

## B. Sc. I

### NOTES

#### UNIT – 2 Stereochemistry of organic compounds : - - - - [5]

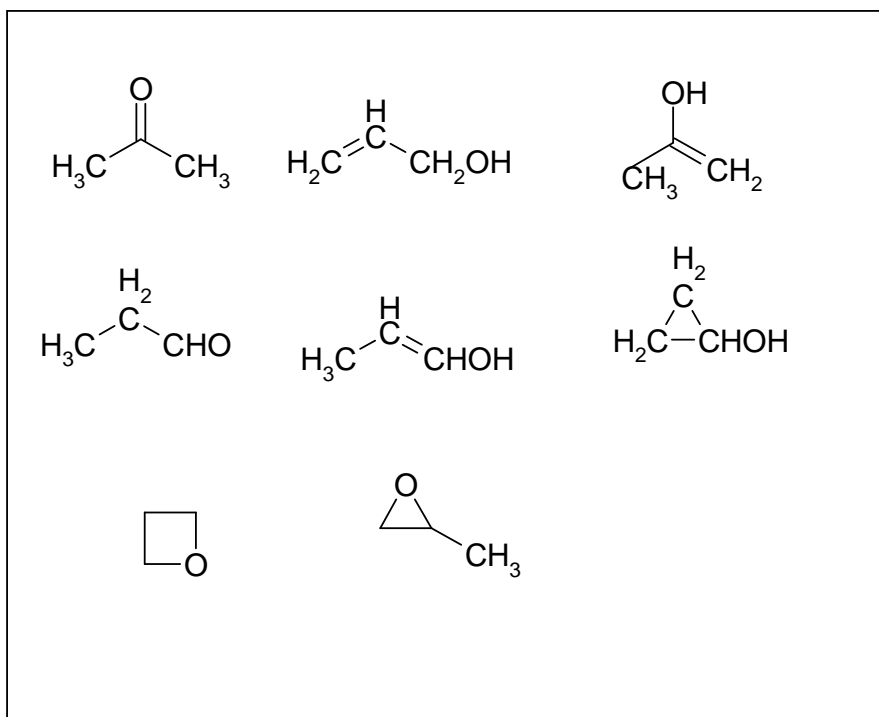
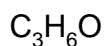
##### 2.1 Stereoisomerism – Introduction.

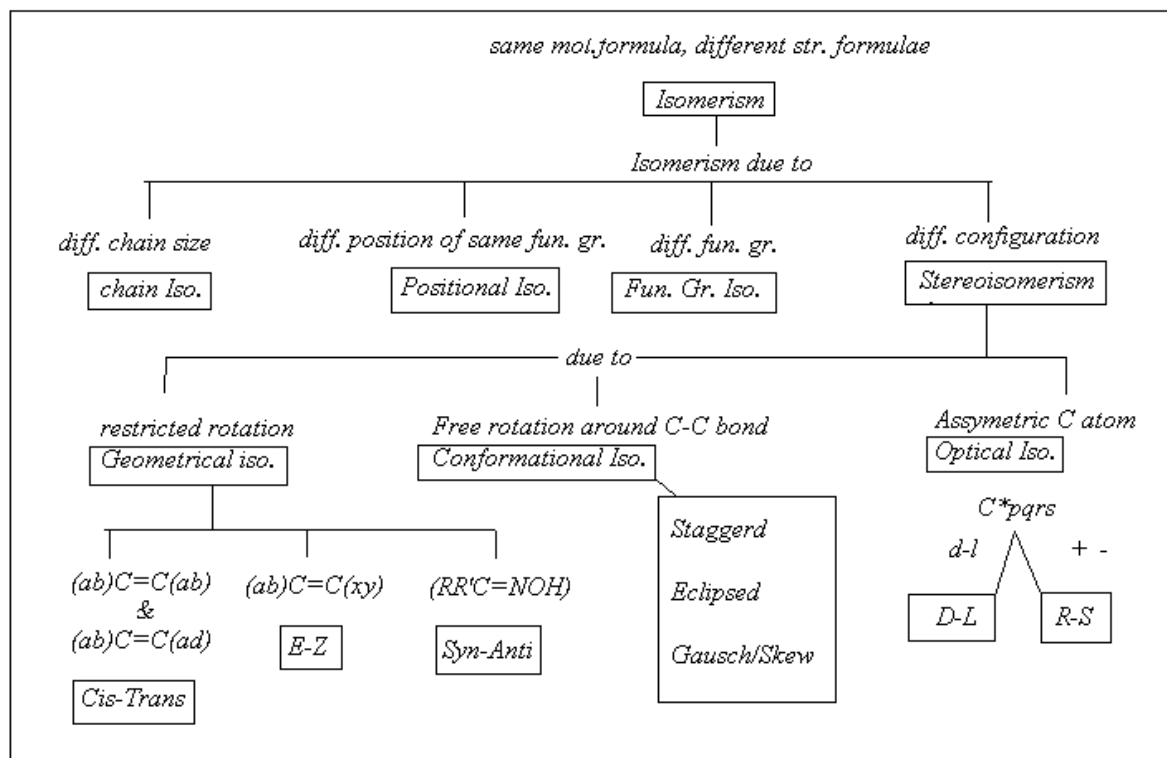
Introduction: Stereochemistry is a branch of chemistry which deals with the study of spatial arrangement of atoms in a molecule.

Stereoisomerism: The isomers have same molecular and structural formulae but different spatial arrangement of atoms or groups are called stereoisomers. The phenomenon is called stereoisomerism.

L-1: Exercise I, scheme I classification of Isomerism.

Q: draw the possible structures for the compound having molecular formula is  $C_3H_6O$



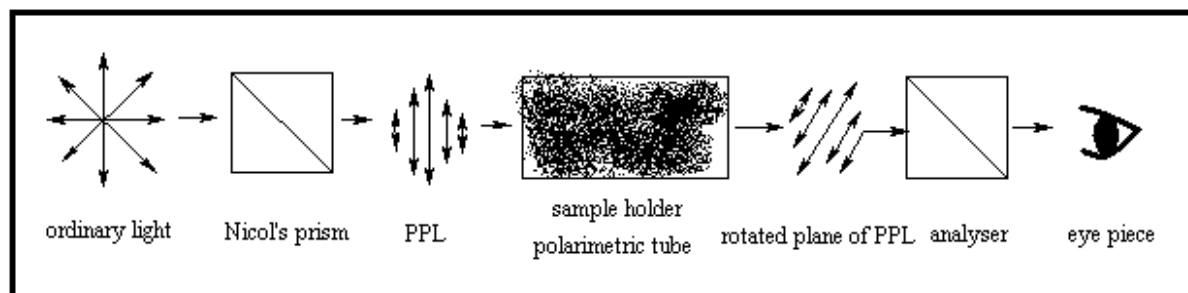


Types of stereoisomerism: Due to different configuration i.e. different arrangement of groups or atoms in space, as follows.

1. optical isomerism: due to asymmetric carbon atom
2. geometrical isomerism: due to restricted rotation
3. conformational isomerism: due to free rotation around C-C bond.

### 2.2 Optical isomerism –Introduction optical isomerism:

optical activity: ability to rotate the plane of plane polarized light (PPL)



Optical isomerism is affected by concentration, length of polarimeter tube, wavelength of PPL and temperature.

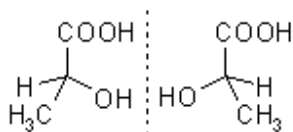
∴ specific rotation  $\alpha$  is given by  $[\alpha]_{\lambda}^t = \theta/l \times c$

$\theta$  = observed angle of rotation,  $l$  = length of polarimeter tube

$C$  concentration,  $t$  = temperature,  $\lambda$  = wavelength of light.

**Optical isomerism:** Organic compounds having asymmetric carbon atom are present in two different forms which are non super imposable mirror images of each other and rotate the plane of PPL to opposite directions with same angle of rotation are called optical isomers and the phenomenon is called optical isomerism.

Eg. lactic acid or 2-hydroxy propanoic acid which has one asymmetric carbon atom. [Asymmetric carbon atom: whose four valencies are satisfied by four different atoms or groups.] the possible number of stereo isomers is given by  $2^n$  where n is the number of asymmetric carbon atoms. Hence lactic acid can be shown by following two structures.



### D and L lactic acid

they are represented as d and l respectively. this is due to the asymmetric carbon atom present in the lactic acid which imparts the dissymmetry or chirality to the molecule, hence it is called as **chiral centre**.

Conditions for a compound to show Optical isomerism are

1. Presence of atleast one asymmetric carbon atom.
2. The molecule as a whole must not have any element of symmetry.

### 2.3 Elements of symmetry.

#### Elements of symmetry:

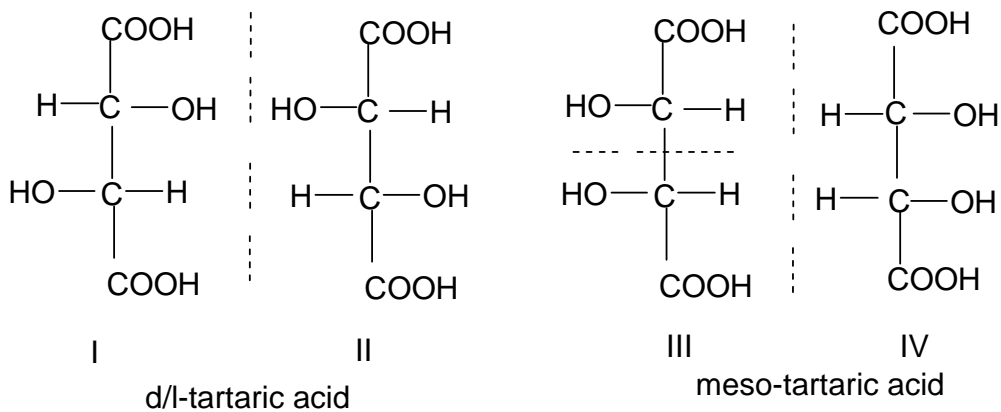
**Exercise:** write down alphabets and classify them into symmetric and unsymmetric ones.

symmetric and unsymmetric alphabets

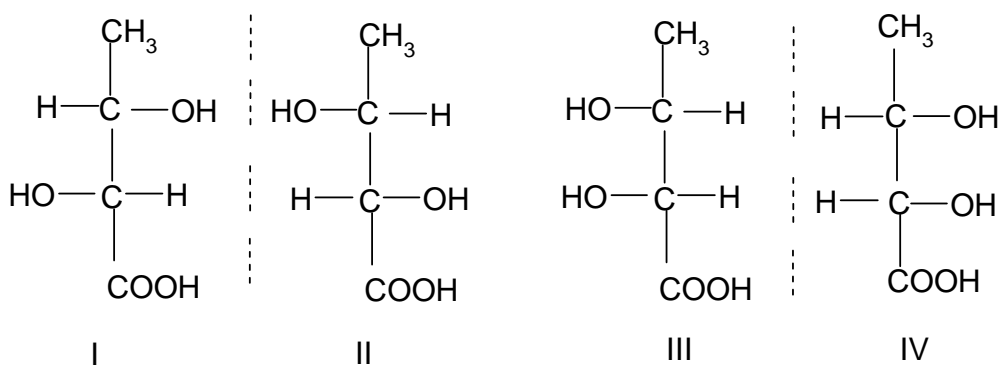
ABCDEFGHIKMNOSTUVVXYZ	FGJLPQR
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### 2.4 Chiral centre. (Explanation with lactic acid.)

### 2.5 Optical isomerism in tartaric acid and 2:3 dihydroxybutanoic acid.



### Stereoisomers of Tartaric acid



### Stereoisomers of 2,3-dihydroxy butanoic acid

2.6 Enantiomers and diastereoisomers.

2.7 Racemic modification.

2.8 Geometrical isomerism – Cause of geometrical isomerism.

2.9 Geometrical isomerism with respect to  $\text{C} = \text{C}$ ,  $-\text{C} = \text{N}$  – and alicyclic compounds (Introduction). Geometrical isomerism in maleic acid and fumaric acid.