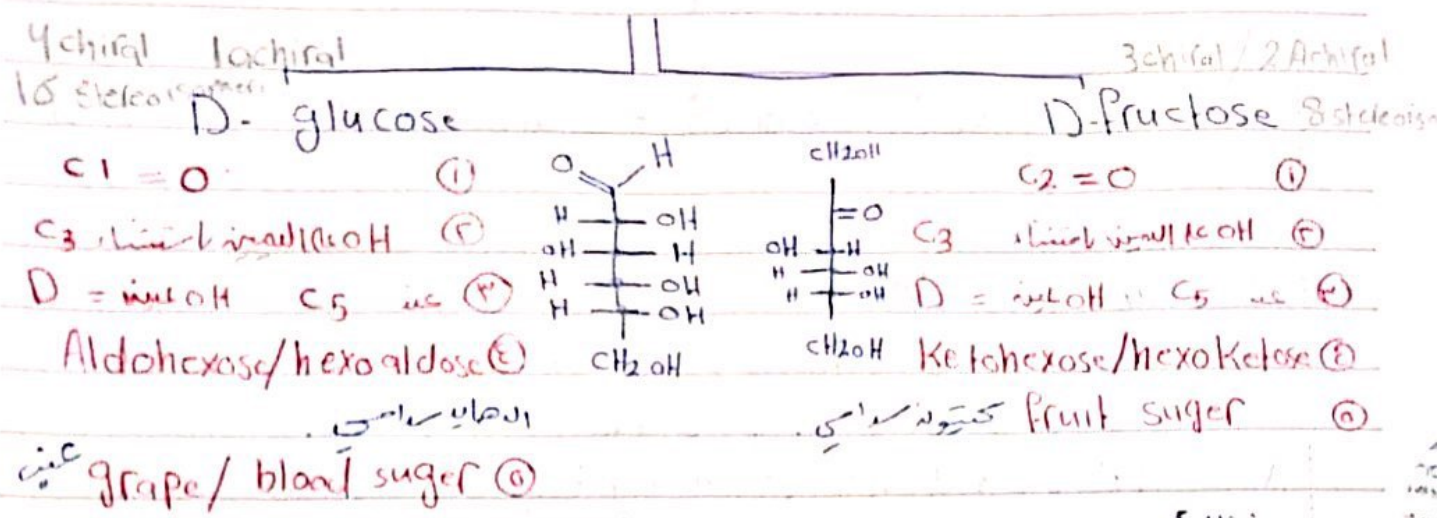


$(C_6H_{12}O_6)_n$ empirical formula \Leftarrow (sugar) \Rightarrow basic units \Rightarrow monosaccharides \Rightarrow basic units.

① عدد ذرات كربون \Rightarrow chemical nature of carbonyl carbon
 Aldoses \Rightarrow carbonyl group is Aldehyde.
 Ketoses \Rightarrow carbonyl group is Ketone.



Isomerization نظائر
 Same molecular formula, different chemical structure

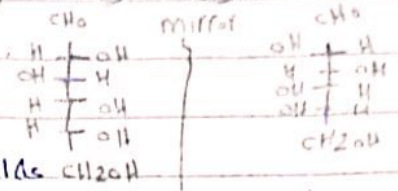
| | |
|---|---|
| <p>Constitutional (تركيب) ربط (ذرات + مجموعات) بموازاة مختلفة</p> | <p>Stereoisomers (ترتيب) ترتيب ذرات configuration of atoms</p> |
|---|---|

- * Chiral \Rightarrow ربط الكربون مع اربع روابط مختلفة
- * number of stereoisomers = 2^n $n =$ عدد chiral 2
- * Chiral \Rightarrow can not superimposed \times لا يمكن تطابق
- * Achiral \Rightarrow can superimposed \checkmark تطابق

Shahed Aref

Stereoisomer

① Enantiomers :- mirror image (all) + not superimposable



D/L

D:- C₅ = OH

L:- C₅ = OH

inverted

inverted

D

L

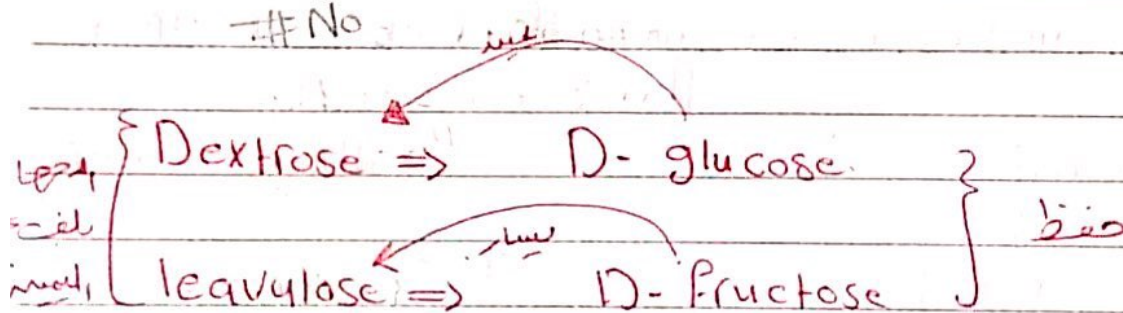
⊛ simple of sugar $\begin{array}{c} \text{CHO} \\ | \\ \text{H} - \text{C} - \text{OH} \\ | \\ \text{CH}_2\text{OH} \end{array}$ D-glyceraldehyde.

⊛ name / called / assigned / designated ⇒ + sugar (

⊛ D-fructose (levulose) ⇒ ~~levor~~ levorotatory. ⊖

⊛ D-glucose (dextrose) ⇒ dextrorotatory. ⊕

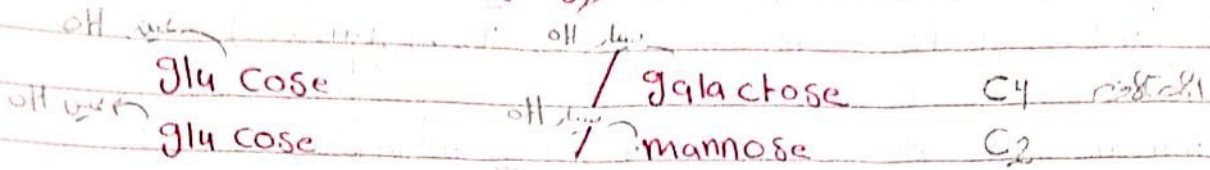
Ex ⇒ optical activities (dextrorotatory / levorotatory) is a concern a relationship that old on the right



Racemic mixture = Net = Zero

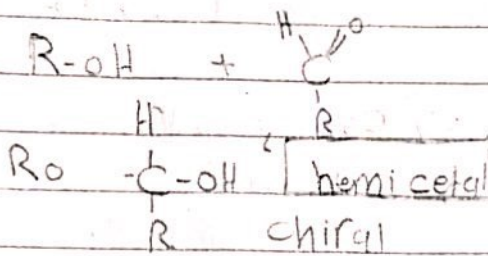
Shah

② Epimers ((only)) one chiral center / not mirror image.



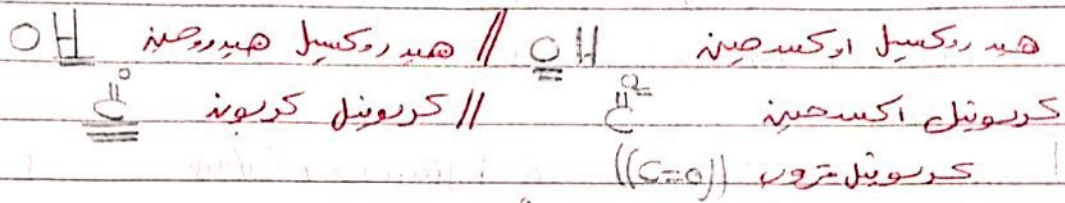
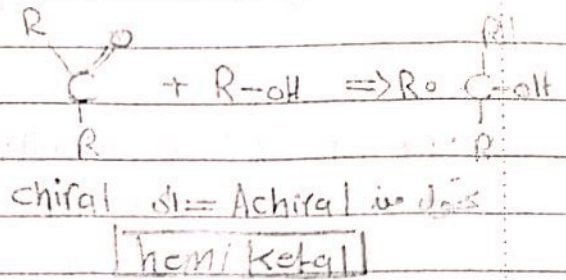
Hemiacetal

alcohol + aldehyde



Hemiketal

ketone + alcohol



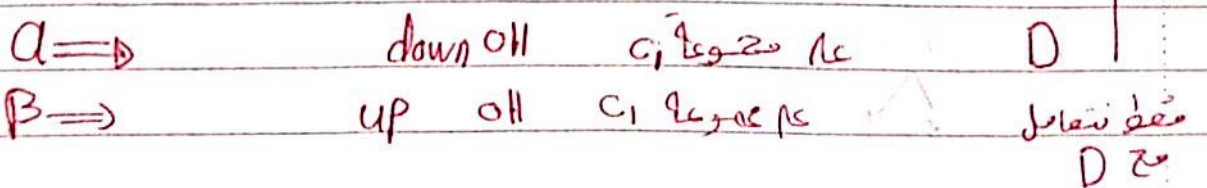
* The fate carbonyl carbon \Rightarrow anomeric carbon (C₁)

* The fate of hydroxyl oxygen \Rightarrow cyclic oxygen (C₅)

* The fate of carbonyl oxygen \Rightarrow hydroxyl (OH)

□ lines \Rightarrow Fischer projection

⊙ rings \Rightarrow Haworth projection



Shahed Apple
Aref

* Pyranoses : Sugar with six membered
 (heterocyclic compound) (Glucopyranose)

* Furanoses : Sugar with five membered
 (heterocyclic) (Fructofuranose)

* glucose # كربون رقم C5 تقل حلقه سايق
 * كربون رقم C4 تقل حلقه سايق

* Ribose : C_5 / حلقه سايق / C_5 ← حوى الكربون
 حلقه سايق / C_4 حلقه سايق

* Fructose : $C_6 \Rightarrow$ حلقه سايق
 $C_5 \Rightarrow$ حلقه سايق

Hexose & Pentose \Rightarrow Pyranose, Furanose Forms

* glucose, fructose \Rightarrow Pyranoses
 ribose \Rightarrow Furanose

③ Anomers: Carbonyl carbon $\xrightarrow{\text{become}}$ chiral center
 | anomeric carbon

OH down $\Rightarrow \alpha$
 OH up $\Rightarrow \beta$

D-glucose



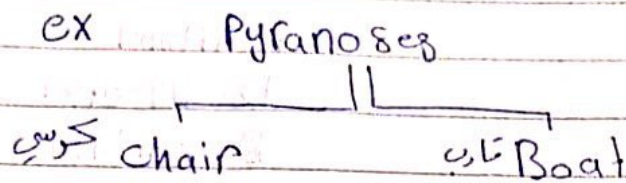
↑ β -anomer α -anomer * More stable / less energy
 (63.6%) (36.4%)

Shahed Al-Jarrah

④ Conformers :-

* carbon atoms of monosaccharide ring is tetrahedral (ترباعي السطوح) sugar rings are not planar

* bond angles are closed (109.5°)

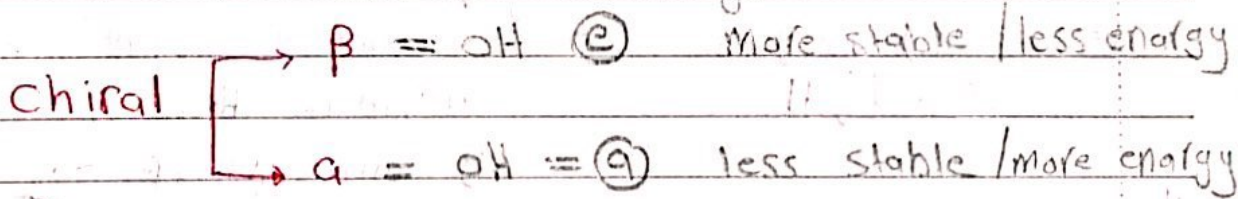


((chair more stable than boat))

conformers (rotations about single bonds) *
 التناظر

(a) axial :- connect up and down of the planar ring

(e) equatorial in parallel to one of the bond in the planar ring.



α is less stable than β ?? steric repulsion

β ⇒ more stable / less energy / low steric repulsion

α ⇒ less stable / more energy / ↑ steric repulsion.

Shahed Aref

Sugar modification.

① Aldonic acids

Oxidation of aldehyde (C1) to carboxylic acid.

D-glyconic acid

* Some drugs are injected in the form (gluconate) the salt of gluconic acid.

* Calcium gluconate solution (I.V)

(cardio protective)

Patient with high K⁺

② Uronic acids

oxidation of OH (C6) to carboxylic acid.

D-glucuronic acid

③ Alditols:

reduction of carbonyl group to alcohol.

D-ribitol *

D-glycerol

D-sorbitol

④ Deoxy sugars:

OH replaced → H

DNA ⇒ Deoxy ribose H

RNA ⇒ Ribose OH

⑤ Amino sugars.

one or more OH groups replaced by amino group

acetylated.

α-D-glucosamine (re build cartilage in osteoarthritis, osteoporosis).

~~α-D-glucosamine~~

Shahed
Al-Marabha