

Organic Chemistry

a German scientist 'Wholar' synthesized an organic compound in lab.

Which was 'urea'. Urea was synthesized in lab by heating Ammonium cyanate (NH_4CNO).



Organic Chemistry

It is the branch of chemistry which deals with the study of hydrocarbons and its derivatives.

Classification Based on Functional Group

Homologous Series

A group or class of organic compounds each containing one particular characteristic functional group constitutes a homologous series.

- The various members are called homologue
- Two successive homologues differ by $>\text{CH}_2$ group or 14 molecular weight.
 $\text{CH}_3\text{-OH}$
 $\text{CH}_3\text{-CH}_2\text{-OH}$

MIND MAP

Nomenclature

- Homologues have same chemical properties but there is a regular change in physical properties.
- All the members can be represented by a general formula.

Degree of Unsaturation

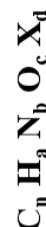
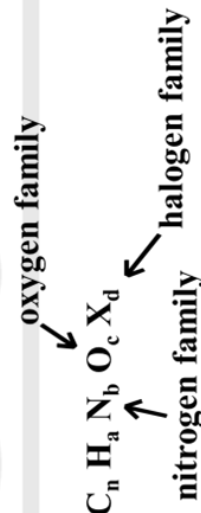
Degree of unsaturation (DU)

Index of hydrogen deficiency (IHD)

Double bond equivalent (DBE)

$\text{DU} = \text{No. of Hydrogen in Corresponding alkane} - \text{no. of hydrogen in given compound} / 2$

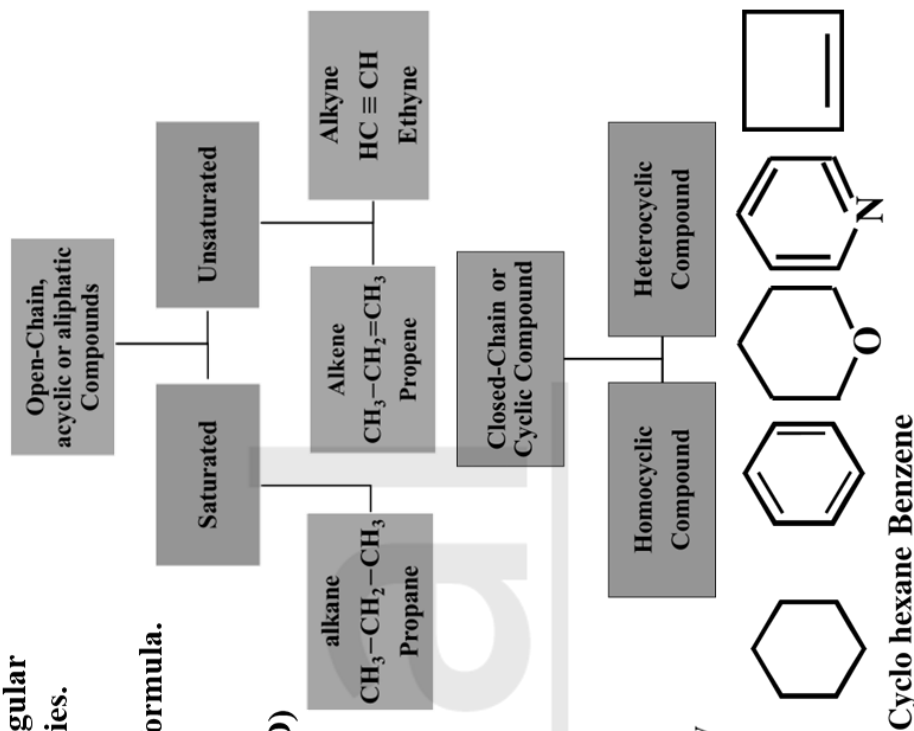
Formula



$$\text{DU} = (n + 1) - \frac{(a - b + d)}{2}$$

a = Number of hydrogen
 n = Number of carbon
 b = Number of nitrogen/phosphorous
 d = Number of halogen

Organic Compounds



Mainly these systems are adopted for naming an organic compound.

- (i) Common names or Trivial system
- (ii) IUPAC system or Geneva system

IUPAC System of Nomenclature

The IUPAC system is the most rational and widely used system of nomenclature in organic chemistry. The most important feature of this system is that any given molecular structure has only one IUPAC name and any given IUPAC name denotes only one molecular structure.

The IUPAC name of organic compound may consist of five parts.

1. Word Root
2. Primary Prefix
3. Secondary Prefix
4. Primary Suffix
5. Secondary Suffix

A complete IUPAC name of an organic compound has the following sequence

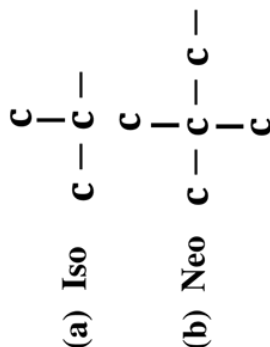
Secondary prefix + Primary prefix + Word root + Primary suffix + Secondary suffix

Numeral Prefixes in complex radicals

- (1) Following Prefixes Are Considered For Alphabetization

MIND MAP

Nomenclature



- (c) Di, Tri, Tetra only in complex radicals.

- (2) Following Are Not Considered

For Alphabetization

- (a) Di, Tri, Tetra for simple radicals.
- (b) Sec, Tert are not considered for alphabetization
- (c) Bis = 2, Tris = 3

Naming of Cyclic Hydrocarbon

(1) Main Chain Selection

- (a) Multiple Bond > Number of carbon atoms > Maximum number of substituents >

Nearest locant > Alphabetization.

(2) Naming

Prefix 'cyclo' just before the word root if it constitutes the main chain.

If cyclic part is the main chain then the prefix 'cyclo' is not considered for alphabetical order.

If cyclic part constitutes the side-chain (substituent) then prefix cyclo is considered for alphabetization.

(3) Numbering

Lowest Locant

Alphabetization

Naming of Compounds Containing Functional Group

Functional Group Table (Seniority Order)

S. No.	Functional Group	Prefix	Suffix
1.	— (C) OOH (carboxylic acid) — COOH	×	oic acid carboxylic acid
2.	— SO ₃ H (sulphonic acid)	sulpho	sulphonic acid

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Nomenclature

3.	$\begin{array}{c} \text{O} \\ \parallel \\ \text{-(C)-O-(C)-} \\ \parallel \\ \text{O} \end{array}$ (anhydride)	×	oic anhydride	$\begin{array}{c} \text{-(C)-} \\ \parallel \\ \text{O} \end{array}$ (Ketone)	keto/oxo	one
4.	$\begin{array}{c} \text{-(C)OOR (ester)} \\ \text{-(COOR)} \end{array}$	×	alkyl ----- oate alkyl-----carboxylate	-OH (alcohol)	hydroxy	ol
5.	$\begin{array}{c} \text{-(C)OX (acid halide)} \\ \text{-(COX)} \end{array}$	×	alkoxy carbonyl or carbalkoxy Halo carbonyl	$\text{-SH (thio alcohol)}$	mercapto	thiol
				$\text{-NH}_2 \text{ (amine)}$	amino	amine
				-OR (ether)	alkoxy	×

Case 1

When carbon containing functional group is directly attached with cyclic ring then carbon of that functional group is not included in parent carbon chain and we use special suffix for them.

Case-2

When more than two same carbon containing functional group are directly attached to parent carbon chain, then functional group is not included in PCC and we use special suffix for them.

6.	$\begin{array}{c} \text{-(C)ONH}_2 \text{ (amide)} \\ \text{-(CONH}_2 \end{array}$	×	amide carboxamide	$\text{-(C)ONH}_2 \text{ (amide)}$		
7.	$\begin{array}{c} \text{-(C)N (cyanide)} \\ \text{-(CN)} \end{array}$	×	Nitrile carbonitrile	-(C)N (cyanide)		
8.	$\begin{array}{c} \text{-(C)HO (aldehyde)} \\ \text{-(CHO)} \end{array}$	×	carbonyl halide carbonyl halide	-(C)HO (aldehyde)		
9.	$\begin{array}{c} \text{-(C)HO (aldehyde)} \\ \text{-(CHO)} \end{array}$	×	aldehyde carbaldehyde	-(C)HO (aldehyde)		

Naming:- General Scheme

The senior most functional group constitutes secondary suffix. Other junior F.G.'s are written in prefix in alphabetical order.

(a) Functional Group > Multiple Bond > No. of carbon atoms > Maximum no. of substituents > Nearest locant > Alphabetization.

(B) Numbering (See F.G. + Sub.)

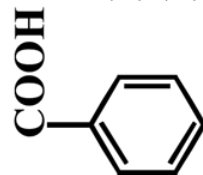
The carbon atom bearing functional group (or C atom of terminal functional group is given lowest number)

(i) Lowest locant (F.G. > M.B. > substituent > Alfab)

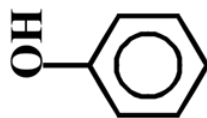
MIND MAP

Nomenclature

Nomenclature of Aromatic Compound

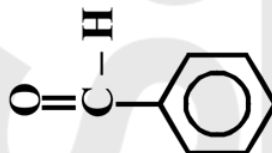


Benzoic acid
Benzene carboxylic acid



Phenol
Hydroxy benzene

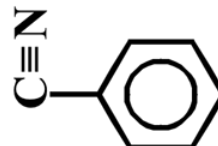
Above given compounds can be directly used as base compound for naming poly functional aromatic compound.



Benzaldehyde
Benzene carbaldehyde



→ 2-Amino benzoic acid
→ 2-Amino benzene carboxylic acid
→ o-Amino benzoic acid



Benzonitrile
Benzene carbonitrile