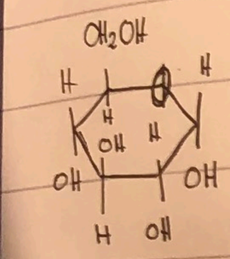
Pyranosis & Furanosis

Pyranoses

=1> Sugars with 6 membered rings are Pyranoses



α-D-glucoPyranose

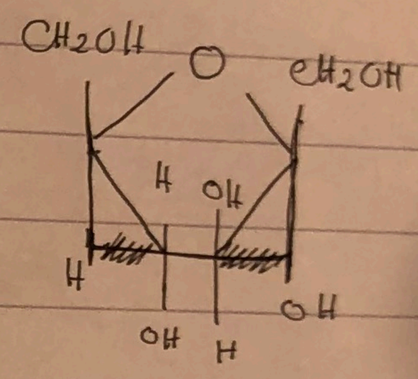
⇓

heterocydic because there is an atom but Carbon which is O

Note that the number of C doesn't effect and limits the shapes of sugars

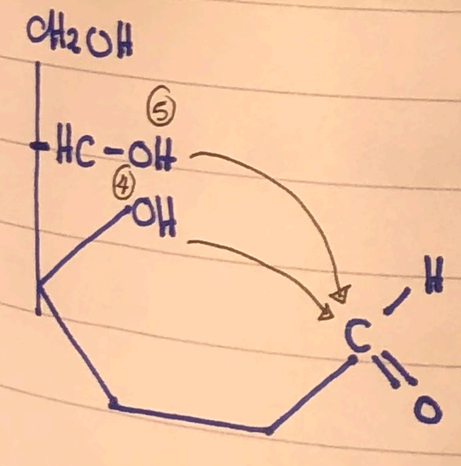
Furanosis

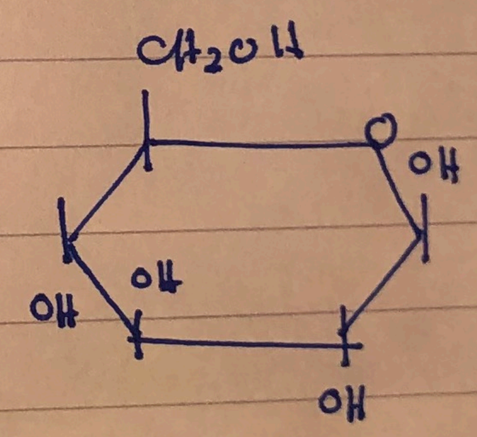
=1> Sugars with 5 membered rings are Furanosis



α-D-FructoFuranosis

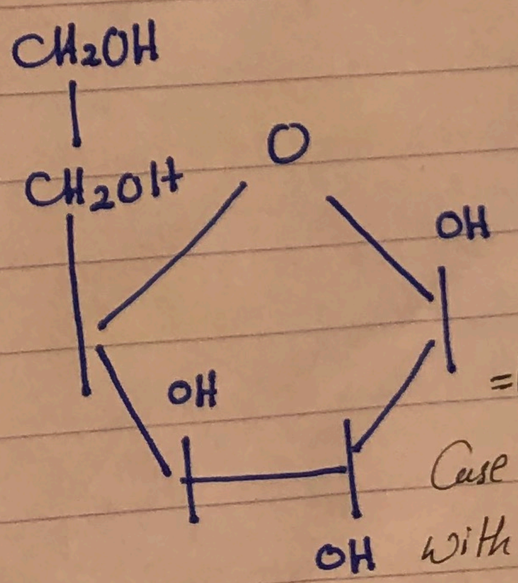
For ex. Glucose Can also make a Furanose :





• β-D-glucopyranose

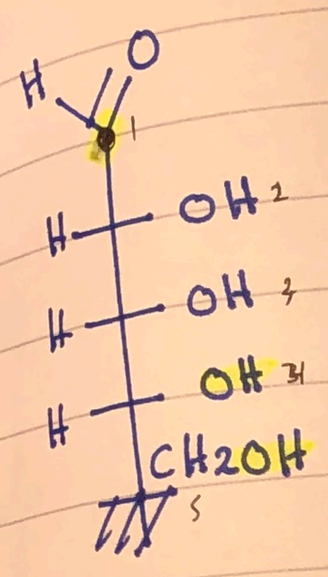
=1> in this Case the anomeric Carbon was joined with the 5th OH



=1> in this Case " " " with OH number 4

• β-D-glucofuranose

So it's a Furanosis



D-ribose

→ IF This Carbon was attached to the 5th OH it's a D-Ribopyranose.

IF it was attached to the 4th, then it's a Ribofuranose.

Pyranosis and Furanosis are isomers

Hexoses } Can exist in Pyranose
Pentoses } and furanose forms. ⇒ " The most stable rings"

glucos } are mostly
fructose } Pyranosis

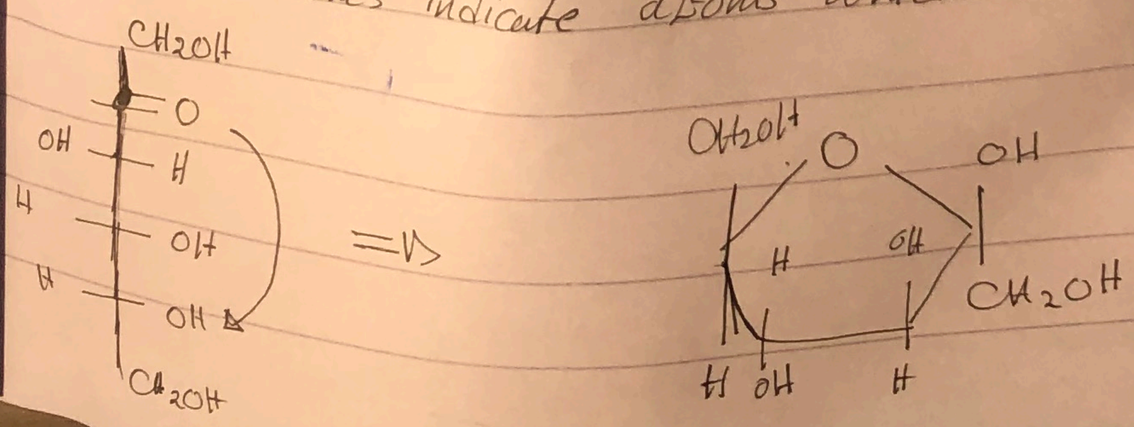
Ribose
⇒ is mostly Furanose.

Haworth Projection

⇒ 3d way to represent the cyclic Monosaccarides.

How to Convert From Fisher to Haworth?

1. The OH groups on the right hand Side in Fisher are down in Haworth. and vice versa
2. The Bold lines indicate atoms which are closer

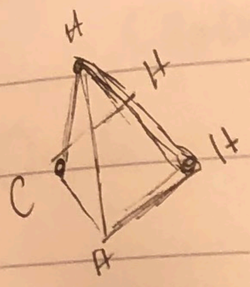


H-C-OH "SP^3"

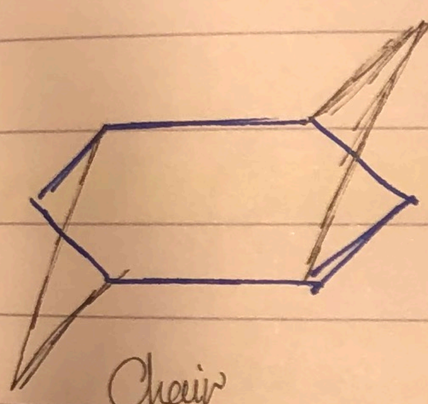
"Conformers."

=|> The geometry of Carbon atoms of monosaccaride ring is ⑭tetrahedral, angles are close to 109.5°

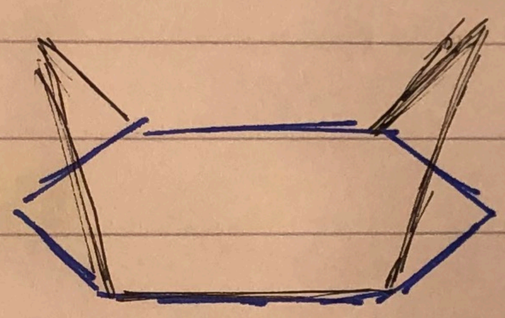
Sugar rings aren't actually planner, Pyranosis → Chair / → boat



Conformers =|> Stereoisomers with different rotations about Single bonds.

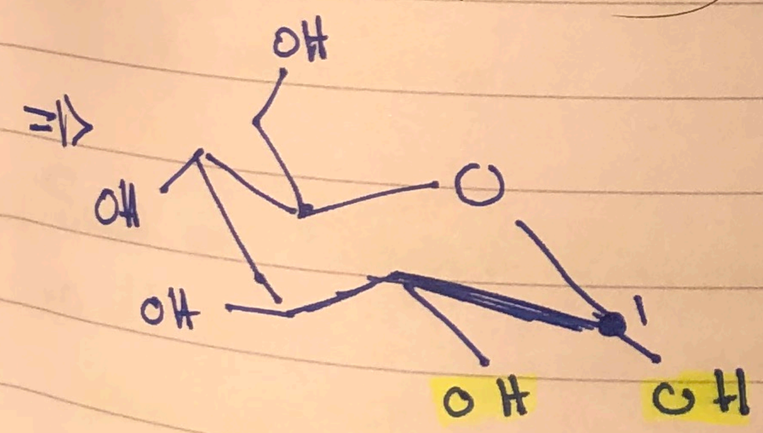


Chair Form



Boat Form

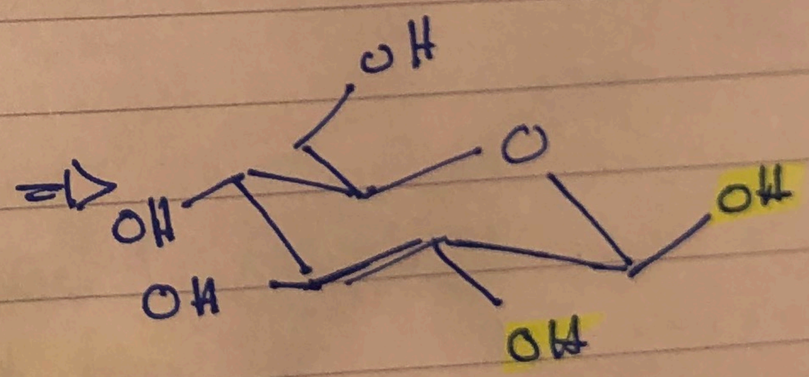
Stereoisomers which differ in the rotations only



=|> Chair Form of α-D

=|> as we can see, Both of those oH's are down and near to eachother which Causes "Steric repulsion"

a: axial
b: equatioral
=|>

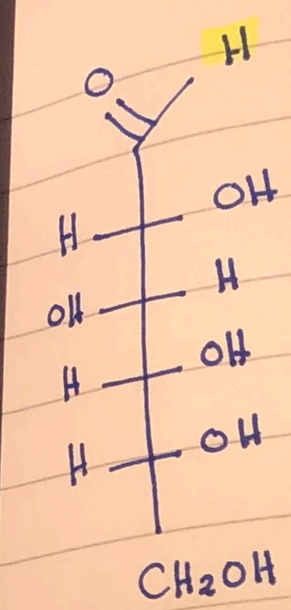


=|> Chair Form of β-D

=|> oH groups are now more stable due to the space between them

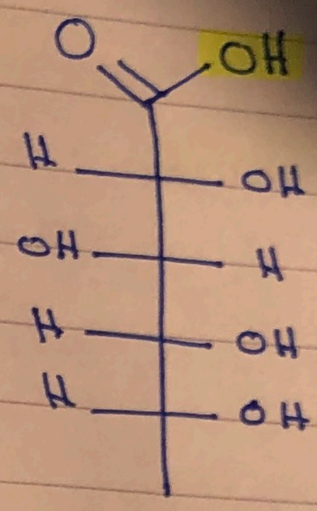
So, β is more stable than α

"Sugar Modification"



D-Glucose

=1> oxidation of aldehyde "C1" to Carboxylic acid



D-Gluconic acid

=1> This is a type of Aldonic acids.

Uses of D-Gluconic acid:

any acid can be used as salt

=1> Gluconic acid can be used as gluconate (COO^-) " H^+ " is removed

- Some drugs are injected in the form of gluconate

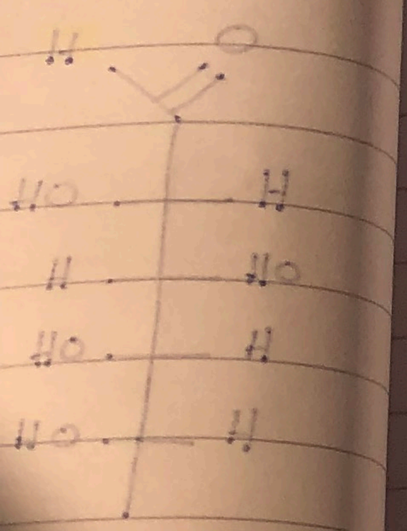
Such as Calcium gluconate Solution (I.V) = intra venous

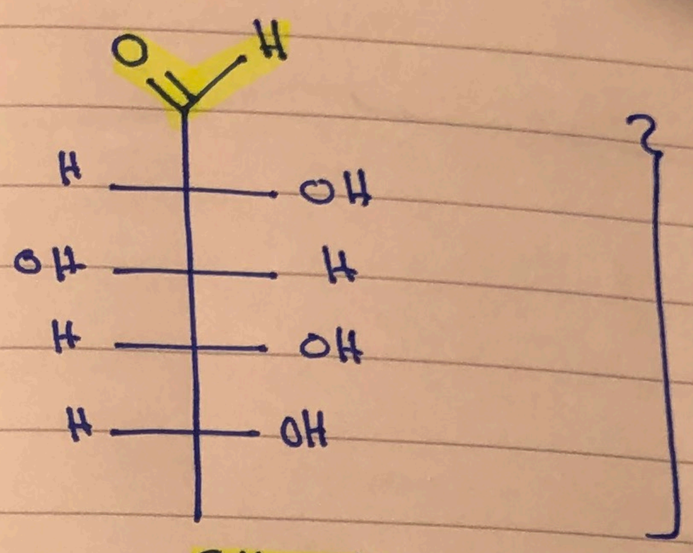
=1> it's given to people who have high blood levels of K^+

=1> Because it effects the heart

=1> This midication is Cardio Protective

Sugar Modifications

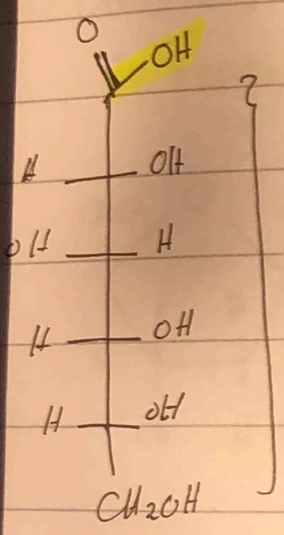




D-Glucose

CH_2OH

=|> Aldonic Acids

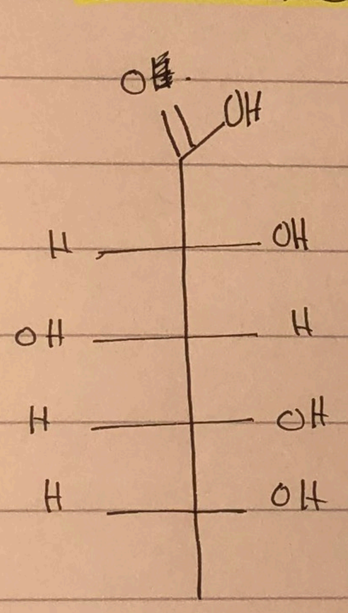


D-gluconic acid

CH_2OH

=|> oxidation of Aldehyde "C1" to Carboxylic acid

=|> Uronic Acids



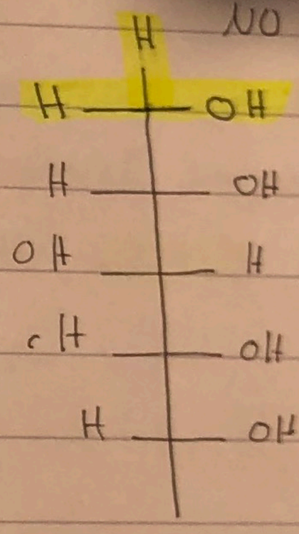
COOH

=|> oxidation of OH at (C6) to Carboxylic acid

D-Glucuronic Acid

=|> Alditols

NO Double bond



CH_2OH

- D-Glucitol

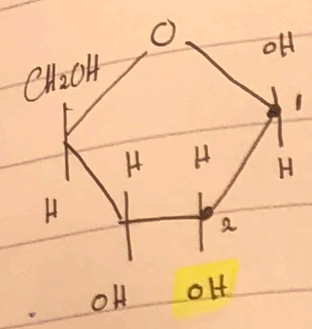
=|> Reduction of Carbonyl group to Alcohol

- D-ribitol ⑤
- D-glycerol ③
- D-Sorbitol ⑥
  ↓
  D-glucitol

"sweetener"

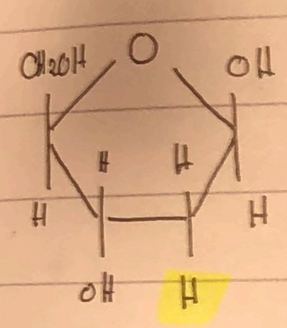
" Sugar Modification "

Deoxy Sugars



• =1> β Ribose

=1> Deoxy Sugars : OH group is replaced by H



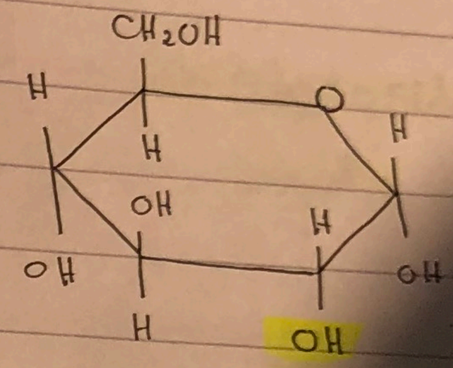
=1> Deoxyribose

• glucosamine
  • To build Cartilage in osteoarthritis
  • " " in osteoprosis

• α-D-N-acetylglucosamine

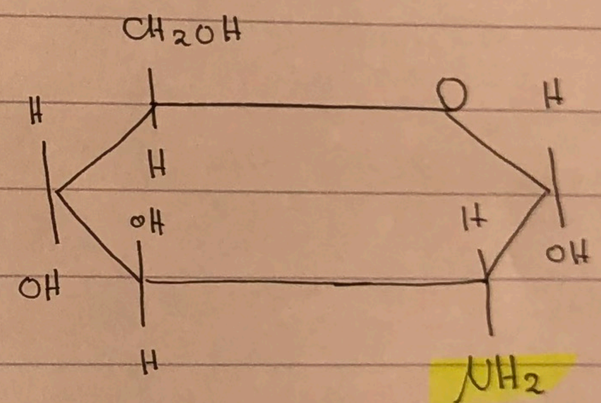
=1> " Both are derivates " of α-D-glucose

Amino Sugars



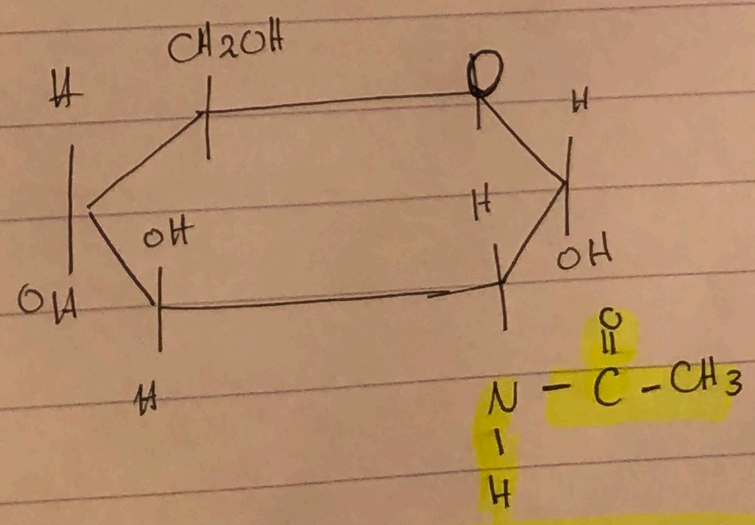
• =1> α-glucopyranose

=1> One ore more OH groups are replaced by amino group (NH_2)



• =1> α-D-glucosamine

=1> NH_2 group is more likely to be acetylated



• =1> α-D-N-acetylglucosamine