

Isomerism

Empirical, molecular and structural formulae

An empirical formula indicates the simplest ratio of the elements in a compound, without indicating how many of them there are or how they are combined.

A molecular formula gives the number of each type of element present in one molecule.

A structural formula shows the relative positions of the atoms and the bonds between them.

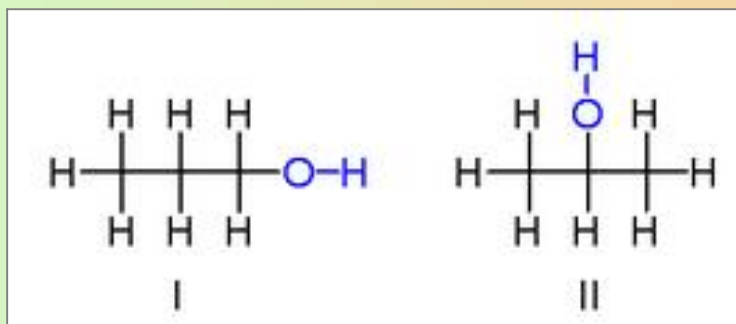
For example, for ethanoic (acetic) acid, the empirical formula is CH_2O , the molecular formula is $\text{C}_2\text{H}_4\text{O}_2$, and the structural formula is CH_3COOH .

Isomerism

Structural Isomerism

Compounds that have the same molecular formula but different structural formulae, are called structural **isomers**.

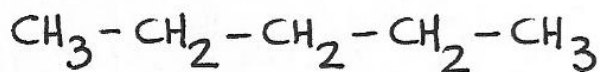
A simple example of **isomerism** is given by propanol: it has the formula C_3H_8O (or C_3H_7OH) and occurs as two isomers: propan-1-ol and propan-2-ol.



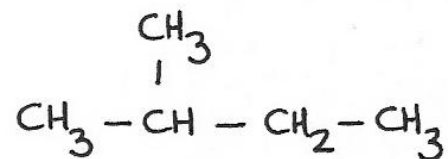
Isomerism

Structural Isomerism: chain isomers

Structural isomers with different arrangement of the carbon skeleton are often called **chain isomers**.



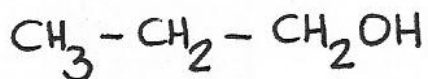
pentane



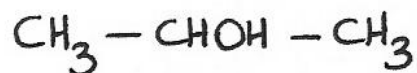
2-methylbutane

Structural Isomerism: positional isomers

Structural isomers with functional groups in a different position of the chain are called **positional isomers**.



propan-1-ol

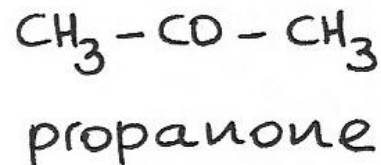
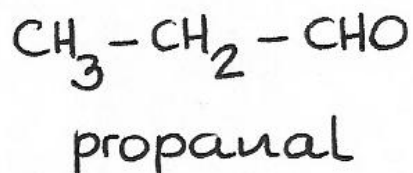


propan-2-ol

Isomerism

Structural Isomerism: chain isomers

Structural isomers with different functional groups are called **functional group isomers**.



Geometric Isomerism: cis-trans isomers

The groups around a double bond are fixed and cannot rotate with respect to each other. Cis means the same side and trans means opposite sides.

