

Stereochemistry

These compounds have the same molecular formula but differ from each other in physical or chemical properties, and are called isomers and the Phenomenon is called isomerism.

There are two main types of isomerism.

(1) Structural isomerism.

(2) Stereoisomerism.

Structural isomerism.

Structural isomers are compounds that have the same molecular formula but different structural formula is called structural isomerism.

They are five types of structural isomerism.

(1) Chain isomerism

(2) Position isomerism.

(3) functional isomerism.

(4) Metamerism.

(5) Tautomerism.

Stereoisomerism

The stereoisomers have the same structural formulas but differ in arrangement of atoms in space. is called stereoisomerism.

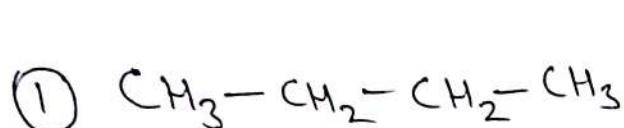
(2)

These are two types.

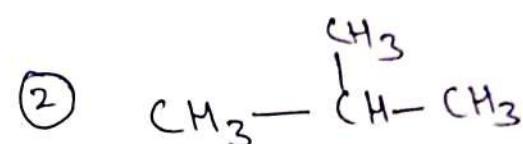
- (1) geometrical or cis-Trans isomerism
- (2) Optical isomerism.

(1) Chain isomerism.

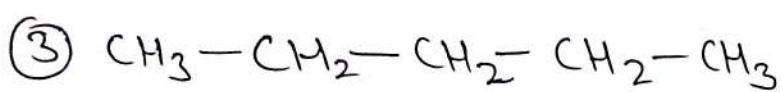
Chain isomers have the same molecular formula but differ in the order in which the carbon atoms are bonded to each other.



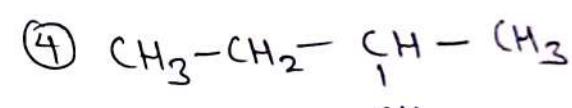
n-Butane



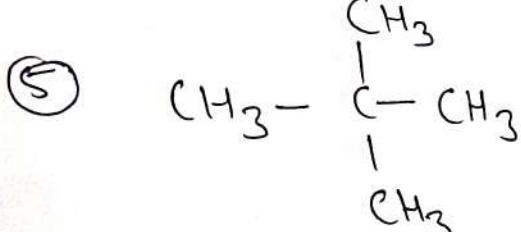
isobutane



n-Pentane



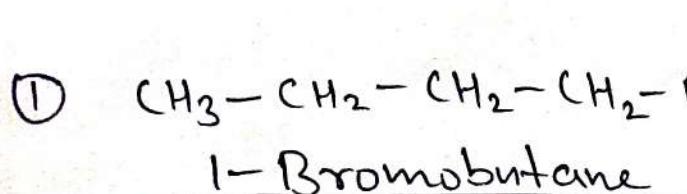
2-methylbutane



2,2-Dimethylpropane.

(2) Position isomerism

Position isomers have the same molecular formula but differ in the position of a functional group on the carbon chain.



1-Bromobutane

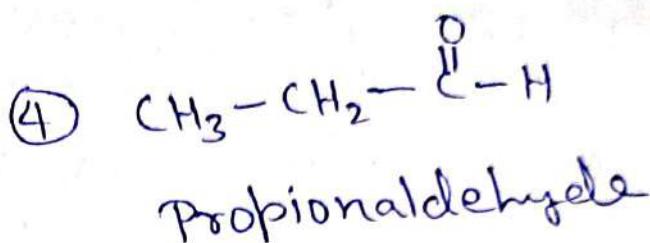
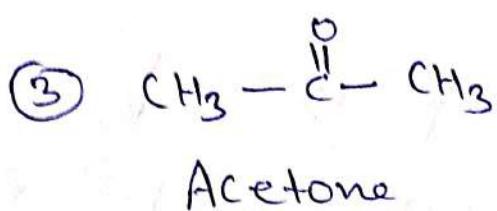
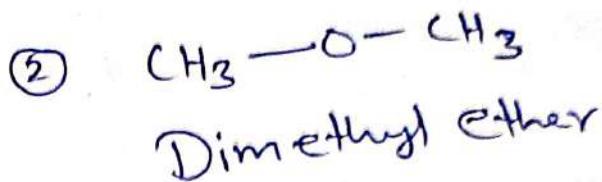
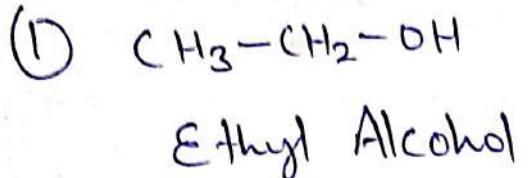


2-Bromobutane

(3) Functional Isomerism.

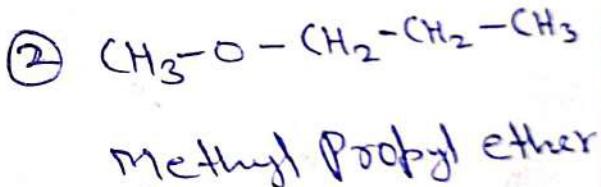
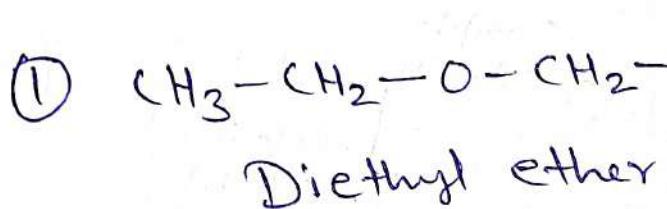
(3)

-functional isomers have the same molecular formula but different functional groups.



(4) Metamerism

This type of isomerism is due to the unequal distribution of carbon atoms on either side of the functional group. Members belong to the same homologous series.

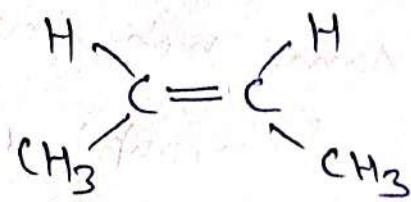


→ Geometrical isomerism (cis-Trans isomerism)

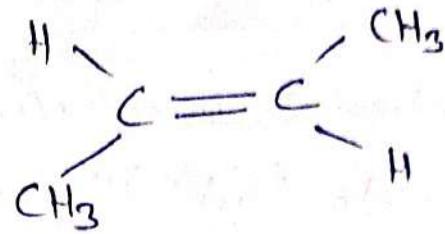
- Geometric isomerism (also called cis-trans isomerism) results from a restriction in rotation about double bonds, or about single bonds in cyclic compounds.
- The cis isomer is one in which two similar groups are on the same side of the double bond. The trans isomer is that in which two similar groups are on the

(4)

Opposite sides of the double bond.



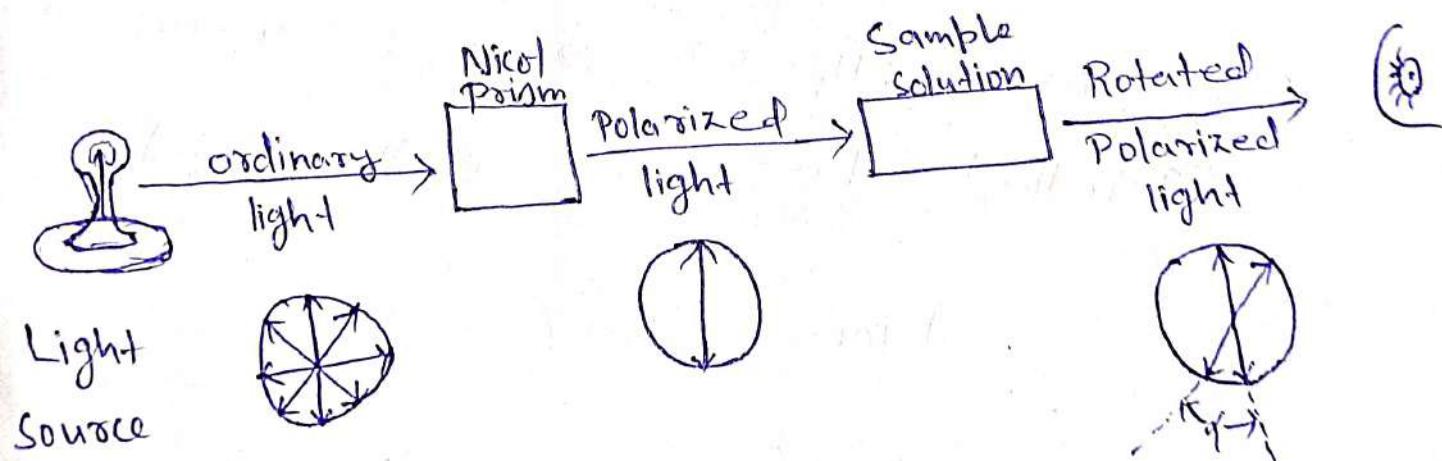
cis



trans

⇒ OPTICAL ACTIVITY

- Light from ordinary electric lamp is composed of waves vibrating in many different planes.
- Solutions of some organic compounds have the ability to rotate the plane of polarized light. These compounds are said to be optically active. This property of a compound is called optical activity.



Simple polarimeter in operation.

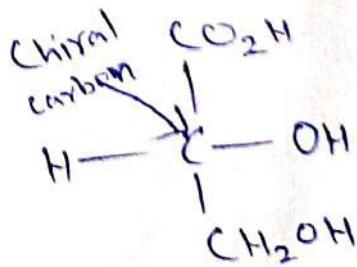
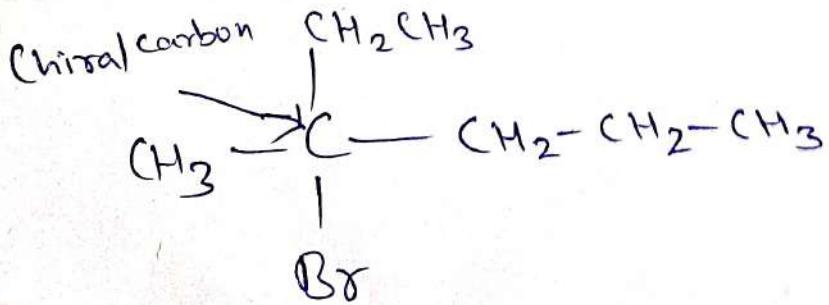
- Optical Activity in a compound is detected and measured by means of a Polarimeter. When a solution of a known concentration of an optically

Active material is placed in the polarimeter^(S)
 the beam of Polarized light is rotated through a certain number of degree, either to the right (clockwise) or to the left (anticlockwise). The compound which rotates the plane of Polarized light to the right (clockwise) is said to be Dextrorotatory, it is indicated by the sign (+). The compound which rotates the plane of Polarized light to the left (anticlockwise) is said to Levorotatory.

- ⇒ Chirality → A molecule is chiral if its two mirror-image forms are not superimposable in three dimension
 Chiral meaning "hand".
- Plane of Symmetry.
 • A Plane which divides an object into two symmetrical halves (BILATERAL) is said to be plane of symmetry.

Chiral Carbon Atom.

- A carbon atom which is bonded to four different groups is called a chiral (or Asymmetric) carbon atom. for example.



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The term chiral (Greek handedness, Pronoun-ed kairal) carbon atom means that a carbon atom is bonded to four different groups and that a molecule of this type lacks a Plane of Symmetry. Such a molecule is also called Dissymmetric or Asymmetric.

- Chirality most often occurs in molecules that contain a carbon that is attached to four different groups.