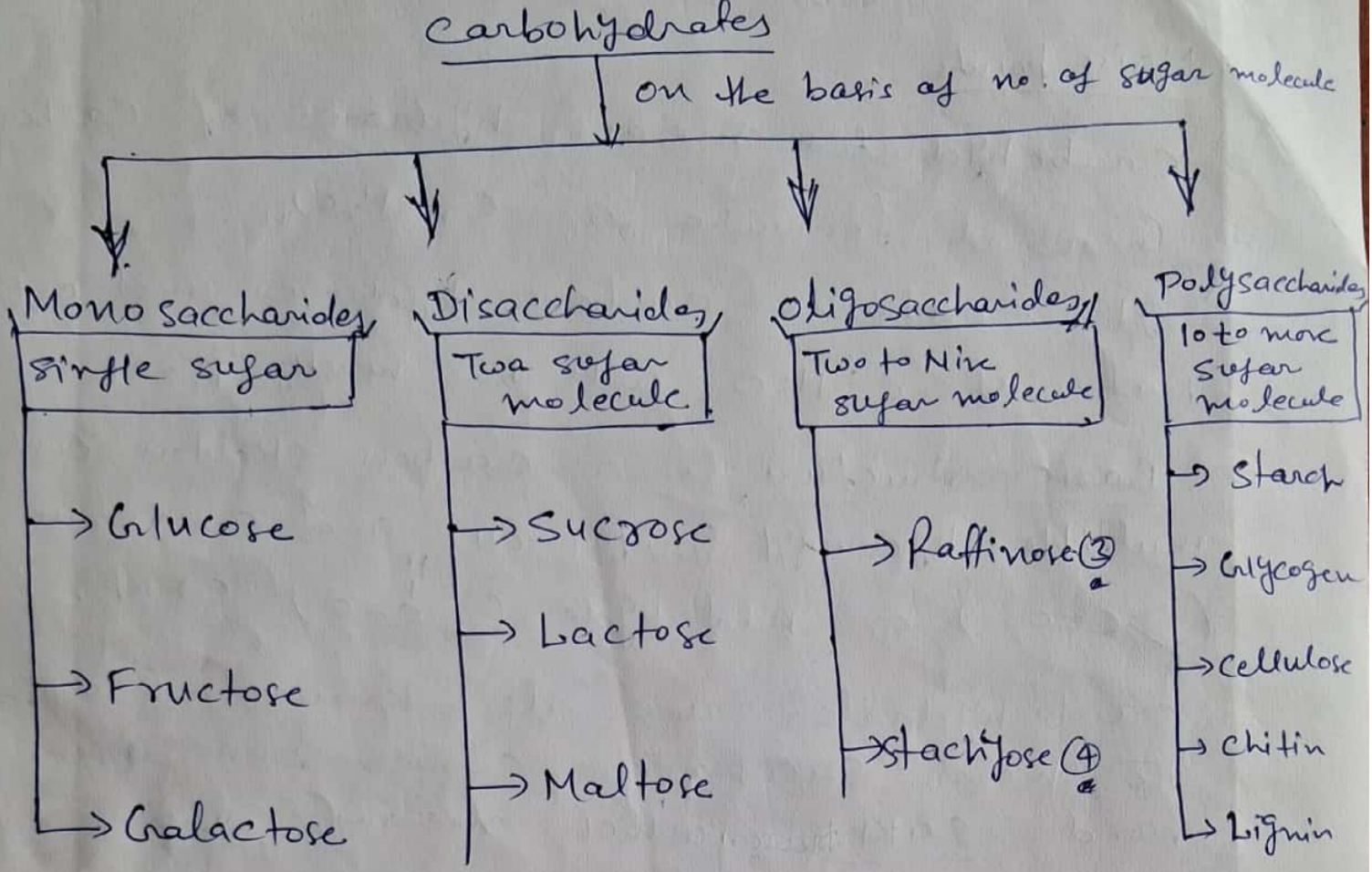
Dihydroxy acetone
(simplest ketose)



Glyceraldehyde
(simplest Aldose)

(Both are Monosaccharides)

(2) Classification of Carbohydrates



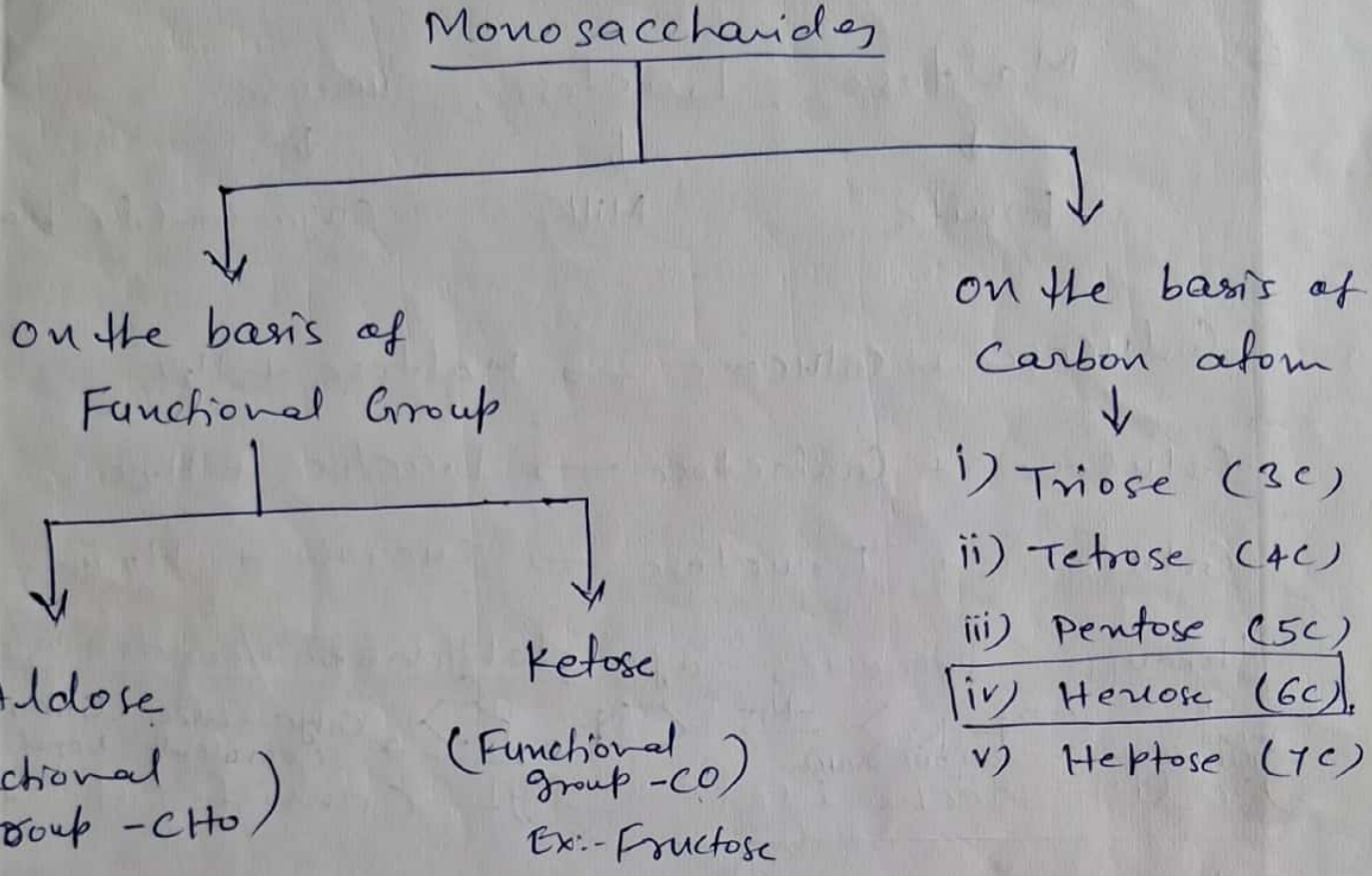
(1) **Monosaccharides** :- It contain one sugar molecule (or unit), which cannot be further decomposed by hydrolysis to give simpler form. It is a simplest form of carbohydrates.

Ex:- Glucose, fructose, Galactose → Hexoses (6 carbons) sugar

Ribose — Pentose (5 carbons) sugar

Properties :- sweet taste, soluble in water. Energy source

Monosaccharides can be further classified on the basis of functional group & number of Carbon atoms



Monosaccharide	Aldose	Ketose
i) Triose (3C)	Glyceraldehyde	Dihydroxyacetone
ii) Tetrose (4C)	Erythrose	Erythrulose
iii) Pentose (5C)	Ribose	Ribulose
iv) Hexose (6C)	Glucose, Galactose	Fructose

2) Disaccharides :- It is the most important carbohydrates consists of two monosaccharides.

Di → Two
saccharides → sugar

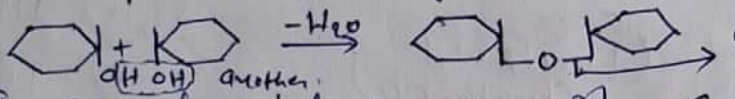
Ex:- Maltose, Lactose, sucrose
Maltose → Fruits
Lactose → Milk
sucrose → Sugarcan (few plants)

Glucose + Glucose → Maltose + H_2O

Glucose + Galactose → Lactose + H_2O

Glucose + Fructose → Sucrose + H_2O

Through processes of dehydration/condensation.



3) Oligosaccharides :- It consists of two to nine (2-9) sugar molecules.

Ex:- Raffinose (3 ~~carbon~~ sugar molecules)

4) Polysaccharides :- It consist of ten to more sugar molecules.

Many → sugar

Ex:- starch, cellulose, Glycogen, ~~cold~~ Chitin, Pectin ~~ect~~ etc.

It is formed by more than ten sugars molecules.

Properties :- ~~co~~ sweetless, insoluble in water.

Types of Polysaccharides

On the basis of "Monomeric units"

- Homopolysaccharides (same sugar molecules)
  - Starch
  - Inulin
  - Glycogen
  - Chitin
  - Cellulose
- Heteropolysaccharides (different)
  - Keratin sulphate
  - Heparin
  - Hyaluronic acid
  - Chondroitin sulphate.

Note: Heparin → Help in blood clotting

Hyaluronic Acid → Found in joints and connective tissues

Monomer

Glucose → Starch, Glycogen, Cellulose.

Fructose → Inulin

NAG (N-acetyl glucosamine) → Chitin