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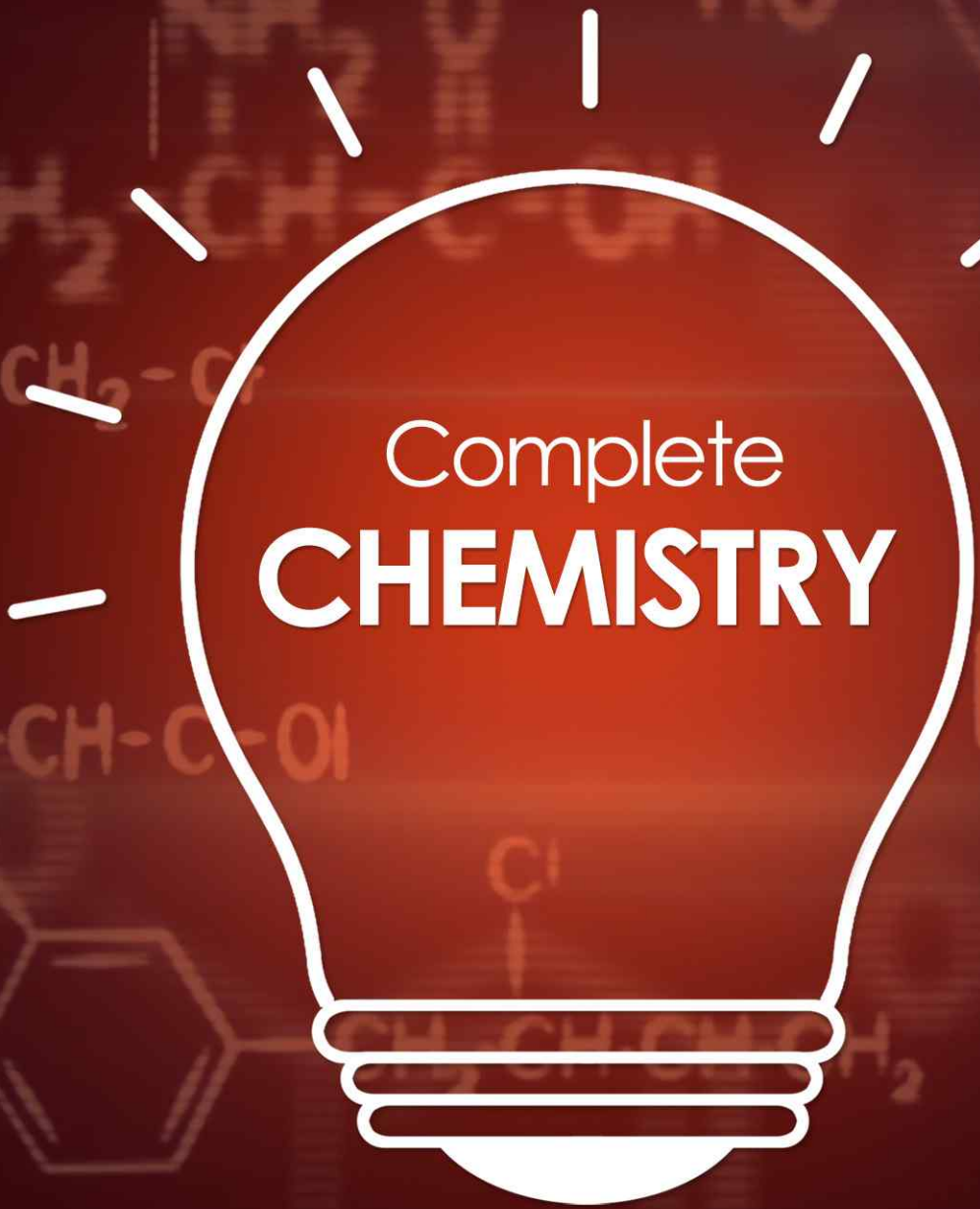


# Complete CHEMISTRY

## IIT-JEE · NEET · CBSE eBOOKS

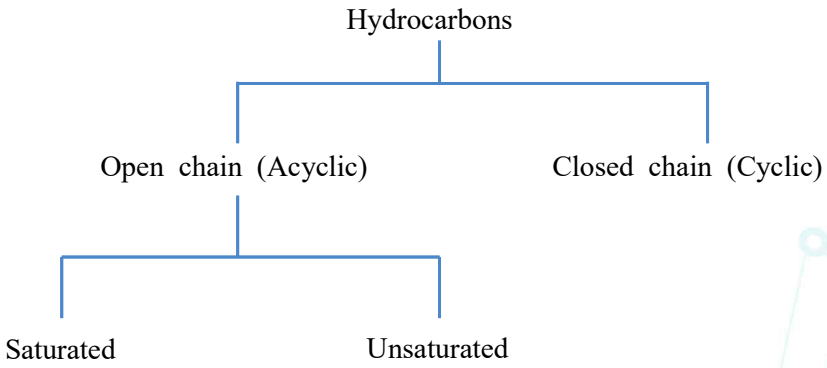
CLASS 11&12th

CLASS 11th

# Hydrocarbons

## 01. Introduction

Organic compounds composed of only carbon and hydrogen are called hydrocarbons.




## 02. Saturated Hydrocarbons

These constitute a homologous series having general formula $C_nH_{2n+2}$ ($n$ may have value 1,2,3,4 ....).

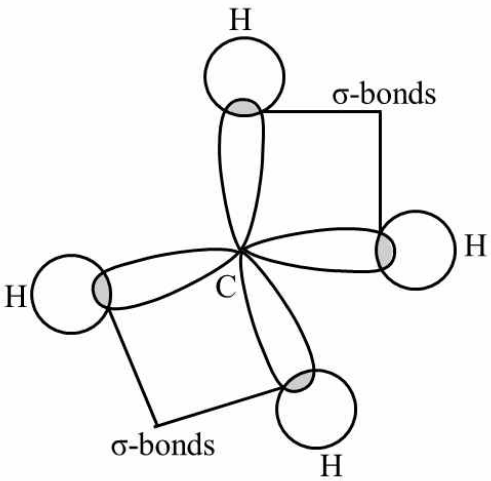
The saturated hydrocarbons are called **paraffins** (Latin: parum= little; affinity= affinity) as they are relatively inert toward chemical reagents. In IUPAC nomenclature, paraffins are termed alkanes. Alkanes have following structural characteristics,

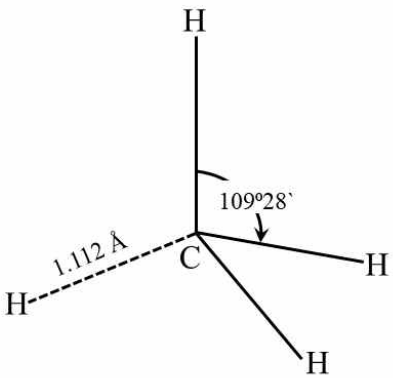
(i) Every carbon atoms is $Sp^3$ hybridized, its four bonding orbitals are directed toward the four corner of a regular tetrahedron.

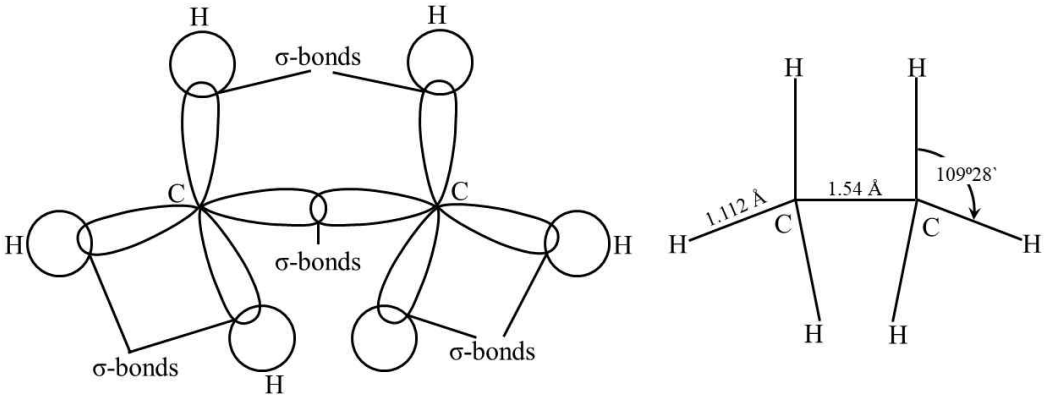
(ii) All the carbon-carbon and caron-hydrogen bonds are strong sigma The carbon-carbon bond is formed form the overlap of $Sp^3$ orbitals, one form each carbon atom. All carbon-hydrogen bonds result in overlap of $Sp^3$ hybrid oritals, one form each carbon, atom. All carbon-hydrogen bonds result in overlap of $Sp^3$ hybrid orbital from carbon and s-orbital form hydrogen.

(iii) The bond lengths between carbon-hydrogen are 1.54Å and 1.112Å respectively.

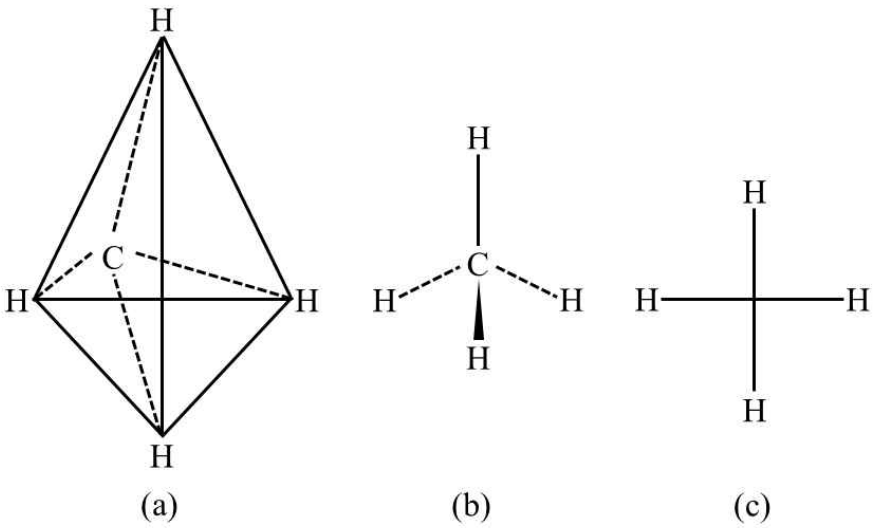
(iv) The bond angles in alkanes are tetrahedral angles having a value of 109.5° (109°28).



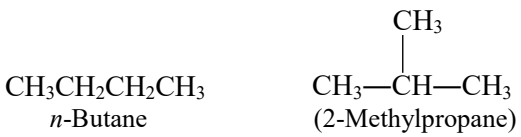



The structure of methane molecule can be represented by (a), (b) and (c).
Fig. (a) is the **tetrahedral structure** of methane in which.




**Structure Isomerism in alkanes**

Alkanes exhibit chain isomerism. The first three members, *viz*., methane, ethane and propane do not exhibit isomerism as they can be represented by only one structural formula.
Butane has two chain isomers.




With increase in the number of carbon atoms in the molecule, the number of chain isomers also increases.

| Alkane | $C_5H_{12}$ | $C_6H_{14}$ | $C_7H_{16}$ | $C_8H_{18}$ | $C_{10}H_{22}$ |
|---|---|---|---|---|---|
| No. of possible isomers | 3 | 5 | 9 | 18 | 75 |

Greater the branching greater the stability; so increasing order of stability is:
*n*-pentane < iso-pentane < neo-pentane;