Chapter 13

FUNDAMENTAL PRINCIPLES OF ORGANIC CHEMISTRY

13.1 IUPAC Nomenclature of Organic Compounds (up to chain having 6-carbon atoms)

Learning outcomes

Candidates should be able to:

- State IUPAC name of the organic compounds.

There are two ways of naming organic compounds:

1. Trivial or common system, and
2. IUPAC system

1. Trivial or common system:

In the early days, before the IUPAC system of nomenclature, trivial or common system was used to name organic compounds. It was mainly based on its source and use. For example, the name Urea was given to the compound, which was derived from urine. Similarly, the name Penicillin was given to the organic compound extracted from the mould called Penicillin notatum.

2. IUPAC system:

As the number of discovered organic compounds increased, it became difficult to remember the names of individual compounds. Furthermore, the same organic compound was named differently in different parts of the world. Hence, a need for a system of nomenclature was realised. Today, the system adopted by the International Union of Pure and Applied Chemistry (IUPAC) is taken as standard.

International **U**nion of **P**ure and **A**pplied **C**hemistry

In general, the IUPAC system, the name of an organic compound consists following parts.

Prefix(es) + Word Root + Primary Suffix + Secondary Suffix

Word root: It **represents the number of carbon atoms in the longest chain** of the compound called the parent chain. The parent chain is the longest possible carbon chain that includes the functional groups and the multiple bonds. Different word roots are given in the table below.

Chain length	Word root
1 carbon	Meth
2 carbons	Eth
3 ″	Prop
4 ″	But
5 ″	Pent
6 ″	Hex
7 ″	Hept
8 ″	Oct
9 ″	Non
10 ″	Dec
11 ″	Undec
12 ″	Dodec

Primary suffix: It is used to represent the nature of carbon-carbon bonds (saturation or unsaturation) in the main chain of the compound.

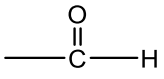
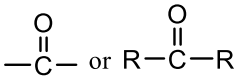
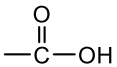
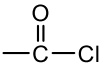
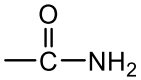
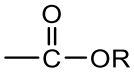
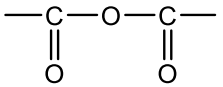
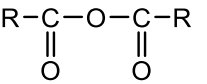
Nature of carbon-carbon bond	**Primary suffix**
Single bond (C-C)	-ane
Double bond (C=C)	-ene
Triple bond (C≡C)	-yne
No bond (in a compound having only one carbon- Methane)	-ane

For example,

Organic compound	**Word root**	**Primary suffix**	**IUPAC name**
$CH_3CH_2CH_2CH_3$	But	ane	Butane
$CH_3CH=CH_2$	prop	ene	Propene
$CH_3C\equiv C-H$	prop	yne	Propyne
$CH_2=CH-CH=CH_2$	but**a**	diene	Buta-1,3-diene
$CH\equiv C-C\equiv CH$	but**a**	diyne	Butadiyne

Secondary Suffix:

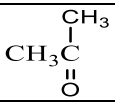
It is the part of the name which comes after the primary suffix. It is used to indicate the **main functional group** present in the organic compound. Secondary suffixes for various functional groups are given below.

Functional group	**Secondary suffix**	**Class of compounds**	**General form**
-OH	**-ol**	Alcohols	R-OH
-CHO or 	**-al**	Aldehydes	R-CHO*
>CO or 	**-one**	Ketones	RCOR
-COOH or 	**-oic acid**	Carboxylic acids	R-COOH*
-COCl or 	**-oyl chloride**	Acid chloride	RCOCl*
-$CONH_2$ or 	**-amide**	Amides	$RCONH_2$*
-COOR or 	**-oate**	Esters	RCOOR
-CO-O-CO- or 	**-oic anhydride**	Acid anhydrides	RCOOCOR or 
-CN	**-nitrile**	Nitriles or cyanides	R-CN
-NC	**-isonitrile**	Isonitriles	R-NC

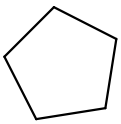
		or isocyanides or carbyl amines	

*In these cases, -R can also be -H

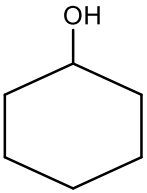
e.g.,

Organic compound	**Word root**	**Primary suffix**	**Secondary suffix**	**IUPAC name**
$CH_3CH_2CH_2OH$	Prop	-ane	-ol	Propan-1-ol
$CH_3CH(OH)CH_3$	Prop	-ane	-ol	Propan-2-ol
CH_3CH_2CN	Prop	-ane	**-**nitrile	Propanenitrile
CH_3CHO	Eth	-ane	-al	Ethanal
CH2=CHCHO	Prop	-ene	-al	Propenal
HCOOH	meth	-ane	-oic acid	Methanoic acid
CH_3COOH	Eth	-ane	-oic acid	Ethanoic acid
HC≡CCOOH	Prop	-yne	-oic acid	Propynoic acid
	Prop	-ane	-one	Propanone

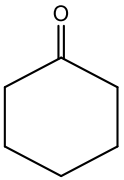
Prefixes: The part of the IUPAC name that is written at the beginning, which indicates the substituent or side chain or certain functional groups of the organic compound, is a prefix. The prefixes may be further categorized into primary and secondary prefixes. The primary prefix is cyclo, used to indicate if the compound is ***carbocyclic*** and not aromatic.



The name of this compound is:
Primary prefix + word root + primary suffix
Cyclo + pent + ane = Cyclopentane



The name of this compound is:
Primary prefix + word root + primary suffix + secondary suffix
Cyclo + hex + ane + ol
It is written as Cyclohexanol



The name of this compound is:
Primary prefix + word root + primary suffix + secondary suffix
Cyclo hex ane one
It is written as Cyclohexanone

Following is the list of some primary prefixes. These are, by default, written as prefixes.

Substituent	Name	Prefix
-R	Alkyl	Alkyl
$-CH_3$	Methyl	Methyl
$-CH_2CH_3$	Ethyl	Ethyl
$-CH_2CH_2CH_3$	Propyl	Propyl etc.
- OR	Alkoxy	Alkoxy
$-OCH_3$	Methoxy	Methoxy
$-OCH_2CH_3$	Ethoxy	Ethoxy
$-OCH_2CH_2CH_3$	Propoxy	Propoxy etc.
$-NH_2$	Amine	Amino
$-NO_2$	Nitro	Nitro

-Cl	Chloro	Chloro
-Br	Bromo	Bromo
-I	Iodo	Iodo
-F	Fluoro	Fluoro
-NO	*Nitroso*	*Nitroso*
-N≡N	*Diazo*	*Diazo*

For example: CH_3-O-C_2H_5 Methoxyethane
$CH_3CH_2CH_2Br$ 1-bromopropane
CH_3NO_2 Nitromethane

Naming hydrocarbons

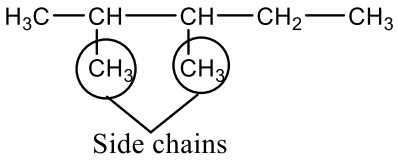
General rules for IUPAC names of alkanes

For alkanes (the saturated hydrocarbons), the word root is "alk," and the primary suffix is "ane". If the substituents are present, they are indicated prior to the word root as prefixes.

For IUPAC names of complex alkanes, the following rules should be followed:

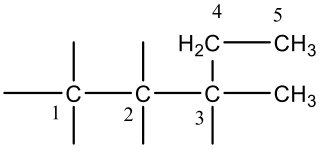
1. Longest Chain Rule

For alkanes with branches, the word root is that of the longest chain of C-atoms, which may or may not be straight but must be continuous. This chain is called the parent chain or principal chain. All the other carbon atoms, which are not included in the parent chain, are called side chains or substituents and are written as prefixes. For example:

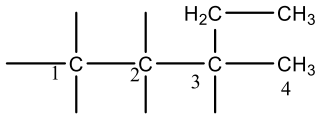


= 2,3-dimethylpentane

- So, first, the longest continuous carbon chain must be located. This gives the name of the parent hydrocarbon i.e., word root. For example:



Pent (Correct)

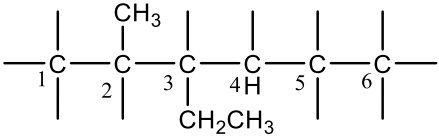


But (Incorrect)

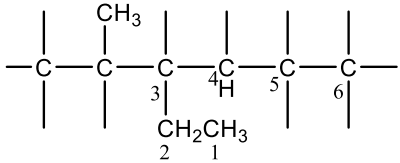
Various substituents are as follows:

Substituent group or side chain	Secondary prefix
$-CH_3$	Methyl
$-C_2H_5$	Ethyl
$-CH_2CH_2CH_3$	Propyl

- If there are two equally long continuous chains are there, the one with the most branches should be selected as the main chain.



Two branches (Correct)



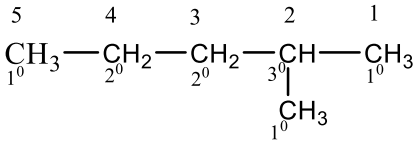
One branch (Incorrect)

2. Lowest Number Rule/ Lowest sum rule

The parent chain is numbered in such a way that the substituent gets the lowest possible number (locant) in the main chain. Locant number is the number that indicates the position of the substituent on the parent chain.

This is called the lowest number rule.

For example:



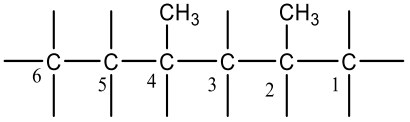
This is the correct numbering, not the other way round.

It is named as

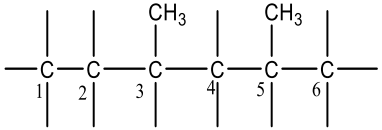
prefix + word root + primary suffix + secondary suffix

2-methyl + pent + ane + N/A = 2-methylpentane

If more than one substituent is present, numbering is done by the lowest sum rule. When two or more identical groups are attached to the parent chain, prefixes such as di-, tri- and tetra- are used.



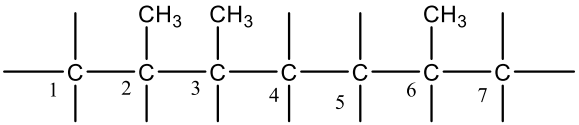
Correct (2,4)



Incorrect (3,5)

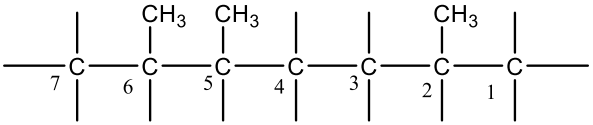
= 2,4-dimethylhexane

Another example of the lowest sum rule.



Locants = 2,3,6 Sum =11

2,3,6-trimethyl heptane (correct)



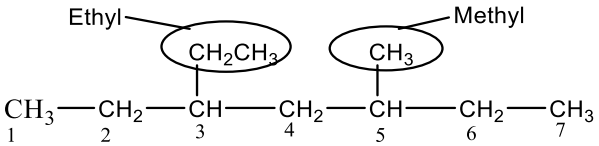
Locants= 2,5,6 sum= 13

2,5,6-trimethyl heptane (Incorrect)

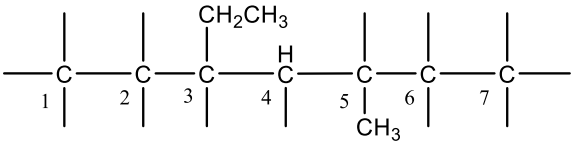
3. Alphabetical Order

If two or more different types of substituents are present, they are listed alphabetically (prefixes like di, tri, are not considered for alphabetizing)

For example:

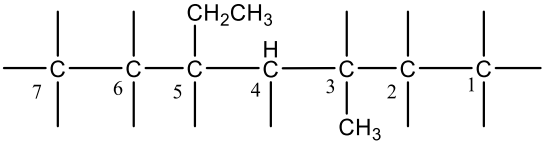


If the substituents are different but locant numbers from either end of the parent chain come to be the same, then begin numbering nearest the substituent whose name has alphabetic priority.



Locants = 3,5

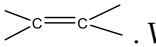
3-ethyl-5-methylheptane (correct)



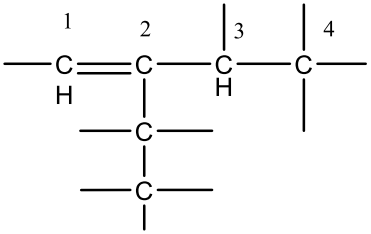
Locants = 3,5

5-ethyl-3 methyl heptane (Incorrect)

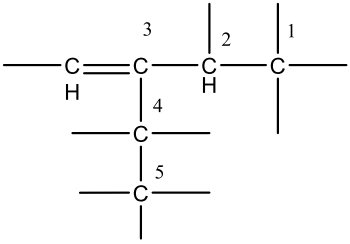
General rules for IUPAC names of unsaturated hydrocarbons (alkenes and alkynes)

The primary suffix "ene" is used to designate a carbon-carbon double bond  . When more than one double bond is present, the suffixes like diene, triene are used. The suffix "yne" is used for a carbon-carbon triple bond. Again, when more than one triple bond is present, the suffixes like diyne, triyne are used. The compounds with both double and triple bonds in the same molecule are enynes.

1. The first longest continuous carbon chain that includes both carbons of a double or a triple bond should be selected. For example:

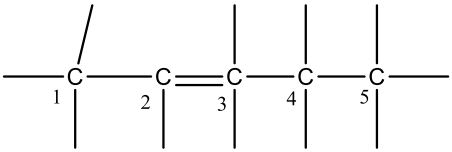


Correct

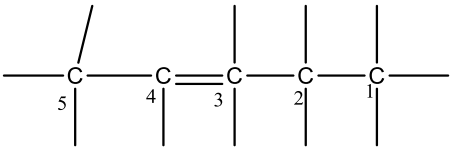


Incorrect

2. Number the chain (parent chain) from the end nearest to the multiple bond, so that the c-atoms in that bond have the lowest possible numbers.

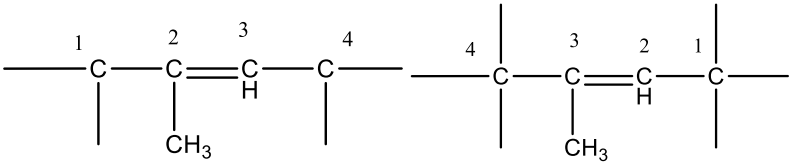


Correct



Incorrect

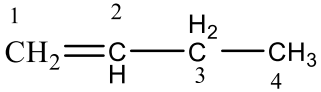
But if the multiple bond is equidistant from either end of the chain, start numbering from the end nearest the first branch point.



Locants = 2,2
Correct

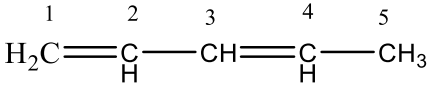
Locants= 2,3
Incorrect

3. Indicate the position of a multiple bond using the lower-numbered carbon atoms of that bond. For example:

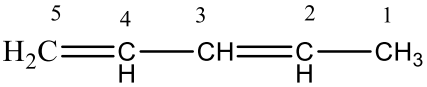


But-1-ene not But-2-ene

4. If more than one multiple bond is present, number using the lowest sum rule. For example

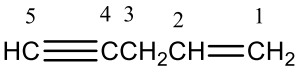


Locants = 1,3 (lower)
Penta-1,3-diene (correct)

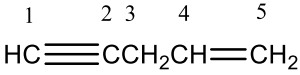


Locants = 2,4 (higher)
Penta-2,4-diene (Incorrect)

If both double and triple bonds are present and the locant numbers from either side of the chain come to be the same, then the double-bonded carbon is numbered before the triple-bonded carbon.



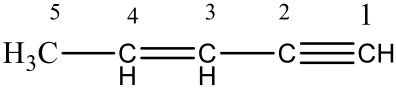
Locants = 1,4 (correct)



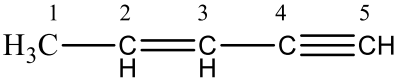
Locants= 1,4 (Incorrect)

Pent-1-en-4-yne

5. In the case of enynes, there are two primary suffixes, ene(s) and yne(s). In this case, the respective locants are written before their respective suffixes, and the terminal 'e' from the suffix ene is dropped.



Locants= 1,3 (lower)
Pent-3-en-2-yne (correct)

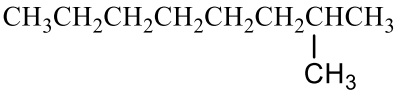


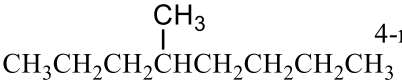
Locants = 2,4 (higher)
Incorrect

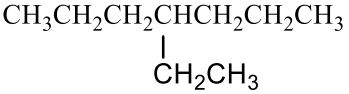
1. Complex Substituent Rule

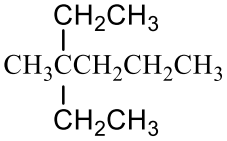
Some solved examples:

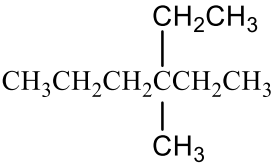
$CH_3CH_2CH_2CH_2CH_2CH_2CH_2CH_2CH_3$ Nonane

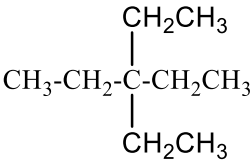

2-methyloctane


4-methyloctane

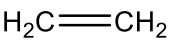

4-ethylheptane

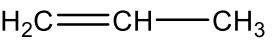

3-ethyl-3-methylhexane

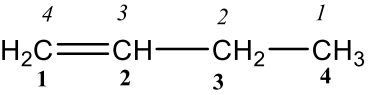


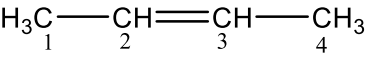


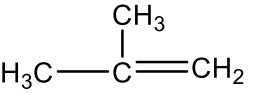
Alkenes

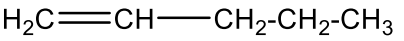
1.  Ethene

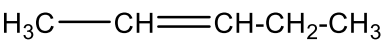
2.  Propene

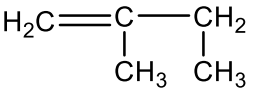
3.  But-1-ene

4.  But-2-ene

5.  Methylpropene or 2-methylprop-1-ene

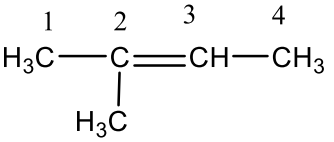
6.  Pent-1-ene

7.  Pent-2-ene

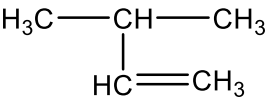
8. 

word root= but
pri. suffix = ene
sec. suffix = X

2-methylbut-1-ene

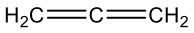
9. 

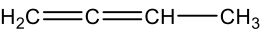
prefix = methyl

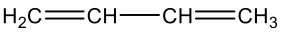
10. 

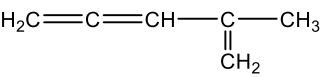
3-methylbut-1-ene

dienes and trienes

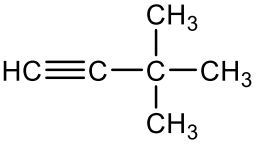
1.  Propadiene

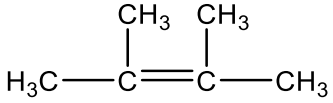
2.  Buta-1,2-diene

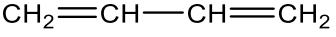
3.  Buta-1,3-diene

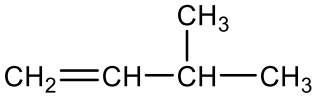
4. 

1. Write the IUPAC name of the following compounds. ***(1 marks each)***

a. 

c. 

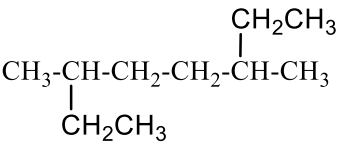
b. 

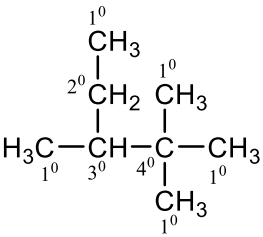
d. 

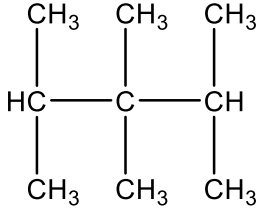
2. Give the structure of the following organic compounds: ***(1 marks each)***

i) 2,2-dimethylpropane
ii) 2-ethylpent-1-ene
iii) 2,3-dimethylbut-2-ene
iv) 2,3,4-trimethylhexane
v) 3-methylbutanoic acid
vi) 3,3-dimethylbutanone
vii) 4-methylpent-2-enal
viii) 3-ethylheptanamide
ix) 2-methylpent-3-ynoic acid
x) 3-chloropropanoic acid
xi) Pentanal
xii) 4,4-dimethylpentan-2-one

3. Name the following compounds:

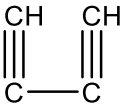
a. 

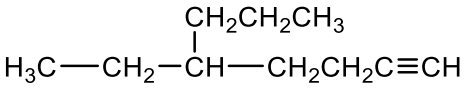
b. 

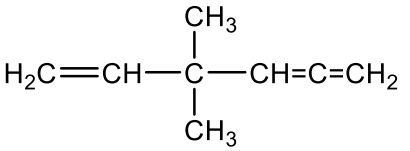


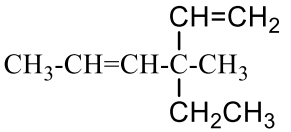
Primary,secondary,tertiary
Quartenary

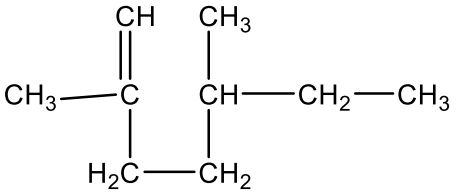
c. 

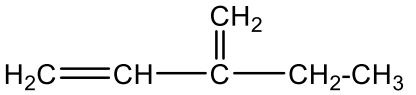
d. 

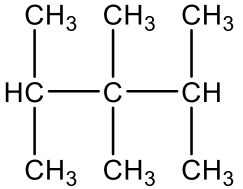
e. 

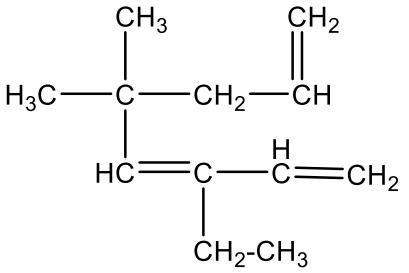
f. 

g. 

h. 

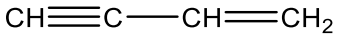
i. 

j. 



k.

1. The IUPAC name of the compound having the formula

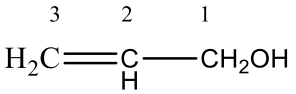
 is

a. 1-butyn-3-ene
b. but-1-yne-3-ene
b. 1-butene-3-yne
c. 3-butene-1-ene

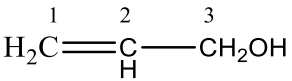
Naming Monofunctional Compounds

IUPAC names of compounds containing single functional groups

1. Locate the **longest parent chain** for the word root. Parent chain here is the longest, continuous carbon chain which includes a functional group and multiple bonds, if present
2. The C-atoms in the parent chain are numbered, with the carbon holding the functional group getting the lowest possible number.

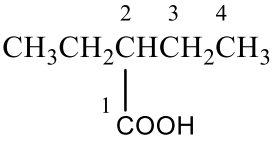


Prop-2-en-1-ol or prop-2-enol
Correct

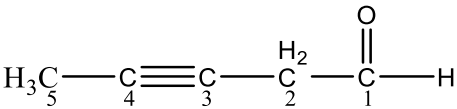


Prop-1-en-3-ol
Incorrect

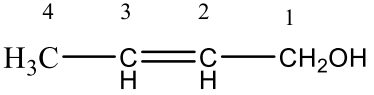
3. When a chain-terminating group such as –CHO, -COOH, -*COOR*, -$CONH_2$, -COCl, -C≡N is present, the C-atoms of these functional groups are always given the number 1. For example:



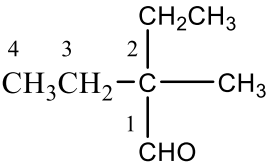
2-ethylbutan-1-oic acid
or 2-ethylbutanoic acid



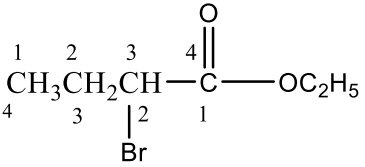
Pent-3-ynal



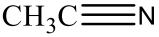
But-2-en-1-ol



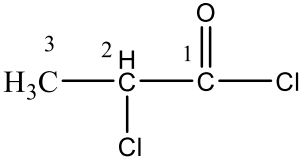
2-ethyl-2-methylbutanal



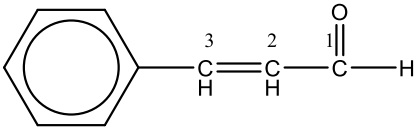
Ethyl-2-bromobutanoate
(ester compound)



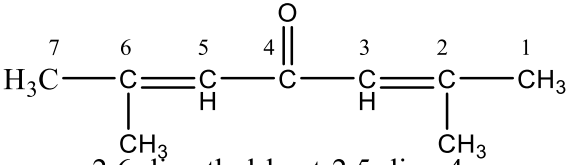
Ethane nitrile



2-chloropropanoylchloride

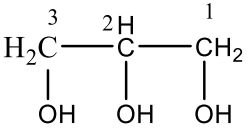


3-phenyl-prop-2-enal

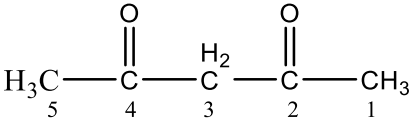


2,6-dimethyl-hept-2,5-dien-4-one

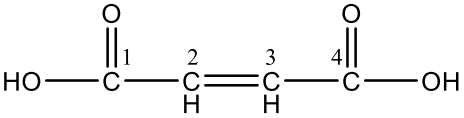
4. If a compound contains two or more functional groups, the words like di-, tri-, tetra- are written before the name of the secondary suffix with respective locant numbers.
In such cases, the last letter 'e' from the primary suffix is not removed.



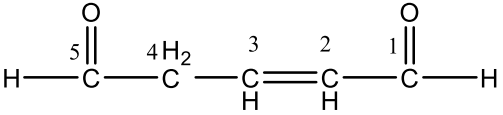
Propane-1,2,3-triol



Pentane-2,4-dione

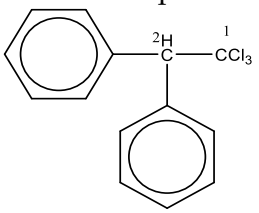


But-2-ene-1,4-dioic acid

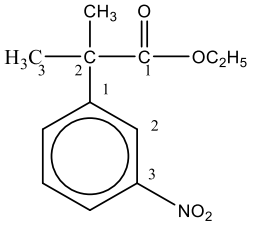


Pent-2-ene-1,5-dial

5. When benzene is present in the parent chain, it is taken as a substituent phenyl. In case the phenyl ring is further substituted, the c-atoms of the ring are separately numbered starting from the C-atoms of the ring directly attached to the parent chain in such a way that the substituent of the ring gets the lowest possible number. Such a substituted phenyl is called a complex substituent and is enclosed in a bracket.

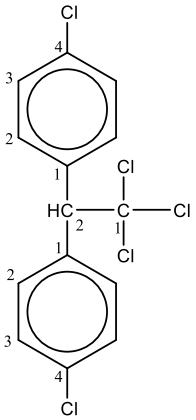


1,1,1-trichloro-2,3, diphenyl ethane



Ethyl-2,2-dimethyl-2-(3-nitrophenyl)propanoate

6. If the compound contains more than one complex substituent, then the words such as si-, tri-, tetra- are replaced by the words like –bis, -tris, -tetrakis, respectively.



1,1,1-trichloro-2,2-bis(4chlorophenyl)ethane

or, DDT (dichlorodiphenyl trichloro ethan

Some solved examples:

Homologous series of compounds having C in the functional group

1. Carboxylic acids (Sec suffix - oic acid)

H-COOH Methanoic acid

CH_3-COOH Ethanoic acid

CH_3-CH_2-COOH Propanoic acid

CH_3-CH_2-CH_2-COOH Butanoic acid

CH_3-CH(CH_3)-COOH 2-methylpropanoic acid

HOOC-CH_2-CH_2-CH_2-CH_3 Pentanoic acid

HOOC-CH_2-CH_2-CH(CH_3)

HOOC-COOH

Ethane-1,2-dioic acid or Ethanedioic acid

1. Acid chlorides -COCl -C(=O)-Cl

-oyl chloride

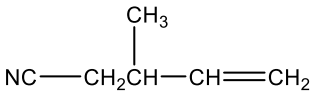
2. Aldehydes (-CHO)

-al

3. Cyanide/nitriles (-CN) -nitrile

4. Amide (-$CONH_2$) -C(=O)-NH_2

-amide



Naming Ethers R-O-R Alkoxyalkane

1. CH_3-O-CH_3 Methoxymethane 2. CH_3-CH_2-O-CH_3 Methoxyethane

3. CH_3-O-CH_2-CH_3 Methoxyethane 4. CH_3-CH_2-O-CH_2-CH_3 Ethoxyethane

5. CH_3-CH_2-CH_2-O-CH_3 (3 2 1)
1-methoxypropane

6. CH_3-CH(O-CH_3)-CH_3 2-methoxypropane

Naming Esters -COOR -C(=O)-O-R

1. H-C(=O)-O-CH_3 Methylmethanoate
$HCOOCH_3$

2. CH_3-$COOCH_3$ CH3-C(=O)-O-CH3 Methylethanoate

3. $HCOOCH_2CH_3$ H-C(=O)-O-CH_2-CH_3 Ethylmethanoate

4. CH_3COOCH_3

5. CH_3-C(=O)-O-CH_2-CH_3

CH_3-C(=O)-O-CH(-CH_3)-CH_3 (1 2)
(1-methylethyl)ethanoate

Complex substitutent rule

Acid anhydride -C(=O)-O-C(=O)-

CH_3-C(=O)-O-C(=O)-CH_3 ← P_2O_5, Δ — CH_3-C(=O)-OH + HO-C(=O)-CH_3

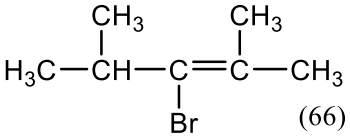
Ethanoic anhydride

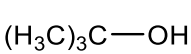
CH_3-CH_2-C(=O)-O-C(=O)-CH_2-CH_3

4. **Write the IUPAC name of the following compounds.** *(1 mark each)*

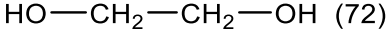
$CHCl_3$ (75)

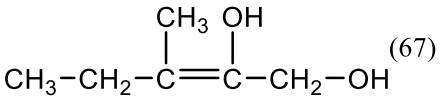
$(CH_3)_3CCHBrCH_2CH_3$ (64)

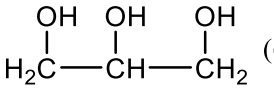

(66)


(76)

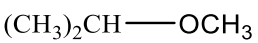
$(CH_3)_2CHCH_2OH$ (74)

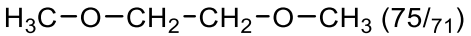


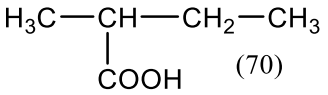

(67)


(66)

$(CH_3)_2CHOCH_3$ (63)



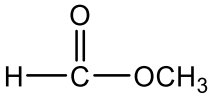


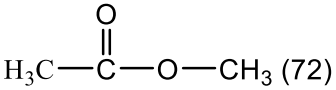

(70)


(74)

$(CH_3)_3CCOCH_2CH_3$ (63)

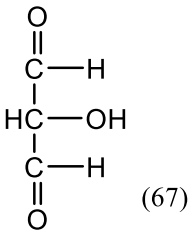
CH_3CONH_2 (76)


(68)



$CH_3CH_2COOCH_3$ (75)

CH_3COOCH_3 (76)


(67)

5. Give the structure of the following organic compounds: *(1 marks each)*

i) 2-methylpropan-1-ol

ii) 2-chloro-2,3-dimethylpentane

iii) Methylmethanoate

iv) Ethylethanoate

v) 3-methylbutanoic acid

vi) Ethane-1,2-dioic acid

vii) 3-chlorobutanal

1. 3-chloropropanoic acid
2. Pentanal
3. 4,4-dimethylpentan-2-one
4. 2,3,4-trimethylhexane

Naming Polyfunctional Compounds

- Polyfunctional rule (order of priority)

Name	Functional group	Prefix	Secondary Suffix
Carboxylic acid	-COOH		-oic acid
Sulphonic acid	$-SO_3H$		-sulphonic acid
Acid anhydride	-COOCO-		-oic anhydride
Ester	-COOR	Alkoxycarbonyl-	-oate
Acid chloride	-COCl	Chlorocarbonyl-	-oyl chloride
Amide	$-CONH_2$	Carbamoyl-	-amide
Cyanide(nitrile)	-CN	**Cyano-**	-nitrile
Aldehyde	-CHO	**Aldo- or formyl-**	-al
Ketones	-CO-	**Keto- or oxo-**	-one
Alcohol	-OH	**Hydroxy-**	-ol
Amines	$-NH_2$	Amino-	-
Alkene (double bond)	>C=C<		ene (primary suffix)
Alkyne (triple bond)	-C≡C-		yne (primary suffix)
Ethers	-OR	Alkoxy-	-
Nitro	$-NO_2$	Nitro-	-
Halo	-X	Halo-	-
Alkyl	*-R*	*Alkyl-*	-

1. Determination of principal functional group

If a compound contains two or more functional groups then one of the functional group then one of them is taken as principal functional group and used as secondary suffix and the other one is referred to as subsidiary functional group and is used as prefixes. The principal functional group in such cases is determined on the basis of priority order as given as IUPAC rules.

All the remaining functional groups such as halo (-X), nitroso (-NO), nitro (NO_2), alkoxy (-OR), alkyl (-R), phenyl (-C_6H_5 etc. are always used as substituent groups.

Secondary functional group	**Prefix name**
-X (X=F, Cl, Br, I)	Halo
-OH	Hydroxyl
-SH	Mercapto
-NH_2	Amino
-NHR	Alkyl amino
-NR_2	Dialkyl amino
-CHO	Formyl
>C=O	Keto or oxo
-COOH	Carboxy
-COOR	Alkoxycarbonyl of carb alkoxy
-COCl	Chloro carbonyl
-CN	Cyano
-$CONH_2$	Carboxyamide or carbamoyl

2. Selecting the principal chain

After determining the principal functional group, the principal chain is selected. It is the longest, continuous carbon chain that has the principal functional group and the maximum number of secondary functional groups, and the multiple bonds (if any) are included.

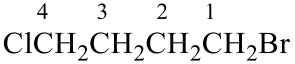
3. Numbering the carbon atoms in the principal chain

The carbon atoms in the principal chain are numbered in such a way that the carbon holding the principal functional group gets

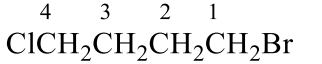
the lowest possible number, followed by the double bond, triple bond, and the substituent.

4. Alphabetical order:

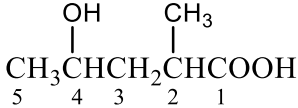
The prefixes for secondary functional groups and other substituents should be written in alphabetical order before the word root. If, however, two groups of the same preference occupy the identical position from either end of the parent chain, the lower number must be given to the group whose name comes first in alphabetical order.



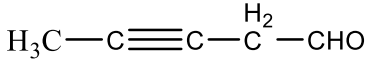
1-bromo-4-chlorobutane
Correct



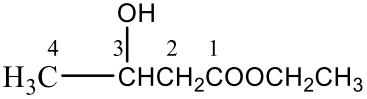
1-chloro-4-bromobutane
Incorrect



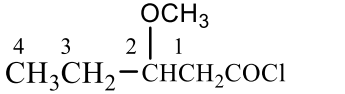
4-hydroxy-2-methyl pentanoic acid



Pent-3-yn-1-al
or 3-pentynal

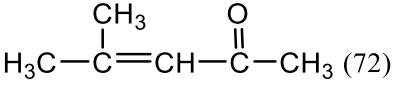


Ethyl-3-hydroxy butanoate

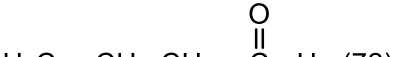


3-methoxypentanoyl chloride

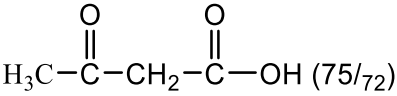
6. Write the IUPAC name of the following compounds. (1 mark each)



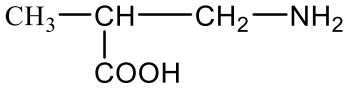
(72)

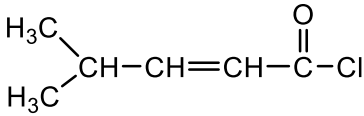


(72)

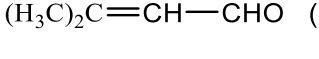


(75/72)

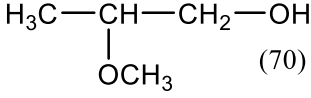




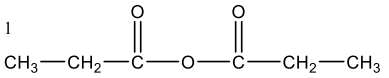
(75)

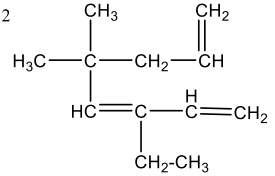


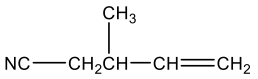
(74)

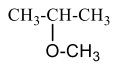


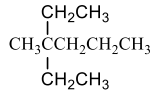
(70)

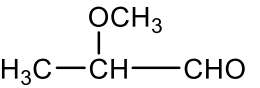
1 

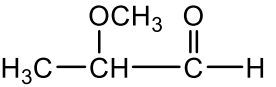
2 

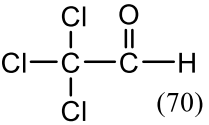
3 

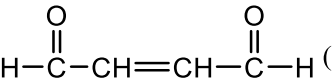
4 

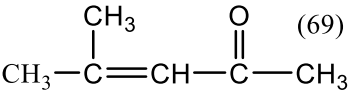
5 


(65)

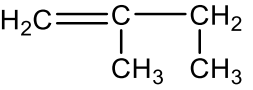



(70)

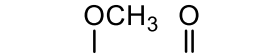

(70)

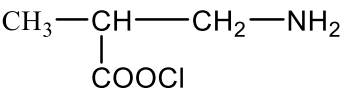

(69)

7. Name the following compounds. 3



a.

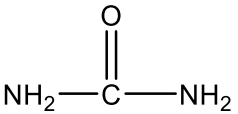
c. 



8. Give the structure of the following organic compounds: *(1 mark each)*

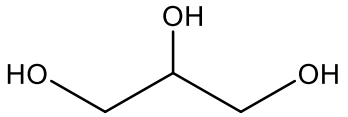
1. 2-methylpropanoyl chloride
2. Propylmethanoate
3. 3-amino-3-bromo-5,5-dichloro-4,4-diethylhexanal
4. 2,3-diethylbutane-1,4-dinitrile
5. 2,3,4,5-tetrahydroxypentanal
6. 3-ketobutanoic acid
7. But-2-ene-1,4-dial

9. Urea is one of the most widely used fertilizers that supplies nitrogen to the plants. Its structure is:



What is its IUPAC name?

10. **Glycerine is a colourless, odourless sweet sweet-tasting, viscous, and hygroscopic liquid. It is used as a sweetener and a humectant in food and beverages. It is also used in pharmaceuticals and personal care products like cough syrups, skin care creams, soaps, etc., to improve smoothness and as moisture moisture-retaining substance. The bond line structural formula of glycerine is**



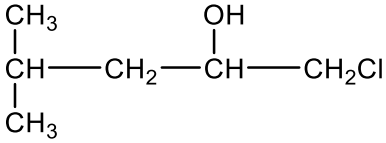
    a. **Which class of compound does this belong? What is the functional group present?**
    b. **Write its IUPAC name.**

11. **Write short notes on IUPAC rules.**

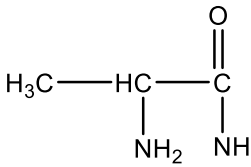
1. The IUPAC name of the compound having the formula $CH{\equiv}C\text{-}CH{=}CH_2$ is
    a. 1-butyn-3ene c. but-1-yne-3-ene
    b. 1-butene-3-yne d. 3-butene-1-yne
2. 1-butene-3-yne d. 3-butene-1-yneThe IUPAC name of ether $CH_3\text{-}O\text{-}CH_3$ is
    a. Dimethyl ether c. Ethoxy methane
    b. Methoxy methane d. Methoxy ethane
3. The class of Alkoxyalkane is
    a. Alcohols b. Aldehyde c. Ketone d. Ethers
4. Alkane nitrile is IUPAC name of
    a. Alcohols b. Cyanides c. Esters d. Olefins
5. IUPAC name of $HO\text{-}CH_2\text{-}CH_2\text{-}OH$ is
    a. Ethanediol c. Ethanol
    b. Ethyl alcohol d. Ethane-1,2-diol
6. The IUPAC name of $(C_2H_5)_2CHCH_2OH$ is
    a. 3-ethylbutanol-1 c. Pentanol
    b. 2-methyl-4-butanol d. 2-ethylbutan-1-ol
7. The IUPAC name of $(CH_3)_3CCH(OH)CH_3$ is
    a. 2,2-dimethylbutan-3-ol c. 2,2-dimethylbutan-2-ol
    b. 3,3-dimethylbutan-3-ol d. 3,3-dimethylbutan-2-ol
8. The - CHO group as a prefix is:
    a. al b. hydroxy c. hydroxyl d. formyl
9. The IUPAC name of CH_3CH_2COOH is

a. Propionic acid c. Propanoic acid
b. Propanone d. Propanal

10. The IUPAC name of $CH_3COCH_2CH_2CH_3$ is
    a. Methyl propyl ketone c. Propyl methyl ketone
    b. Pentan-4-one d. Pentan-2-one
11. The IUPAC name of CH_3-O-C_2H_5 (Common name=ethyl methyl ether) is
    a. Methoxy methane c. Methoxyethane
    b. Ethoxyethane d. Methoxypropane
12. The IUPAC name of CH_3CN is
    a. Methanecyanide b. methyl cyanide
    b. Ethanenitrile d. methancyanide
13. The IUPAC name of $HCOOC_2H_5$ is
    a. Ethoxy ethane c. ethyl formate
    b. Ethyl methanoate d. ethoxy methanoate
14. The IUPAC name of $CH_3COOC_2H_5$(Common name= Ethyl acetate) is
    a. Ethyl acetate c. Ethylethanoate
    b. Methyl propanoate d. Methyl propionate
15. The name of the following compound is



    a. 1-chlorohexan-2-ol
    b. 4,4-dimethyl-1-chlorobutan-2-ol
    c. 1-chloro-2-hydroxyhexane
    d. 1-chloro-4-methylpentan-2-ol

16. The IUPAC name of the compound  the compound is
    a. 2.3-amino-3-ketopropane c. 2,3-diaminopropan-3-one
    b. 2,3-diaminopropan-3-one d. 2-aminopropanamide

17. An organic compound was found to have a molecular formula C_nH_{2n}. Among the following, the most probable compound is;

    a. But-1-ene
    b. Butane
    c. But-1-yne
    d. Butan-1-ol

STUDY ALL OTHER RULES FOR IUPAC NOMENCLATURE FROM TEXT BOOKS AND PRACTICE.