CHEMISTRY STUDY MATERIALS FOR CLASS 10
(NCERT Based notes of Chapter -04)

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CARBON AND ITS COMPOUND

VERSATILE NATURE OF CARBON

Initially, compounds of carbon could only be obtained from living sources and there was no way of synthesizing them. Hence, carbon compounds are also known as organic compounds. Carbon forms a large number of compounds. So far, formulae of about 3 million carbon compounds are known.

Cause of formation of such a large number of compounds by carbon:

- Carbon can form bonds with other carbon atoms. This property of carbon is known as CATENATION. Because of catenation, carbon can form a long chain; while making bond with other carbon atoms. Carbon can make single, double and triple bonds by catenation.
- Carbon can form branched chain; along with straight chain; while combining with carbon atoms, i.e. because of the property of catenation.
- Due to the valency of four, carbon is capable of bonding or pairing with four other carbon atoms or with the atoms of some other monovalent elements. It also forms compounds with oxygen, nitrogen, sulphur, hydrogen and many other elements. This gives rise to compounds with specific properties which depend on the element other than carbon present in the molecule.
- Bonds which carbon forms with other elements are very strong thus, making these compounds very stable. The main reason for such strong bond formation is the small size of carbon. As a result, the shared pair of electrons are tightly held by the nucleus.

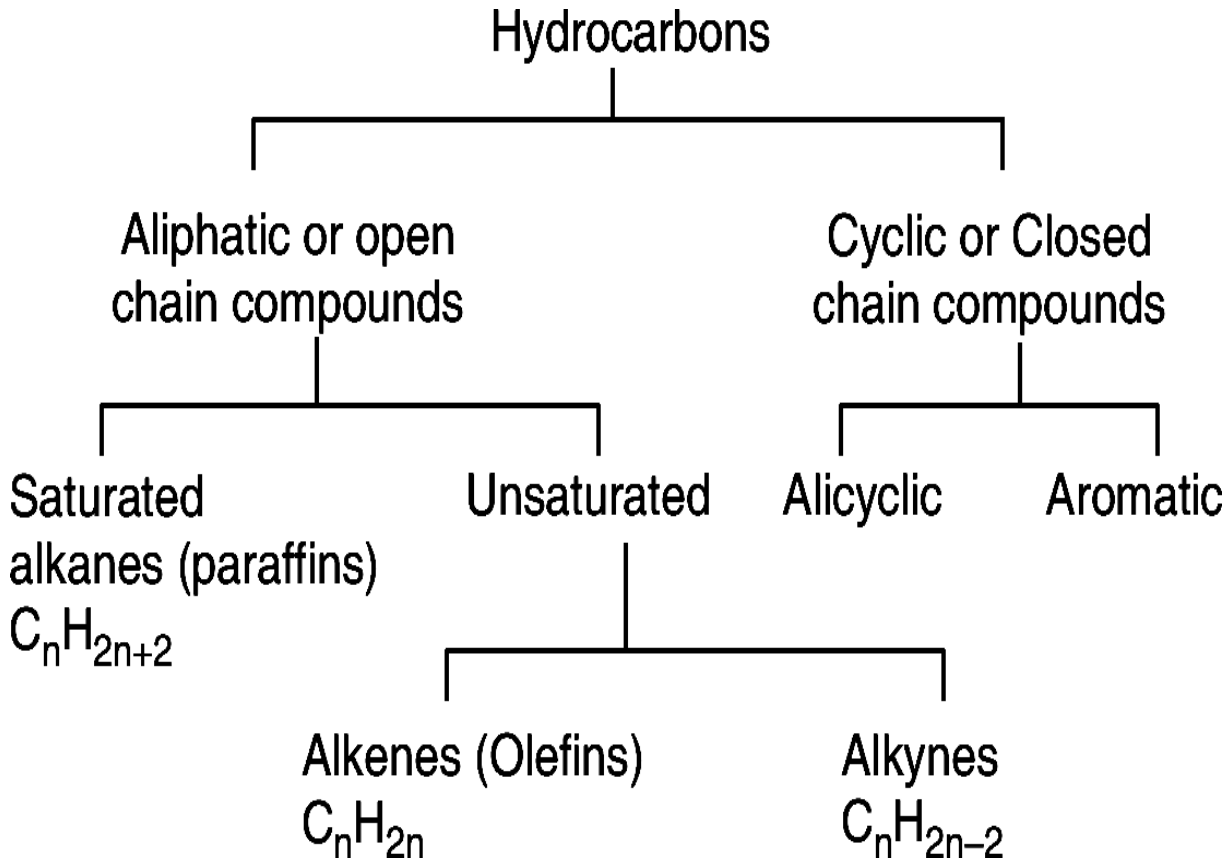
ORGANIC COMPOUNDS

The compounds of carbon except its oxides, carbonates and hydrogen carbonate salts, are known as ***organic compounds*.** These compounds were initially extracted from natural substances and were believed that some vital force was necessary for the synthesis of these compounds (vital force theory).

HYDROCARBONS

(Hydrogen + Carbon = Hydrocarbon) Compounds formed because of the combination of hydrogen and carbons are known as hydrocarbons. These are regarded as the **parent organic compounds** and all other compounds are considered to be derived from them by the replacement of one or more hydrogen atoms by other atoms or groups of atoms.

Hydrocarbons can be divided into various classes as shown in below:



ALIPHATIC HYDROCARBONS

The word aliphatic is derived from the Greek word aleiphar meaning fat. Aliphatic hydrocarbons were named so because they were derived from fats and oils. Hydrocarbons can be *acyclic* compounds, which are straight chain compounds, or cyclic compounds, which have rings of carbon atoms.

AROMATIC HYDROCARBONS

The word aromatic is derived from the word *aroma* meaning fragrance. The aromatic compounds have a characteristic smell. Structurally, they include benzene and its derivative.

The *aliphatic hydrocarbons* can be divided into two categories:

Saturated hydrocarbons and **unsaturated hydrocarbons**

In *saturated hydrocarbons*, carbon atoms are linked to each other by single bonds whereas in *unsaturated hydrocarbons*, multiple bond (double and triple bonds) are present between carbon atoms.

SATURATED HYDROCARBONS

Alkanes

General formula = C_nH_{2n+2} Suffix: ane

These are the organic compounds which contain carbon – carbon single bond.

These were earlier named as **paraffins** (Latin: meaning little affinity) due to their least chemical reactivity. According to IUPAC system, these are named as ***alkanes*** (ane is suffix with root word).

UNSATURATED HYDROCARBONS

These are hydrocarbons which contain carbon to carbon double bonds or carbon to carbon triple bonds in their molecules.

These are further classified into two types: *alkenes and alkynes*.

Alkenes: *General formula:* C_nH_{2n} *Suffix :* ene

The hydrocarbons containing at least one carbon to carbon double bond are called ***alkenes.*** They have the general formula C_nH_{2n} .These were previously called ***olefins*** (Greek: olefiant – oil forming) because the lower gaseous members of the family form oily products when treated with chlorine.

In IUPAC system, the name of alkene is derived by replacing suffix "**ane"** of the corresponding alkane by "**ene"**.

For example,

In higher alkenes, the position of the double bond can be indicated by assigning numbers 1, 2, 3, 4 … to the carbon atoms present in the molecule.

Alkene	Common name	IUPAC name
$CH_2 = CH_2$	Ethylene	Ethene
$CH_3CH = CH_2$	Propylene	Propene
$CH_3CH_2–CH=CH_2$	α-Butylene	But–1–ene
$CH_3CH = CHCH_3$	β-Butylene	But–2–ene

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