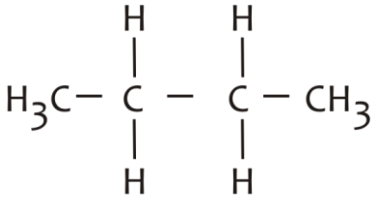
INTRODUCTION TO ISOMERISM

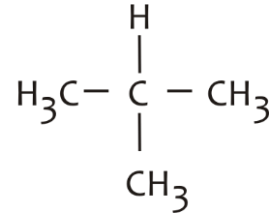
Stereochemistry is the study of structure in three dimensions. Isomerism is a stereochemical concept.

If we study the structural formula of butane or other higher hydrocarbons of the alkane series, we will observe that it is possible to arrange the atoms in the molecule in more than one way. This means that it is possible to have two or more different structural arrangements for the same molecular formula. For example, butane can be



Butane

or



2-methyl propane

(isobutane)

This would mean that there are two (2) compounds with the molecular formula, C_4H_{10}. This has been supported by experimental evidence which shows that there are two compounds with different physical properties (e.g. the boiling point of one is 0.6°C, while that of the other is 12°C) but with the same molecular formula of C_4H_{10}. Such phenomenon is known as *Isomerism*.

Isomerism is the existence of two or more compounds (known as isomers) with the same molecular formula but different molecular structures.

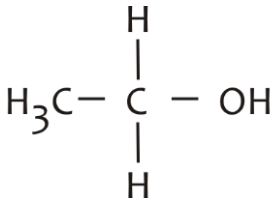
Isomerism is a very common feature in organic chemistry. As the number of carbon atoms in a molecule increases, the number of isomers also increases. For example, pentane C_5H_{12} has three possible isomers, while calculations show that there are 75 isomers for

decane $C_{10}H_{22}$ and up to 366319 isomer for eicosane, $C_{20}H_{42}$.

Generally, isomers with the same molecular formula and belonging to the same homologous series tend to have similar chemical properties (as they have the same functional group), but slightly different physical properties as a result of their structural differences.

However, it is also possible to have isomers with the same molecular formula but belonging to different homologous series. For example, both ethane and methoxymethane (dimethyl ether) have the same molecular formula of C_2H_5OH, but belong to the alkanol and ether series respectively. Such isomers usually have different physical as well as chemical properties because of their different structural formulae and functional

groups respectively. Thus, ethanol is a liquid at room temperature and it reacts readily with phosphorus (V) chloride due to the presence of the hydroxyl group, –OH. Methoxymethane, which has a lower boiling point exists as a vapour at room temperature and does not react with phosphorus (V) chloride due to the absence of the hydroxyl group.



Ethanol



Methoxymethane

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