

CHEMISTRY STUDY MATERIALS FOR CLASS 10

(Based on NCERT: Carbon and its compounds)

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Functional Groups

- All organic compounds are derivatives of hydrocarbons.
- Derivatives are obtained by replacing one or more hydrogen atoms by some other atom or group of atoms.
- The new set of compounds formed after replacement has functions different from the parent hydrocarbon.
- Functional group:** An atom or a group of atoms present in the molecules, which determines the characteristics property of the organic compounds, is called the functional group.

Functional group	General formulae	Organic compound	Suffix	Examples with common & IUPAC name
Halide-X (F,Cl,Br,I)	R-X	Haloalkanes	-ane	CH ₃ Cl Common name: Methyl chloride IUPAC name: Chloromethane
Hydroxyl-OH	R-OH	Alcohols	-ol	C ₂ H ₅ OH Common name : Ethyl alcohol IUPAC name: Ethanol
Aldehyde - CHO	$\begin{matrix} \text{H} \\ \\ \text{R} > \text{C}=\text{O} \end{matrix}$	Aldehydes	-al	CH ₃ CHO Common name: Acetaldehyde IUPAC name: Ethanal
Carboxyl- COOH	$\begin{matrix} \text{O} \\ \\ \text{R} - \text{C} - \text{O} - \text{H} \end{matrix}$	Carboxylic acids	-oic acid	CH ₃ CH ₂ COOH Common name: Propionic acid IUPAC name: Propanoic acid
Keto $\begin{matrix} \text{O} \\ \\ - \text{C} - \end{matrix}$	$\begin{matrix} \text{O} \\ \\ \text{R} - \text{C} - \text{R}' \end{matrix}$	Ketones	-one	CH ₃ COC ₂ H ₅ Common name: Diethyl ketone IUPAC name: Pentanone
Ethers $\begin{matrix} & & \\ - \text{C} - \text{O} - \text{C} - \\ & & \end{matrix}$	R-O-R'	Ethers	-oxy	CH ₃ - O - C ₂ H ₅ Common name: Ethyl methyl ether IUPAC name: Methoxy ethane

HOMOLOGOUS SERIES

It is a group of organic compounds having a similar structure and chemical properties in which the successive compounds differ by a **-CH₂** group.

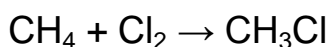
Characteristics of a Homologous Series

- Each member of the series differs from the preceding one by the addition of a **-CH₂** group and by 14 amu.
- All members of a homologous series have the same general formula.

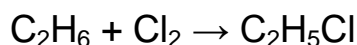
For example: the general formula for alkane is C_nH_{2n+2} and alkene is C_nH_{2n} .

- The physical properties of the members show a gradation in properties as their molecular mass increases.
- The chemical properties also show a gradient similarity.

For example: Methane and ethane react with chlorine to form methyl chloride and ethyl chloride respectively.



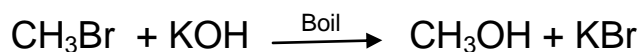
Methane Methyl chloride



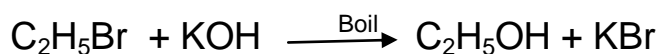
Ethane Ethyl chloride

- All members of a homologous series can be prepared by the same general method of preparation.

For example: Alcohols can be prepared from alkyl halides.



Methyl bromide Methyl alcohol



Ethyl bromide Ethyl alcohol

Nomenclature of Functional groups

Functional group	Prefix/Suffix	Example
1. Halogen	Prefix-chloro, bromo, etc.	$\begin{array}{c} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{Cl} \\ & & \\ \text{H} & \text{H} & \text{H} \end{array}$ Chloropropane
		$\begin{array}{c} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{Br} \\ & & \\ \text{H} & \text{H} & \text{H} \end{array}$ Bromopropane
2. Alcohol	Suffix - ol	$\begin{array}{c} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{OH} \\ & & \\ \text{H} & \text{H} & \text{H} \end{array}$ Propanol
3. Aldehyde	Suffix - al	$\begin{array}{c} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}=\text{O} \\ & & \\ \text{H} & \text{H} & \end{array}$ Propanal
4. Ketone	Suffix - one	$\begin{array}{c} \text{H} & & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & \\ \text{H} & \text{O} & \text{H} \end{array}$ Propanone
5. Carboxylic acid	Suffix - oic acid	$\begin{array}{c} \text{H} & \text{H} & \text{O} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{OH} \\ & & \\ \text{H} & \text{H} & \end{array}$ Propanoic acid
6. Double bond (alkenes)	Suffix - ene	$\begin{array}{c} \text{H} & \text{H} & & \text{H} \\ & & & / \\ \text{H}-\text{C}-\text{C}=\text{C} & & \text{H} \\ & & \backslash \\ \text{H} & & \text{H} \end{array}$ Propene
7. Triple bond (alkynes)	Suffix - yne	$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{C}=\text{C}-\text{H} \\ \\ \text{H} \end{array}$ Propyne

Correction-

3. Aldehyde	Suffix - al	Propanal
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