

Chemistry Study Materials for Class 11

(NCERT Based Notes of Chapter- 12)

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SOME BASIC PRINCIPLES AND TECHNIQUES

Classification of Organic compounds

Organic compounds can be broadly classified into two – Acyclic or open chain compounds and cyclic or ring compounds.

1. Acyclic or open chain or aliphatic compounds:

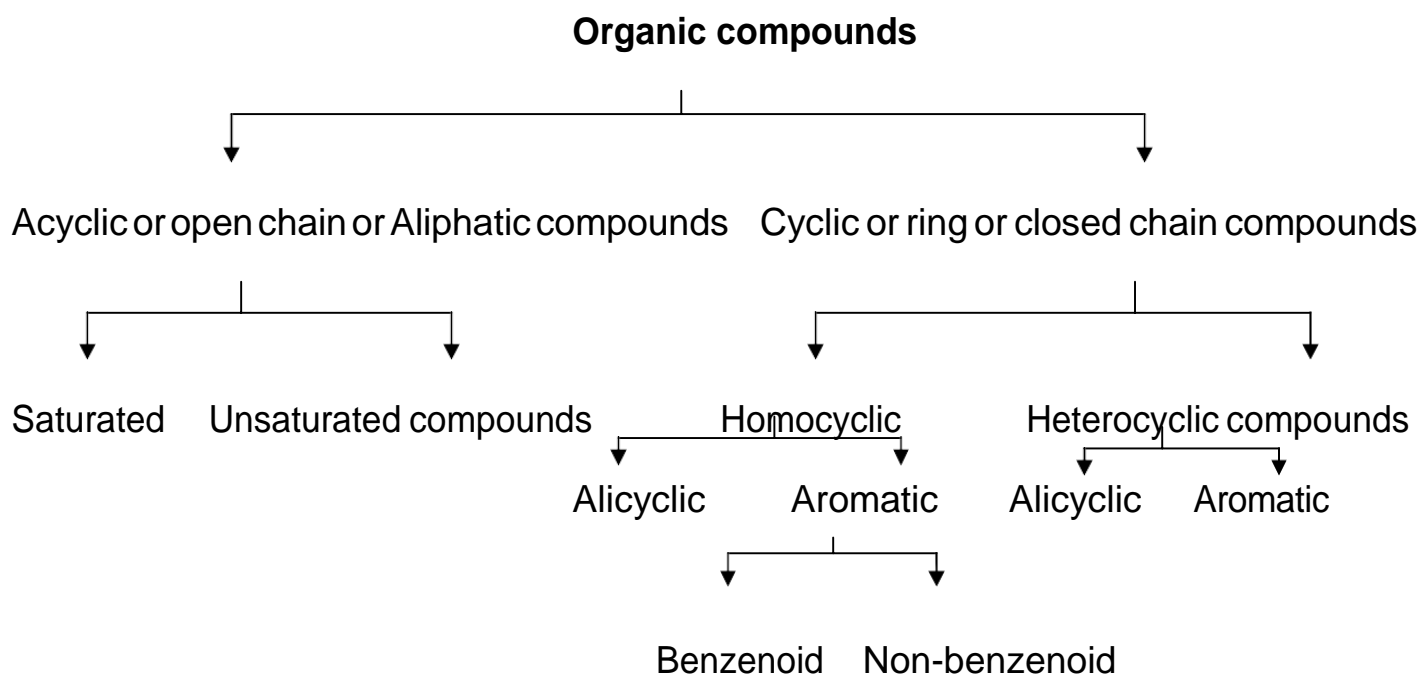
In these compounds, the carbon atoms are joined together to form long chains which may be straight chain or branched chain. They are further classified as *saturated compounds* and *unsaturated compounds*. **Saturated compounds** contain only carbon – carbon single bonds. But **unsaturated compounds** contain at least one carbon – carbon multiple bond (double or triple bond). Saturated hydrocarbons are called *alkanes* and unsaturated hydrocarbons are of two types – *alkenes and alkynes*.

2. Cyclic or closed chain or ring compounds:

In these compounds, the carbon atoms are joined together to form rings. These rings may be *homocyclic or heterocyclic*. If the ring contains only carbon atoms, it is called homocyclic compound and if it contains atoms other than carbon (like O, N, S etc), it is called heterocyclic compound.

Homocyclic compounds are further classified into two – *Alicyclic compounds and Aromatic compounds*. **Alicyclic compounds** contain at least one carbo-cyclic ring. *Alicyclic hydrocarbons* are of three types – *cycloalkanes, cycloalkenes and cycloalkynes*. **Aromatic compounds** are some special type of compounds. These are of two types. Aromatic compounds containing benzene ring are called *benzenoid compounds* and those which do not contain benzene ring are called *non-benzenoid compounds*. E.g. for a non-benzenoid aromatic compound is tropolone. Heterocyclic compounds may be alicyclic heterocyclic compounds or aromatic heterocyclic compounds.

The classification of organic compounds can be diagrammatically represented as follows:



Functional groups:

Atoms or group of atoms (except hydrogen) which are bonded to carbon atoms are called functional groups. These groups are responsible for the characteristic chemical properties of the organic compounds. Some important functional groups, their names and name of the compounds are listed below:

Functional group	Name of the group	Name of compound
-OH	Hydroxyl group	Alcohol
-NH ₂	Amino group	Amine
-X	Halo group	Halo compound
-CHO	Aldehydic (formyl) group	Aldehyde
-CO- or >CO	Carbonyl (keto) group	Ketone
-COOH	Carboxyl group	Carboxylic acid
-O-	Oxy group	Ether
-CN	Cyano group	Nitrile
-NO ₂	Nitro group	Nitro compound

Homologous series:

A series or group of organic compounds in which adjacent members are differed by a $-\text{CH}_2$ group is called a homologous series. The members of a homologous series are called *homologues*. They contain same functional groups, have similar chemical properties and show gradation in physical properties. They can be prepared by some general methods of preparation. E.g. for homologous series are alkanes, alkenes, alkynes, alcohols, ethers, carboxylic acids, aldehydes, ketones, amines, halo compounds etc.

Nomenclature of organic compounds

An organic compound has two types of names – Common name and IUPAC name. The common name is based on the source or some properties. For e.g. citric acid is named so because it is found in citrus fruits and the acid found in red ant is named formic acid since the Latin word for ant is Formica.

IUPAC Nomenclature of organic compounds

A systematic name of an organic compound is generally derived by identifying the parent hydrocarbon and the functional group(s) attached to it. This name is called IUPAC name. It contains two parts – word root and suffix or prefix. The word root indicates the number of carbon atoms in the compound. The word roots for compounds containing 1 -12 carbon atoms are as follows:

No. of C atoms	Word root	No. of C atoms	Word root
C_1	Meth-	C_7	Hept-
C_2	Eth-	C_8	Oct-
C_3	Prop-	C_9	Non-
C_4	But-	C_{10}	Dec-
C_5	Pent-	C_{11}	Undec-
C_6	Hex-	C_{12}	Dodec-

There are two types of suffixes – primary suffix and secondary suffix. Primary suffix indicates saturation or unsaturation [for alkane the primary suffix is –ane, alkene –ene and for alkyne –yne]. Secondary suffix indicates the type of functional group. Some functional groups are also indicated as prefixes.

Nomenclature of branched chain alkanes:

A branch (side chain or substituent) is obtained by removing a hydrogen atom from an alkane. The resulting group is called an **alkyl group** [alkane – H = alkyl (i.e. **word root + yl**)]. The names of some common branches are as follows:

Branch	Name
$-\text{CH}_3$	Methyl
$-\text{CH}_2-\text{CH}_3$	Ethyl
$-\text{CH}_2-\text{CH}_2-\text{CH}_3$	n-propyl (normal propyl)
$(\text{CH}_3)_2\text{CH}-$	isopropyl
$-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3$	n-butyl
$\text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}_3$	sec-butyl (secondary butyl)
$(\text{CH}_3)_2\text{CH}-\text{CH}_2-$	isobutyl
$(\text{CH}_3)_3\text{C}-$	tert-butyl (tertiary butyl)
$(\text{CH}_3)_3\text{C}-\text{CH}_2-$	neopentyl
