Chapter -1

NOMENCLATURE OF ORGANIC COMPOUNDS AND ISOMERISM

Nomenclature of Alkanes

- ✓ Saturated hydrocarbon = Alkane
- ✓ General formula of alkane = C_nH_{2n+2}

Naming of alkanes without Branch

Name of alkane = Word root + ane

Eg:

- ✓ $CH_3 - CH_2 - CH_2 - CH_3$

Number of carbon atoms = 4

Word root = But

IUPAC name = **Butane**

Naming of alkanes with one branch

- ✓ The longest chain containing maximum number of carbon atoms should be considered as the main chain and the remaining as branches.
- ✓ Numbering should be done in such a way that the carbon atom carrying branch gets the lowest number.
- ✓ The small branches attached to carbon atoms are called alkyl groups.
- ✓ An alkyl group is obtained when a hydrogen atom is removed from a carbon atom in a saturated hydrocarbon.

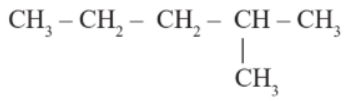
Name of alkyl group = Word root of branch + yl

Eg:

Structural formula	Name of alkyl group
$\boldsymbol{CH_3 -}$	Methyl
$\boldsymbol{CH_3 - CH_2 -}$	Ethyl
$\boldsymbol{CH_3 - CH_2 - CH_2 -}$	Propyl

Name of alkane = Position number of branch + hyphen + name of alkyl group + Word root of main chain + ane

- ✓ Example 1



Number of carbon atoms in the main chain = 5

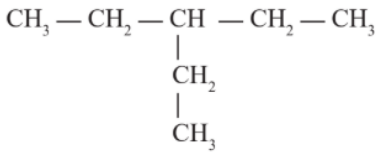
Word root of main chain = Pent

Position number of branch = 2

Name of alkyl group = $Methyl$

IUPAC name = $2 - Methylpentane$

✓ Example 2



Number of carbon atoms in the main chain = 5

Word root of main chain = Pent

Position number of branch = 3

Name of alkyl group = $Ethyl$

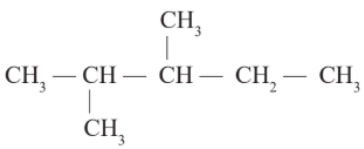
IUPAC name = $3 - Ethylpentane$

Naming of alkanes with more than one branch

- ✓ The longest chain containing maximum number of carbon atoms should be considered as the main chain and the remaining as branches.
- ✓ Number the carbon atoms from left to right or right to left in such a way that the carbon atoms with branches get the lowest position numbers.
- ✓ If the same branch appears more than once in a carbon chain, the number of branches is to be indicated using **prefixes** like di (two), tri (three), tetra (four) etc.
- ✓ Position numbers should be separated by commas.

Name of alkane = position number of branches + hyphen + prefix + name of alkyl group + word root of main chain + ane

✓ Example 1



Number of carbon atoms in the main chain = 5

Word root of main chain = Pent

Number of branches = 2

Position number of branches = 2,3

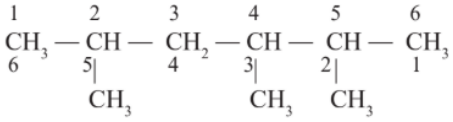
Here both the branches are same $(CH_3 -)$

Name of branch = Methyl

Prefix = Di

IUPAC name = $2,3-Dimethylpentane$

- ✓ Example 2



Number of carbon atoms in the main chain = 6

Word root of main chain = Hex

Number of branches = 3

Position number of branches = 2,3,5

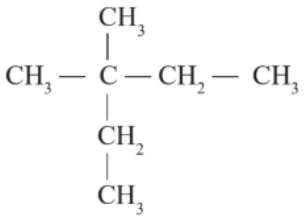
Here all the three branches are same (CH_3-)

Name of branch = Methyl

Prefix = Tri

IUPAC name = $2,3,5-Timethylhexane$

- ✓ Example 3



Number of carbon atoms in the main chain = 5

Word root of main chain = Pent

Number of branches = 2

Position number of branches = 3,3

Here both the branches are same (CH_3-)

Name of branch = Methyl

Prefix = Di

IUPAC name = $3,3-Dimethylpentane$

Nomenclature of Unsaturated Hydrocarbons

- ✓ Both alkenes and alkynes are unsaturated hydrocarbons.
- ✓ General formula of alkenes = C_nH_{2n}
- ✓ General formula of alkynes = C_nH_{2n-2}

Naming of Alkenes

- ✓ In the nomenclature of alkenes, the numbering should be done in such a way that the carbon atoms linked by the double bond gets the lowest position number.

Name of alkene = Word root + hyphen + position of double bond + hyphen + ene

- ✓ Example 1

$CH_3 - CH_2 - CH = CH - CH_3$

Number of carbon atoms = 5

Word root = Pent

Position number of carbon atom having double bond = 2

IUPAC name = $Pent - 2 - ene$

Naming of Alkynes

- ✓ In the nomenclature of alkynes, the numbering should be done in such a way that the carbon atoms linked by the triple bond gets the lowest position number.

Name of alkyne = Word root + hyphen + position of triple bond + hyphen + yne

- ✓ Example 1

$CH_3 - C \equiv C - CH_2 - CH_3$

Number of carbon atoms = 5

Word root = Pent

Position number of carbon atom having triple bond = 2

IUPAC name = $Pent - 2 - yne$

Functional groups

- ✓ A functional group is an atom or a group of atoms, bonded to carbon in an organic compound, determines the chemical and physical properties of that compound.

Functional group	Name of functional group	Common name
$-OH$	Hydroxyl	Alcohol
$-COOH$	Carboxyl	Carboxylic acid
$-CHO$	Aldehydic	Aldehyde

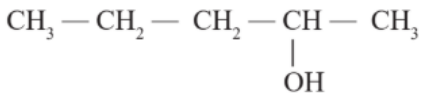
$-CO-$	Keto	Ketone
$-O-R$	Alkoxy	Ether
$-F, -Cl, -Br, -I$	Halo	Halo compounds

Hydroxyl group $(-OH)$

- ✓ The aliphatic hydrocarbons in which –OH group is attached as a functional group are called **alcohols**.

Name of alcohol = word root + an + hyphen + position number of $-OH$ group + hyphen + ol

- ✓ Example 1



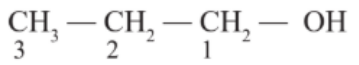
Number of carbon atoms = 5

Word root = Pent

position number of the – OH group = 2

IUPAC name = $Pentan-2-ol$

- ✓ Example 2



Number of carbon atoms = 3

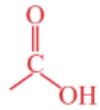
Word root = Prop

position number of the – OH group = 1

IUPAC name = $Propan-1-ol$ (Propanol)

Carboxyl group $(-COOH)$

- ✓ Structure of this compound is



- ✓ Compounds containing the – COOH functional group are known as carboxylic acids.

Name of carboxylic acid = word root + an + oic acid

- ✓ Example 1

$CH_3 — CH_2 — CH_2 — COOH$

Number of carbon atoms = 4

Word root = But

IUPAC name = *Butanoic acid*

- ✓ Example 2

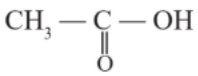
$H — COOH$

Number of carbon atoms = 1

Word root = Meth

IUPAC name = *Methanoic acid*

- ✓ Example 3



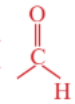
Number of carbon atoms = 2

Word root = Eth

IUPAC name = *Ethanoic acid*

Aldehyde group ($-CHO$)

- ✓ Structure of this compound is



- ✓ Compounds with – CHO functional group are called aldehydes.

Name of aldehyde = word root + an + al

- ✓ Example 1

$CH_3 — CH_2 — CHO$

Number of carbon atoms = 3

Word root = Prop

IUPAC name = *Propanal*

- ✓ Example 2

$H - CHO$

Number of carbon atoms = 1

Word root = Meth

IUPAC name = *Methanal*

Keto group ($-CO-$)

- ✓ Structure of this compound is

  $>C=O$
- ✓ Ketones are compounds with $-CO-$ as the functional group.
- ✓ The position of the functional group must be considered while naming ketones with more than 3 carbon atoms.
- ✓ The compound $CH_3-CO-CH_3$ is known as **acetone** (**propanone**)

Name of ketone = word root + an + hyphen + position number of keto group + one

- ✓ Example 1

$\underset{5}{CH_3}-\underset{4}{CH_2}-\underset{3}{CH_2}-\underset{2}{CO}-\underset{1}{CH_3}$

Number of carbon atoms = 5

Word root = Pent

Position number of keto group = 2

IUPAC name = $Pentan-2-one$

Halo group ($-F, -Cl, -Br, -I$)

- ✓ The compounds formed when one or more hydrogen atoms in a hydrocarbon is replaced with an equal number of halogen atoms are called halo compounds.
- ✓

Name of halo compounds = position of the halo group + hyphen + prefix + name of the halo group + word root + ane

- ✓ Example 1

$CH_3-\underset{\underset{F}{|}}{CH}-CH_3$

Number of carbon atoms = 3

Word root = Prop

Position number of halo group = 2

Name of the halo group = $Fluoro$

IUPAC name = $2-Fluoropropane$

- ✓ Example 2

$\underset{3}{CH_3}-\underset{2}{CH_2}-\underset{1}{CH_2}-Cl$

Number of carbon atoms = 3

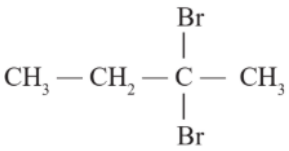
Word root = Prop

Position number of halo group = 1

Name of the halo group = $Chloro$

IUPAC name = $1-Chloropropane$ (Chloropropane)

- ✓ Example 3



Number of carbon atoms = 4

Word root = But

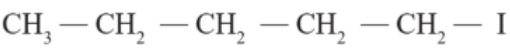
Position numbers of halo group = 2,2

Prefix = Di

Name of the halo group = $Bromo$

IUPAC name = $2,2-Dibromobutane$

- ✓ Example 4



Number of carbon atoms = 5

Word root = Pent

Position numbers of halo group = 1

Name of the halo group = $Iodo$

IUPAC name = $1-Iodopentane$ (Iodopentane)

Alkoxy group $(-O-R)$

- ✓ Ethers are compounds containing alkoxy group.
- ✓ $-O-$ group is called ether linkage.
- ✓ Of the alkyl groups on either side of ether linkage (−O−), the **longer alkyl** group is considered as **alkane** and the **shorter** as **alkoxy** group.
- ✓ Ethers are named as alkoxyalkane.
- ✓ Example 1

Number of carbon atoms in longer alkyl group = 3

Number of carbon atoms in smaller alkyl group = 1

IUPAC name = $Methoxypropane$

- ✓ Example 2

$CH_3-CH_2-O-CH_2-CH_2-CH_3$

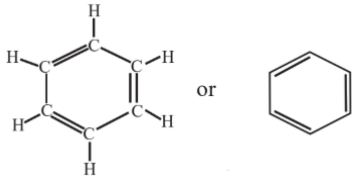
Number of carbon atoms in longer alkyl group = 3

Number of carbon atoms in smaller alkyl group = 2

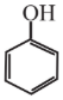
IUPAC name = $Ethoxypropane$

Aromatic compounds

- ✓ Aromatic compounds are cyclic compounds having a unique aroma. Eg : Benzene



- ✓ Benzene (C_6H_6), phenol (C_6H_5-OH), Benzoic acid (C_6H_5-COOH) are aromatic compounds.
- ✓ Phenol is the compound obtained when a hydrogen atom in benzene is replaced with an −OH group.



Phenol

(C_6H_5-OH)

- ✓ When a hydrogen atom is replaced with a −COOH group, the resulting compound is benzoic acid.

Benzoic acid

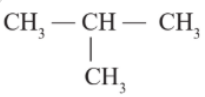
(C_6H_5-COOH)

Isomerism

- ✓ Compounds having same molecular formula and different chemical and physical properties are called isomers.
- ✓ This phenomenon is called isomerism. The structural formulae of these compounds are different.
- ✓ Organic compounds show different types of isomerism based on the difference in structures. Some of them are:
  a. Chain isomerism b. Functional isomerism
  c. Position isomerism d. Metamerism

a. Chain Isomerism

- ✓ Compounds that have the same molecular formula but differ in the structures of carbon chain are called chain isomers.
- ✓ This phenomenon is known as chain isomerism.
- ✓ Example

i. $CH_3-CH_2-CH_2-CH_3$ ii. 

Here the molecular formulae of these compounds are the same (C_4H_{10}) but the structures of the carbon chain are different. Hence compound (i) and (ii) are called chain isomers.

b. Functional Isomerism

- ✓ When compounds have the same molecular formula but different functional groups, they are known as functional isomers.
- ✓ This phenomenon is called functional isomerism.
- Example 1

i. CH_3-CH_2-OH ; IUPAC name = Ethanol

ii. $CH_3 - O - CH_3$; IUPAC name = Methoxymethane

Here the molecular formulae of these compounds are the same (C_2H_6O) but functional groups are different. Hence compound (i) and (ii) are called functional isomers.

- Example 2

i. $CH_3 - CH_2 - CHO$; IUPAC name = Propanal

ii. $CH_3 - CO - CH_3$; IUPAC name = Propanone

Here the molecular formulae of these compounds are the same (C_3H_6O) but functional groups are different. Hence compound (i) and (ii) are called functional isomers.

c. Position Isomerism

- ✓ When two compounds have same molecular formula and same functional group, but differ in the position of the functional group, they are called position isomers.
- ✓ This phenomenon is known as position isomerism.
- Example 1

i) $CH_3 — CH_2 — CH_2 — OH$ ii) $CH_3 — \underset{\underset{OH}{|}}{CH} — CH_3$

IUPAC name of compound i. = Propanol

IUPAC name of compound ii. = Propan$-2-$ol

Here the molecular formulae of these compounds are the same (C_3H_8O) but the position numbers of their functional groups are different. Hence compound (i) and (ii) are called position isomers.

- Example 2

i) $CH_3 — CH_2 — CH = CH_2$ ii) $CH_3 — CH = CH — CH_3$

IUPAC name of compound i. = But $-1-ene$

IUPAC name of compound ii. = But $-2-ene$

Here the molecular formulae of these compounds are the same (C_4H_8) but the position of the double bond in them differs. Hence compound (i) and (ii) are called position isomers.

- Example 3

i) $CH_3 — CH_2 — C \equiv CH$ ii) $CH_3 — C \equiv C — CH_3$

IUPAC name of compound i. = But $-1-yne$

IUPAC name of compound ii. = But $-2-yne$

Here the molecular formulae of these compounds are the same $(C_4 6)$ but the position of the triple bond in them differs. Hence compound (i) and (ii) are called position isomers.

Metamerism

- ✓ The isomerism exhibited by compounds with the same molecular formula but different alkyl groups on either side of the bivalent functional group (group having valency 2, is known as metamerism.
- Example 1

i) $CH_3 — CH_2 — O — CH_2 — CH_3$

ii) $CH_3 — O — CH_2 — CH_2 — CH_3$

IUPAC name of compound i = Ethoxyethane

IUPAC name of compound ii = Methoxypropane

Here the molecular formulae of both the compounds are same $(C_4H_{10}O)$ but the alkyl groups attached to either side of the functional group are different. Hence compound (i) and (ii) are called metamers.

- Example 2

i) $CH_3 — CH_2 — CO — CH_2 — CH_3$

ii) $CH_3 — CO — CH_2 — CH_2 — CH_3$

IUPAC name of compound i = Pentan – 3 – one

IUPAC name of compound ii = Pentan – 2 – one

Here the molecular formulae of both the compounds are same $(C_5H_{10}O)$ but the alkyl groups attached to either side of the functional group are different. Hence compound (i) and (ii) are called metamers.

Question : Examine the compounds given below and identify the isomeric pairs. Specify the type of isomerism exhibited by each pair.

i) $CH_3 - CH_2 - CH_2 - CH_2 - OH$

ii) $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$

iii) $CH_3 - CH_2 - CH_2 - O - CH_3$

iv) $CH_3 — CH_2 — \underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}} — CH_3$

v) $CH_3 - CH_2 - O - CH_2 - CH_3$

vi) $CH_3 — CH_2 — \underset{\displaystyle OH}{\overset{\displaystyle |}{CH}} — CH_3$

Answer:

Chain isomerism	$(ii) and (iii)$
Position isomerism	$(i) and\ (vi)$
Functional isomerism	$(i) and (iii), (i) and\ (v),$ $(iii)\ and\ (vi), (v) and\ (vi)$
Metamerism	$(iii), (v)$

Let us assess

1. A chain having 6 carbon atoms is given below.

$$C — C — \underset{\displaystyle C}{\overset{\displaystyle |}{C}} — C$$
$$\underset{\displaystyle C}{\overset{\displaystyle |}{}}$$

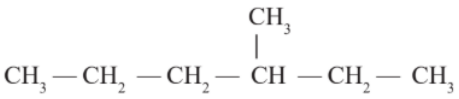
a. Complete the structure by adding hydrogen atoms to each carbon atom.

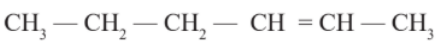
b. Write the molecular formula of this compound.

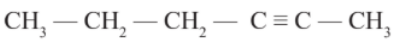
c. How many carbon atoms are there in the main chain of this compound?

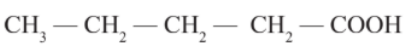
d. Write its IUPAC name.

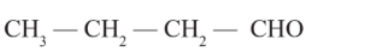
2. Write down the IUPAC names of the given compounds.

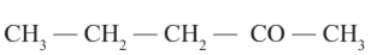
a) 

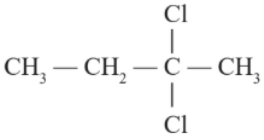
b) 

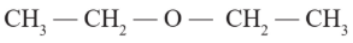
c) 

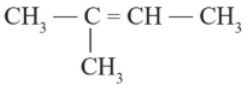
d) 

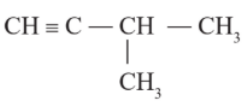
e) 

f) 

g) 

h) 

i) 

j) 

3. Write the structural formulae of the compounds given below.

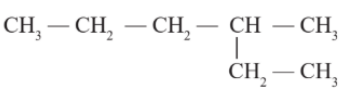
a. 2,3,3–Trimethylhexane b. Ethoxybutane

c. Butan-2-one d. Pent–1–yne

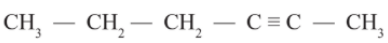
e. Hexan–2–ol f. 3–Bromoheptane

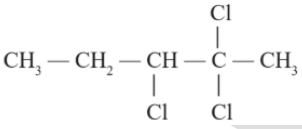
g. Pentanal

4. The structural formulae and IUPAC names of certain compounds are given. Identify the wrong ones and correct them.

i)  2–Ethylpentane

ii)  Pentan–2–one

iii)  Hex–3–yne

iv)  2,3–Dichloropentane

5. i. $CH_3 - CH_2 - O - CH_2 - CH_3$

ii. $CH_3 - CH_2 - CH_2 - CH_2 - OH$

a. What type of isomerism do these compounds exhibit?

b. Write the structural formula of the metamer of compound (i).

6. The structural formulae of two compounds are given.

i. $CH_3 - CH_2 - CH_2 - CH_2 - CHO$

ii. $CH_3 - CH_2 - CH_2 - CO - CH_3$

a. What is the IUPAC name of the first compound?

b. These two compounds are isomers. Why?

c. What type of isomerism do these compounds exhibit?

d. Write the structural formula of the position isomer of the second compound.

7. Examine the compounds given below and identify the isomeric pairs. What type of isomerism is shown by each pair?

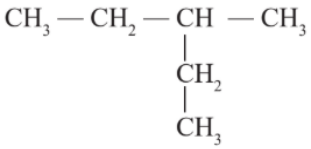
a. Methoxypropane b. 2,3–Dimethylbutane

c. Propan–1–ol d. Ethoxyethane

e. Propan–2–ol f. Hexane

Answers

1. a.



b. C_6H_{14}

c. 5

d. $3-$ Methylpentane

2. a. $3-$ Methylhexane

b. Hex $-2-$ ene

c. Hex $-2-$ yne

d. Pentanoic acid

e. Butanal

f. Pentan $-2-$ one

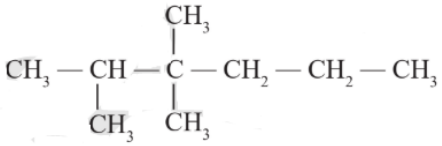
g. $2,2-$ Dichlorobutane

h. Ethoxyethane

i. $2-$ Methylbut $-2-$ ene

j. $3-$ Methylbut $-1-$ yne

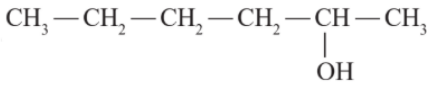
3. a.



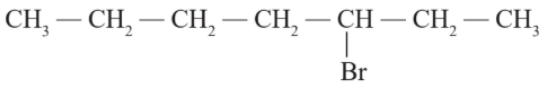
b. $CH_3-CH_2-O-CH_2-CH_2-CH_2-CH_3$

c. $CH_3 - CO - CH_2 - CH_3$

d. $CH \equiv C - CH_2 - CH_2 - CH_3$

e. 

f.



g. $CH_3 - CH_2 - CH_2 - CH_2 - CHO$

4. i. 3 − Methylhexane

iii. Hex −2 − yne

iv. 2,2,3 − Trichloropentane

5. a. Functional isomerism

b. $CH_3 - O - CH_2 - CH_2 - CH_3$

6. a. Pentanal

b. Same molecular formula but different functional group

c. Functional isomerism.

d. $CH_3 - CH_2 - CO - CH_2 - CH_3$

7.

(a) and (d) are metamerism

(b) and (f) are chain isomerism

(c) and (e) are position isomerism

Question bank with answers

1. Match the following:

	A		B
(X)	$-CHO$	(i)	Ether
(Y)	$-O-R$	(ii)	Aldehyde
(Z)	$-OH$	(iii)	Keto
		(iv)	Hydroxyl

Choose the correct answer from the options given below.

	(X)	(Y)	(Z)
(a)	(ii)	(iii)	(iv)
(b)	(iv)	(i)	(ii)
(c)	(ii)	(i)	(iv)
(d)	(ii)	(iv)	(i)

2. The molecular formulae of the first three members of a homologous series are given.

$C_2H_2,\quad C_3H_4,\quad C_4H_6$

a. Write the molecular formula of the fifth member of this series.

b. Write the structural formula of a position isomer of this compound.

3. Some hints about an organic compound is given.

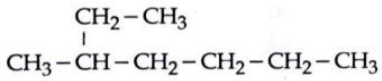
i. There are five carbon atoms in one molecule.

ii. The position of $-CO-$ group is two.

a. Write the structural formula of this organic compound.

b. Write the structural formula and IUPAC name of a functional isomer of this compound.

4. Structure of a hydrocarbon is given.



a. How many carbon atoms are in the main chain?

b. What is the position number of the branch?

5. The IUPAC name of a compound is but $-1-$ ene

a. How many carbon atoms are present in this compound?

b. Write the structural formula of the alkyne containing the same number of carbon atoms.

6. The compound X belongs to ether family. There is an ethyl group on each side of the ether linkage in it.

a. Write the structural formula of this compound.

b. What is the name of functional group present in it?

c. Write the structural formula and IUPAC name of the metamer of this compound.

d. Write the structural formula of a compound having the same molecular formula different functional group

7. X and Y are two organic compounds with different functional group and their molecular formula is $C_5H_{10}O$.

a. Write the structural formula of compound X having $-CHO$ as functional group.

b. By what name are compounds containing this functional group generally known?

c. Write the structural formula of compound Y.

d. Write the structural formula of the position isomer of compound Y.

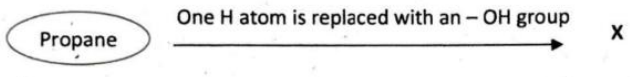
8. Which is the functional group present in acetone?

9. An aromatic hydrocarbon has 6 carbon atoms in its molecule.

a. Draw the struucture of compound when a hydrogen atom of this compound is replaced with an $-OH$ group.

b. Write the name of this compound.

10. Analyse the following.



a. Write the structural formula of X.

b. What is its IUPAC name?

11. One molecule of an aliphatic organic compound has 6 carbon atoms. It is identified as a saturated carboxylic acid.

a. Write the structural formula of this compound.

b. Write the IUPAC name of a compound in this family with 5 carbon atoms.

12. Write the structural formulae of the given compounds.

a. $2,2-$ Dibromopropane

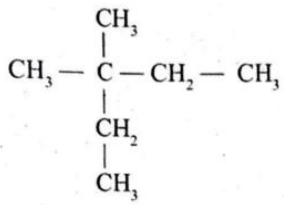
b. Propyne

13. A saturated aliphatic hydrocarbon molecule contains a total of 7 carbon atoms. There is a methyl group as brach at second carbon atom of its main chain.

a. Draw the structure of this compound.

b. Write the IUPAC name of this compound.

14. Analyse the given structure



a. Write the number of carbon atoms in the longest chain.

b. What is the position number of carbon atom to which methyl groups are attached?

c. What is the IUPAC name of this compound?

15. Compound (1) CH_3-CHO and compound (2) CH_3-CH_2-CHO are members of a homologous series.

a. Write the name of family to which these compounds belong.

b. Write the IUPAC name of these compounds.

c. Draw the structure of a compound having the same molecular formula of compound (2), but having another functional group.

16. Pentan $-2-$ one and Pentan $-3-$ one are a pair of isomers.

a. Write the structural formulae of these compounds.

b. To which family of organic compounds do they belong?

c. Write the structural formula of a compound which has the same molecular formula of these compounds but belong to another family.

17. Molecular formula of a compound is $C_4H_{10}O$

a. Which are the families of organic compounds having this molecular formula?

b. Write the structural formulae of a pair of functional isomers having this molecular formula.

c. Write the structural formulae of a pair of position isomers having this molecular formula. (1)

d. Write the structural formulae of a pair of metamers having this molecular formula.

18. C_4H_6 is the molecular formula of an open chain hydrocarbon.

a. Write the general formula of family to which this hydrocarbon belongs. (1)

b. Write the possible structural formulae of this hydrocarbon. (1)

c. Identify the type of isomensm exhibited by these compounds. (1)

d. 4 hydrogen atoms are added to a molecule of this compound. Write the structural formulae of a pair of chain isomers of the product. (1)

Answers

1. (c)

2. a. C_6H_{10}

b. $CH_3 - C \equiv C - CH_2 - CH_2 - CH_3$

3. a. $CH_3 - CO - CH_2 - CH_2 - CH_3$

b. $CH_3 - CH_2 - CH_2 - CH_2 - CHO$

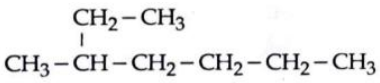
IUPAC name = Pentanal

4. a. 7

b. 3

c.

4. Structure of a hydrocarbon is given.



a. How many carbon atoms are in the main chain?

b. What is the position number of the branch?

5. a. 4

b. $CH \equiv C - CH_2 - CH_3$

6. a. $CH_3 - CH_2 - O - CH_2 - CH_3$

b. Alkoxy group (Ethoxy group)

c. $CH_3 - O - CH_2 - CH_2 - CH_3$

IUPAC name = Methoxypropane

d. $CH_3 - CH_2 - CH_2 - CH_2 - OH$

7. a. $CH_3 - CH_2 - CH_2 - CH_3 - CHO$

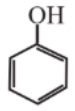
b. Aldehydes

c. $CH_3 - CH_2 - CO - CH_2 - CH_3$

d. $CH_3 - CO - CH_2 - CH_2 - CH_3$

8. Keto group

9. a.



Phenol

$(C_6H_5 - OH)$

b. Phenol

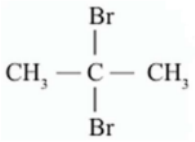
10. a. $CH_3 - CH_2 - CH_2 - OH$

b. Propan $-1-$ ol (Propanol)

11. a. $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - COOH$

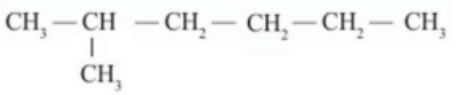
b. Pentanoic acid

12. a.



b. $CH \equiv C - CH_3$

13. a.



b. $2-$ Methylhexane

14. a. 5

b. 3,3

c. 3,3 $-$ Dimethylpentane

15. a. Aldehyde

b. IUPAC name of compound (1) = Ethanal

IUPAC name of compound (2) = Propanal

c. $CH_3 - CO - CH_3$

16. a.

Pentan $-2-$ one : $CH_3 - CO - CH_2 - CH_2 - CH_3$

Pentan $-3-$ one : $CH_3 - CH_2 - CO - CH_2 - CH_3$

b. Ketone

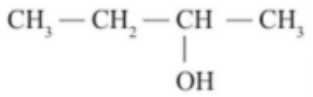
c. $CH_3 - CH_2 - CH_2 - CH_2 - CHO$

17. a. Alcohol and Ether

b. $CH_3 - CH_2 - CH_2 - CH_2 - OH$

$CH_3 - CH_2 - O - CH_2 - CH_3$

c. $CH_3 - CH_2 - CH_2 - CH_2 - OH$



d. $CH_3 - CH_2 - O - CH_2 - CH_3$

$CH_3 - O - CH_2 - CH_2 - CH_3$

18. a. Alkyne

b. $CH \equiv C - CH_2 - CH_3$

$CH_3 - C \equiv C - CH_3$

c. Position isomerism

d. $CH_3 - CH_2 - CH_2 - CH_3$