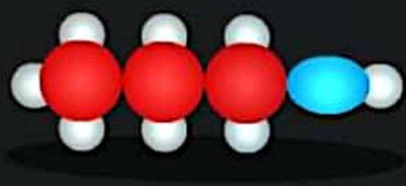
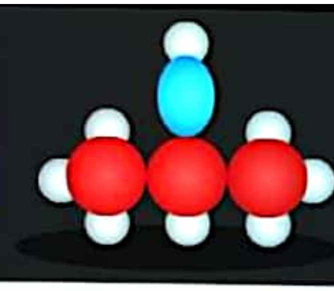


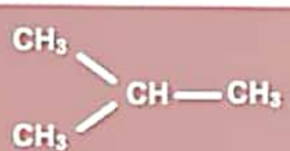
TYPES OF STRUCTURAL ISOMERISM



CHAIN ISOMERISM

$CH_3 - CH_2 - CH_2 - CH_3$

Butane



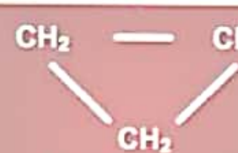
Isobutane

Same molecular formula, difference in arrangement. Chain of minimum 4 carbons is necessary.

RING CHAIN ISOMERISM

$CH_3 - CH = CH_2$

Propene



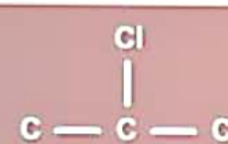
Cyclopropane

Mode of chain formation differs in open and close chain formation.

POSITION ISOMERISM

C — C — C — Cl

1 - Chloropropane



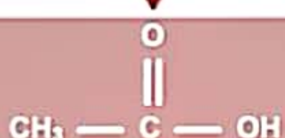
2 - Chloropropane

Same molecular formula, difference in the position of either the functional group or the multiple bond or the branched chain.

FUNCTIONAL ISOMERISM

Ester

functional isomer



Carboxylic acid

Same molecular formula but different in functional group. Other two functional group Isomers

Alcohol & Ether.

- Aldehydes & Ketones.

METAMERISM

$CH_3 - O - CH_2 - CH_2 - CH_3$

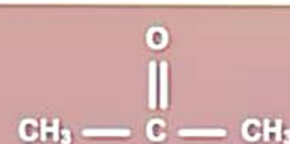
Methyl propyl ether

$CH_3 - CH_2 - O - CH_2 - CH_3$

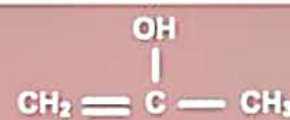
Diethyl ether

Compound having same molecular formula but differ from the nature of alkyl group directly attached with polyvalent atom or polyvalent functional group.

TAUTOMERISM



Dimethyl ketone



Prop - 1 - en - 2 - ol

Compound having same molecular formula but different due to oscillation of an atom (usually H^+) are known as tautomers.

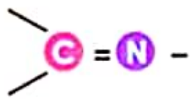
GEOMETRICAL ISOMERISM

PART-I

Isomers which possess the same molecular and structural formula but differ in the arrangement of atoms or groups in space due to restricted rotation are known as **geometrical isomers** and the phenomenon is known as **geometrical isomerism**.

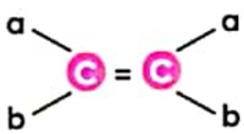
CONDITION OF GEOMETRICAL ISOMERISM

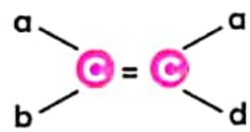
PRESENCE OF A DOUBLE BOND OR A RING STRUCTURE

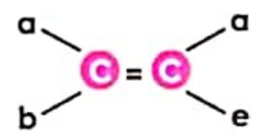


-N = N - or ring structure

DIFFERENT GROUPS SHOULD BE ATTACHED AT EACH DOUBLY BONDED ATOM







CONFIGURATIONAL NOMENCLATURE IN GEOMETRICAL ISOMERISM

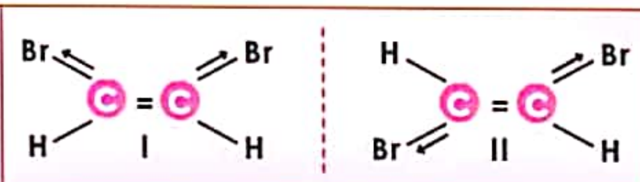
Configuration	Criteria	Remarks
cis / trans	Similarity of groups	If the two similar groups are on same side of **restricted bond**, the configuration is cis otherwise trans.
E/Z	Seniority of groups	If the two senior groups are on same side of restricted bond, the configuration is **Z (Z = zusammen = together)** otherwise **E (E = entgegen = opposite)**.

NUMBER OF GEOMETRICAL ISOMERS

Number of geometrical isomers can be found by calculating the number of **stereocentres** in the compound. **Stereocentre** is defined as an atom or bond bearing groups of such nature that an interchange of any two group will produce a **stereoisomer**.

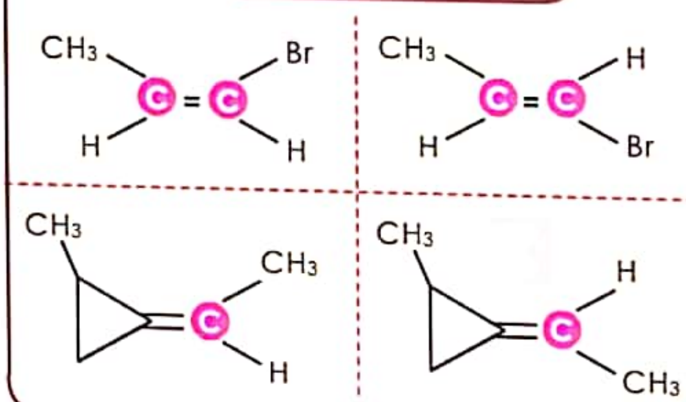
Nature of compound	No. of G.I. (n = no. of stereocentres)	Example	No. of Isomers
Compound with dissimilar ends	2^n	$CH_3-CH=CH-CH=CH-C_2H_5$	4
Compound with similar ends with even stereocentres	$2^{n+1} + 2^{\frac{n}{2}-1}$	$CH_3-CH=CH-CH=CH-CH_3$	3
Compound with similar ends with odd stereocentres	$2^{n-1} + 2^{\frac{n-1}{2}}$	$CH_3-CH=CH-CH=CH-CH=CH-CH_3$	6

PHYSICAL PROPERTIES OF GEOMETRICAL ISOMERS

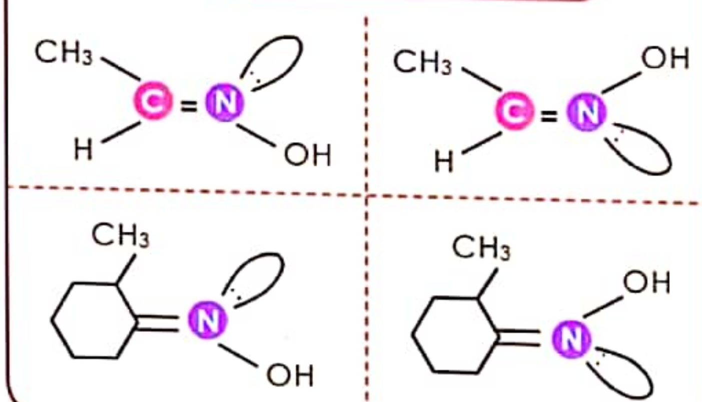
Physical properties		Example
Dipole moment	I > II	Only **cis – isomer** has dipole
Boiling point	I > II	High **boiling point** due to larger intermoleculer force of attraction
Solubility **(in H_2O)**	I > II	Polar molecules are more soluble in **H_2O**
Melting point	I < II	More **symmetric isomers**, higher melting points
Stability	I < II	More **vander waal strain**, less stable molecule

EXAMPLES OF GEOMETRICAL ISOMERS

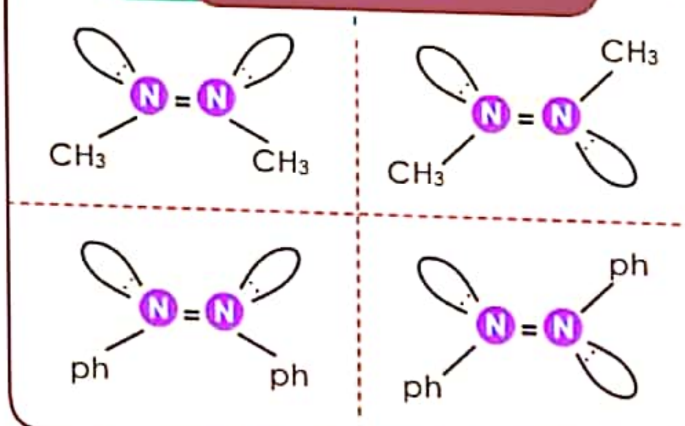
01 Along C = C bond



02 Along C = N – bond



03 Along – N = N – bond



04 Along σ bond of cycloalkane