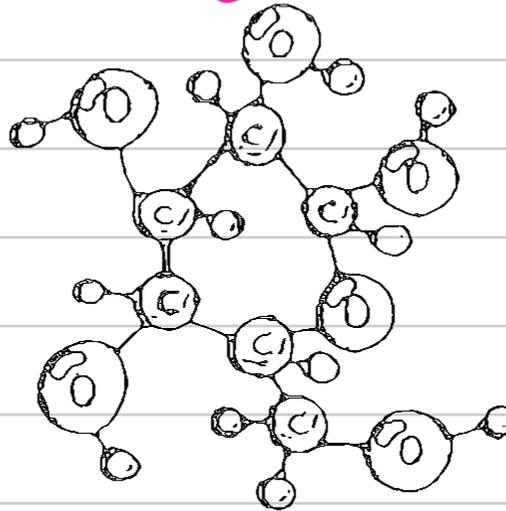


Carbohydrates 1



CARBOHYDRATE

vector illustration

consist of the empirical formula
 $(CH_2O)_n$

$n \geq 3$.

Carbohydrates are
sugars, Saccharides

carbohydrates
C H₂O

glucose, ribose and glyceraldehyde have same empirical formula
 $(CH_2O)_n$.

Molecular formula:
glucose $C_6H_{12}O_6$
ribose $C_5H_{10}O_5$

classification of Carbohydrates



Monosaccharides

basic units of CHO which cannot be hydrolyzed into smaller sugars.

- glucose.
- galactose.
- Fructose.

Disaccharides

contain two monosaccharides covalently linked by **glycosidic bond**.

- sucrose
 - ↳ fructose
 - ↳ glucose.

Polysaccharides

polymeric molecules composed of long chains of monosaccharides linked together via **glycosidic bond**.

Starch, cellulose, glycogen.

Monosaccharides

→ They are classified according to the number of carbon atoms :-

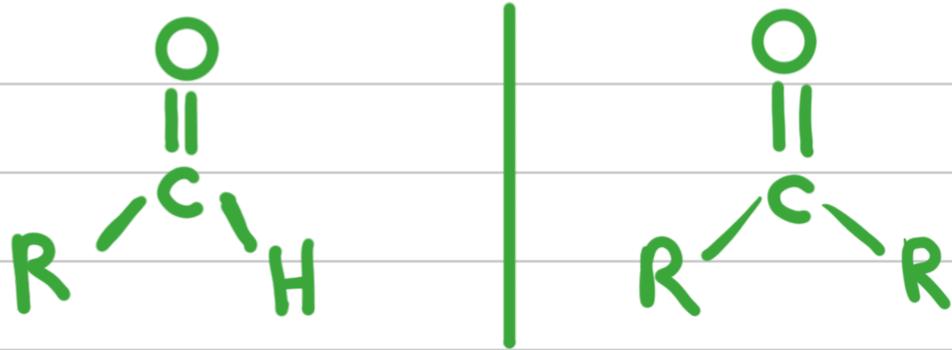
→ trioses, tetroses, pentoses, hexoses.

→ Also classified according to the chemical nature of the

carbonyl group

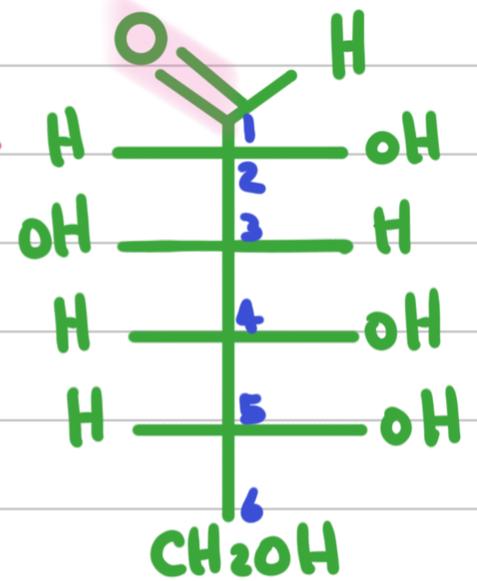
Aldoses. (aldehyde).

Ketoses. (ketone).



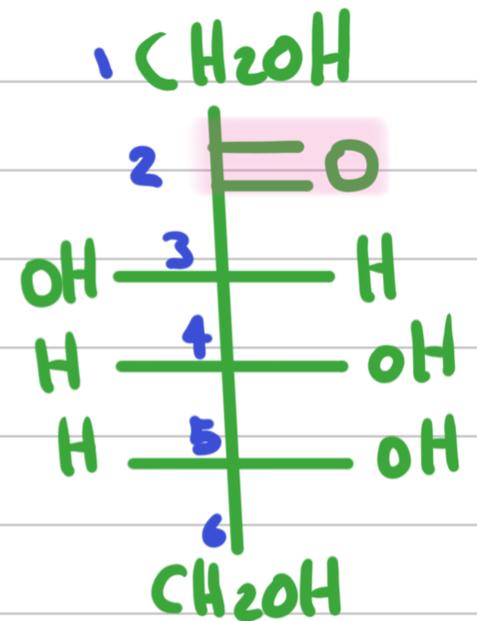
— D-glucose (grape or blood sugar).

↳ Hexoaldose, Aldohexose.



— D-fructose (fruit sugar).

↳ Hexoketose, Ketohexose.



— D-glucose or D-fructose.

* Hexoses C₆H₁₂O₆

Isomerization

→ Isomers :- are molecules with same molecular formula but different chemical structures.

1 - Constitutional (structural).

- atom and functional groups bind together in different ways like → glucose and fructose.

2 - Stereoisomers (spatial isomers).

- differ in the configuration of atoms in space.

* The number of stereoisomers for any given molecules = 2^n . n → number of chiral centers.

* Chiral carbon → (asymmetric) carbon atom attached to 4 different groups of atoms.

* Chiral molecules → contain at least one chiral center.

(a) chiral object → Cannot be superimposed.

like → Left hand and Right hand.

Achiral object → Can be superimposed.

like → two Flask.

Stereoisomers

- Enantiomers .

- Epimers .

Enantiomers

→ two stereoisomers that are mirror images to each other.

→ not superimposable and all the chiral centers different.

* Enantiomers are optically active and can rotate the polarized light plane either

- clockwise (d, +)
- counterclockwise (l, -)

D/L Monosaccharides

- D-glyceraldehyde , L-glyceraldehyde.
- D-fructose , L-fructose.
- D-glucose , L-glucose .

* D-(dexter) → OH group on the right-hand side.

* L-(laevus) → OH group on the left-hand side.

D-isomers
biologically
active
form.

clockwise \rightarrow (+) or (d) \rightarrow dextrorotatory.

D-glucose (Dextrose).

counter clockwise \rightarrow (-) or (l) \rightarrow levorotatory.

D-fructose (Laevulose).

* Racemic mixture

\rightarrow contains equal amounts of each enantiomer
(net rotation is zero).

Epimers → are stereoisomers that differ in the configurations of atoms at **only one chiral center**.

- they are not mirror image isomers.

- Glucose and galactose are **C4 epimers**.

- Glucose and mannose are **C2 epimers**.