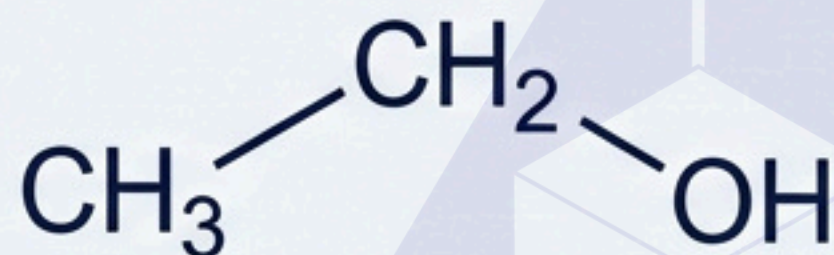


The Isomerism Paradox: Same Formula, Different Compounds

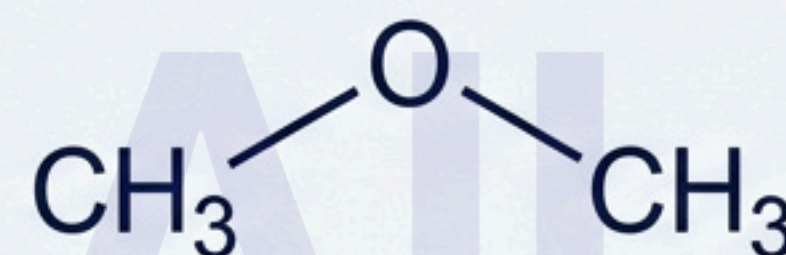
Ethanol



- Contains the alcohol (–OH) functional group.
- Liquid at room temperature.
- Acts as a central solvent and reagent.



Dimethyl Ether



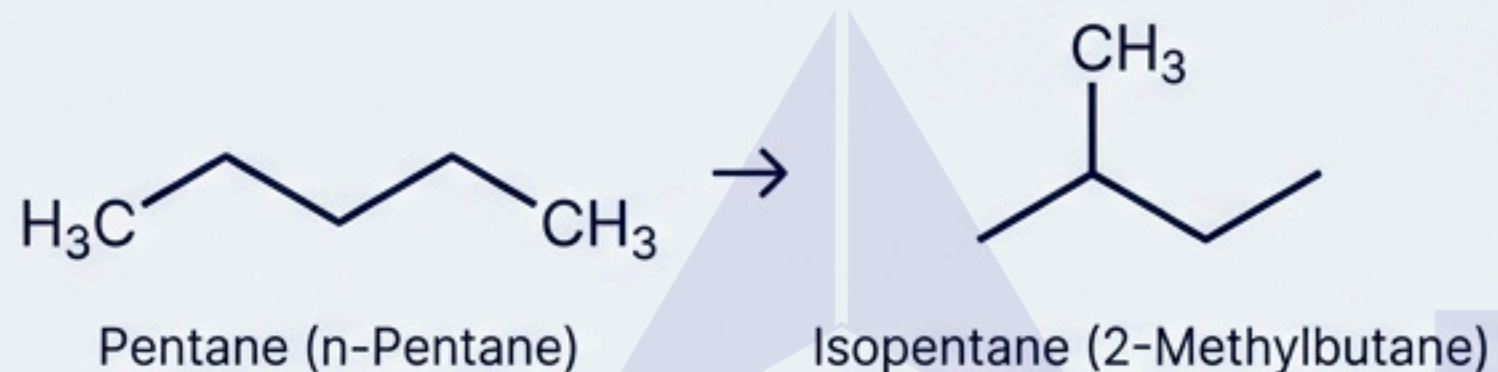
- Contains the ether (–O–) functional group.
- Gas at room temperature.
- Fundamentally different chemical reactivity.

Core Definition: Isomers are two or more compounds possessing the identical molecular formula but exhibiting completely different physical or chemical properties due to distinct structural or spatial arrangements.

Structural Isomerism: Rewiring the Carbon Skeleton

Chain Isomerism

Differing carbon skeleton lengths.



Formula: C₅H₁₂

Functional Group Isomerism

Differing functional groups despite the same atomic ingredients.



Formula: C₃H₆O

Position Isomerism

Differing location of a functional group or substituent on the main chain.



Formula: C₃H₈O

Metamerism

Differing alkyl chains distributed on either side of a polyvalent functional group.



Formula: C₄H₁₀O



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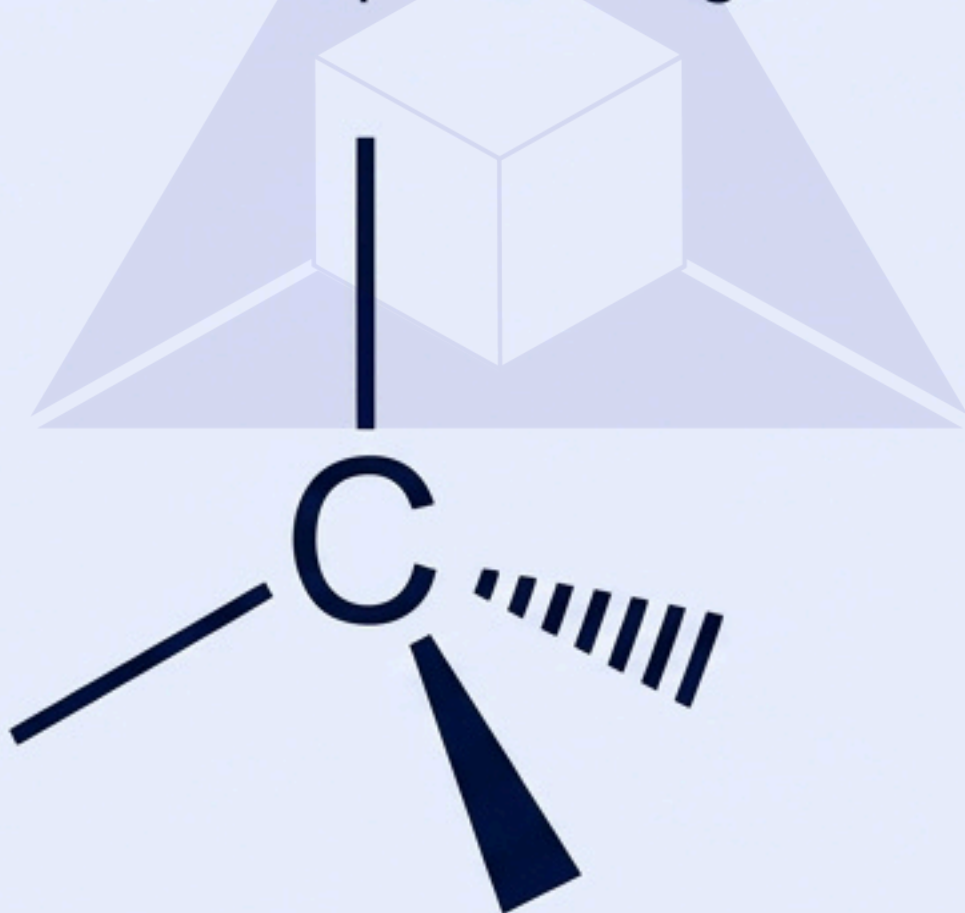
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Stereoisomerism: Same Links, Different 3D Space

The constitution and sequence of covalent bonds remain strictly identical. Only the relative positioning of atoms and groups in three-dimensional space changes.



Geometrical Isomerism

Spatial arrangements restricted by double bonds or ring structures.

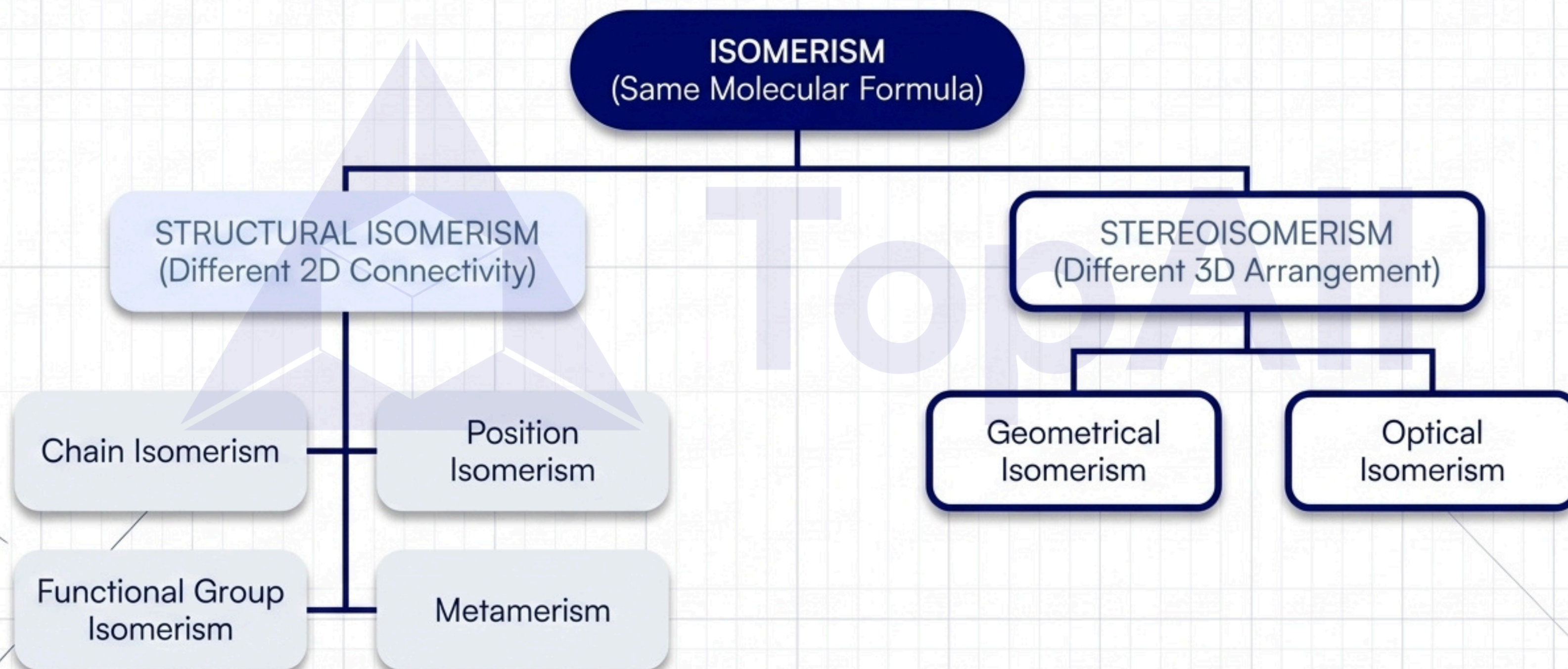
Identifies cis (same side) versus trans (opposite side) configurations.

Optical Isomerism

Molecules featuring chiral centers that result in non-superimposable mirror images.

Like left and right hands, they share connectivity but cannot be perfectly overlapped in 3D space.

The Complete Isomerism Classification Framework



Revision Frame: Quick Diagnostic Matrix

Isomer Type	The Key Differentiator (Diagnostic Question)	Classic JEE Formula Anchor
Chain	Does the main carbon skeleton length change?	C_5H_{12} (Pentane derivatives)
Position	Does the location number of the functional group/substituent change?	C_3H_8O (Propanol derivatives)
Functional	Does the actual chemical class (e.g., alcohol vs. ether) change?	C_3H_6O (Propanone/Propanal)
Metamerism	Do the alkyl group sizes on either side of a central heteroatom ($-O-$, $-S-$) change?	$C_4H_{10}O$ (Ethers)
Stereo	Is connectivity identical, with only the 3D wedge/dash spatial orientation changing?	Molecules with $>C=C<$ or chiral centers

 Screenshot this frame for quick reference and diagnostic recall during problem-solving.



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