STEREOCHEMISTRY

Deg-II (H) , Paper-IV ,Chapter-4

Lecture-10 ,Date : 08-08-2020

Optical Isomerism Continue..

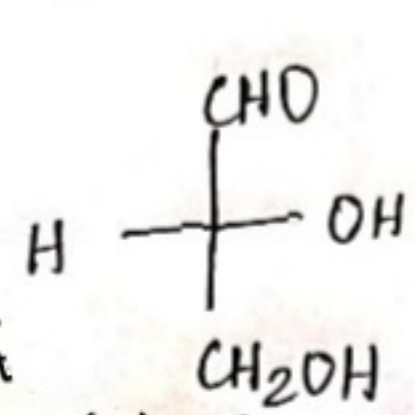
Relative Configuration (D , L- Nomenclature)

By-Dr.Rinky

* Before 1951, there was no method for determining the absolute configuration of a compound and hence the configuration of all the compounds were studied with respect to glyceraldehyde (relative configuration), the configuration of which was taken as an arbitrary standard.

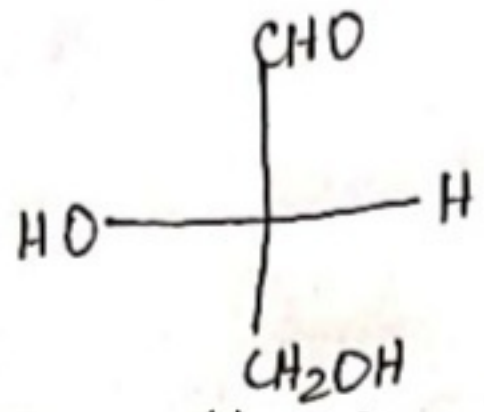
(+) - Glyceraldehyde, having the -OH group on the right and the hydrogen atom on the left, the -CHO and $-CH_2OH$ groups being at the top and bottom respectively, was arbitrarily given the configurational symbol D.

The mirror image compound (-) - glyceraldehyde, in which the -OH group is on the left and hydrogen on right was given the configuration, L.



* Having -OH to the right

D(+)-Glyceraldehyde

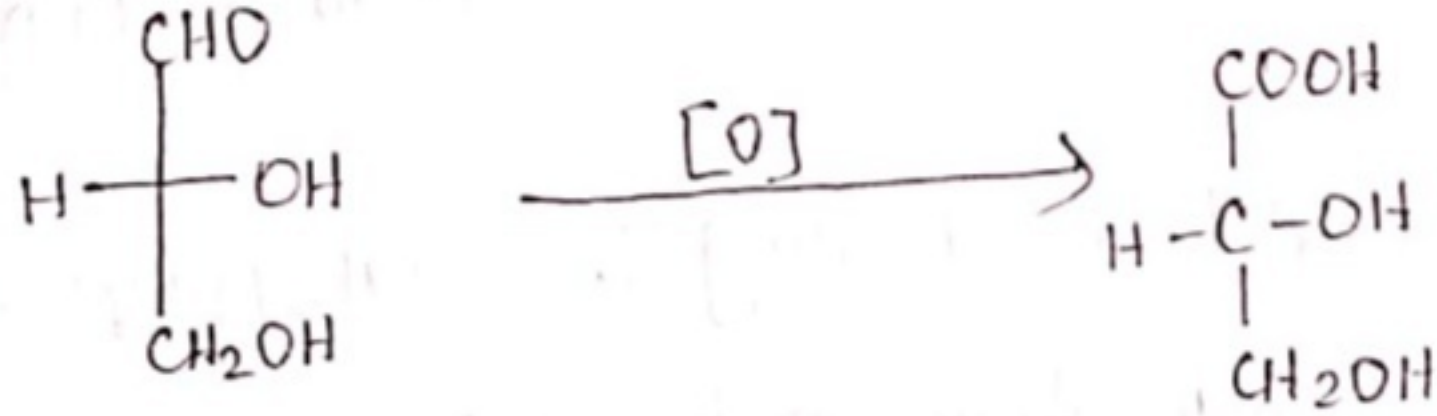


* Having -OH to the left

L(-) -Glyceraldehyde

Any compound that can be prepared from or converted into D-(+) glyceraldehyde will belong to the D-series; and Similarly any compound that can be prepared from Or converted into L(-)-glyceraldehyde will belong to the L-series (relative configuration).

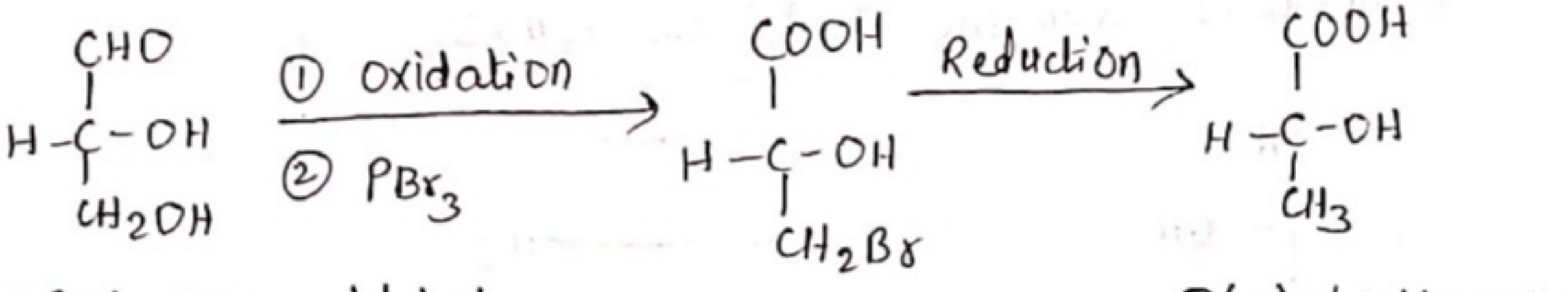
For example, D-glyceraldehyde can be converted to glycesic acid by simple oxidation and thus the configuration of glycesic acid Obtained must be 'D'!



D(+)-Glyceraldehyde

D(-)-Glycesic acid

* Similarly, Lactic acid Obtained from D(+)-glyceraldehyde in the following ways is also assigned D-configuration.

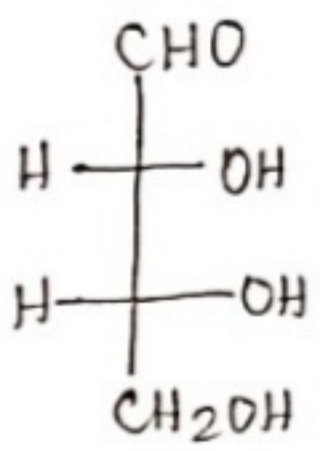


D(+)-Glyceraldehyde

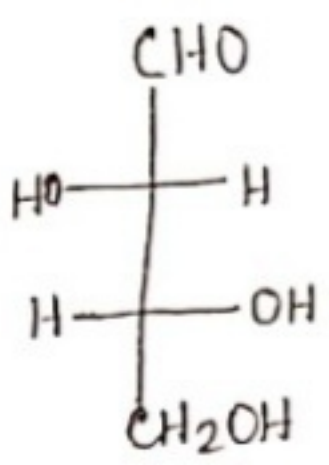
D(-)-Lactic acid

In the sugar series where the compound contains more than one chiral carbon atom, its configuration is assigned with respect to the highest asymmetric carbon atom (next to the primary alcoholic group; the glyceraldehyde carbon atom), eg (−) - erythrose and (−) - threose belong to the D- series, whereas the corresponding (+) - enantiomers belong to L- series.

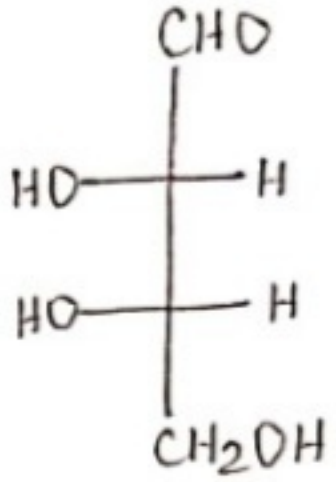
Similarly, natural (+) - glucose is D(+)- glucose.



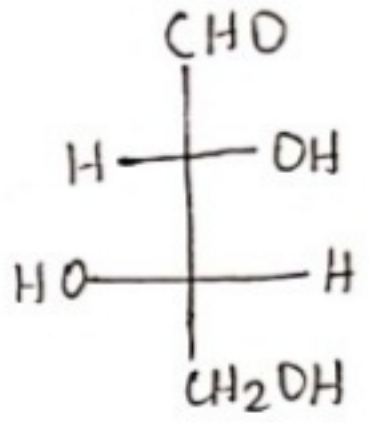
(−)- Erythrose



(−) Threose



(+)- Erythrose



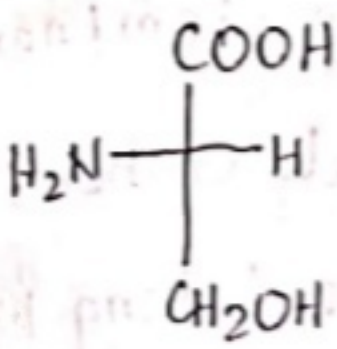
(+) - Threose

D- series

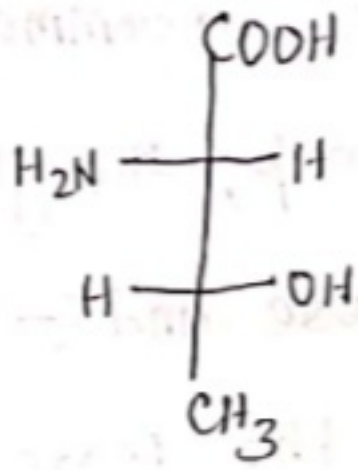
L- series

For the amino acids, (−) serine has been used as an arbitrary standard for the configurational studies. But at the (−) threonine molecule contains two asymmetric carbon atoms, one related to the sugars and other related to amino acids.

* The situation is some what complicated; and hence subscripts are used to avoid unnecessary confusi



L (-) - serine



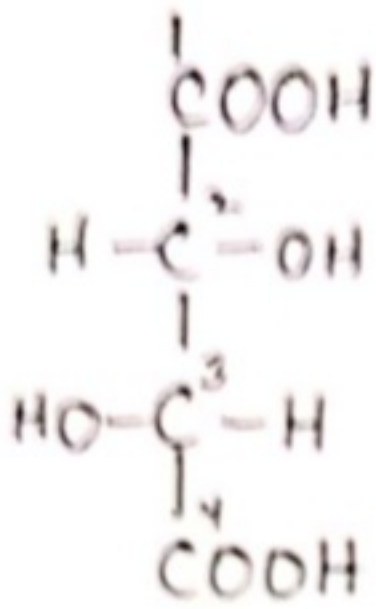
Ls or Dg (-) - Threonine

Whereas Ls and Dg represent the L- and D- configuration of the molecule with respect to serine and glyceraldehyde respectively.

However, this D,L- system of nomenclature faces difficulty in assigning the configuration to some compound.

eg; Natural dextrorotatory tartaric acid may be assigned L- configuration with respect to bottom asymmetric carbon atom (C_3) or, D- configuration with respect to top asymmetric carbon atom (C_2).

To avoid confusion and for the complete specification of configuration, it is essential to consider each centre of asymmetry in turn.

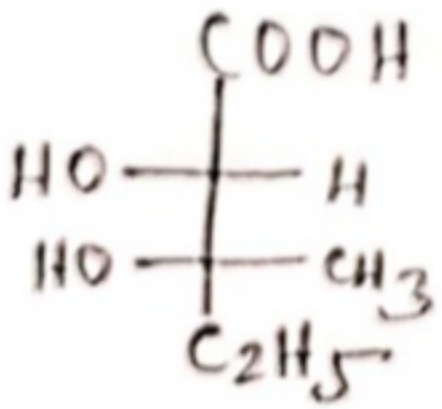


Natural (+) - tartaric acid

* The D, L - nomenclature can also be extended to compounds possessing more than one asymmetric carbon atoms and to compounds having asymmetric carbon atom in rings.

In such cases, the carbon chain is numbered from the top and the various functional groups, are assigned 'D' and 'L' configurations depending upon whether they are attached to the right or left to the asymmetric centre concerned.

eg;



2, D - Hydroxy - 3 - D - methyl - 3 - L - hydroxy pentanoic acid.

To be continued in next lecture..