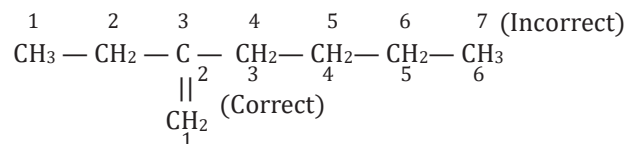
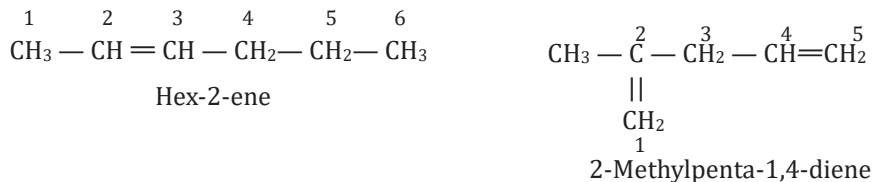


NOMENCLATURE OF UNSATURATED HYDROCARBONS

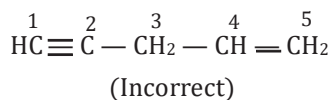
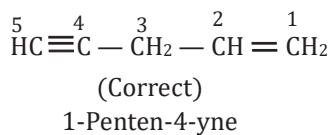
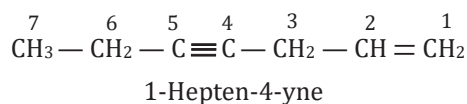
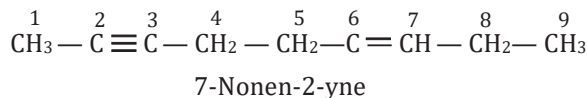
- a) Choose the longest carbon chain with the most unsaturated carbon atoms or the highest number of double or triple bonds, even if it means breaking the earlier rules.



Note: Lowest number is assigned to first unsaturated carbon



- b) Hydrocarbon containing both $\text{C}=\text{C}$ and $\text{C}\equiv\text{C}$: If a hydrocarbon has both a double bond and a triple bond, it's referred to as alkenynes (not alkynenes). We number the main chain so that the multiple bond (either double or triple) gets the smallest possible number. When these bonds are in equivalent positions, priority is given to the double bond over the triple bond.




Nomenclature of Organic Compounds having functional group(s)

Functional Group

A functional group is an atom or a group of atoms joined together in a special way within a molecule, and it greatly influences the chemical properties of that molecule.

Organic compounds with the same functional group exhibit similar chemical behaviors. For instance, alcohols like CH_3OH , $\text{CH}_3\text{CH}_2\text{OH}$, $(\text{CH}_3)_2\text{CHOH}$, etc., all release hydrogen when reacted with sodium metal.

The existence of a functional group is denoted by adding specific suffixes or prefixes. The table below provides the prefixes and suffixes for various functional groups.

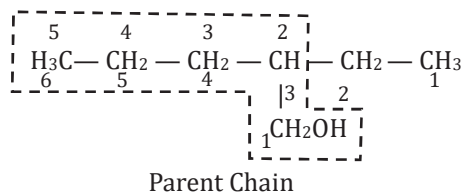
Class of Compounds	Functional group structure	IUPAC group prefix	IUPAC group suffix	Example
Alkanes	—	—	—ane	Butane, $\text{CH}_3(\text{CH}_2)_2\text{CH}_3$
Alkenes	$\text{>C}=\text{C}<$	—	—ene	But-1-ene $\text{CH}_2=\text{CHCH}_2\text{CH}_3$
Alkynes	$\text{—C}\equiv\text{C—}$	—	—yne	But-1-yne $\text{CH}\equiv\text{CCH}_2\text{CH}_3$
Arenes	—	—	—	Benzene, 
Halides	—X (X = F, Cl, Br, I)	halo—	—	1-Bromobutane, $\text{CH}_3(\text{CH}_2)_2\text{CH}_2\text{Br}$
Alcohols	—OH	hydroxy—	—ol	Butan-2-ol, $\text{CH}_3\text{CH}_2\text{CHOHCH}_3$
Aldehydes	—CHO	formyl, or oxo*—	—al	Butanal $\text{CH}_3(\text{CH}_2)_2\text{CHO}$
Ketones	$\text{>C}=\text{O}$	oxo—	—one	Butan-2-one $\text{CH}_3\text{CH}_2\text{COCH}_3$
Nitriles	$\text{—C}\equiv\text{N}$	cyano—	nitrile	Pentanenitrile. $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CN}$
Ethers	—R—O—R—	alkoxy—		Ethoxyethane, $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_3$
Carboxylic acids	—COOH	carboxy	—oic acid	Butanoic acid, $\text{CH}_3(\text{CH}_2)_2\text{COOH}$
Carboxylate ions	—COO^-	—	—oate	Sodium butanoate, $\text{CH}_3(\text{CH}_2)_2\text{COO}^-\text{Na}^+$
Esters	—COOR	alkoxy carbonyl	—oate	Methyl propanoate $\text{CH}_3\text{CH}_2\text{COOCH}_3$
Acyl halides	—COX (X = F, Cl, Br, I)	Halocarbonyl	—oyl halide	Butanoyl chloride $\text{CH}_3(\text{CH}_2)_2\text{COCl}$
Amines	—NH_2 , >NH , >N—	amino—	—amine	Butan-2-amine, $\text{CH}_3\text{CH}_2\text{CHNH}_2\text{CH}_2\text{CH}_3$
Amides	—CONH_2 , —CONHR , —CONR_2	—carbamoyl	—amide	Butanamide, $\text{CH}_3(\text{CH}_2)_2\text{CONH}_2$
Nitro	—NO_2	Nitro	—	1-Nitrobutane, $\text{CH}_3(\text{CH}_2)_3\text{NO}_2$

Use the "oxo" prefix when counting the carbon of the aldehyde functional group in the main carbon chain; otherwise, use "formyl."

Here are the guidelines for naming organic compounds with functional groups:

1. Parent Chain

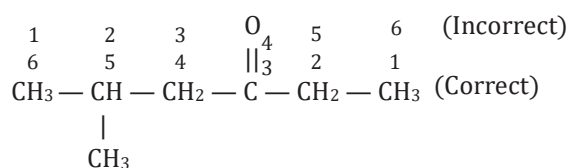
The parent chain is the carbon chain containing the functional group, whether or not it forms the longest possible chain.



For instance, the parent chain may have five carbon atoms instead of six.

2. Numbering the Parent Chain

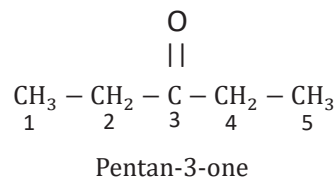
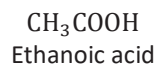
Arrange the chain so that the carbon attached to the functional group gets the lowest number.



3. Functional Group Indication

Show the presence of a functional group by adding a secondary suffix after the primary suffix (ane, ene, yne).

If the secondary suffix starts with 'a', 'i', 'o', 'u', or 'e', omit the 'e' from the primary suffix.



4. Multiple Functional Groups

If there are several functional groups, designate one as the principal functional group, naming it with a suffix.

The other functional groups, treated as substituents, are named with prefixes.

The principal functional group is chosen based on a preference order.

Here is the priority order of certain functional groups, listed from highest to lowest.

Functional Groups in Order of Decreasing Priority

Class	Formula	Prefix name (Substituent Name)	Suffix (Principal name)
Carboxylic acid	$\begin{array}{c} \text{O} \\ \\ -\text{C}-\text{OH} \end{array}$	Carboxy	-oic acid
Sulphonic acid	$-\text{SO}_3\text{H}$	Sulpho	Sulphonic acid
Carboxylic anhydride	$\begin{array}{c} \text{O} \quad \text{O} \\ \quad \\ -\text{C}-\text{O}-\text{C}- \end{array}$		oic anhydride
Ester	$\begin{array}{c} \text{O} \\ \\ -\text{C}-\text{OR} \end{array}$	Alkoxy carbonyl	oate
Acylchloride	$\begin{array}{c} \text{O} \\ \\ -\text{C}-\text{Cl} \end{array}$	Halocarbonyl	-oyl chloride
Amide	$\begin{array}{c} \text{O} \\ \\ -\text{C}-\text{NH}_2 \end{array}$	Carbamoyl	amide
Cyanide	$-\text{C}\equiv\text{N}$	Cyano	nitrile
Aldehyde	$-\text{CHO}$	Formyl	al, carbaldehyde
Keto	$\begin{array}{c} \text{O} \\ \\ -\text{C}- \end{array}$	oxo	-one
Alcohol	$-\text{OH}$	Hydroxyl	-ol
Thiol	$-\text{SH}$	Mercapto	-thiol
Amine	$-\text{NH}_2$	Amino	-amine
Ether	$-\text{O}-$	Alkoxy	

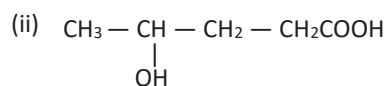
All other functional groups like halo (fluoro, chloro, bromo, iodo), nitroso (-NO), nitro (-NO₂), alkoxy (-OR), R (alkyl), C₂H₅ (phenyl), and so on are always considered as substituent groups.

Examples



7-Hydroxyheptan-2-One

In the above compound, keto group is preferred, so considered as main functional group, whereas hydroxyl group is considered as a substituent.



4-Hydroxypentanoic acid

(Here -OH group is considered as a substituent)



3-Bromoprop-1-ene (Correct)

1-Bromoprop-2-ene (Incorrect)

5. More than one Functional Groups of Same Type

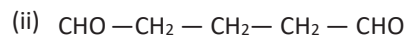
If there are multiple functional groups of the same type, show the number by adding "di," "tri," etc., before the class suffix.

In such organic compounds, we write the complete name of the parent alkane before the class suffix.

Examples



Ethane-1, 2-diol



Pentane-1, 5-dial

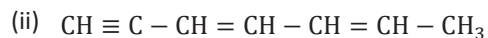


Propane -1, 2, 3-triol

If an organic compound has more than one $\text{C}=\text{C}$ or CC , then word root is written as 'alka'.



Buta-1, 3-diene



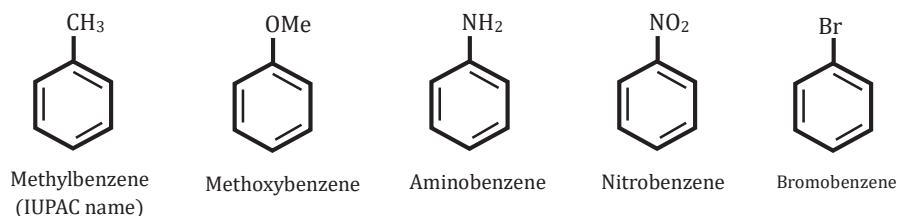
Hepta-3, 5-dien-1-yne

NOMENCLATURE OF SUBSTITUTED BENZENE COMPOUNDS

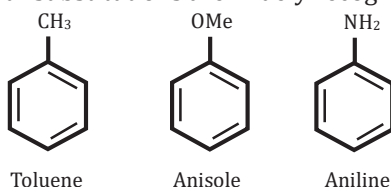
Monosubstituted Benzene Compounds

- a) When giving names to benzene compounds with substitutions, just add the prefix of the substituent to the word 'benzene.'

Example



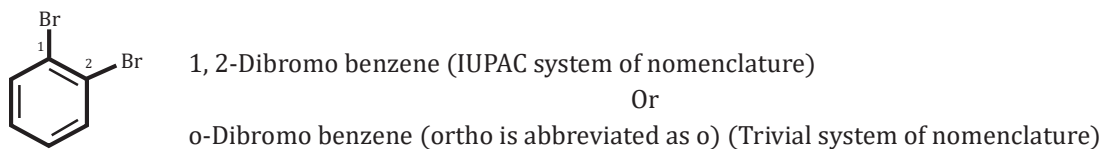
- b) Most benzene compounds with substitutions are widely recognized by their common names.



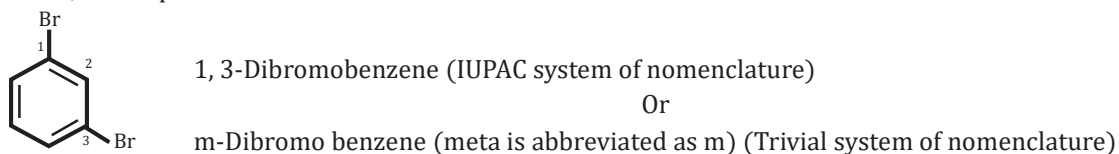
Disubstituted Benzene Compounds

When two hydrogen atoms in benzene are swapped with two single atoms or groups, it creates a disubstituted benzene derivative. To identify the positions of these substituents, we number the carbon atoms in the ring, ensuring the substituents get the smallest numbers. There are three possible forms of disubstituted benzene compounds.

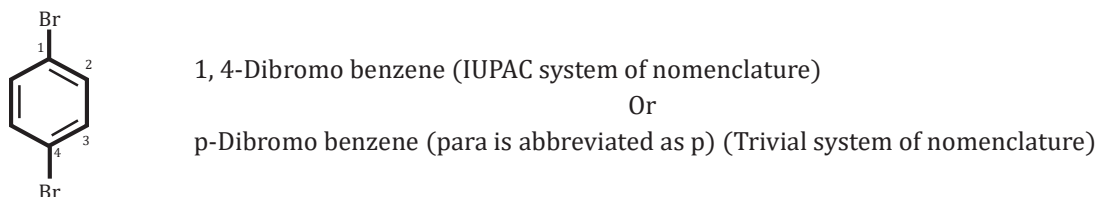
- a) **1, 2 (ortho)-form:** If the two substituents are on the carbon atoms next to each other.



- b) **1, 3 (meta)-form:** If the two substituents are on the carbon atoms that are not next to each other, but skip one in between.



- c) **1, 4 (para)-form:** If the two substituents are on carbon atoms that are diagonally positioned to each other.



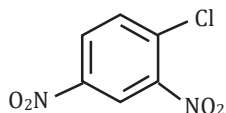
Tri- or Higher Substituted Benzene Derivatives

To name benzene compounds with three or more substitutions, we find the positions of the substitutions on the ring using the lowest locant rule.

- (i.) A compound with three functional groups is named by considering it as a derivative of the compound where the main functional group is positioned at number 1.

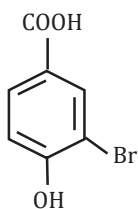
Examples:

(a)



1-Chloro-2, 4-dinitrobenzene
(not 4-chloro-1, 3-dinitrobenzene)

(b)

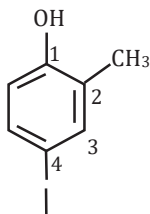


3-Bromo-4-hydroxybenzoic acid
(-COOH is the principal functional)

- (ii.) The base compound's suffix is given the number 1, and then we choose the numbering direction so that the following substituent receives the smallest possible number.

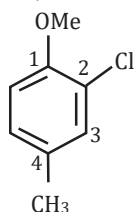
Examples:

a)

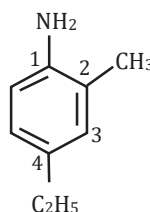


4-Iodo-2-methylphenol
(-OH is the principal functional group)

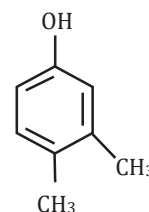
- b) If a substituent, when combined with a benzene ring, gives a special name to the molecule, it is named as a derivative of that molecule with the substituent.



2-Chloro-4-methylanisole

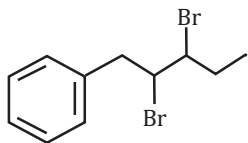


4-Ethyl-2-methylaniline

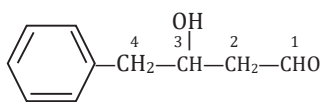


3, 4-Dimethylphenol

- c) If a benzene ring is connected to a straight-chain molecule with a functional group, it is called a phenyl derivative of that straight-chain compound.



2,3-Dibromopentylbenzene



3-Hydroxy-4-phenylbutanal