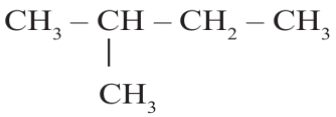
1 NOMENCLATURE OF ORGANIC COMPOUNDS AND ISOMERISM

The structural formulae of two hydrocarbons are given below.

Hydrocarbon I

$CH_3 - CH_2 - CH_2 - CH_2 - CH_3$

Hydrocarbon II



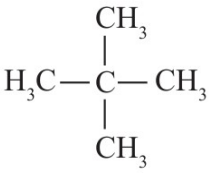
You are familiar with the formula of **hydrocarbon I**

- How many carbon atoms are there in this chain? : 5
- What is the word root of this carbon chain? : Pent
- Write the IUPAC name of this compound. : Pentane

Analyse the structural formula of **hydrocarbon I** and **hydrocarbon II.**

- What is the molecular formula of these two hydrocarbons? : C_5H_{12}
- How do they differ in the structure of the carbon chain? : Hydrocarbon I is a straight chain.
  : Hydrocarbon II has a branch

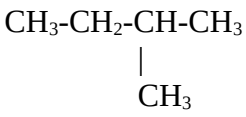
Have a look at the structural formula of another hydrocarbon with the same molecular formula



It is clear that carbon atoms can form branched compounds.

Nomenclature of alkanes with one branch

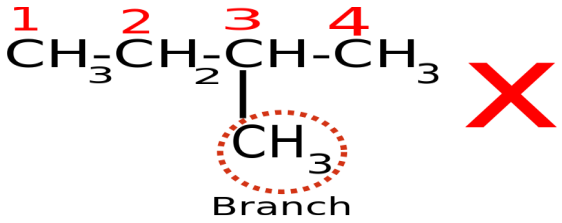
Consider the following compound

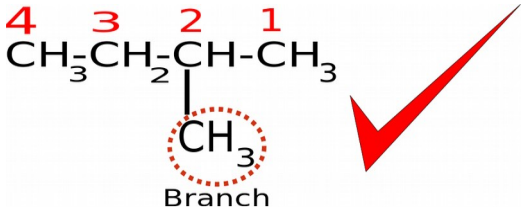


According to the IUPAC rules of nomenclature, the longest chain (with the maximum number of carbon atoms) should be considered as the main chain and the remaining as branches.

The position of the branch can be found out by numbering carbon atoms in the main chain. ***Numbering of the carbon atoms in the chain should be done in such a way that the carbon atom carrying the branch gets the lowest number.***

Hence the numbering should be done in the following way.





After understanding the correct numbering , go through the following points.

a) Number of carbon atoms in the main chain	: 4
b) Word root	: But
c) Suffix	***: ane***
d) Name of the alkyl radical coming as branch	: Methyl
e) **Position of the branch**	**: 2**
f) IUPAC name	: 2-Methylbutane

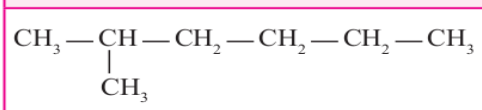
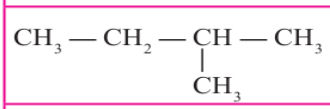
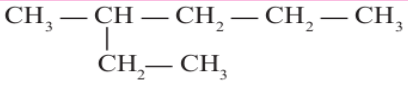
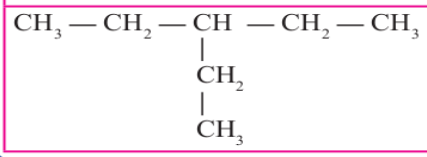
Position number of branch + hyphen + name of radical(branch) + word root + suffix.

A hyphen (-) is used to separate numerals and alphabets while writing the IUPAC name.

Number of carbon atoms	1	2	3	4	5	6	7	8	9	10
Word Root	Meth	Eth	Prop	**But**	**Pent**	**Hex**	**Hept**	Oct	Non	Dec

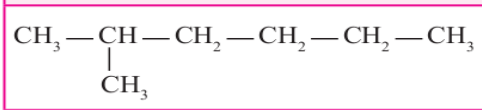
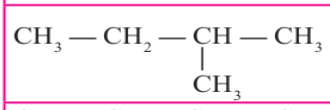
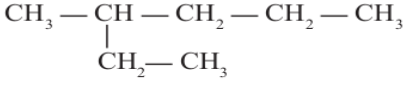
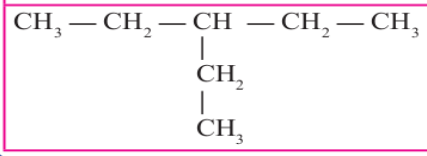
1. Write IUPAC names of the hydrocarbons given below.

Complete the table.

Compound	Number of carbon atoms in the longest chain	Name of branch	Position of branch	IUPAC name
	.....	.....	.....	.....
	.....	.....	.....	.....
	.....	.....	.....	.....
	.....	.....	.....	.....

Answer:

Complete the table.

Compound	Number of carbon atoms in the longest chain	Name of branch	Position of branch	IUPAC name
	6	Methyl	2	2-Methylhexane
	4	Methyl	2	2-Methylbutane
	6	Methyl	3	3-Methylhexane
	5	Ethyl	3	3-Ethylpentane

More practice questions.

2. Write the IUPAC names of the following .

Compound	Number of carbon atoms in the longest chain	Name of branch	Position of Branch	IUPAC Name
CH_3-CH(CH_3)-CH_2-CH_3				
CH_3-CH_2-CH_2-CH(CH_3)-CH_3				
CH_3-CH_2-CH_2-CH_2-CH(CH_3)-CH_3				
CH_3-CH_2-CH_2-CH(CH_3)-CH_2-CH_3				
CH_3-CH_2-CH(CH_3)-CH_2-CH_2-CH_3				
CH_3-CH_2-CH(CH_2-CH_3)-CH_2-CH_3				
CH_3-CH_2-CH_2-CH(CH_2-CH_3)-CH_2-CH_3				

Answer:

Compound	Number of carbon atoms in the longest chain	Name of branch	Position of Branch	IUPAC Name
CH_3-CH(CH_3)-CH_2-CH_3	4	Methyl	2	2-Methylbutane
CH_3-CH_2-CH_2-CH(CH_3)-CH_3	5	Methyl	2	2-Methylpentane
CH_3-CH_2-CH_2-CH_2-CH(CH_3)-CH_3	6	Methyl	2	2-Methylhexane

CH_3-CH_2-CH_2-CH-CH_2-CH_3 | CH_3	6	Methyl	3	3-Methylhexane
CH_3-CH_2-CH-CH_2-CH_2-CH_3 | CH_3	6	Methyl	3	3-Methylhexane
CH_3-CH_2-CH-CH_2-CH_2-CH_3 | CH_2-CH_3	6	Ethyl	3	3-Ethylhexane
CH_3-CH_2-CH_2-CH-CH_2-CH_3 | CH_2 | CH_3	6	Ethyl	3	3-Ethylhexane

3.Complete the table.

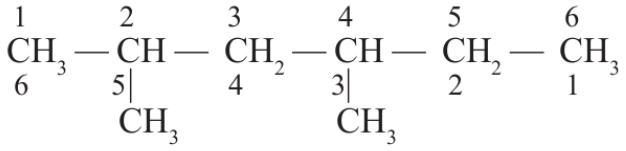
IUPAC Name	Structural formula
2 – Methylpropane	
3 – Methylheptane	
3 – Ethyloctane	
4– Ethyldecane	

Answer:

IUPAC Name	Structural formula
2 – Methylpropane	CH_3 | CH_3-CH-CH_3
3 – Methylheptane	CH_3 | CH_3-CH_2-CH-CH_2-CH_2-CH_2-CH_3
3 – Ethyloctane	CH_2-CH_3 | CH_3-CH_2-CH-CH_2-CH_2-CH_2-CH_2-CH_3
4– Ethyldecane	CH_2-CH_3 | CH_3-CH_2-CH_2-CH-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3

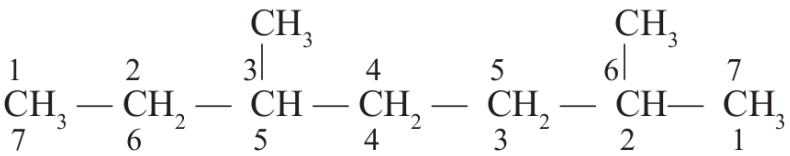
Nomenclature of hydrocarbons with more than one branch

►*If more than one branch is present, select the longest carbon chain. 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.*

Eg. 

Correct way of numbering	:	Left to right
Position number of the first branch	:	2
Correct position number of the branches	:	2, 4

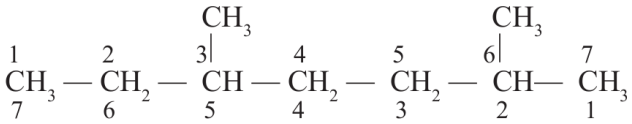
►*If the same branch appears more than once in a carbon chain, the number of branches is to be indicated using prefixes like* ***di (two), tri (three), tetra (four) etc****.*
Position numbers should be separated by commas.



- Number of carbon atoms in the main chain : 7
- Number of branches : 2
- Name of branches : Methyl

- Position of the first branch while numbering from left to right : 3
- Position of the first branch while numbering from right to left : 2
- Correct way of numbering : Right to left
- Correct position number of the branches : 2, 5
- IUPAC name : 2,5–Dimethylheptane

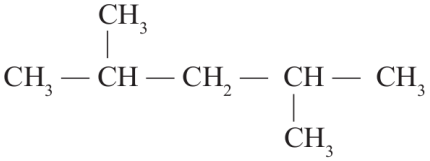
If the same** type of **branch** is present **more than once,** as per rule, **numbering should be done** either from left to right or from right to left **so as to get the lowest number for the branch coming first in the longest chain.



- Number of carbon atoms in the main chain : 7
- Number of branches : 2
- Name of branches : Methyl

- Position of the first branch while numbering from left to right : 3
- Position of the first branch while numbering from right to left : 2
- Correct way of numbering : Right to left
- Correct position number of the branches : 2, 5
- IUPAC name : 2,5–Dimethylheptane

4.The structural formula of a hydrocarbon is given below.



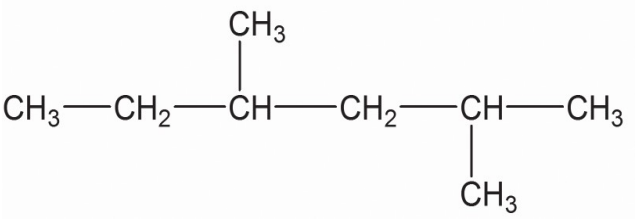
Find,

(a) The number of carbon atoms in the main chain.
(b) Number of branches
(c) Position of first branch while numbering from left to right
(d) Position of first branch while numbering from right to left
(e) Is there any change in the position number ?
(f) Write the Correct way of numbering.
(g) Write the IUPAC name of the compound

Answer:

a) The number of carbon atoms in the main chain : 5
(b) Number of branches : 2
(c) Position of first branch while numbering from left to right : 2
(d) Position of first branch while numbering from right to left : 2
(e) Is there any change in the position number ? : No
(f) Correct way of numbering : 2,4
(g) IUPAC name of the compound : 2,4 – Dimethylpentane.

5.The structural formula of another hydrocarbon is given below.



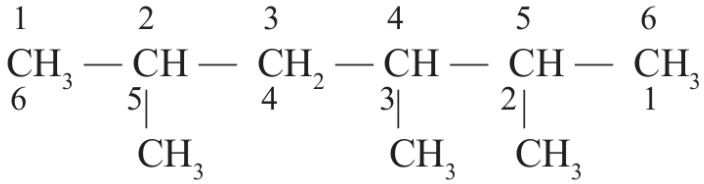
Find,

(a) The number of carbon atoms in the main chain.
(b) Number of branches
(c) Position of first branch while numbering from left to right
(d) Position of first branch while numbering from right to left
(e) Correct way of numbering
(f) IUPAC name of the compound

Answer:

a) The number of carbon atoms in the main chain : 6
(b) Number of branches : 2
(c) Position of first branch while numbering from left to right : 3
(d) Position of first branch while numbering from right to left : 2
(e) Correct way of numbering :
(f) IUPAC name of the compound : 2,4 – Dimethylhexane.

6. The structural formula of a hydrocarbon is given below.



Find,

(a) The number of carbon atoms in the main chain.
(b) Number of branches
(c) Position of first branch while numbering from left to right
(d) Position of first branch while numbering from right to left
(e) Is the position number of the first branch the same?
(f) If yes, Which is the second branch?
(g) When does the second branch get a lower position number ?Put a ✓ mark against the correct option.

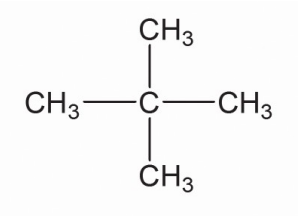
While numbering from left to right ☐
While numbering from right to left ☐

(h) Correct way of numbering
(i) IUPAC name of the compound

Answer:

(a) The number of carbon atoms in the main chain : 6
(b) Number of branches : 3
(c) Position of first branch while numbering from left to right : 2
(d) Position of first branch while numbering from right to left : 2
(e) Is the position number of the first branch the same? **: Yes**
(f) If yes, Which is the next branch? **: CH_3**
(g) When does the next branch get the lowest number? **: While numbering from right to left**
(h) Correct way of numbering : 2,3,5
(i) IUPAC name of the compound :2,3,5 – Trimethylhexane

7. The structural formula of a hydrocarbon is given below.



Find,

(a) Number of carbon atoms in the main chain :
(b) Number of branches :
(c) Name of the branches :
(d) Position numbers of branches :
(e) IUPAC name :

Answer:

(a) Number of carbon atoms in the main chain :3
(b) Number of branches present in this compound :2
(c) Name of the branches : Methyl , Methyl
(d) Position numbers of branches :2, 2
(e) IUPAC name : 2,2 – Dimethylpropane

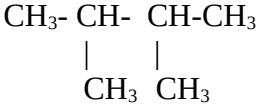
8.If a carbon atom has two identical branches, their position the numbers should be repeated.

Represent the structural formula of each of the following compounds.

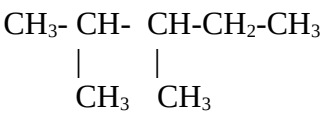
(a) 2,3- Dimethylbutane
(b) 2,3- Dimethylpentane
(c) 2,2- Dimethylbutane
(d) 2,2- Dimethylpentane

Answer:

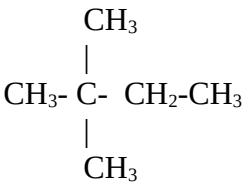
(a) 2,3- Dimethylbutane



(b) 2,3- Dimethylpentane



(c) 2,2- Dimethylbutane

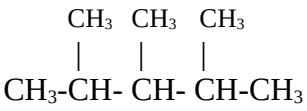
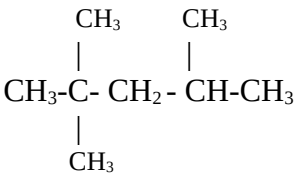
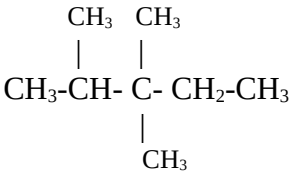
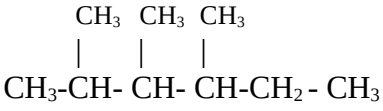
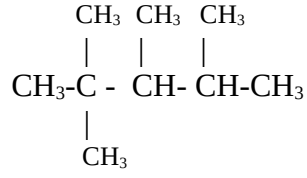
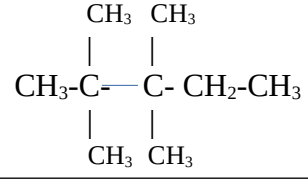


(d) 2,2- Dimethylpentane (For self writing)

More examples.
9.Represent the structures of the following compounds.

(a) 2,3,4- Trimethylpentane
(b) 2,2,4- Trimethylpentane
(c) 2,3,3- Trimethylpentane
(d) 2,3,4- Trimethylhexane
(e) 2,2,3,4- Tetramethylpentane
(f) 2,2,3,3- Tetramethylpentane

Answer:

IUPAC Name	Structure
(a) 2,3,4- Trimethylpentane	
(b) 2,2,4- Trimethylpentane	
(c) 2,3,3- Trimethylpentane	
(d) 2,3,4- Trimethylhexane	
(e) 2,2,3,4-Tetramethylpentane	
(f) 2,2,3,3-Tetramethylpentane	

Nomenclature of unsaturated Hydrocarbons

Classify and tabulate the following compounds into alkanes, alkenes and alkynes.

C_5H_{10} , C_6H_{10} , C_2H_4 , C_5H_{12} , C_6H_{12} , C_7H_{12} , $C_{10}H_{22}$, C_4H_{10} , C_4H_8 , C_4H_6 ,C_2H_6 , C_3H_6 ,C_2H_2 , C_3H_4 C_3H_8.

Answer:

Alkane	Alkene	Alkyne
C_5H_{12}	C_5H_{10}	C_6H_{10}
$C_{10}H_{22}$	C_2H_4	C_7H_{12}
C_4H_{10}	C_6H_{12}	C_4H_6
C_2H_6	C_4H_8	C_2H_2
C_3H_8	C_3H_6	C_3H_4

10.Write the structural formula of the compound C_2H_4

Answer: $CH_2=CH_2$

11.What is the IUPAC name of the compound **$CH_2=CH_2$** ?

(Hint : Replace the 'ane' in the IUPAC name of the alkane with 'ene'. Alk + ene = alkene)

Answer: The IUPAC is Ethene.

More examples:

12.What is the IUPAC name of the compound **CH_3-CH=CH_2** ?

Answer: Propene.

13.What is the IUPAC name of the compound **CH_2=CH-CH_2-CH_3** ?

If your answer is Butene, then ,what is the IUPAC name of **CH_3-CH=CH-CH_3 ? Is it Butene?**

Look at the difference in the position of the double bond .

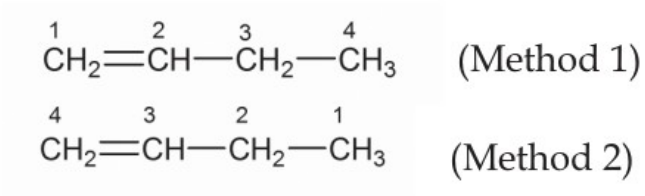
> ***For unbranched, unsaturated hydrocarbons with <u>four or more carbon atoms</u>***, position number of the doubly bonded carbon atom should be indicated.

Then ,

14.What is the IUPAC name of the compound CH_3-CH_2-CH=CH_2 ?

Let's go through this example

Notice the position numbers given to the carbon atoms.



While numbering the carbon atoms, during IUPAC naming, ***the carbon atoms linked by double bond should be given the lowest position number.***

Accordingly, it is in ***method (1)*** *that the lowest position numbers are given to the doubly bonded carbon atoms. What will be the IUPAC name of the compound then?*

Answer: But-1-ene

15.What is the structure of **But-2-ene ?**
Answer: CH_3-CH=CH-CH_3
16.What is the IUPAC name of **CH_3-CH_2 - CH=CH-CH_3 ?**
Answer: Pent-2-ene
17.What is the IUPAC name of **CH_3-CH=CH-CH_2-CH_3 ?**
Answer: Pent-2-ene.

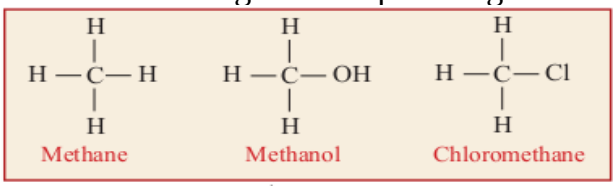
For naming alkynes , the same method has to be followed . Alk + yne = Alkyne.

18.What is the IUPAC name of **CH≡CH ?**
Answer: Ethyne
19.What is the IUPAC name of **CH_3-C≡CH ?**
Answer: Propyne
20.What is the IUPAC name of **CH_3-CH_2- C≡CH ?**

21.What is the structure of **But-2-yne ?**
Answer: CH_3-C≡C-CH_3
22.What is the structure of Pent-**2-yne ?**
Answer: CH_3-CH_2-C≡C-CH_3 **OR** CH_3-C≡C-CH_2 -CH_3

Functional groups.

Examine the structure and name of the organic compounds given below.



The chemical and physical properties of methanol and chloromethane are entirely different from those of methane.
Carbon and hydrogen are not the only elements present in organic compounds. There are other atoms and groups of atoms present in the place of hydrogen atoms in organic compounds.

An atom or a group of atoms, bonded to carbon in an organic compound, determines the distinctive chemical and physical properties of that compound. This atom or group of atoms is called a functional group.

1.Hydroxyl Group (- OH)
IUPAC Name : Alkane - e + ol → Alkanol

23.What is the IUPAC name of CH_3-OH?
Answer: Methane-e+ ol = **Methanol**
24.What is the IUPAC name of CH_3-CH_2-OH?
Answer: Ethanol
25.What is the IUPAC name of CH_3-CH_2-CH_2-OH?
Is it Propanol ? If yes, then , what is the IUPAC name of CH_3-CH-CH_3 ?
|
OH

CH_3-CH_2-CH_2-OH is Propan-1-ol

CH_3-CH-CH_3
| **is Propan-2-ol**
OH

26.What is the IUPAC name of CH_3-CH_2-CH_2-CH_2-OH?
Answer : Butan-1-ol
27.What is the IUPAC name of CH_3-CH-CH_2-CH_3 ?
|
OH
Answer : Butan-2-ol
28.What is the IUPAC name of CH_3-CH_2-CH_2-CH-CH_3 ?
|
OH

Tick ✓ the correct one

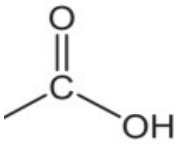
Pentan-4-ol	
Pentan-2-ol	

(Hint: The main chain should be numbered from the end nearest to the functional group.)

29.What is the IUPAC name of CH_3-CH_2-CH-CH_3 ?
|
OH
Answer : Butan-2-ol

30.What is the structural difference between CH_3-CH_2-CH_2-OH and CH_3-CH-CH_3 ?
|
OH
Answer: The position of functional group is different.

2. Carboxyl Group (-COOH) or



IUPAC Name : Alkane - e + oic acid → Alkanoic acid

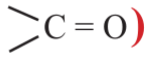
Eg : H-COOH – Methanoic acid
CH_3-COOH – Ethanoic acid

31.What is the IUPAC name of CH_3-CH_2-CH_2-COOH
Answer: Butanoic acid

3. Aldehyde group ( or –CHO)

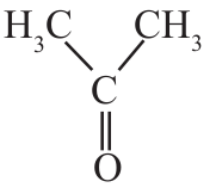
Compounds with -CHO functional group are called aldehydes.
IUPAC Name : Alkane - e + al → Alkanal

Eg :	H-CHO	–	Methane – e + al Methanal
	CH_3-CHO	–	Ethanal
	CH_3-CH_2-CHO	–	Propanal
	CH_3-CH_2-CH_2-CH_2-CHO	–	Pentanal

4. Keto group ()

Ketones are compounds with > C=O as the functional group
IUPAC Name : Alkane - e + one → Alkanone

32.What is the IUPAC name of the compound given below?

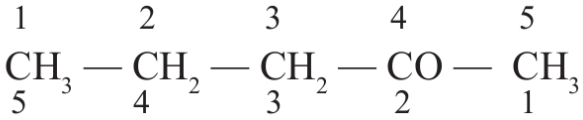


Answer:
Number of carbon atom in this chain : 3
Name of alkane having 3 carbon atoms : Propane
IUPAC name = Propane – e + one : Propanone

This compound is known by the name acetone.

The position of the functional group must be considered while naming ketones with 5 or more carbon atoms.

33.What is the IUPAC name of the compound given below?



Answer:
Number of carbon atom in this chain : 5
Name of alkane having 3 carbon atoms : Pentane
Correct position number of the functional group : 2
IUPAC name = Propane – e + one : Pentan-2-one

What is the IUPAC name of the compound given below?

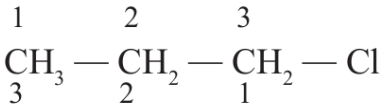
CH_3-CH_2-CH_2-CO-CH_2-CH_3
Answer : Hexan-3-one

No ketones can be written with one or two carbon atoms in one molecule. (Think why?)]

5. Halo group (−F, −Cl, −Br, −I)

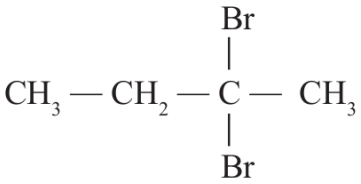
The compounds formed when one or more hydrogen atoms in a hydrocarbon is replaced with an equal number of halogen atoms are called halo compounds. There are organic compounds with functional groups such as fluoro (−F), chloro (−Cl), bromo (−Br), and iodo (−I).

Write the IUPAC name of the compound given below.



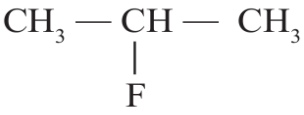
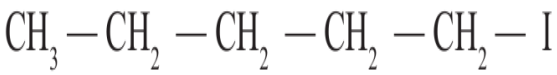
Number of carbon atoms in the main chain : 3
Name of alkane with the same number of carbon atoms :1
Name of halo group : Chloro
Correct position number of the carbon to which the halo group is attached :1
IUPAC name : 1–Chloropropane----------

34.Write the IUPAC name of the compound given below

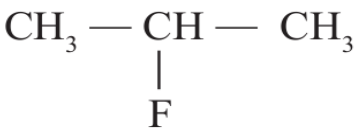
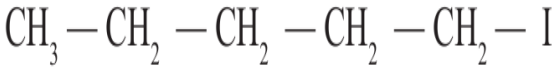


Answer : 2,2 - Dibromobutane

Complete the table given below

Compound	IUPAC Name
CH_3-CH(Cl)-CH(Cl)-CH_3	2,3– Dichlorobutane
	
	
CH(Cl)-CH(Cl)	

Answer:

Compound	IUPAC Name
CH_3-CH(Cl)-CH(Cl)-CH_3	2,3– Dichlorobutane
	2–Fluoropropane
	1– Iodopentane
CH(Cl)-CH(Cl)	1,2-Dichloroethane

More examples

35.What are the IUPAC names of the following.

CH_3-Br

CH_3-CH_2- Br

CH_3-CH_2-CH_2- Br

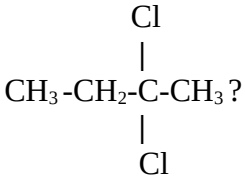
CH_3-CH(Br)-CH_3

Answer:

CH_3-Br : Bromo methane
CH_3-CH_2- Br : Bromoethane
CH_3-CH_2-CH_2- Br : 1- Bromo propane

CH_3-CH-CH_3
|
Br **: 2- Bromo propane**

36. What is the IUPAC name of the following compound.



Answer: 2,2– Dichloro butane

(The position of the halo group – name of halo group + name of alkane)

4. Alkoxy Group (- R-O)

Ethers are compounds containing alkoxy group.

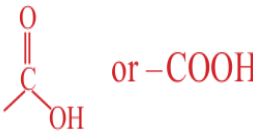
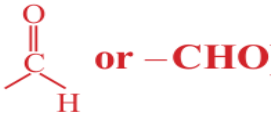
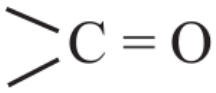
IUPAC Name: Alkoxyalkane

Examples are given below.

Sl No	Ether	IUPAC name
1	CH_3-O-CH_3	Methoxy methane
2	CH_3-CH_2-O-CH_2-CH_3	Ethoxy ethane
3	CH_3-CH_2-CH_2-O-CH_2-CH_2-CH_3	Propoxy propane
4	CH_3-O-CH_2-CH_3	*Methoxy ethane*
5	CH_3-CH_2-O-CH_3	*Methoxy ethane*
6	CH_3-CH_2-O-CH_2-CH_2-CH_3	Methoxy propane
7	CH_3-O-CH_2-CH_2-CH_2-CH_3	Methoxy butane
-8	CH_3-CH_2-O-CH_2-CH_2-CH_3	Ethoxy propane
9	CH_3-CH_2-CH_2-CH_2-O-CH_2-CH_3	Ethoxy butane
10	CH_3-CH_2-CH_2-CH_2-O-CH_3	Methoxy butane

*Here among the alkyl radicals on either side of the -O- group , the **longest alkyl group is taken as alkane** and the other as alkoxy group.*

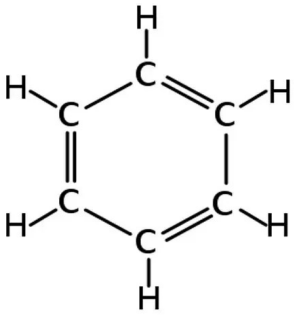
Summary

Sl No	Functional group	Structure	Name	IUPAC Name
1	Hydroxyl group	-OH	Alcohol	Alkanol
2	Carboxyl group		Carboxylic acids	Alkanoic acid
3	Aldehyde group		Aldehyde	Alkanal
4	Keto group		Ketone	Alkanone
5	Halo group	-F /-Cl /-Br/-I etc	Halo compounds	Halo_____
6	Alkoxy group	- O - R	Ether	Alkoxyalkane

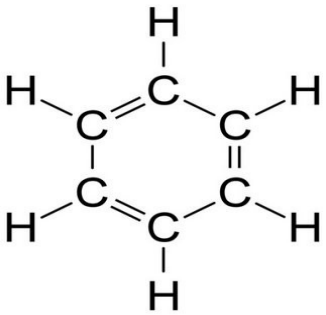
(R – Alkyl groups like CH_3-, CH_3-CH_2-, CH_3-CH_2-CH_2- or Aryl groups like C_6H_5-)

Cyclic or Ring Compounds

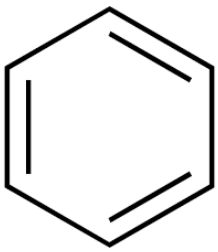
Aromatic compounds



OR



or **OR**



37.Which category does this compound belong to?(Aliphatic / Alicyclic/ Aromatic)

Answer : Aromatic

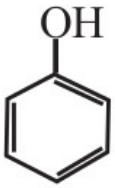
38.What is the name of this compound?

Answer : Benzene

39.Write the molecular formula of this compound?

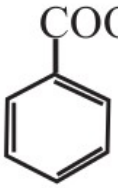
Answer : C_6H_6

Phenol is the compound obtained when a hydrogen atom in benzene is replaced with an −OH group. Similarly, when a hydrogen atom is replaced with a −COOH group, the resulting compound is benzoic acid.



Phenol

$(C_6H_5 - OH)$



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.

1

Look at the following compounds.

(i) $CH_3-CH_2-CH_2-CH_3$

(ii)
$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3$$

● What are the similarities between these two compounds?

Number of carbon atoms	4
Number of hydrogen atoms	10
Molecular formula	**C_4H_{10}**

●What is the peculiarity in the molecular formulae? Molecular formula is same

●Write their IUPAC names.

Compound (i) : Butane

Compound (ii) : 2-Methylpropane

Although the molecular formulae of these compounds are the same, the structures of the carbon chain are different. Such isomers are called ***chain isomers.***

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.***

Examples

Compound	CH_3-CH_2-CH_2-CH_2-CH_3	CH_3-CH(CH_3)-CH_2-CH_3	CH_3-C(CH_3)(CH_3)-CH_3
Molecular formula	C_5H_{12}	C_5H_{12}	C_5H_{12}
IUPAC Name	Pentane	2-Methylbutane	2,2-Dimethylpropane
Reason for different properties	Difference in carbon chain		

40. (a) How many chain isomers are possible for CH_3-CH_2-CH_2-CH_2-CH_2-CH_3?
Answer: 5
(b) Give their structures
Answer: Self Assessment
(c) Write their IUPAC names
Answer:
Hexane , 2-Methylpentane,3-Methylpentane,
2,2- Dimethylbutane, 2,3- Dimethylbutane

2

If the position of the functional group is different in compounds having the same molecular formula and the same functional group, then they are position Isomers.

Examples

1.

Compound	CH_3-CH_2-CH_2-OH	CH_3-CH(OH)-CH_3
Molecular formula	C_3H_8O	C_3H_8O
IUPAC Name	Propan-1-ol	Propan-2-ol
Reason for different properties	*Position of the functional group is different*	

2.

Compound	CH_3-CH_2-CH_2-Cl	CH_3-CH(Cl)-CH_3
Molecular formula	C_3H_7Cl	C_3H_7Cl
IUPAC Name	1-Chloropropane	2-Chloropropane
Reason for different properties	*Position of the functional group is different*	

3.

Compound	CH_3-CH_2-CH_2-CH_2 -CH_2- OH	CH_3-CH(OH)-CH_2-CH_2-CH_3	CH_3-CH_2-CH(OH)-CH_2-CH_3
Molecular formula	$C_5H_{12}O$	$C_5H_{12}O$	$C_5H_{12}O$
IUPAC Name	Pentan-1-ol	Pentan-2-ol	Pentan-3-ol
Reason for different properties	*Position of the functional group is different*		

41. Write the structure of the position isomer of Butan-1-ol

Answer : CH_3-CH(OH)-CH_2-CH_3

42.Analyse the structural formulae of the two pairs of compounds given below

CH_3-CH_2-CH=CH_2

CH_3CH=CH-CH_3

What is the molecular formula of these compounds?C_4H_8

Write their IUPAC names. Compound (i) But-1-ene Compound (ii) But-2-ene

Although their molecular formulae are the same, the position of the double bond in them differs. Hence, they exhibit position isomerism.

43.Analyse the structural formulae of the two pairs of compounds given below

CH_3-CH_2-C≡CH

CH_3-C≡C-CH_3

What is the molecular formula of these compounds?C_4H_6

Write their IUPAC names.

Compound (i) But-1-yne Compound (ii) But-2-yne

Although their molecular formulae are the same, the position of the triple bond in them differs. Hence, they also exhibit position isomerism.

After analysing the previous examples, it is clear that double bond and triple bond are also considered as functional groups.

44.Write down the structural formulae of all the possible position isomers of the compound CH_3-CH_2-CH_2-CH_2-CH_2-Cl .

Answer:

For Self Assessment

[Hint : 2-Chloropentane , 3-Chloropentane]

45.Write the structural formula and IUPAC name of the position isomers of the compound Pentan-2-one.

For Self Assessment

[Hint : Pentan-3-one]

When compounds have the same molecular formula but different functional groups, they are known as functional isomers, and this phenomenon is called functional isomerism.

Examples

1.

Compound	CH_3-CH_2-OH	CH_3-O-CH_3
Molecular formula	C_2H_6O	C_2H_6O
IUPAC Name	Ethanol	Methoxymethane
Reason for different properties	*Difference in their functional groups*	

2.

Compound	CH_3-CH_2-CH_2-OH	CH_3-O-CH_2-CH_3
Molecular formula	C_3H_8O	C_3H_8O
IUPAC Name	Propan-1-ol	Methoxyethane
Reason for different properties	*Difference in their functional groups*	

46.Write the IUPAC name of the functional isomer of Ethoxy ethane

Answer : Butan-1-ol or Butan-2-ol.

3

Compound	CH_3-CH_2-CHO	CH_3-CO-CH_3
Molecular formula	C_3H_6O	C_3H_6O
IUPAC Name	Propanal	Propanone
Reason for different properties	*Difference in their functional groups*	

Write the structural formula and IUPAC name of the functional isomer of the compound CH_3-CH_2-CH_2-CHO

Answer

Structural formula : CH_3-CH_2-CO-CH_3

IUPAC Name : Butanone

Metamerism

The structural formulae of two ethers are given below.

i) CH_3-CH_2-O-CH_2-CH_3
ii) CH_3-O-CH_2-CH_2-CH_3

Write the molecular formulae of these compounds.: $C_4H_{10}O$
Now, examine the alkyl groups on either side of the ether linkage -O-

What is peculiar about the number of alkyl groups on either side of the ether linkage -O-in compound (i)? :Two alkyl groups are on the left side and two alkyl groups are on the right side

What is peculiar about the number of alkyl groups on either side of the ether linkage -O-in compound (ii)?:One alkyl group is on the left side and three alkyl groups are on the right side.

In compound (i), the ether linkage -O- has same alkyl groups on either side, whereas in compound (ii), the ether linkage-O- has different alkyl groups on either side.
These types of isomers are called metamers.

Compounds having same molecular formula but different alkyl groups attached to either side of the functional group are called metamers.

Look at another example.
CH_3-CO-CH_2-CH_2-CH_3
CH_3-CH_2-CO-CH_2-CH_3

Write their molecular formula
Answer :$C_5H_{10}O$
These are also metamers.

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, eg. (-O- , >C = O) is known as metamerism.

It is understood that the above metamers are also examples of position isomers.

47.Write the structural formulae and IUPAC names of any two metamers of the compound
CH_3-CH_2-CH_2-O-CH_2-CH_2-CH_3

Answer: CH_3-O-CH_2-CH_2-CH_2-CH_2-CH_3
(Methoxypentane)

CH_3-CH_2-CO-CH_2-CH_2-CH_2-CH_3
(Ethoxybutane)

48.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) $CH_3 — CH_2 — \underset{\displaystyle CH_3}{\underset{|}{CH}} — CH_3$

v) $CH_3 — CH_2 — O — CH_2 — CH_3$

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

Answer:

Compound	Molecular Formula
i)	$C_4H_{10}O$
ii)	C_5H_{12}
iii)	$C_4H_{10}O$
iv)	C_5H_{12}
v)	$C_4H_{10}O$
vi)	$C_4H_{10}O$

Chain isomerism	**ii) , iv)**
Position isomerism	**i) , vi)**
Functional isomerism	**Pair1 : i) , iii)** **Pair 2 : i) , v)** **Pair 3 : iii) , vi)** **Pair 3 : v) , vi)**
Metamerism	**iii) , v)**