

CHEMISTRY STUDY MATERIALS FOR CLASS 10

(NCERT Based notes of Chapter -04)

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CARBON AND ITS COMPOUND

CARBOXYLIC ACIDS

Carboxylic acids are carbon compounds containing -COOH group attached to a hydrogen atom or alkyl group. The general formula of acid is R-COOH where 'R' is a **hydrogen atom** or **alkyl group** and -COOH is the **functional group**.

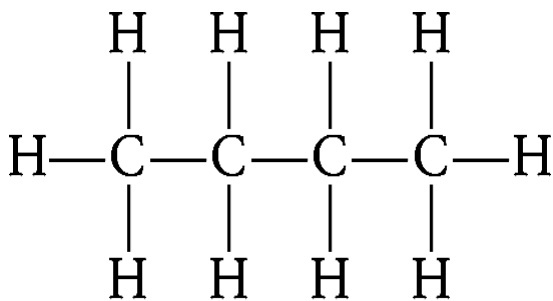
The IUPAC name of acid is derived by replacing -e , in the word alkane, by the suffix -oic acid . Hence we get the name "**alkanoic acid**".

Molecular formula	Common name	IUPAC name
HCOOH	Formic acid	Methanoic acid
$\text{CH}_3\text{-COOH}$	Acetic acid	Ethanoic acid
$\text{CH}_3\text{-CH}_2\text{-COOH}$	Propionic acid	Propanoic acid
$\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-COOH}$	n-Butyric acid	Butanoic acid

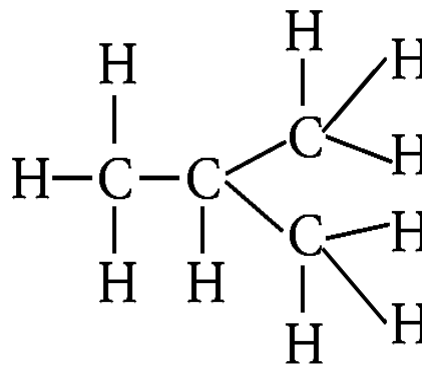
ISOMERISM

Carbon compounds or organic compounds with same molecular formula can show different structures and hence, different properties. This phenomenon is called **isomerism** and compounds are called **isomers**.

For example, following two arrangements are possible for butane, an alkane with four C atoms (C_4H_{10})



Straight chain structure



Branched chain structure

Such pair of isomers is called **chain isomers** and the isomerism is called **chain isomerism**.

Thus, **chain isomers** are the compounds that have same molecular formula but differ in the arrangement of carbon chains.

NOMENCLATURE OF CARBON COMPOUNDS

In general, the names of organic compounds are based on the name of basic carbon chain modified by a prefix (phrase before) or suffix (phrase after) showing the name of the functional group.

Following steps are used to write the name of an organic compound

Step 1 Count the number of carbon atoms in the given compound and write the root word for it (Root word up to 10 carbon atoms are tabulated below.)

Root Words for Carbon Atoms

No. of C atoms	Root word	No. of C atoms	Root word
1 (C ₁)	Meth	6 (C ₆)	Hex
2 (C ₂)	Eth	7 (C ₇)	Hept
3 (C ₃)	Prop	8 (C ₈)	Oct
4 (C ₄)	But	9 (C ₉)	Non
5 (C ₅)	Pent	10 (C ₁₀)	Dec

Step 2 If the compound is saturated, add suffix 'ane' to the root word, but if is unsaturated, add suffix 'ene' and 'yne' for double and triple bonds respectively.

For example, $\text{CH}_3\text{CH}_2\text{CH}_3$ contains three C atoms so root word is 'prop' and it contains only single bonds, so suffix used is 'ane'. Hence, the name of this compound is propane.

Similarly, the compound $\text{CH}_3\text{CH}=\text{CH}_2$ is named as propene as here suffix 'ene' is used for double bond.

Prefix and Suffix of Different Functional Groups

Functional Group	Prefix/Suffix	Example
Alcohol	Suffix -ol	$\text{C}_3\text{H}_7\text{OH}$ - Propane + ol Propanol
Aldehyde	Suffix -al	CH_3CHO - Ethane + al = Ethanal
Ketone	Suffix -one	CH_3COCH_3 - Propane + one Propanone
Carboxylic acid	Suffix -oic acid	CH_3COOH - Acetic acid/ Ethanoic acid
Halogen	Prefix -chloro, bromo, etc.	CH_3Cl - Chloromethane $\text{C}_2\text{H}_5\text{Br}$ - Bromoethane
Double bond (alkenes)	Suffix -ene	$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}=\text{C} \begin{array}{l} / \text{H} \\ \backslash \text{H} \end{array} \\ \\ \text{H} \end{array} $ - Propene
Triple bond (alkynes)	Suffix -yne	$ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{C}\equiv\text{C}-\text{H} \\ \\ \text{H} \end{array} $ - Propyne

Step 3 If functional group is present in the compound, it is indicated by adding its suffix (which are given in the table above).

- *Prefix 'iso' and 'neo' represent the presence of one or two carbon atoms respectively as side chain.*
- *If the functional group is named as a suffix, the final 'e' of alkane (or alkene or alkyne) is substituted by appropriate suffix.*
- *If the functional group and substituents are not present at first carbon, then their location is indicated by digits 1,2,3... .*
