

CHEMISTRY STUDY MATERIALS FOR CLASS 10

(Based on NCERT : Carbon and its compounds)

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Versatile Nature of Carbon

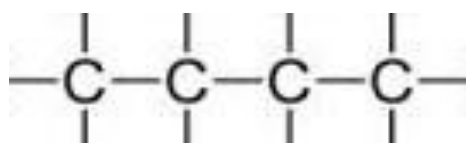
The two characteristic properties of the element carbon which leads to the formation of a very large number of organic compounds are:

- i. **Catenation:** The property of the element carbon due to which its atoms can join one another to form long carbon chains is called catenation.

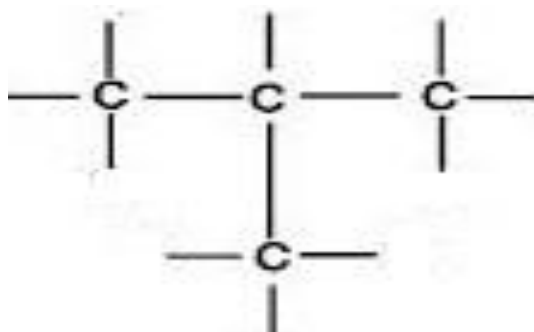
Types of Chains

- Straight chain
- Branched chains
- Closed or ring chains

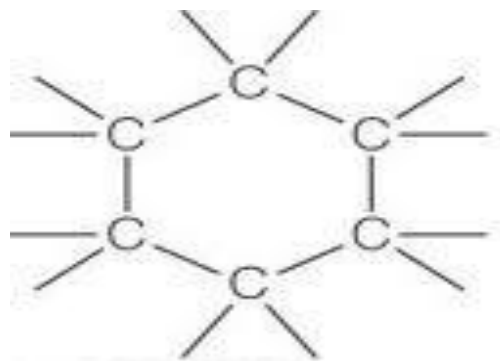
a. Straight chain of carbon atoms



b. Branched chain of carbon atoms



c. Closed or ring chain of carbon atoms

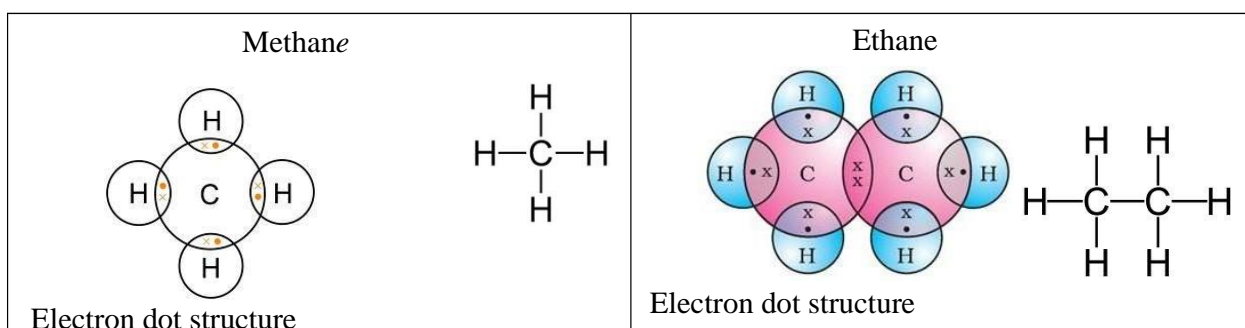


- ii. **Tetravalency:** Carbon has a valency of four. So, it is capable of bonding with four other atoms of carbon or atoms of some other monovalent element.

Compounds of carbon are formed with oxygen, nitrogen, hydrogen, sulphur, chlorine and many other elements, giving rise to compounds with specific properties which depend on the elements other than the carbon present in the molecule.

Classification of Hydrocarbons

- Hydrocarbons in which the carbon atoms are connected by only single bonds are called saturated hydrocarbons.
- Saturated hydrocarbons are called alkanes.
- General formula of alkanes: C_nH_{2n+2} , n = number of carbon atoms ($n = 1, 2, 3, 4, \dots$)
- Methane and ethane are saturated hydrocarbons, which contain only carbon-carbon single bonds.



Unsaturated Hydrocarbons (Alkenes and Alkynes)

- Hydrocarbons in which two carbon atoms are connected by a double or a triple bond are called unsaturated hydrocarbons.
- Unsaturated hydrocarbons are of two types
 - Alkenes
 - Alkynes

ALKENES

An unsaturated hydrocarbon in which two carbon atoms are connected by a double bond is called an alkene.

Alkenes contain the  group.

General formula: C_nH_{2n} , where n = number of carbon atoms

ALKYNES

An unsaturated hydrocarbon in which two carbon atoms are connected by a triple bond is called an alkyne.

An alkyne contains the $-C \equiv C-$ group.

General formula: C_nH_{2n-2} , where n = number of carbon atoms

Cyclic Hydrocarbons

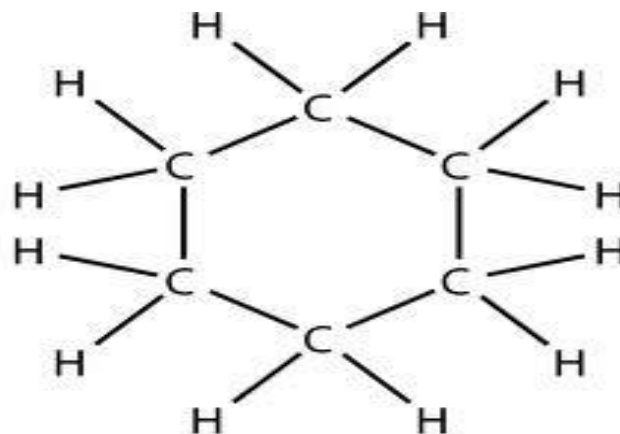
- Hydrocarbons in which the carbon atoms are arranged in the form of a ring are called cyclic hydrocarbons.
- Cyclic hydrocarbons may be saturated or unsaturated.

1. Saturated cyclic hydrocarbon

Cyclohexane is an example of a saturated cyclic hydrocarbon.

- Formula: C_6H_{12}

- Cyclohexane contains 6 carbon atoms arranged in a hexagonal ring, with each carbon atom attached to 2 hydrogen atoms.



2. Unsaturated cyclic hydrocarbon

- Benzene is an example of an unsaturated cyclic hydrocarbon.
- Formula: C_6H_6
- Benzene is made up of 6 carbon atoms and 6 hydrogen atoms.

