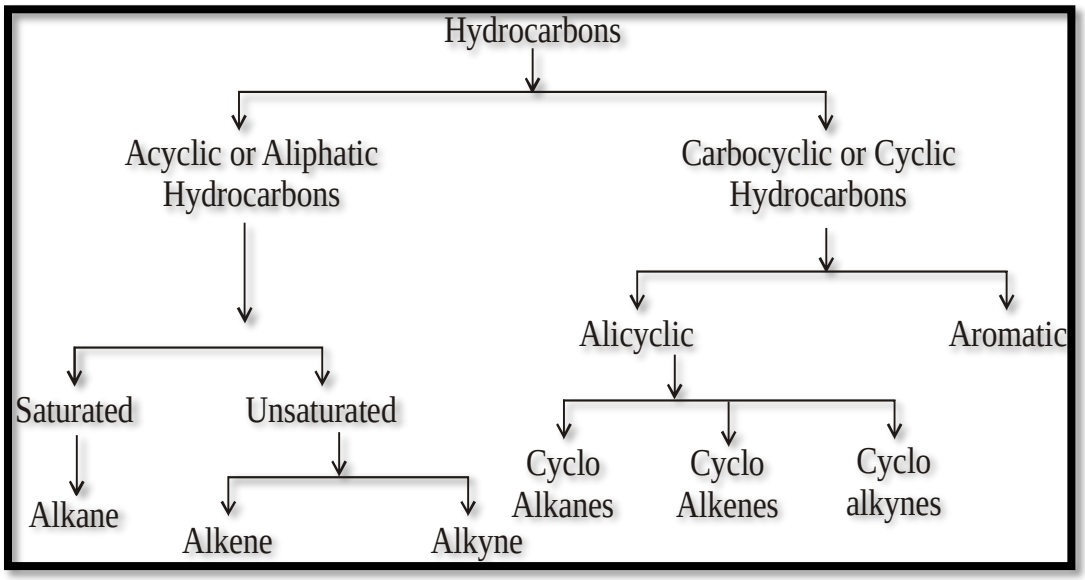
Chemistry
Carbon & its Compounds
Hydrocarbons

❖ CLASSIFICATION OF ORGANIC COMPOUNDS



➢ HYDROCARBONS

Compounds made up of carbon and hydrogen are called hydrocarbons and all other compounds may be regarded to have been derived from them by replacement of one or more of their hydrogen atoms by other atom or group of atoms. These can be divide into two parts:

(a) Saturated Hydrocarbon: Compounds of carbon which have only single bonds between carbon atoms are called saturated compounds. These are also known as alkanes. Example- ethane, propane, methane etc. General formula for alkane is C_nH_{2n+2}.

(b) Unsaturated Hydrocarbon: Compounds of carbon which contain one or more double or triple bonds between C-C atoms are called unsaturated compounds. These compounds can be further divide into two parts:

(i) Alkene: If there is atleast one double bond between (C = C) such hydrocarbons are known as alkenes. Example of alkenes are Ethene (ethylene), Butene, Propene etc. General formula of alkene is C_nH_{2n}

(ii) Alkyne: If there is atleast one triple bond between (CC) such hydrocarbons are known as alkynes. Example of alkynes are Ethyne (acetylene), Butyne, Propyne etc. Alkynes are represented as C_nH_{2n-2}

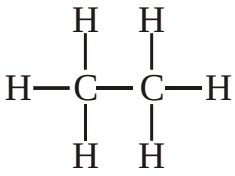
Where n is the number of carbon atoms.

➢ **Open Chain Compound (Acyclic Compounds) and closed Chain (Cyclic Compounds) :**

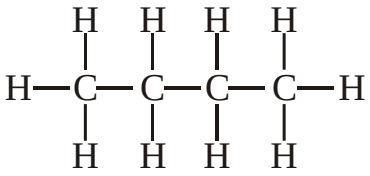
- **Open Chain Compounds:** The organic compounds in which the carbon atoms are linked to each other in such a manner that the molecules having an open chain structure are called **open chain** or **acyclic** or **aliphatic compound.**

This may be of two types **straight chain** and **Branched chain** compound.

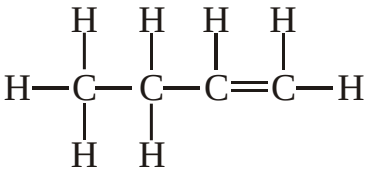
(i) Straight Chain:



Ethane (C_2H_6)

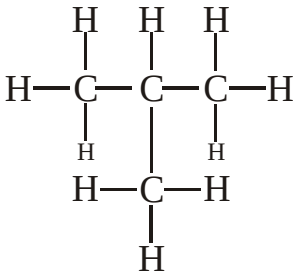


Propane (C_3H_8)



Butene (C_4H_8)

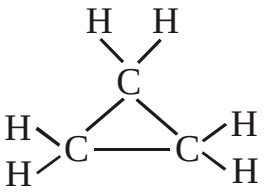
(ii) Branched Chain :



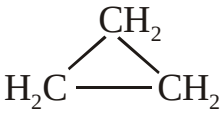
(2-methyl propane) or C_4H_{10} (Iso butane)

- **Closed Chain or Cyclic Compounds:** Compounds of carbon in, which carbon atoms are arranged in a ring are called **cylic compounds**.

(a) Alicyclic Compounds : These compounds contain ring of three or more carbon atoms and resemble aliphatic compounds in characteristics. For example, cyclopropane (C_3H_6) can have the following ring structures which are all basically same but differ in presentation.



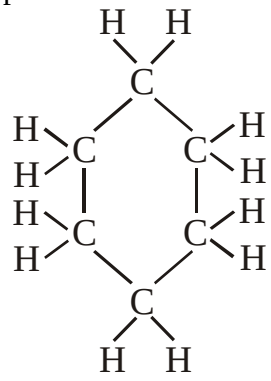
(Structural formula)



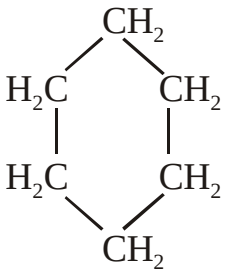
or (Condensed formula) or

(Bond line notation)

Cyclohexane (C_6H_{12}) another organic compound can be represented as follows :



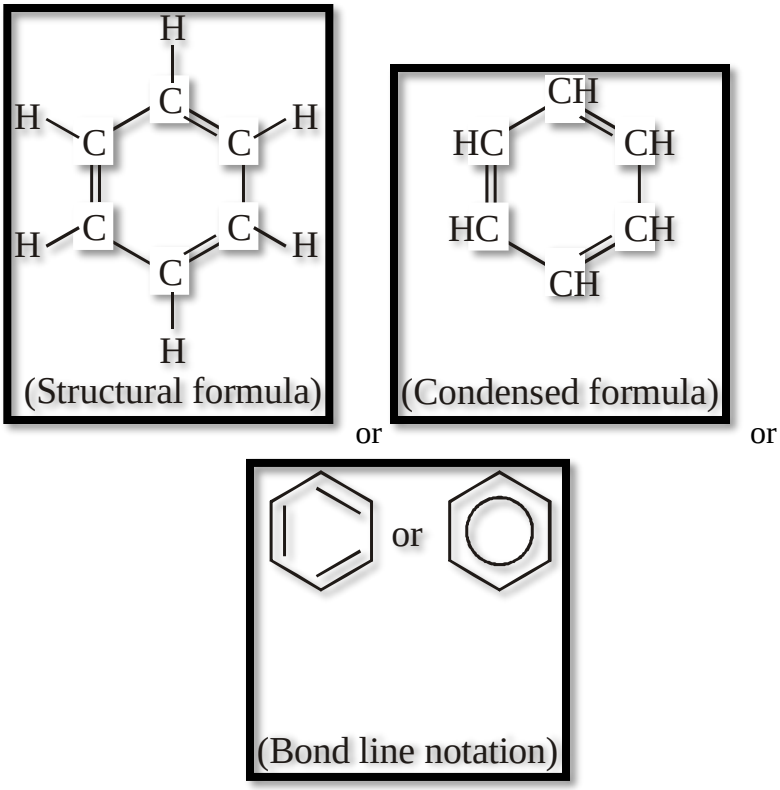
(Structural formula)



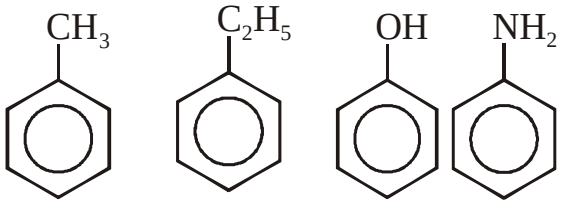
or (Condensed formula) or

(Bond line notation)

(b) Aromatic Compounds: Aromatic compounds are the cyclic compounds which contain in them one or more hexagonal rings of carbon atoms with three double bonds in the alternate positions. This is known as benzene ring.



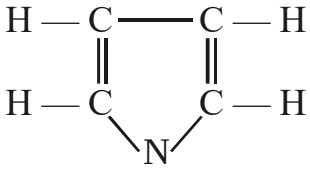
These compounds are mostly represented by bond line notation. A few more example of the aromatic compounds are :



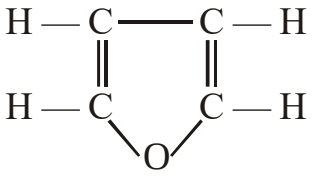
Toluene Ethylbenzene Phenol Aniline

(c) Heterocyclic compounds: Both alicyclic and aromatic compounds have rings of carbon atoms only. These are therefore, homocyclic in nature. In heterocyclic compounds, the ring may contain one or more atoms of either N, O or S etc. as its constituent. These are called heteroatoms.

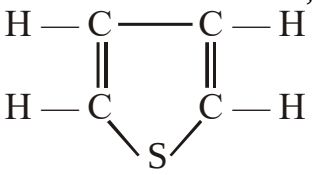
For example,



Pyrrole ;



Furan ;



Thiophene

➢ DERIVATIVES OF HYDROCARBON

If hydrogen of a hydrocarbon is displaced from other atoms or group of atoms such compounds are known as derivative of hydrocarbons. Examples are alcohol, ether, aldehyde etc. Such compounds can be divide into two parts:

(a) Hydrocarbon Group (Radical): When one hydrogen is removed from hydrocarbon rest species is known as hydrocarbon radical. It determines the physical properties of an organic compound. It is donated by **R**. On the basis of parent hydrocarbon, it can be named as below:

Hydrocarbon	**Formula**	**Name of radical**	**Formula**
Alkane	Alkyl group		
Alkene	Alkenyl group		
Alkyne	Alkynyl group		

(b) Functional Groups: An atom or a group of atoms which displaces the hydrogen atom from hydrocarbon molecule is called **Functional Group.** It determines the characteristic chemical properties of an organic compound. It is denoted by **G**. Some examples of function group are given below.

All compounds with same functional group belong the same family.

Example: - Alcohol family contains -OH group.

Formula of unction group	**Name of Functional group**	**Types of organic Family compound**	
— Cl	Chloro	R-Cl	Halogen
— Br	Bromo	R-Br	Halogen
— I	Iodo	R-I	Halogen
— F	Floro	R-F	Halogen
— OH	Hydroxyl	R-OH	Alcohol
	Aldehyde	R-CHO	Aldehyde
	Ketone		Ketone
	Carboxyl	R-COOH	Carboxylic acid
— NH_2	Amino	RNH_2	Amine
—OR	Alkoxy	R-O-R	ether
	Ester	R-COOR	Ester