Q. What are the different isomers of Carbohydrat

The compounds that have the same molecular formula b different structural formula or spatial arrangment, Known isomers. The number of isomers of a Compound depends on th number of asymmetric carbon, Which carries four differen groups on its four valencies.

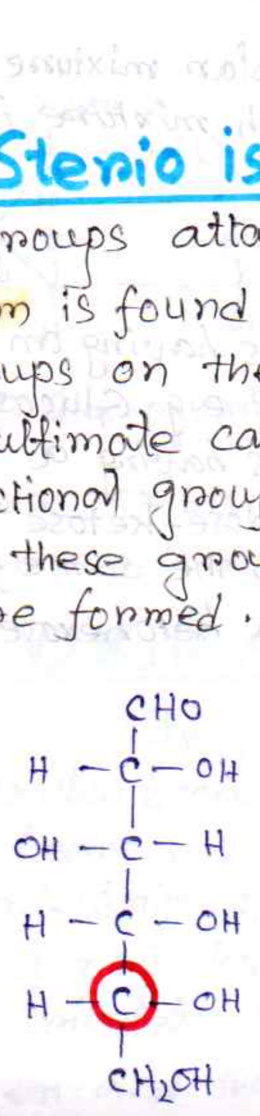
$$\text{Number of isomer} = 2^n, \quad n = \text{No. of Asymmetric Carbon}$$

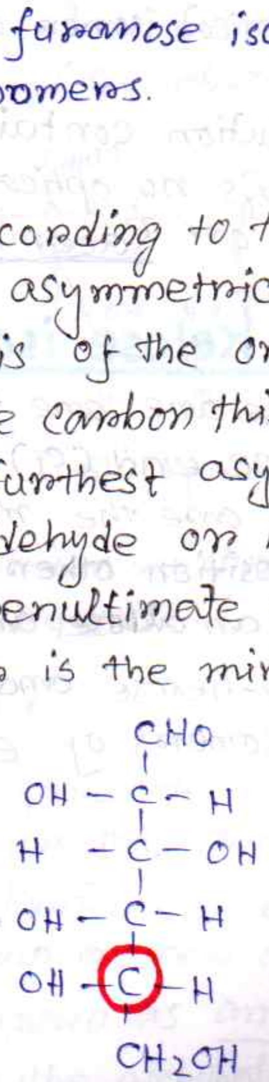
For example Glucose have four asymmetric carbon therefo it has $2^4 = 16$ isomers. Several types of isomerism are found in monosaccharide.

These are —

i) Sterio isomer
ii) optical isomer
iii) Aldose-ketose isomer
iv) Pyranose furanose isomer.
v) α, β Anomers.

i) Sterio isomer: According to the spatial arrangme of the groups attached to the asymmetric carbon, D-L ster -isomerism is found. On the basis of the orientation of –H an –OH groups on the penultimate carbon this isomer is produce The penultimate carbon is the furthest asymmetric carbon fr the functional groups that is aldehyde or keto group. On the basis of these groups on the penultimate carbon **L** and **D** isomer are formed. The L isomer is the mirror image of D isome





L Glucose

D Glu

ii) Optical isomer :

Optical activity of a substance is the capacity to rotate the plane of polarised light depends on its asymmetri Carbons. If polarised light is passed through a solution havi asymmetric carbons, the light can rotates eaither clockwise (rotation to the right or dextrorotation) or anticlockwise (rotation to the left or Levorotation). On the basis of the direction of rotation o the polarised light the optical isomers are produced. The dextroro tari isomers are indicated by the prefix 'd' or (+). If the isomer is levorotatory then it is indicated as Prefix 'l' or (−). Two optical isomers of a substance are mirror image each ot

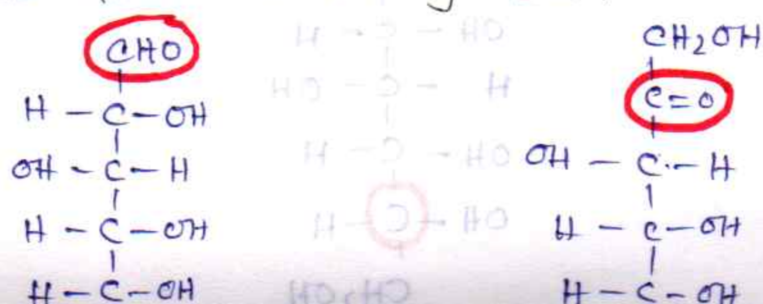
+ D Glyceraldehyde   − L Glyceraldehyde.

Fig :- Examples of optical isomer of Glyceraldehyde.

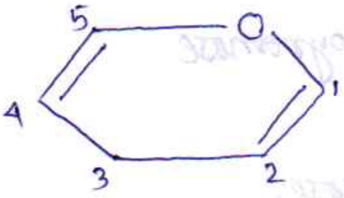
If a solution contains the equimolar mixture of two optical isomers shows no optical activity, Such mixture is know as d-l mixture or Racemic mixture.

iii) Aldose - ketose isomer :

Aldose are are monosaccharides having an aldehy group (H−C(=O)−) at one end (C_1) of the molecule e.g. Glucose, Galac manose etc. Ketoses are the monosaccharides having a ketone group (−C(=O)−) on the position other then (C_1). Aldose-ketose isomer is the existance of an aldose and ketose with the same formu Glucose is an Aldose-hexose and fructose is a ketohexose. So th are Aldose-ketose isomers of each other.



These isomers are based on the stable ring structure of monosaccharide & simillar to the structure of Pyran and furan ring.



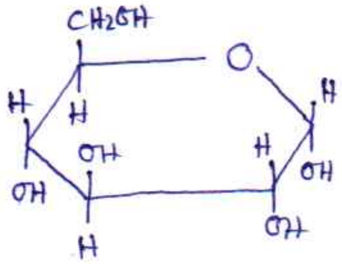
Pyran ring

Furan ring.

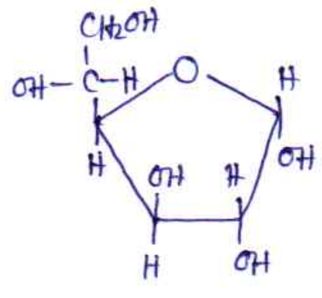
Both aldose and ketose with six or more carbons can show the Pyran and furan forms. In this form the aldehyde or ketone group is changed to an addetion of $-OH$ group and linked to the alchoholic carbon by $C-O-C$ bridge.

Pyranose isomer : Six members pyran ring
(5 Carbon + 1 oxyzen)

Furanose isomer : Five members furan ring
(4 carbon + 1 oxyzen)



D Glucopyranose

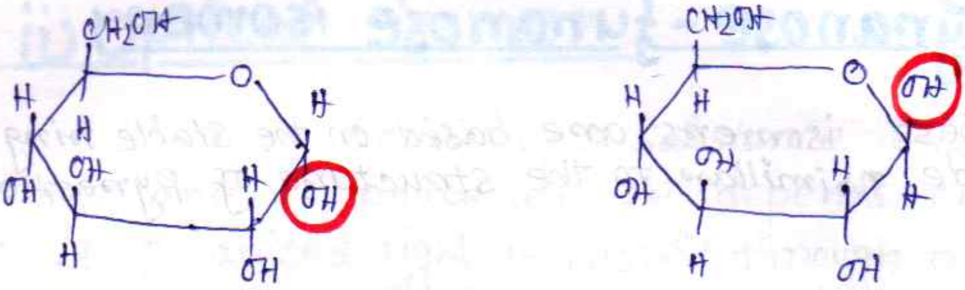


D Glucofuranose

D Glucose exists as an equlibrium mixture of D Glucopyranose, D Glucofuranose and open chain D Glucose.

V) α, β Anomerism :

In Pyranose and furanose the aldehydic and ketonyl carbon becomes a new asymmetric carbon. This new asymmetric carbons bears an $-OH$ group known as annomeric $-OH$. The spetial orientation of this $-OH$ group on new asymmetric carbon produces a new isomer which is known as annomerism. If the $-OH$ group is orientate furthest from the alchoholic group is called α annomer and the opposite orientation is known as β annomer.



α - D Glucopyranose β – D Glucopyranose

Fig: Examples of α and β annomers of Glucose.