CARBOHYDRATES

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30-05-2020 Last Lecture (11)

Topic- Epimers And Enantiomers

Deg-II (Sub.) Only

Ch-3, Group-'C'

* The maximum number of optical isomers of a sugar is calculated by following equation.

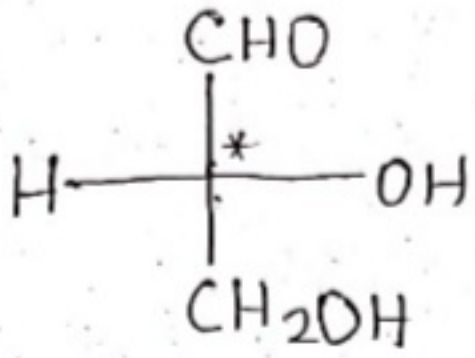
Maximum no. of optical isomers $= 2^n$

where, n = No. of asymmetric carbon (chiral carbon)

* The carbon in a molecule to which four different atom of group attached with their four valencies.

For example

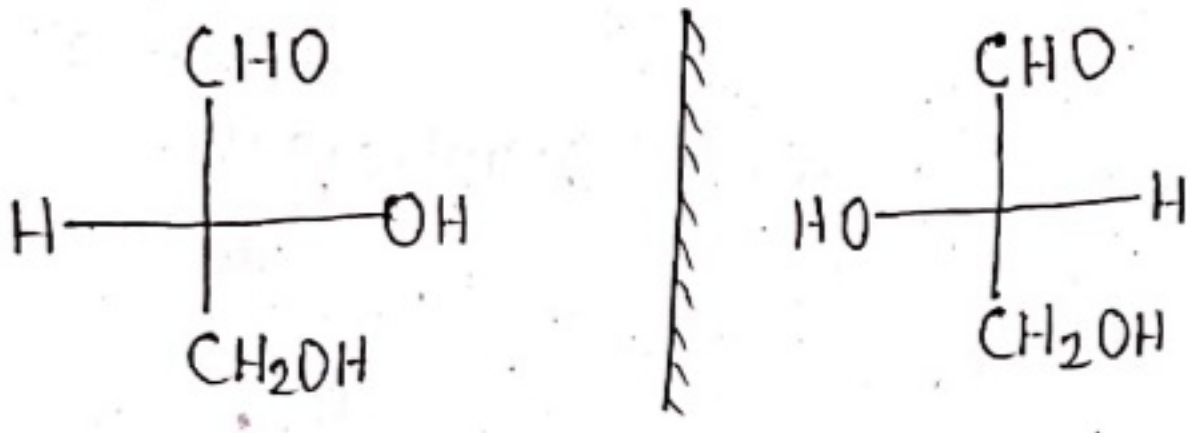
$C_3H_6O_3$ (Aldotriose)



n = 1

Glyceraldehyde

No. of optical isomer $= 2^1 = 2$

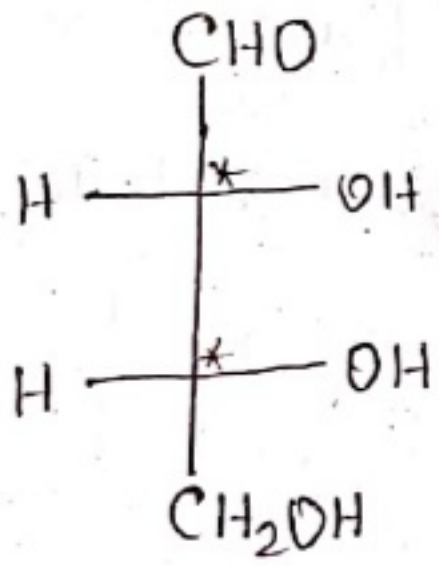


D-(+)-Glyceraldehyde

L-(-)-Glyceraldehyde

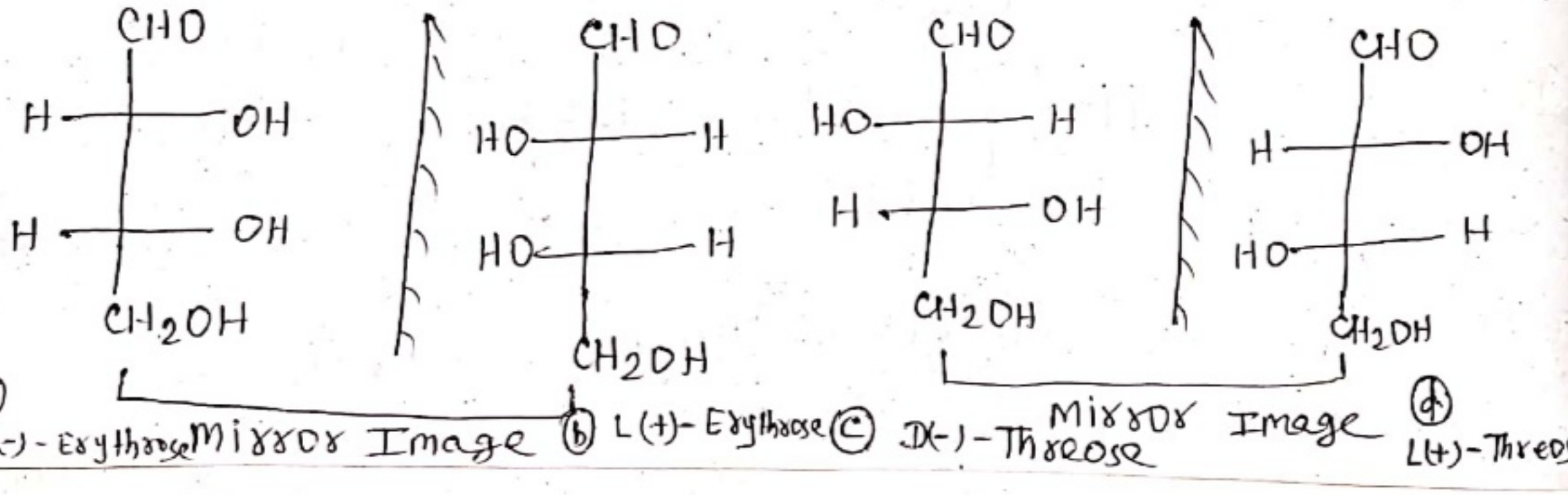
Mirror Image

Aldotetrose



$n = 2$

No. Of optical isomer $= 2^{2} = 4$



(a) D(-)-Erythrose

Mirror Image

(b) L(+)-Erythrose

(c) D(-)-Threose

Mirror Image

(d) L(+)-Threose

* The non-superimposable mirror images are called enantiomers.

ⓐ & ⓑ are enantiomers

ⓒ & ⓓ are enantiomers

ie; D-erythrose and L-erythrose are enantiomers and D-Threose and L-threose are enantiomers.

* The optical isomers that are not mirror images are called diastereomers.

* In above example of aldotetrose

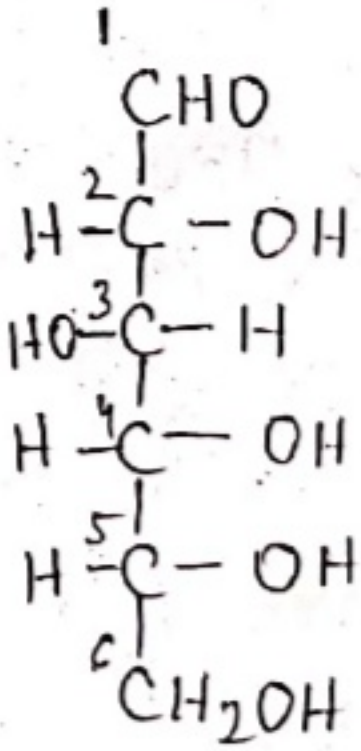
D-erythrose and L-Threose are not mirror image, that is they are diastereomers.

* A pair of diastereomers that differ only in the configuration about a single carbon atom are said to be epimers.

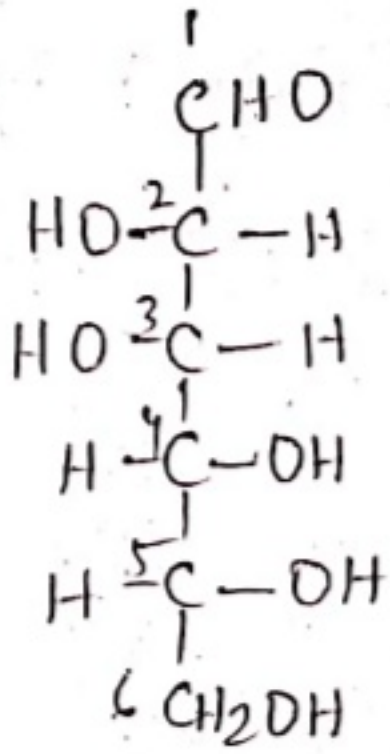
example

D(+)-mannose and D(+)-galactose are said to be epimers of D(+)-glucose.

4.

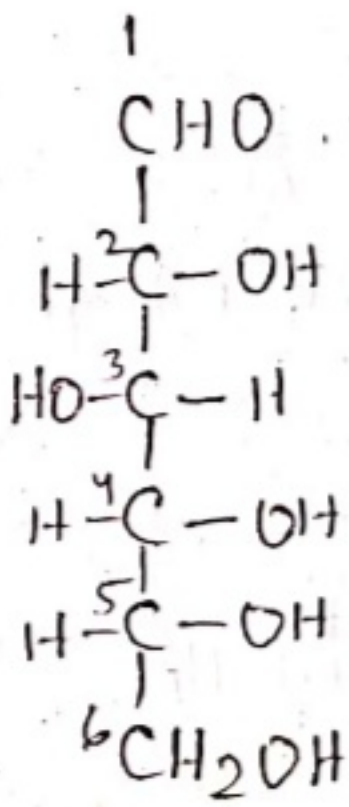


D-(+)-Glucose

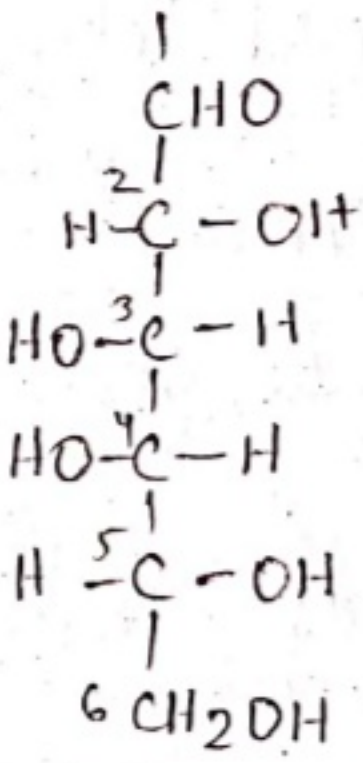


D-(+)-mannose

Both are not mirror image and differ only in the configuration about carbon no. 2. Hence they are epimer.



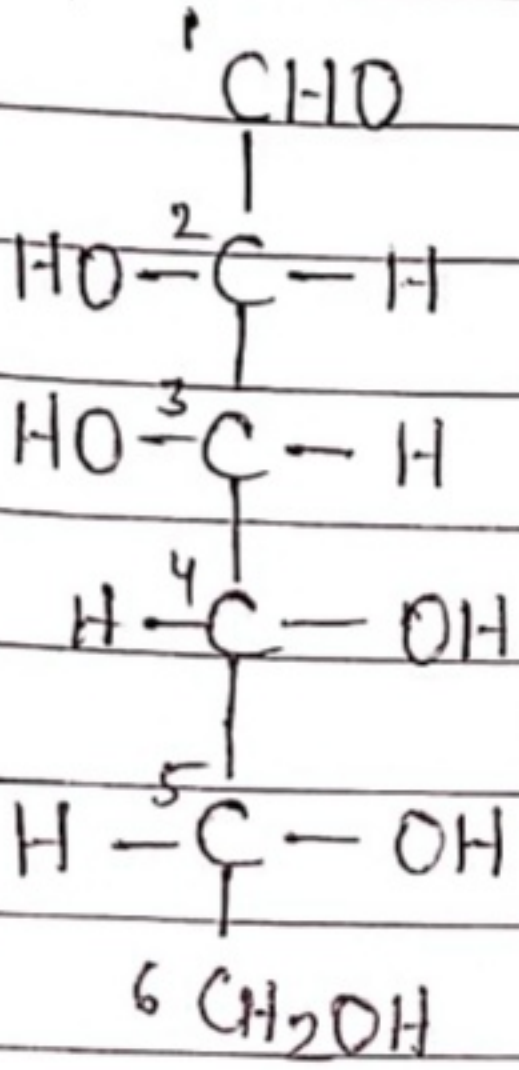
D-(+)-Glucose



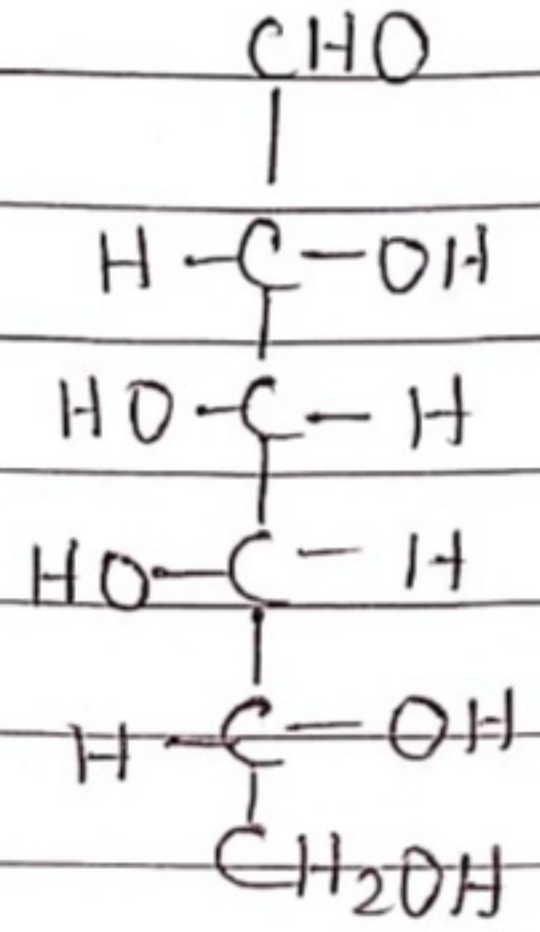
D-(+)-Galactose

Diastereomer, differ only at carbon no. 4, therefore both are epimer.

* No epimeric relationship exists between D(+)-mannose and D(+)-galactose.



D(+)-Mannose



D-(+)-Galactose

They are differ at two position. carbon-2 and carbon 4.

Hence, they are not epimer.

The End

Carbohydrates
Ch-3, Group-'C'
Deg-II (Sub)
Completed.