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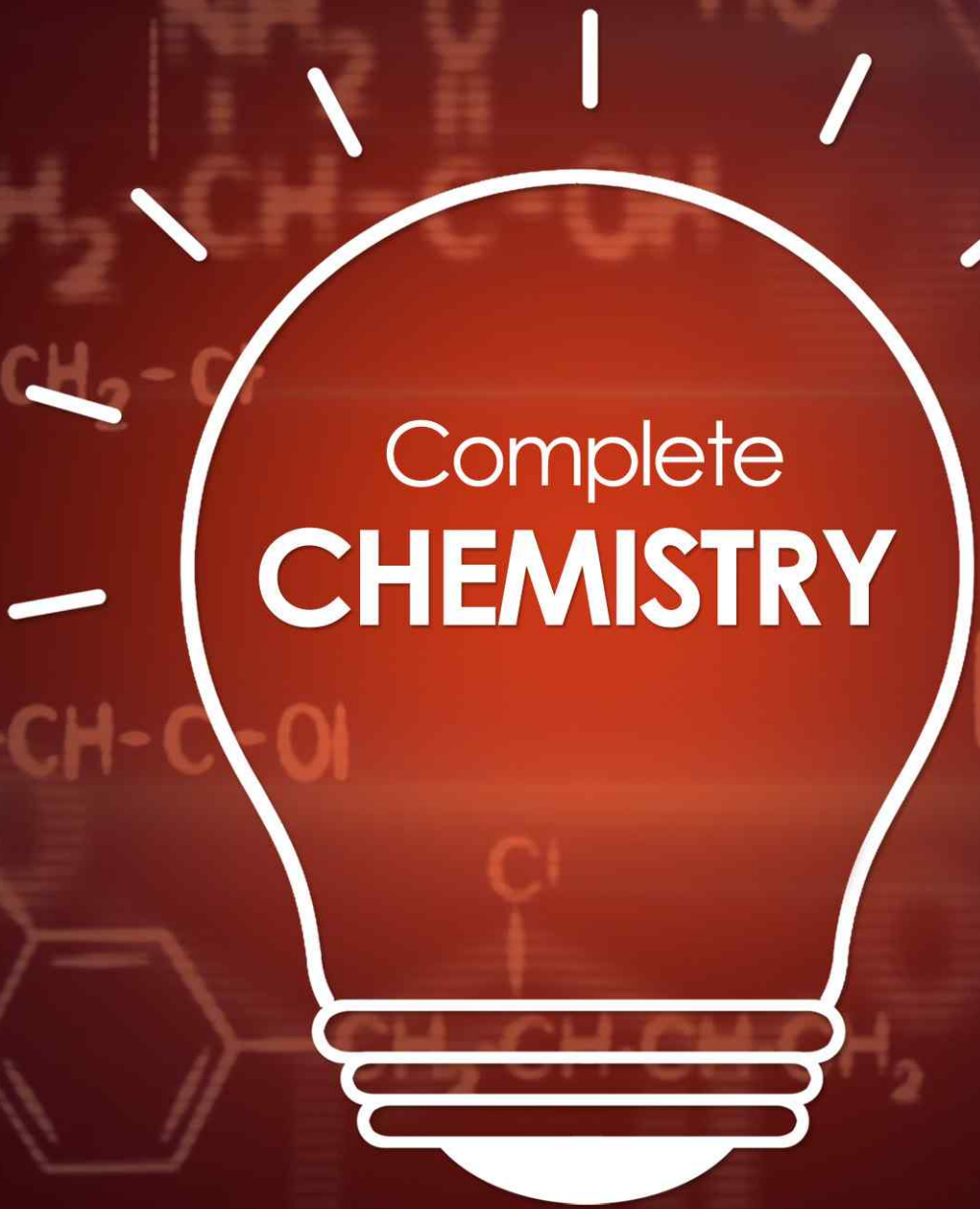

Complete CHEMISTRY

IIT-JEE · NEET · CBSE eBOOKS

CLASS 11&12th

CLASS 11th

Isomerism

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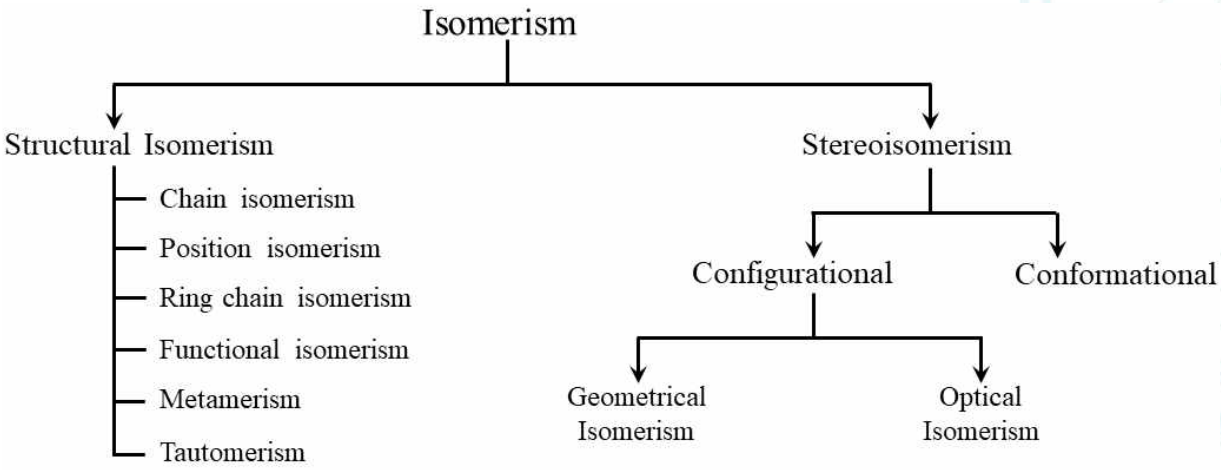
01. Introduction

The compound which have the same molecular formula but differ in physical and chemical properties are called as Isomer and the phenomenon is called Isomerism. The isomer was derived from Greek word meaning 'equal or like part' (isos = equal; meros = parts)

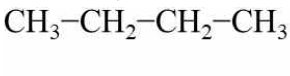


Structural isomerism/Constitutional isomerism

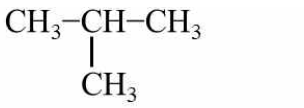
Structural isomers possess the same molecular formula but different connectivity of atoms. It is sub-classified into following types.

Chain Isomerism (Cl) :

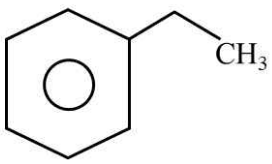
The compounds which have same molecular formula, same functional group, same position of functional group or multiple bond or substituent but different arrangement of carbon chain (main chain or side chain) show chain isomerism.



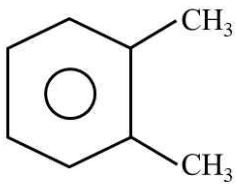
Butane(4C)



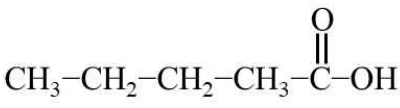
2-Methyl propane(3C)



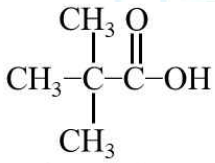
Ethyl benzene



O-Xylene



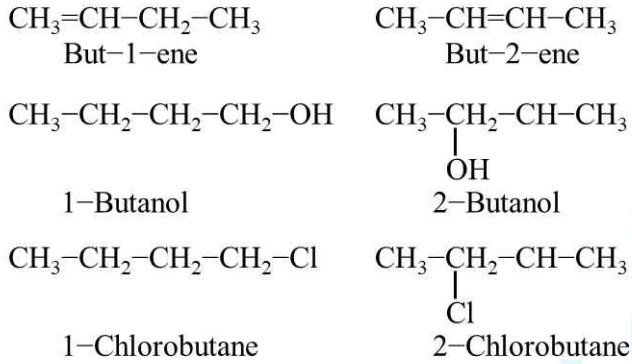
Pentanoic acid



2,2-Dimethyl propanoic acid

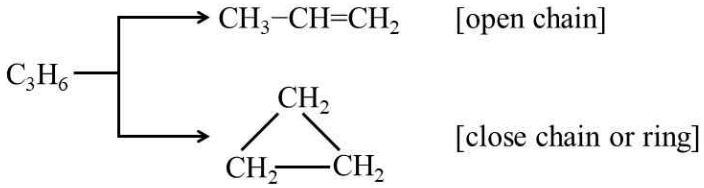
Position Isomerism (PI) :

The compounds which have same molecular formula, same functional group, same parent carbon chain but different position of functional group or multiple bond or substituents, show position isomerism.



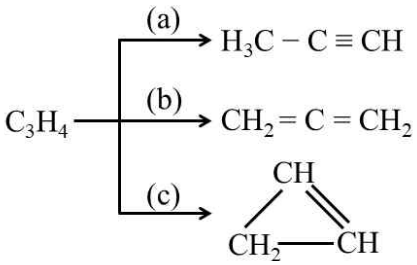
Ring chain isomerism (RCI) :

Same molecular formula but different mode of linking (open chain or closed chain) of carbon atoms.



They have same molecular formula so they are Ring chain isomers.

Example : Relate a,b and c :-



Solution a–b → Functional Isomers

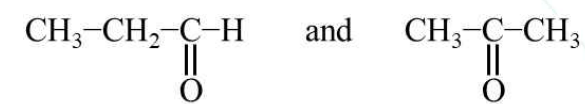
a–c , b–c → Ring-chain Isomers, Functional Isomers

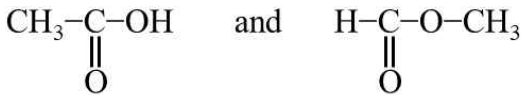
Functional Isomerism :

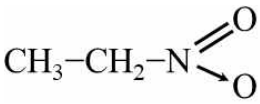
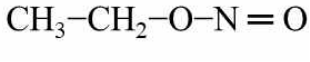
Same molecular formula but different functional groups.

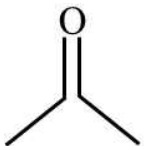
Following compounds show Functional isomerism, as they have same molecular formula and different functional group.

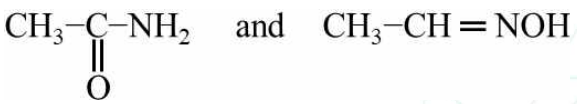
(i) Alcohol and ether → $CH_3—CH_2—OH$ and $CH_3—O—CH_3$

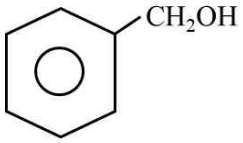
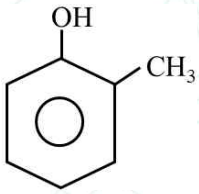
(ii) Aldehydes and ketones → 

(iii) Acids and ester → 

(iv) Nitro and Nitrite →  and 

(v) Carbonyl compound & unsaturated alcohol →  and 

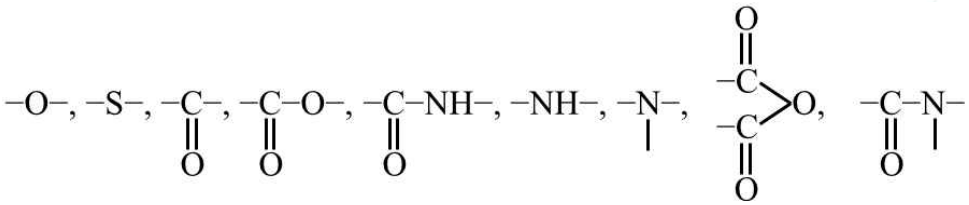
(vi) Amide and Oxime → 

(vii) Alcoholic and phenolic compounds →  and 

Metamerism :

Same molecular formula, same polyvalent Functional group but different alkyl groups attached to polyvalent Functional group.

Polyvalent Functional group [More than one valency] are :



Example

(i) $CH_3-O-CH_2-CH_2-CH_3$; $CH_3-CH_2-O-CH_2-CH_3$
Both are metamers.

(ii) $CH_3-CH_2-NH-CH_2-CH_3$; $CH_3-NH-CH_2-CH_2-CH_3$
N−Ethyl ethanamine N−Methyl propanamine
They are only metamers not Cl

(iii) $CH_3-CH_2-NH-CH_2-CH_3$; $CH_3-NH-CH_2-CH_2-CH_3$
N−Ethyl ethanamine N−Methyl propanamine
They are only metamers not Cl

Tautomerism

Tautomerism and Desmotropism

Tautomerism was introduced by "Laar". It's also called desmotropism.

- Desmotroism means bond turning. [Desmos = Bond ; Tropos = Turn]
- Tautomers have same molecular formula but different structural formula due to wandering nature of active hydrogen between two atoms.
- The tautomerism is also called **kryptomerism or allotropism or desmotropism or dynamic isomerism.**