

# STEREOCHEMISTRY

1.

27-07-2020

Degree-II (H), Paper-IV, Lecture-6

Topic:- Optical Isomerism Continue...

## Characteristics of Enantiomers

1. Enantiomers have identical physical properties like melting points, boiling points, densities, refractive indices etc.
    - \* They differ only in their action on plane polarised light, one enantiomer rotates the PPL to the right and the other to the same magnitude but to the left.
    - \* The two enantiomers are designated as dextro rotatory or d or (+) and laevo rotatory l or (-).
  2. Enantiomers have identical chemical properties except their action towards optically active compound.
  3. When the two enantiomers are mixed in equimolecular quantities, it results in the formation of an optically inactive compound called racemic mixture, or Racemic modification or dl-mixture or ( $\pm$ ) mixture.
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# Conditions For Optical Activity 2.

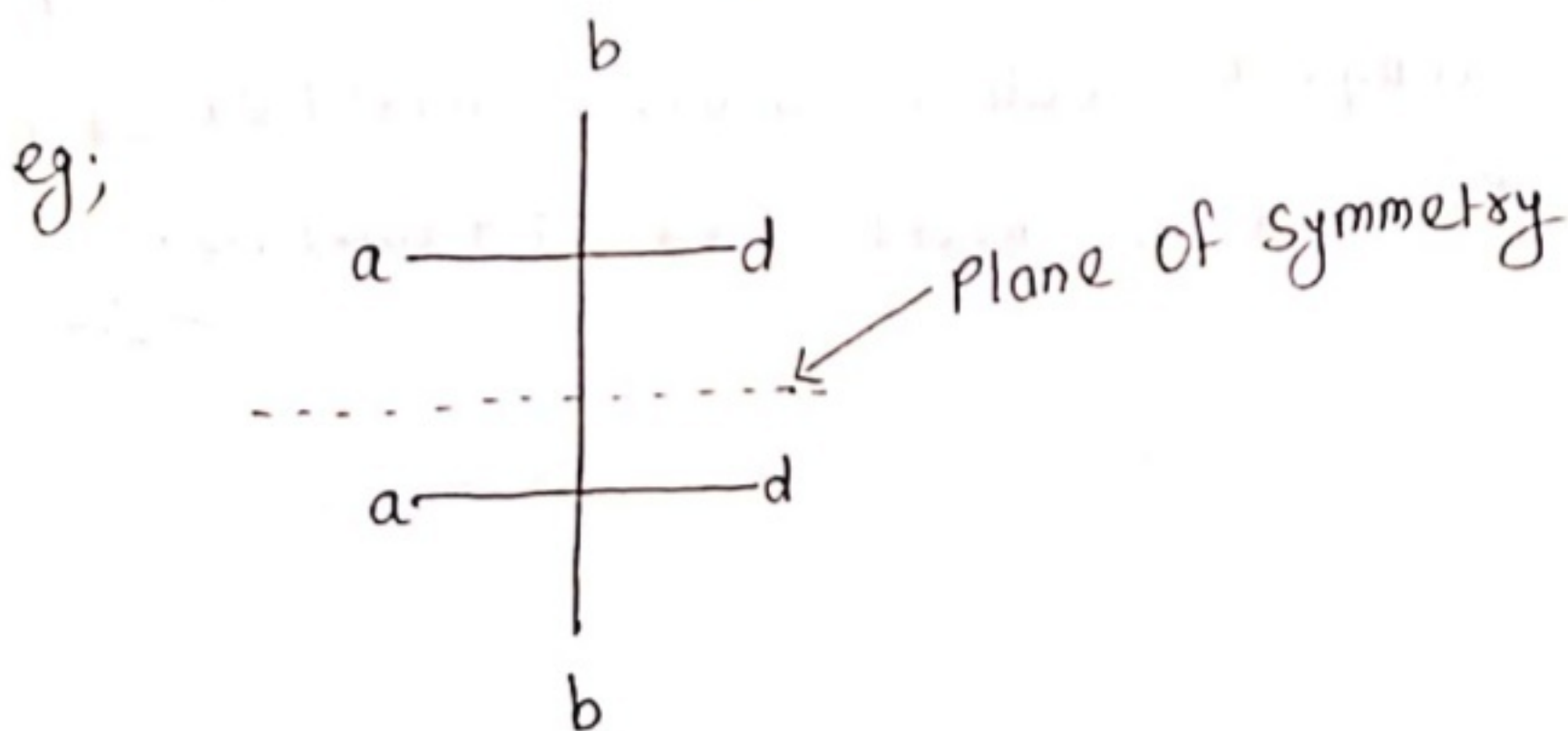
A compound can show optical activity only when it is devoid of the elements of symmetry, viz;

- (i) a plane of symmetry
- (ii) a centre of symmetry
- and (iii) an alternating axis of symmetry.

\* If a molecule possesses one or more of the above elements of symmetry, it is symmetrical, if it does not possess either of these elements of symmetry, it is asymmetric.

## (i) A plane of Symmetry :-

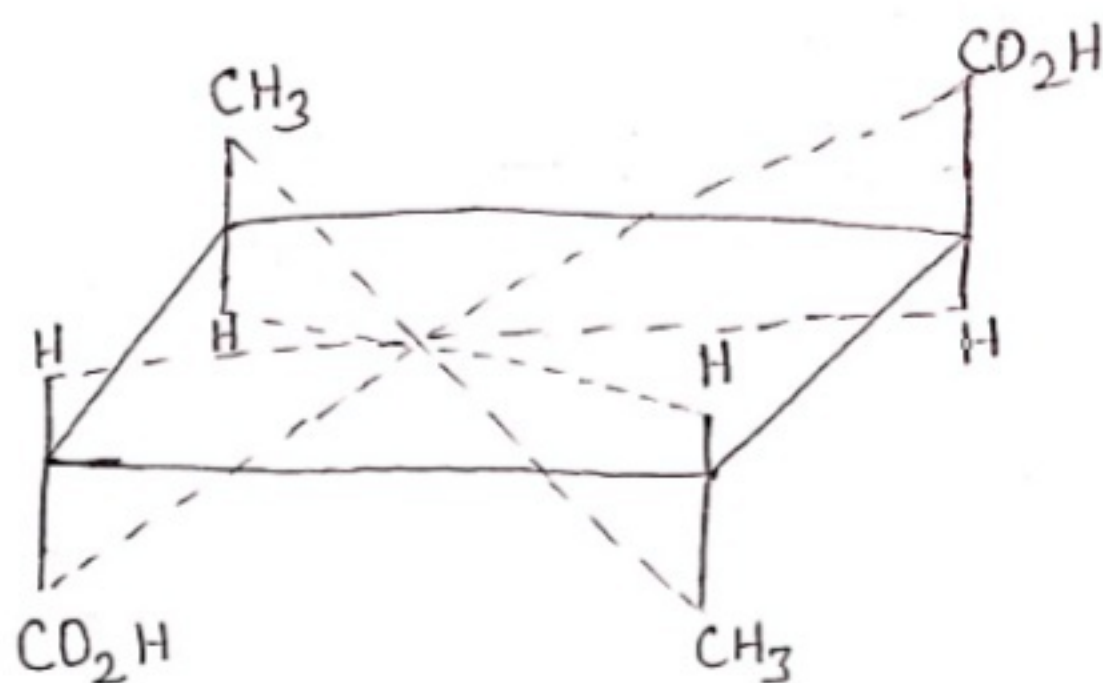
A molecule will be said to possess a plane of symmetry if it can be divided into two equal halves in any plane and thus the atoms or groups on one side of the plane form mirror image of those on the other side.



## (ii) A centre ( Point) of Symmetry :- 3.

A centre of symmetry is an imaginary point in the centre of a molecule from which if lines are drawn, on any group, on both the sides to an equal distance, it divides the molecule into two equal halves which are the mirror image of each other.

eg; 2,4-dimethylcyclobutane-1,3-dicarboxylic acid



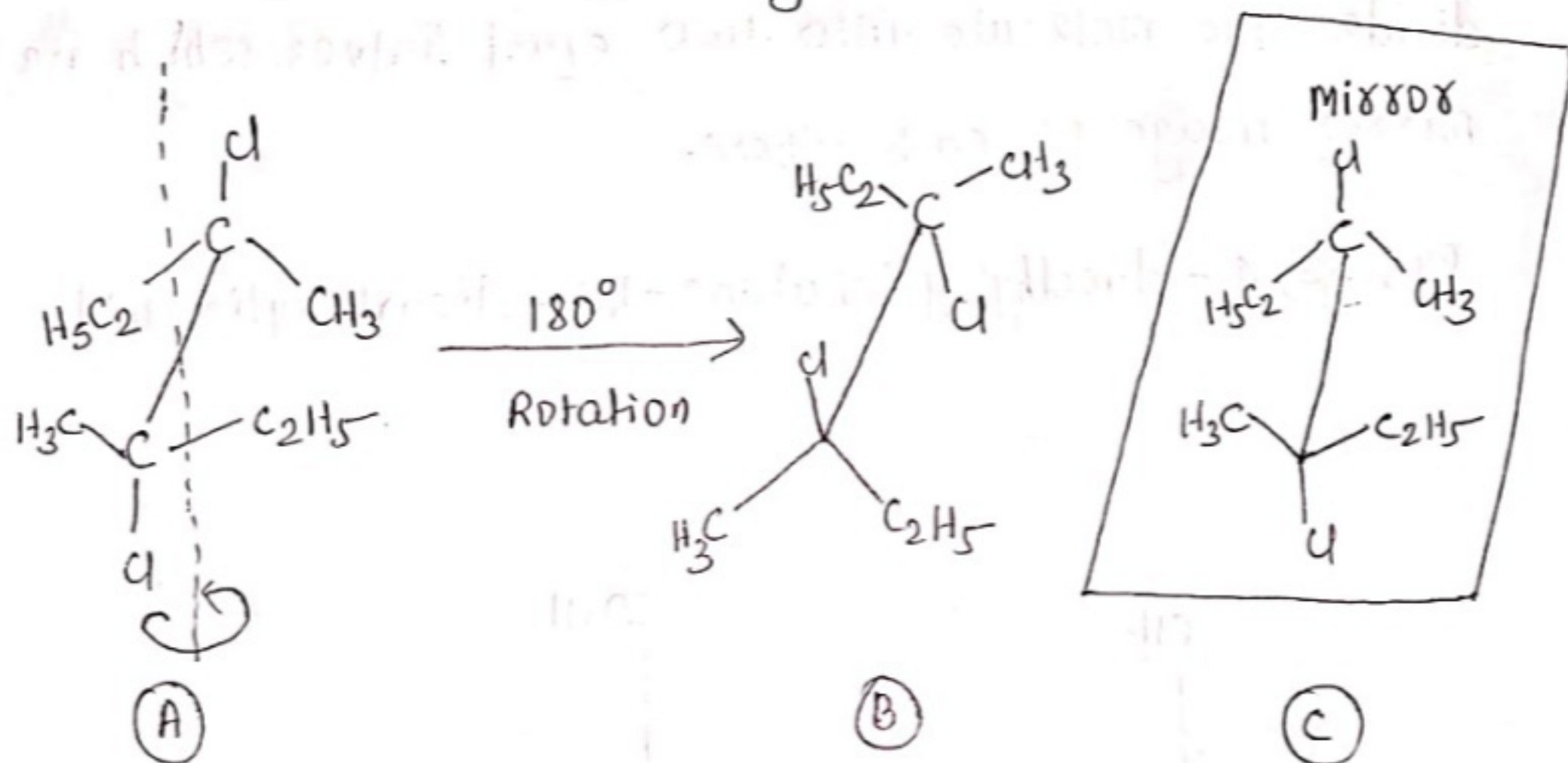
## (iii) Alternating axis of Symmetry :-

A molecule is said to possess an  $n$ -fold alternating axis of symmetry if, when it is rotated through an angle of  $360^\circ/n$  about this axis and then reflected across a plane perpendicular to the axis, an identical



Structure is obtained.

ex: 3,3-dichloro-3,3-dimethylhexane is found to be optically inactive due to the presence of two fold alternating axis of symmetry.



A = Line passing through the centre of the molecule.

B = Same as initial compound.

C = Reflection obtained in a plane perpendicular to the line passing through the centre.

**To be continued in next lecture...**