Nomenclature of Organic Compounds

B. Sc I Year (Semester –I)

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- **Functional Groups :**

  " Functional group is an atom or group of atoms in a molecule which gives characteristics chemical properties to the molecule".

  Ex. CH_3-CH_2-CH_2-OH

  In 1-propanol –OH group is a functional group.

Some of the functional groups and their examples as follows :

Class	Functional group	Examples
Alkene	**-C=C-**	$CH_2=CH_2$, $CH_3-CH=CH_2$
Alkyne	**-C≡C-**	CH≡CH, $CH_3-C\equiv CH$
Alcohol	**-OH**	CH_3-OH, CH_3-CH_2-OH
Aldehyde	**-CHO**	CH_3-CHO, CH_3-CH_2-CHO
Ketone	**-CO-**	$CH_3-CO-CH_3$, $CH_3-CO-CH_2-CH_3$
Ether	**>C-O-C<**	CH_3-O-CH_3, $CH_3-O-CH_2-CH_3$
Carboxylic acid	**-COOH**	H-COOH, CH_3-COOH

Class	Functional group	Examples
Esters	**-COOR**	CH_3-$COOCH_3$, CH_3-$COOC_2H_5$
Amine	**-NH_2 , -NH-, -N<**	CH_3-NH_2, CH_3-NH-CH_3, $(CH_3)_3N$
Amide	**-$CONH_2$**	H-$CONH_2$, CH_3-$CONH_2$
Halide	**-X (F,Cl,Br,I)**	CH_3-Br, CH_3-Cl, CH_3-CH_2-I
Sulphonic acid	**-SO_3H**	CH_3-CH_2-SO_3H
Nitro Comp.	**-NO_2**	CH_3-NO_2 , CH_3-CH_2-NO_2
Nitrile	**-C≡N**	CH_3-CN , CH_3-CH_2-CN

Types of Organic Compounds :

There are main five classes of organic compounds :

a) Aliphatic compounds :

Compounds which consists of open chain carbon atoms are called aliphatic compounds.

Ex. CH_3-CH_3 , CH_3-CH_2-CH_3 , CH_3-CH_2-OH , CH_3-COOH , CH_3-CH_2-NH_2 etc.

b) Saturated and unsaturated compounds :

- **Saturated compounds :**

  Compounds which contain only single bonds are called ***saturated compounds.***

  Ex. CH_3-CH_3 , CH_3-CH_2-CH_3 etc.

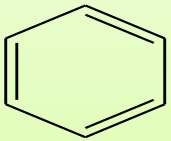
- ***Unsaturated compounds :***

  Compounds containing multiple bonds (double or triple bonds) are called ***unsaturated compounds.***

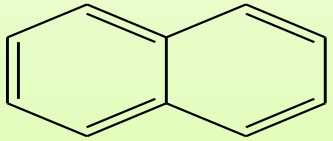
  Ex. CH_2=CH_2 , CH_3-CH_2=CH_2 , CH≡CH etc.

c) Aromatic compounds : The compounds which contains one or more benzene rings or physical and chemical properties of compound resembles like benzene are called as aromatic compounds.

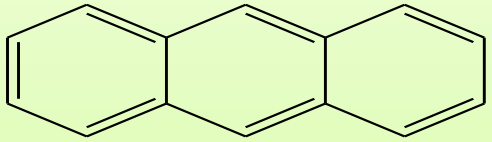
Ex.



Benzene



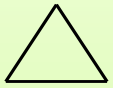
Napthalene



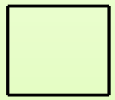
Anthracene

d) Alicyclic compounds : Cyclic compounds which consists of only saturated carbon atoms are called alicyclic compounds or carbocyclic compounds.

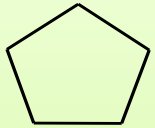
Ex.



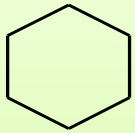
Cyclopropane



Cyclobutane



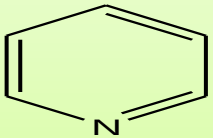
Cyclopentane



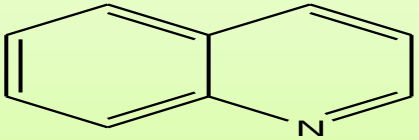
Cyclohexane

e) Heterocyclic compounds : Cyclic compounds which contain at least one hetero atom other than carbon are called heterocyclic compounds. Hetero atoms are generally N,O and S.

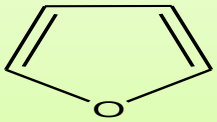
Ex.



Pyridine



Quinoline



Furon

Pyrrole

Basic rules of IUPAC nomenclature of Organic Compounds

i) In mono functional organic compound, selection of longest continuous carbon chain including functional group.

ii) Number is given to the carbon atom in longest chain towards closer to the functional group.

iii) Parent name is derived on the basis of their carbon atoms in longest chain and functional group.

iv) Name of the substituent and their position can be written before parent name.

v) If there are different substituent's, they are listed alphabetically with their positions.

1) Alkane

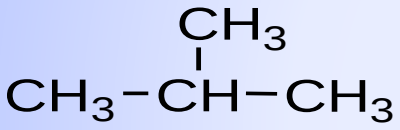
"Alkane are aliphatic saturated hydrocarbon"
They are also called as 'paraffin' The general formula of alkane is C_nH_{2n+2}
Where, n = No. of carbon atom

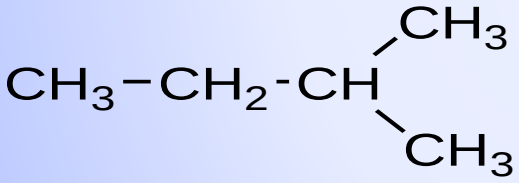
IUPAC Rules :

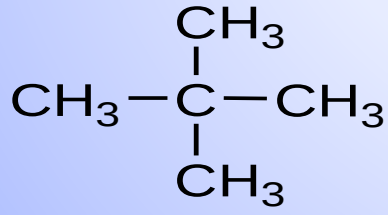
1) Select the longest continuous carbon chain.
2) Name of the longest chain to be given on the basis of number of carbon atoms present in longest chain as follows.

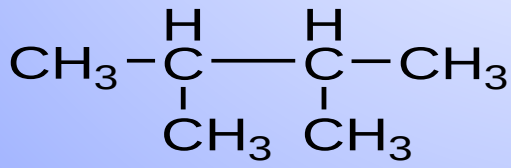
No. of carbon atoms	Name
1	Methane
2	Ethane
3	Propane
4	Butane
5	Pentane
6	Hexane
7	Heptane
8	Octane
9	Nonane
10	Decane

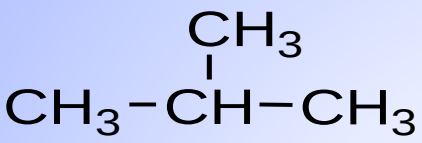
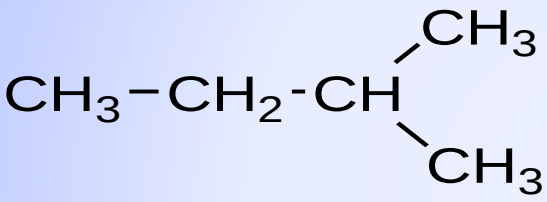
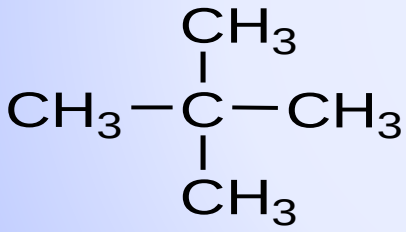
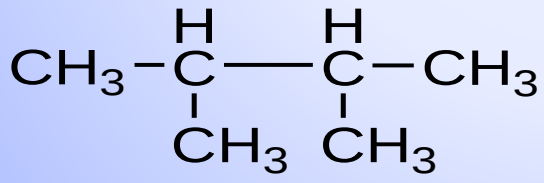
3) Number is given to the selected chain towards nearer to the substituent or alkyl group.
4) If there is substituent, their name & position can be written before parent name.
5) If there are two or more same substituent's, then the prefix di, tri, tetra can be used for two, three, four substituent's respectively.
6) If there are different substituent's, then they are listed alphabetical order with their positions.

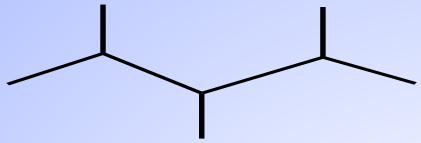
1) 

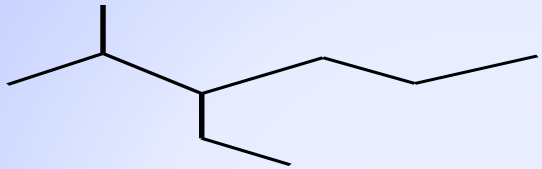
2) 

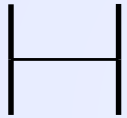
3) 

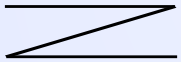
4) 

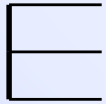
Examples	IUPAC Names
1) 	2-methyl propane
2) 	2-methyl butane
3) 	2,2-dimethyl propane
4) 	2,3-dimethyl butane

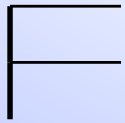
5) 

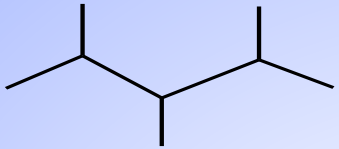
6) 

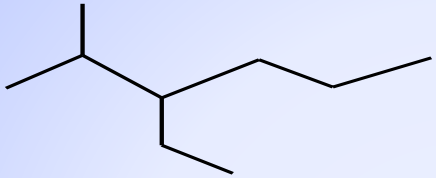
7) 

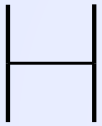
8) 

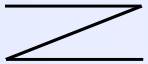
9) 

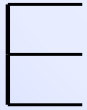
10) 

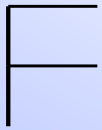
5)  2,3,4-trimethyl pentane

6)  3-ethyl-2-methyl hexane

7)  2,3-dimethyl butane

8)  butane

9)  3-methyl pentane

10)  2-methyl butane

2) Alkene

Alkenes are unsaturated hydrocarbons containing one carbon - carbon double bond. They are also called as ‘olefins’. The general molecular formula of alkene is C_nH_{2n}

Where, n - no. of carbon atoms

Ex. $CH_2=CH_2$

Ethylene

IUPAC Rules

1. Selection of longest continuous carbon chain including -C=C-
2. Number is given to the selected chain towards closer to -C=C-
3. Parent name can be derived by changing last letter of parent alkane i.e. ‘ane’ by ‘ene’
4. If there is substituent or alkyl group, their position and name can be written before parent alkene name.
5. Position of double bond can be indicated by proper number.
6. If there are two or more same substituent’s, then the prefix di, tri, tetra can be used for 2, 3, 4 same substituent respectively.
7. If there are different substituent’s, they are listed alphabetically with their positions.

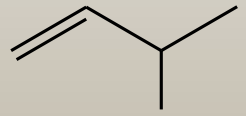
Examples

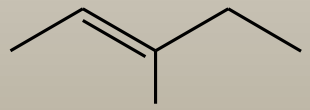
1) $CH_2=CH_2$

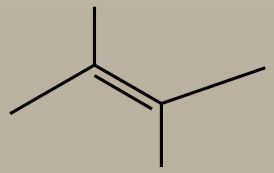
2) $CH_3\text{-}CH=CH_2$

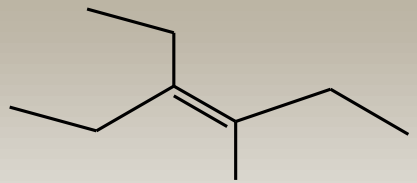
3) $CH_3\cdot CH_2\text{-}CH=CH_2$

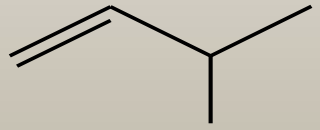
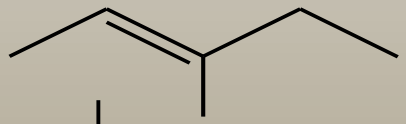
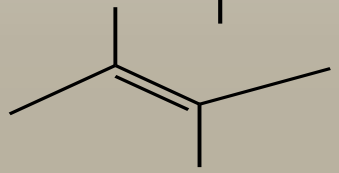
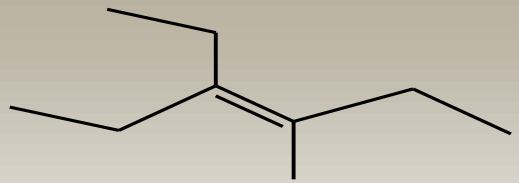
4) $CH_3\text{-}CH=CH\text{-}CH_3$

5) 

6) 

7) 

8) 

	Examples	IUPAC Names
1)	$CH_2=CH_2$	Ethene
2)	$CH_3-CH=CH_2$	Propene
3)	$CH_3-CH_2-CH=CH_2$	1-butene
4)	$CH_3-CH=CH-CH_3$	2-butene or but-2-ene
5)		3-methyl-1-butene
6)		3-methyl-2-pentene
7)		2,3-dimethyl-2-butene
8)		3-ethyl-4-methyl-3-hexene

3) Alkyne

Unsaturated hydrocarbons containing one carbon carbon triple bond are called as alkynes. They are also called as 'Acetylenes'

The general molecular formula alkyne is C_nH_{2n-2}

Where, n = no. of carbon atoms.

Ex. H-C≡C-H

Acetylene.

IUPAC Rules

1. Selection of longest continuous carbon chain including -C≡C-
2. Number is given to the selected chain towards closer to the -C≡C-
3. The parent alkyne name can be derived by changing last letter of parent alkane 'ane' by 'yne'
4. Position of -C≡C- can be indicated by proper number.
5. If there is substituent, their name & position can be written before parent name.
6. If there are two or more same substituent's, then the prefix di, tri, tetra can be used for two, three, four substituents respectively.
7. If there are different substituent's, then they are listed alphabetical order with their positions.

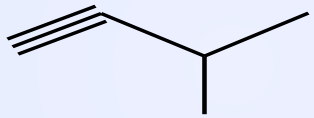
Examples

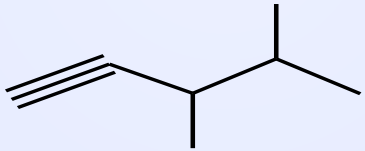
1) $CH \equiv CH$

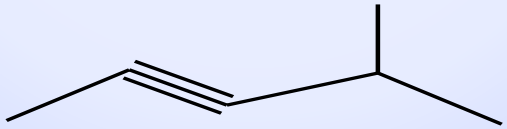
2) $CH_3 - C \equiv CH$

3) $CH_3 - CH_2 - C \equiv CH$

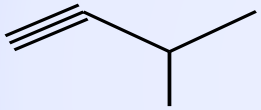
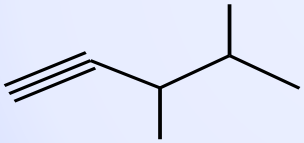
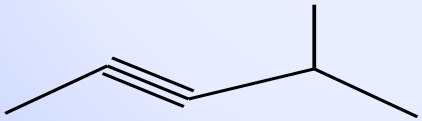
4) $CH_3 - C \equiv C - CH_3$

5) 

6) 

7) 

8) 

	Examples	IUPAC Names
1)	$CH \equiv CH$	Ethyne
2)	$CH_3-C \equiv CH$	Propyne
3)	$CH_3-CH_2-C \equiv CH$	1-butyne or but-1-yne
4)	$CH_3-C \equiv C-CH_3$	2-butyne or but-2-yne
5)		3-methyl-1-butyne
6)		3,4-dimethyl-1-pentyne
7)		4-methyl-2-pentyne
8)		3-hexyne

4) Alcohol

Organic compounds in which hydroxyl group is attached to carbon atom of alkyl group are called as alcohols.

The general molecular formula of alcohol is C_nH_{2n+1} OH

Where, n= no. of carbon atoms

Ex. CH_3-OH C_2H_5-OH

Methyl alcohol Ethyl alcohol

IUPAC Rules

1. Selection of longest continuous carbon chain including -OH group.
2. Number is given to the selected chain towards closer to the -OH group.
3. Alcohol name can be derived by changing last letter of parent alkane ‘e’ by ‘ol’
4. Position of -OH group can be indicated by proper number.
5. If there is substituent, their name & position can be written before parent name.
6. If there are two or more same substituent’s, then the prefix di, tri, tetra can be used for two, three, four substituent’s respectively.
7. If there are different substituent’s, then they are listed alphabetical order with their position.

Examples

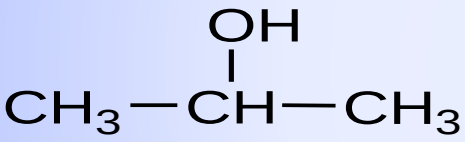
1) CH_3-OH

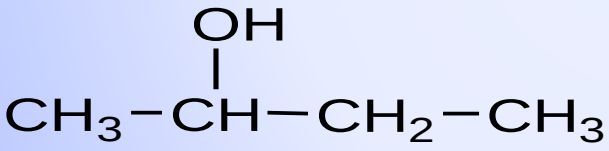
2) CH_3-CH_2-OH

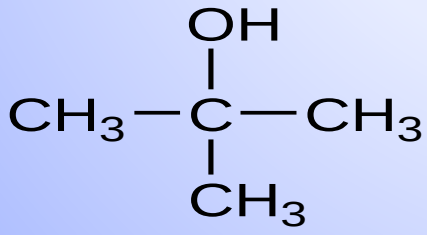
3) CH_3-CH_2-CH_2-OH

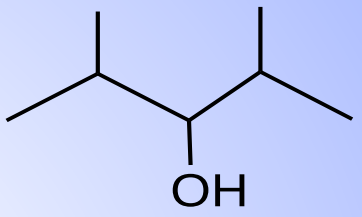
4) CH_3-CH_2-CH_2-CH_2-OH

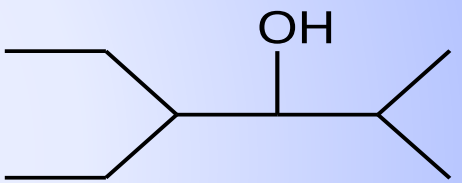
5) CH_3-CH_2-CH_2-CH_2-CH_2-OH

6) 

7) 

8) 

9) 

10) 

Examples

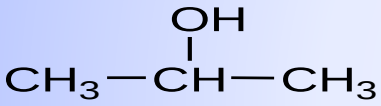
1) CH_3-OH — Methanol

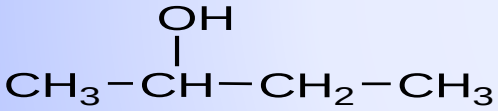
2) CH_3-CH_2-OH — Ethanol

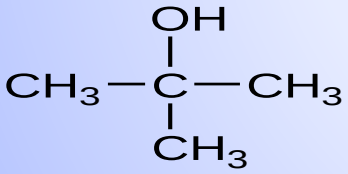
3) CH_3-CH_2-CH_2-OH — 1- propanol or propan-1-ol

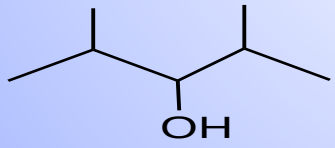
4) CH_3-CH_2-CH_2-CH_2-OH — 1- butanol or butan-1-ol

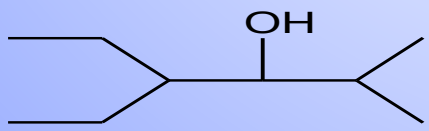
5) CH_3-CH_2-CH_2-CH_2-CH_2-OH — 1-pentanol or pentan-1-ol

6)  — 2-propanol

7)  — 2-butanol

8)  — 2-methyl-2-propanol

9)  — 2,4-dimethyl-3-pentanol

10)  — 4-ethyl-2-methyl-3-hexanol

5) Ethers

These are the organic compounds in which divalent oxygen atom is attached to two similar or different alkyl groups

The general molecular formula of ether is $C_nH_{2n}O$

Where n = no. of carbon atoms.

They are represented as R-O-R'

Where R & R' may be similar or different alkyl groups

Ex. CH_3-O-CH_3 CH_3-O-C_2H_5

Dimethyl ether Ethyl methyl ether

IUPAC Rules :

1) In IUPAC nomenclature ethers are referred as 'alkoxy alkanes'

2) In unsymmetrical ether smaller alkyl group considered as alkoxy and larger alkyl group considered as parent alkane.

Examples

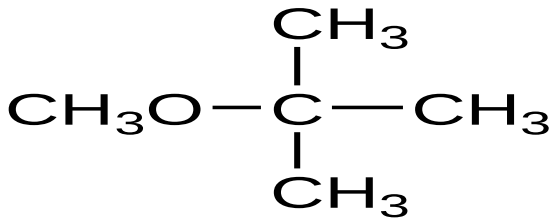
1) $CH_3\text{-}O\text{-}CH_3$

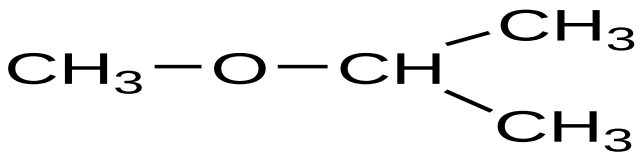
2) $CH_3\text{-}O\text{-}CH_2\text{-}CH_3$

3) $CH_3\text{-}CH_2\text{-}O\text{-}CH_2\text{-}CH_3$

4) $CH_3\text{-}O\text{-}CH_2\text{-}CH_2\text{-}CH_3$

5) $CH_3\text{-}CH_2\text{-}O\text{-}CH_2\text{-}CH_2\text{-}CH_3$

6) 

7) 

Examples

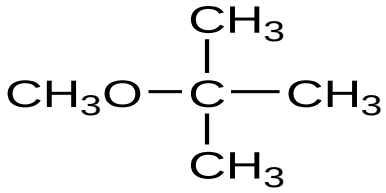
1) CH_3-O-CH_3 Methoxy methane

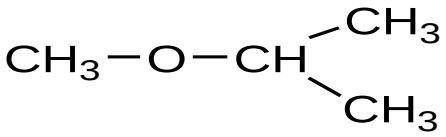
2) CH_3-O-CH_2-CH_3 Methoxy ethane

3) CH_3-CH_2-O-CH_2-CH_3 Ethoxy ethane

4) CH_3-O-CH_2-CH_2-CH_3 1-methoxy propane

5) CH_3-CH_2-O-CH_2-CH_2-CH_3 1-ethoxy propane

6)  2-methoxy, 2-methyl propane

7)  2-methoxy propane

6) Aldehydes

These are the carbonyl compounds in which carbonyl carbon is attached to at least one hydrogen atom.

The general molecular formula of aldehyde is $C_nH_{2n}O$

Where, n = no. of carbon atoms

They are represented as R-CHO

Where, R = H, alkyl group, aryl group

Ex. H-CHO, CH_3-CHO

Formaldehyde Acetaldehyde

IUPAC Rules

1) Selection of longest continuous carbon chain including -CHO gr.
2) Number is given to the selected carbon chain towards -CHO gr.
3) Parent aldehyde name can be derived by changing last letter of parent alkane 'e' by 'al'
4) If there is substituent, their name & position can be written before parent name.
5) If there are two or more same substituent's, then the prefix di, tri, tetra can be used for two, three, four substituent's respectively.
6) If there are different substituent's, then they are listed alphabetical order with their position.

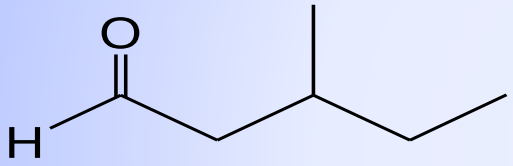
Examples

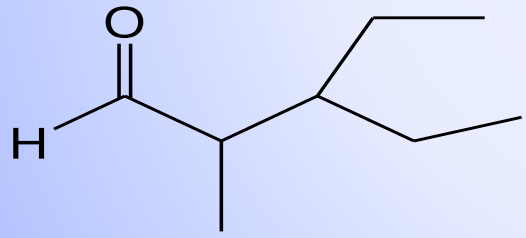
1) H-CHO

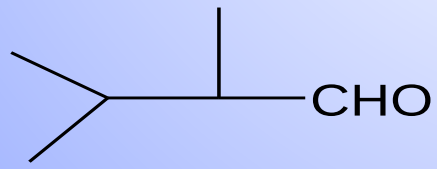
2) CH_3-CHO

3) CH_3-CH_2-CHO

4) CH_3-CH_2-CH_2-CHO

5) 

6) 

7) 

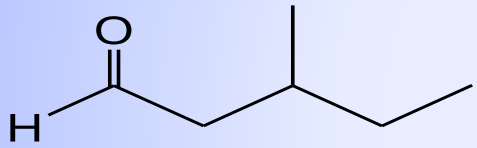
Examples

1) H-CHO — Methanal

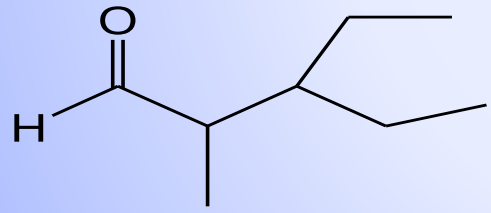
2) CH_3-CHO — Ethanal

3) CH_3-CH_2-CHO — Propanal

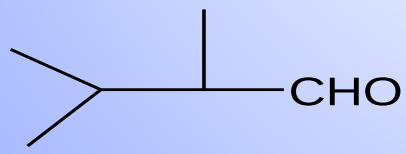
4) CH_3-CH_2-CH_2-CHO — Butanal

5) 

3-methyl pentanal

6) 

3-ethyl-2-methyl pentanal

7) 

2,3-dimethyl butanal

7) Ketones

Ketones are the carbonyl compounds in which carbonyl carbon is attached to two similar or different alkyl groups.

The general molecular formula of ketone is $C_nH_{2n}O$

Where, n = no. of carbon atoms

They are represented as R-CO-R'

Where, R & R' may be similar or different alkyl groups

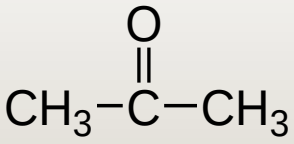
Ex. CH_3COCH_3 $CH_3COC_2H_5$

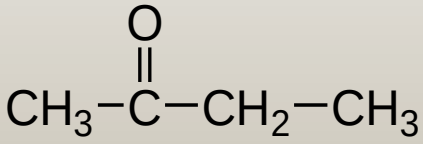
Acetone Ethyl methyl ketone

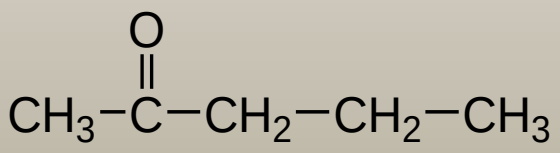
IUPAC Rules :

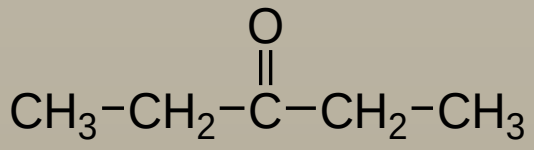
1) Selection of longest continuous carbon chain including-CO- group.
2) Number is given selected chain towards closer to the -CO- group.
3) Ketone name can be derived by changing last letter of parent alkane 'e' by 'one'
4) Position of carbonyl group can be indicated by proper number.
5) If there is substituent, their name & position can be written before parent name.
6) If there are two or more same substituent's, then the prefix di, tri, tetra can be used for two, three, four substituent's respectively.
7) If there are different substituent's, then they are listed alphabetical order with their positions.

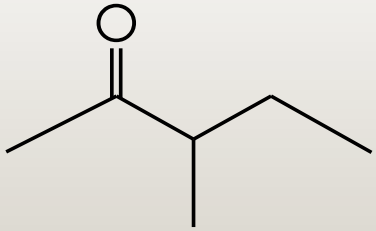
Examples

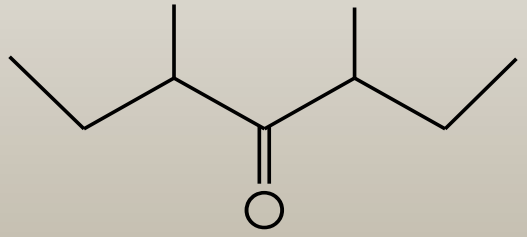
1) 

2) 

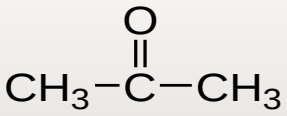
3) 

4) 

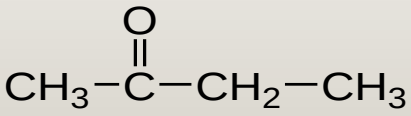
5) 

6) 

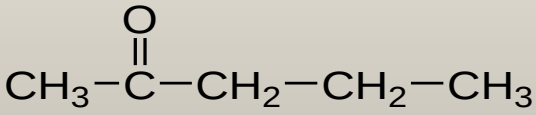
Examples

1) 

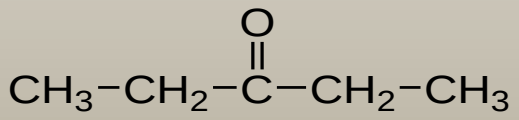
Propanone

2) 

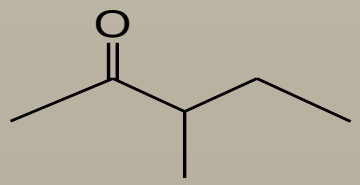
2-butanone or butan-2-one

3) 

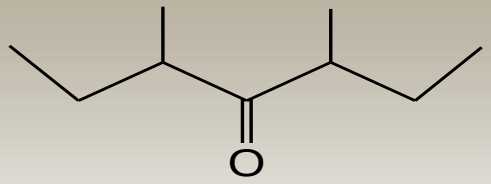
2-pentanone or pentan-2-one

4) 

3-pentanone or pentan-3-one

5) 

3-methyl-2-pentanone

6) 

3,5-dimethyl-4-heptanone

8) Carboxylic Acids

The organic compound which contain carboxyl group (-COOH) are called as carboxylic acids.

The general molecular formula of carboxylic acid is $C_nH_{2n+1}COOH$

Where, n- no.of C-atoms

They are represented as R-COOH

R = Alkyl group, aryl, hydrogen atom

Ex.	H-COOH,	CH_3-COOH,	C_6H_5-COOH
	Formic acid	Acetic acid	Benzoic acid

IUPAC Rules

1) Selection of longest continuous carbon chain including -COOH group.
2) Number is given to the selected chain towards -COOH group.
3) Parent carboxylic acid name can be derived by changing last letter of parent alkane 'e' by 'oic acid'
4) If there is substituent, their name & position can be written before parent name.
5) If there are two or more same substituent's, then the prefix di, tri, tetra can be used for two, three, four substituent's respectively.
6) If there are different substituent's, then they are listed alphabetical order with their positions.

Examples

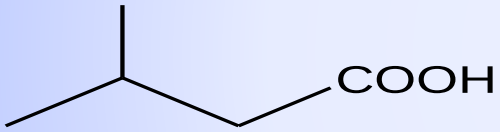
1) H-COOH

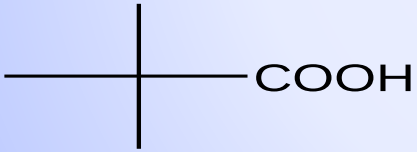
2) CH_3-COOH

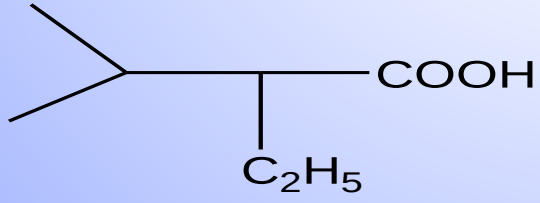
3) CH_3-CH_2-COOH

4) CH_3-CH_2-CH_2-COOH

5) CH_3-CH_2-CH_2-CH_2-COOH

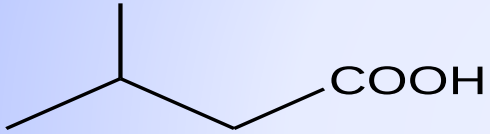
6) 

7) 

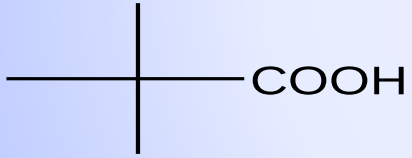
8) 

Examples

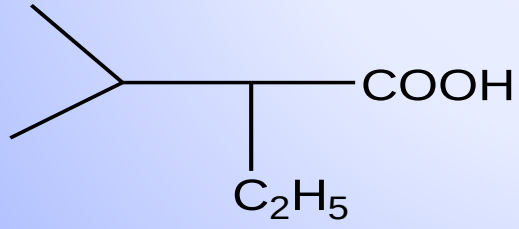
1) H-COOH — Methanoic acid
2) CH_3-COOH — Ethanoic acid
3) CH_3-CH_2-COOH — Propanoic acid
4) CH_3-CH_2-CH_2-COOH — Butanoic acid
5) CH_3-CH_2-CH_2-CH_2-COOH — Pentanoic acid

6) 

3-methyl butanoic acid

7) 

2,2-dimethyl propanoic acid

8) 

2-ethyl-3-methyl butanoic acid

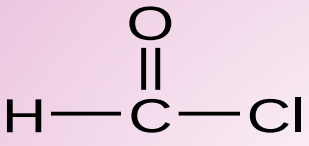
9) Acid Halides

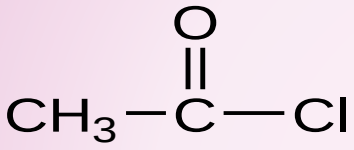
These are the derivatives of carboxylic acids obtained by replacing –OH group of carboxylic acid by halogen atom (Cl, Br, I) are called as acid halides.
They are represented as R-CO-X
Where, X = Cl, Br, I
Ex. CH_3COCl
Acetyl chloride

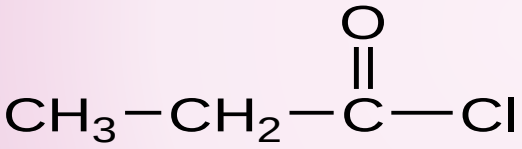
IUPAC Rules

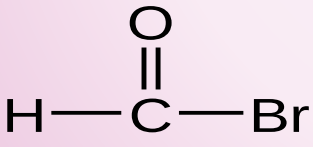
1. IUPAC name of acid halide derived from parent carboxylic acid by changing last letter of carboxylic acid 'ic acid' by 'yl halide'
2. Therefore they are called as **alkanoyl halide**.

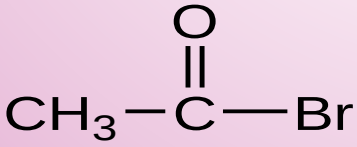
Examples

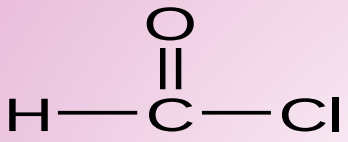
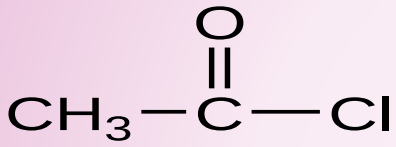
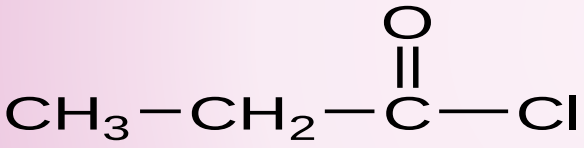
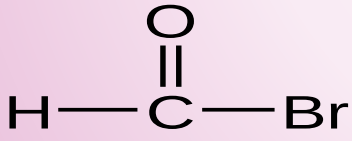
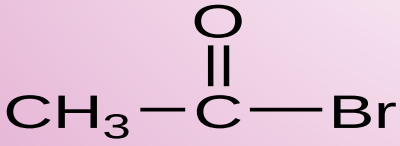
1) 

2) 

3) 

4) 

5) 

	Examples	IUPAC name
1)		Methanoyl chloride
2)		Ethanoyl chloride
3)		Propanoyl chloride
4)		Methanoyl bromide
5)		Ethanoyl bromide

10) Esters

These are the derivatives of carboxylic acids obtained by replacing –OH group of carboxylic acid by alkoxy group (-OR) are called as acid esters.

The general molecular formula of ester is $C_nH_{2n}O_2$
Where, n = no. of C-atoms
They are represented as R-COOR'
Where = R & R' may be similar or different alkyl groups
Ex. $H\text{-}COOCH_3$, $CH_3\text{-}COOCH_3$
Methyl formate Methyl acetate

IUPAC Rules

1. IUPAC name of ester is given by **alkyl alkanoate**'
2. Alkanoate name can be derived depending on no. of carbon atoms in carboxylate group.

Examples

1) $H\text{-}COOCH_3$
2) $CH_3\text{-}COOCH_3$
3) $CH_3\text{-}COOC_2H_5$
4) $CH_3\text{-}CH_2\text{-}COOCH_3$
5) $CH_3\text{-}CH_2\text{-}COOC_2H_5$

Examples	**IUPAC Names**
1) $H\text{-}COOCH_3$	Methyl methanoate
2) $CH_3\text{-}COOCH_3$	Methyl ethanoate
3) $CH_3\text{-}COOC_2H_5$	Ethyl ethanoate
4) $CH_3\text{-}CH_2\text{-}COOCH_3$	Methyl propanoate
5) $CH_3\text{-}CH_2\text{-}COOC_2H_5$	Ethyl propanoate

11) Acid Anhydride

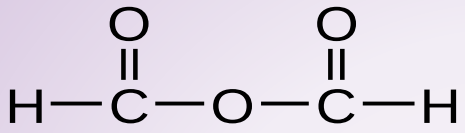
These are the derivatives of carboxylic acids obtained by replacing -OH group of carboxylic acid by –OCOR group are called as acid anhydride.

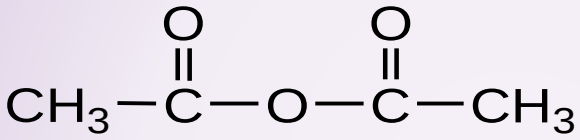
They are represented as $(R\text{-}CO)_2O$
Where, R = alkyl groups or hydrogen atoms.
Ex. $(CH_3\text{-}CO)_2O$
Acetic anhydride

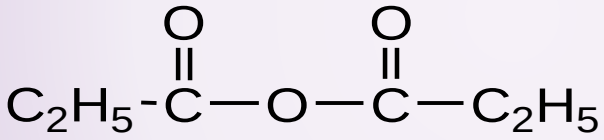
IUPAC Rules

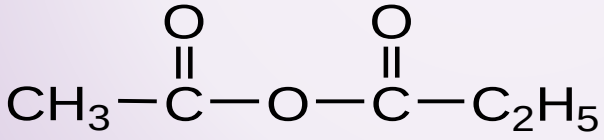
1. IUPAC name of acid anhydride derived from parent carboxylic acid by changing last letter of carboxylic acid 'acid' by 'anhydride'
2. Therefore acid anhydride is given by **alkanoic anhydride.**

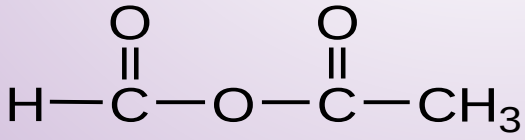
Examples

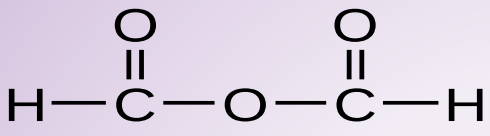
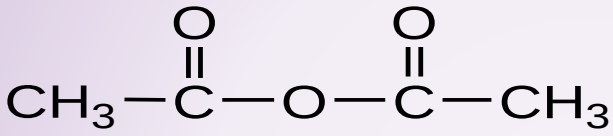
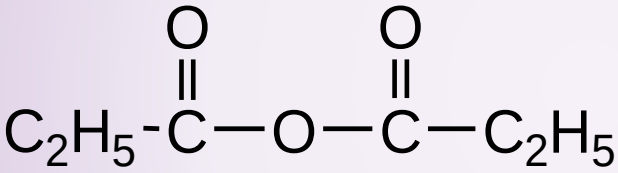
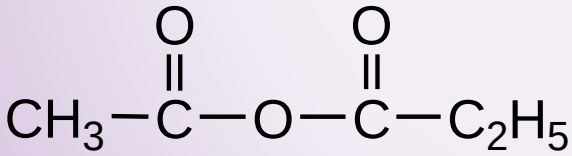
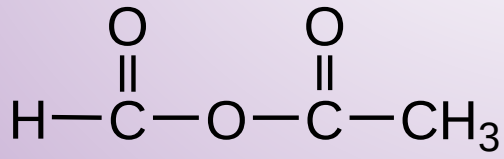
1) 

2) 

3) 

4) 

5) 

	Examples	IUPAC name
1)		Methanoic anhydride
2)		Ethanoic anhydride
3)		Propanoic anhydride
4)		Ethanoic propanoic anhydride
5)		Ethanoic methanoic anhydride

12) Amides

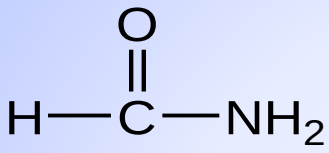
These are the derivatives of carboxylic acids obtained by replacing –OH group of carboxylic acid by $–NH_2$ group are called as amides.

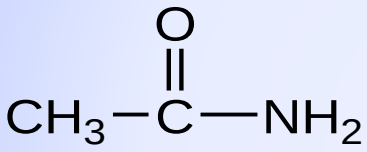
They are represented as $R\text{-}CO\text{-}NH_2$
Where, R = alkyl groups or hydrogen atoms.
Ex. $CH_3\text{-}CO\text{-}NH_2$
Acetamide

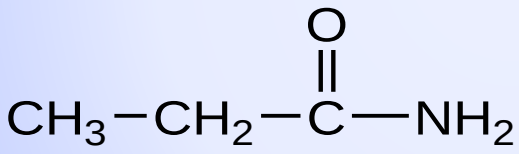
IUPAC Rules

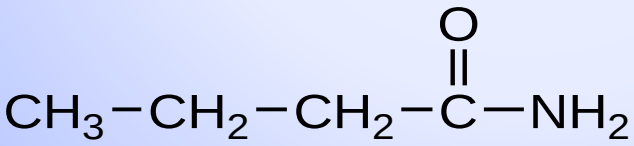
1. IUPAC name of amide derived from parent carboxylic acid by changing last letter of carboxylic acid 'oic acid' by 'amide'
2. Therefore amides are referred as alkanamides.

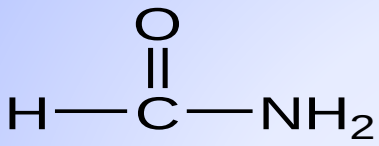
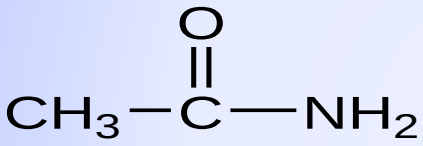
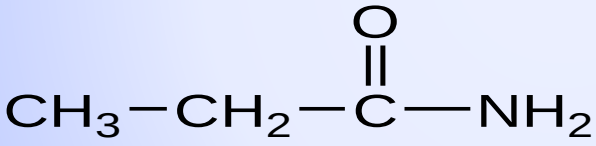
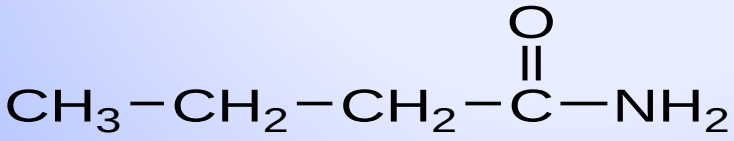
Examples

1) 

2) 

3) 

4) 

	Examples	IUPAC name
1)		Methanamide
2)		Ethanamide
3)		Prapanamide
4)		Butanamide

13) Amines

Amines are alkyl derivative of ammonia obtained by replacing one or more hydrogen atoms of ammonia by alkyl groups.

They are represented as $R\text{-}NH_2$, $R_2\text{-}NH$, R_3N

Where , R - Alkyl groups.

Ex. i) $CH_3\text{-}NH_2$ Methyl amine (Primary amine)

ii) $(CH_3)_2\ NH$ Dimethyl amine (Secondary amine)

iii) $(CH_3)_3N$ Trimethyl amine (Tertiary amine)

IUPAC Rules

1) In IUPAC nomenclature primary amines are named as alkanamines.

2) Alkyl group considered as alkane & changing last letter of parent alkane ‘e’ by ‘amine’

3) Number is given to the selected chain towards closes to the $–NH_2$ group

4) Position of $–NH_2$ group can be indicated by proper number.

5) In secondary and tertiary amines, they are named as N-alkyl alkanamine.

6) Larger alkyl group considered as alkanamine & smaller alkyl group considered as N-alkyl.

Examples

1) $CH_3\text{-}NH_2$

2) $CH_3\text{-}CH_2\text{-}NH_2$

3) $CH_3\text{-}CH_2\text{-}CH_2\text{-}NH_2$

4) $CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}NH_2$

5) $(CH_3)_2NH$

6) $CH_3\text{-}NH\text{-}C_2H_5$

7) $C_2H_5\text{-}NH\text{-}\ C_2H_5$

8) $CH_3\text{-}NH\text{-}CH_2\text{-}CH_2\text{-}CH_3$

9) $(CH_3)_3NH$

10) $(CH_3)_2NH\text{-}\ C_2H_5$

11) $(C_2H_5)_3N$

Examples		IUPAC Names
1)	CH_3-NH_2	Methanamine
2)	CH_3-CH_2-NH_2	Ethanamine
3)	CH_3-CH_2-CH_2-NH_2	1-propanamine
4)	CH_3-CH_2-CH_2-CH_2-NH_2	1-butanamine
5)	$(CH_3)_2NH$	N –methyl methanamine
6)	CH_3-NH-C_2H_5	N -methyl ethanamine
7)	C_2H_5-NH- C_2H_5	N-ethyl ethanamine
8)	CH_3-NH-CH_2-CH_2-CH_3	N –methyl-1-propanamine
9)	$(CH_3)_3NH$	N,N -dimethyl methanamine
10)	$(CH_3)_2$NH- C_2H_5	N,N -dimethyl ethanamine
11)	$(C_2H_5)_3N$	N,N -diethyl ethanamine

14) Nomenclature of Aromatic compounds

These are the derivatives of benzene obtained by replacing one or more hydrogen atoms of benzene ring by substituent's.

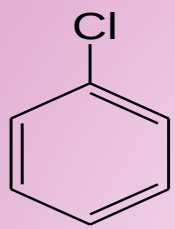
IUPAC nomenclature

1) For mono substituted benzene, they are obtained by prefixing the name of the substituent before word benzene.

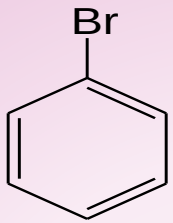
2) For disubstituted benzene, three positional isomers are formed.

i) **Ortho (o)** : If the two substituent's are on adjacent carbon atoms. i.e. 1,2 position.
ii) **Meta (m)** : If the two substituent's are on alternate carbon atoms. i.e. 1,3 position
iii) **Para (p)** : If the two substituent's are present on diagonally opposite carbon atoms. i.e. 1,4 position.

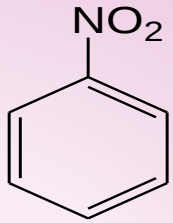
3) For polysubstituted benzene, lowest possible number is given to that substituent's.



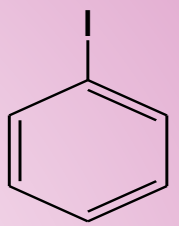
Chlorobenzene



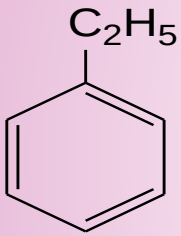
Bromobenzene



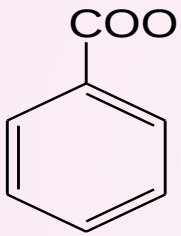
Nitrobenzene



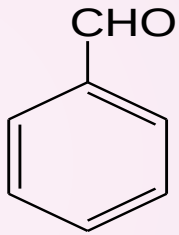
Iodobenzene



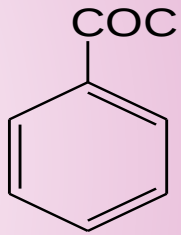
Ethyl benzene



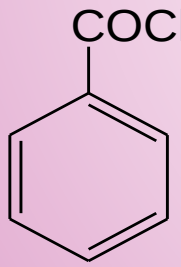
Benzoic acid



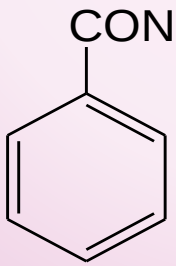
Benzaldehyde



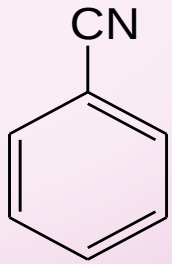
Acetophenone



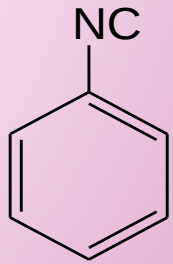
benzoyl chloride



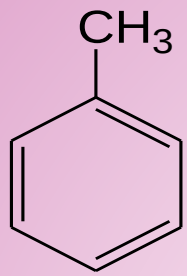
benzamide



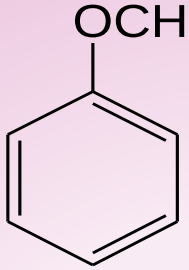
benzonitrile



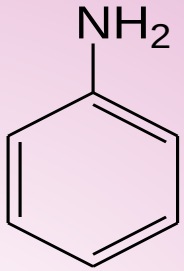
Isocyanobenzene



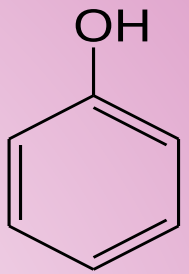
toluene



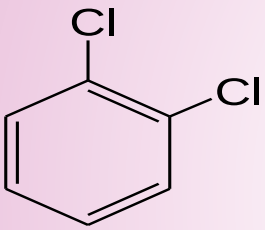
anisole



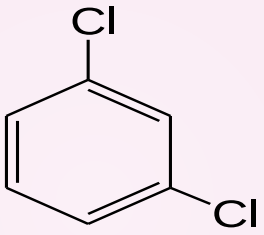
aniline



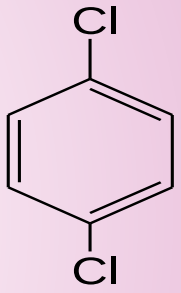
phenol



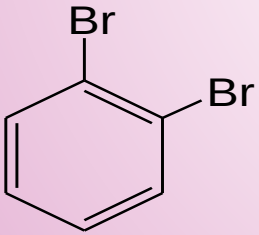
1,2-dichlorobenzene
(o-dichloro benzene)



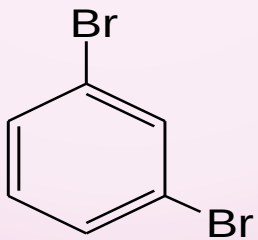
1,3-dichlorobenzene
(m-dichloro benzene)



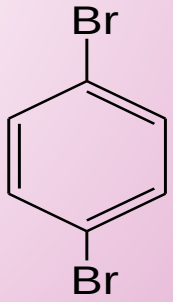
1,4-dichlorobenzene
(p-dichloro benzene)



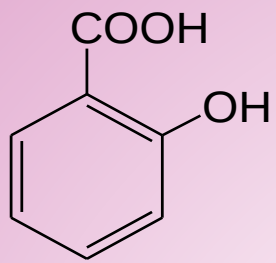
1,2-dibromo benzene
(o-dibromo benzene)



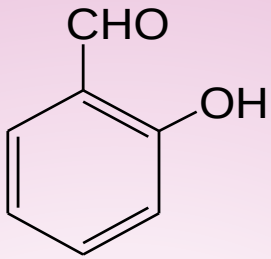
1,3-dibromo benzene
(m-dibromo benzene)



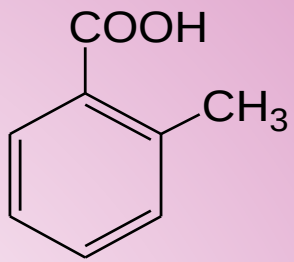
1,4-dibromo benzene
(p-dibromo benzene)



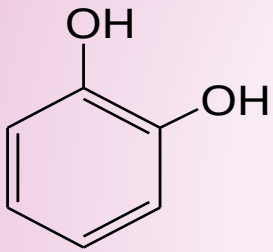
2-hydroxy benzoic acid
(Salicylic acid)



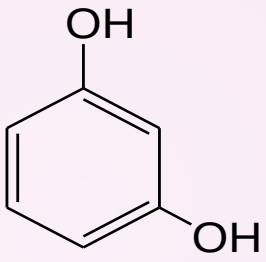
2-hydroxy benzaldehyde
(Salicyladehyde)



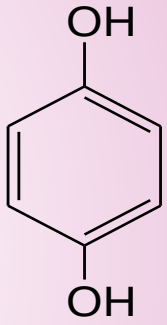
2-methyl benzoic acid
(o-toluic acid)



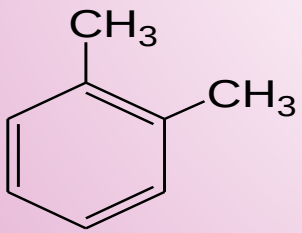
Catachol
(1,2-dihydroxy benzene)



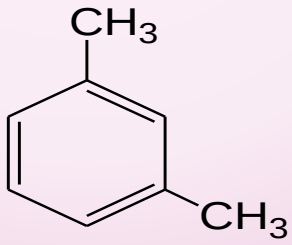
Resorcinol
(1,3-dihydroxy benzene)



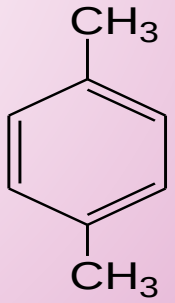
Quinol
(1,4-dihydroxy benzene)



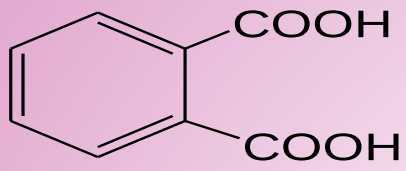
1,2-dimethyl benzene
(o-xylene)



1,3-dimethyl benzene
(m-xylene)

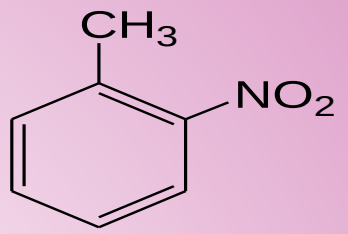


1,4-dimethyl benzene
(p-xylene)

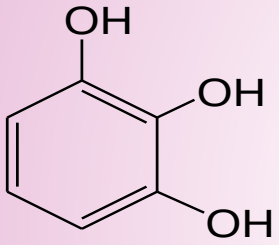


Phthalic acid

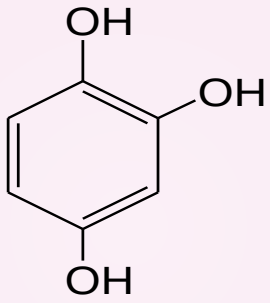
2-methyl phenol
(o-cresol)



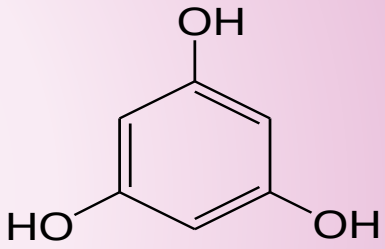
2-nitro toluene
(o-nitro toluene)



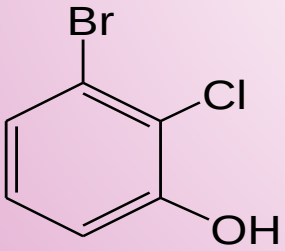
1,2,3-trihydroxy benzene
(pyrogallol)



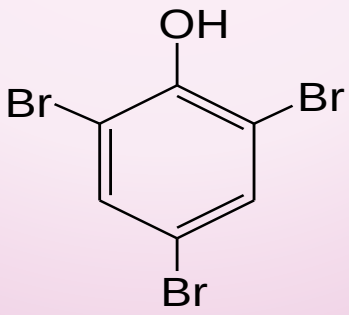
1,2,4-trihydroxy benzene
(hydroxy quinol)



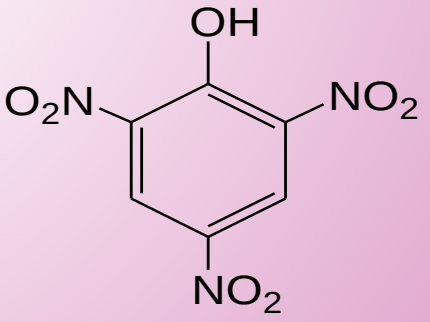
1,3,5-trihydroxy benzene
(phlorogucinol)



3-bromo-2-chloro phenol



2,4,6-tribromo phenol



2,4,6-trinitro phenol

Basic rules of IUPAC nomenclature of Bifunctional Organic compounds

i) In bi-functional (poly functional) organic compounds, selection of principal functional group as follows.

Priority of principal functional groups :

S.No.	Class	Functional group	Suffix used
1	Carboxylic acid	-COOH	-oic acid
2	Sulphonic acid	$-SO_3H$	-sulphonic acid
3	Ester	-COOR	Alkyl –oate
4	Acid halide	-COX	-oyl halide
5	Amide	$-CONH_2$	-amide
6	Nitrile	-CN	-nitrile
7	Aldehyde	-CHO	-al
8	Ketone	-CO-	-one
9	Alcohol	-OH	-ol
10	Amine	$-NH_2$	-amine
11	Ethers	-O-	Alkoxy alkane
12	Alkene	-C=C-	-ene
13	Alkyne	-C≡C-	-yne

ii) Following functional groups are always named as substituent's and their prefixes used as follows :

Functional group	**Prefix**
-Cl	Chloro
-Br	Bromo
-I	Iodo
-F	Fluoro
-CN	Cyano
-R	Alkyl
-OR	Alkoxy
$-NH_2$	Amino
$-NO_2$	Nitro
-NO	Nitroso

iii) In poly functional compounds, higher priority functional group considered as principal functional group (main functional group)

iv) Numbering is given to the longest carbon chain towards principal functional group.

v) In poly functional compounds, remaining functional groups are considered as substituents.

vi) Following sequence is used for nomenclature of poly functional compounds.

Prefix(es) + word root + primary suffix + secodary suffix

Prefixes : Prefixes are used to represent the **name of the alkyl group** or some **functional groups.**

Word root : It represents the **number of carbon atoms** in the parent chain.

Primary suffix : It represent **saturation or unsaturation** in the carbon chain.

Secondary suffix : It indicate the **main functional group** in organic compound.

Ex. 1) CH_3-CH_2-CH(-CH_3)-CH_2-COOH Methyl ……. pent …….. an …… oic acid

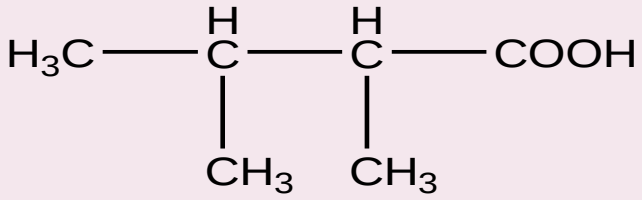
prefix word root pri. Suffix sec. suffix

(3-methyl pentanoic acid)

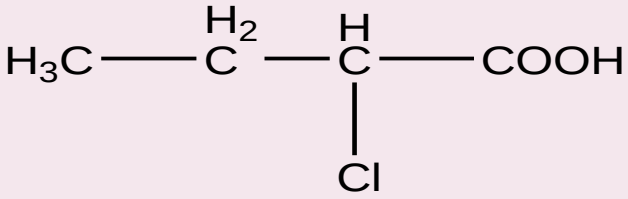
2) CH_3-C(-Cl)=CH-CHO Chloro …… but ……..…en ……..…… al

prefix word root pri. suffix sec. suffix

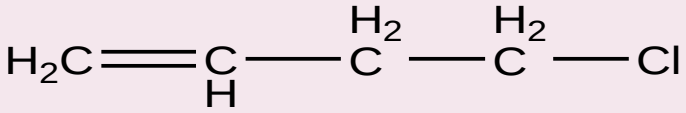
(3-chloro but-2-enal)

3) 

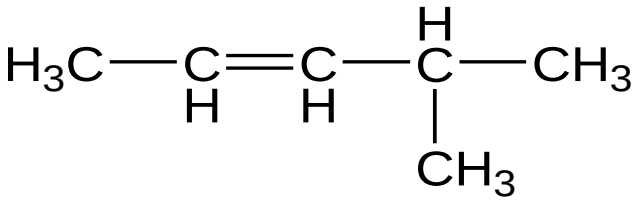
2,3-dimethyl butanoic acid

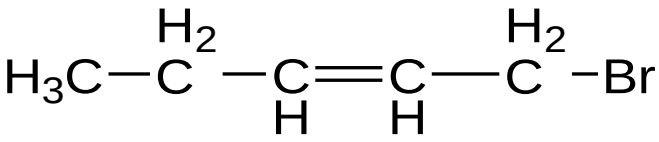
4) 

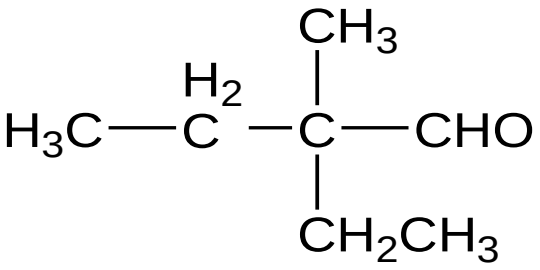
2-chloro butanoic acid

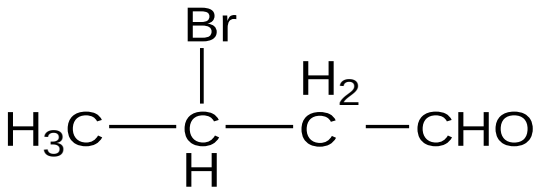
5) 

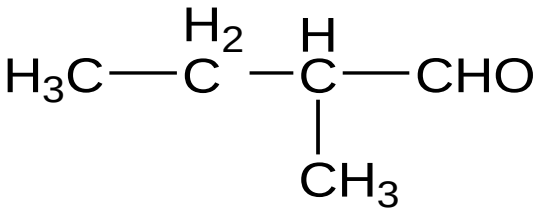
4-chloro but 1-ene

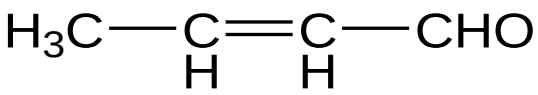
6) 

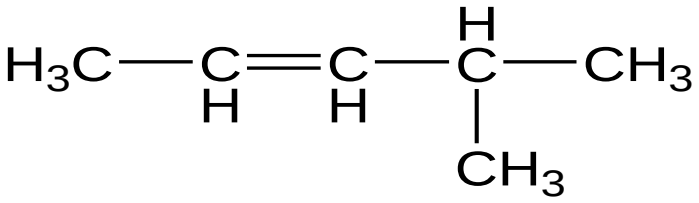
7) 

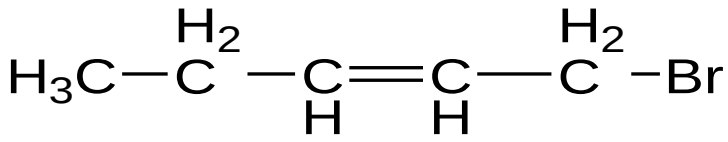
8) 

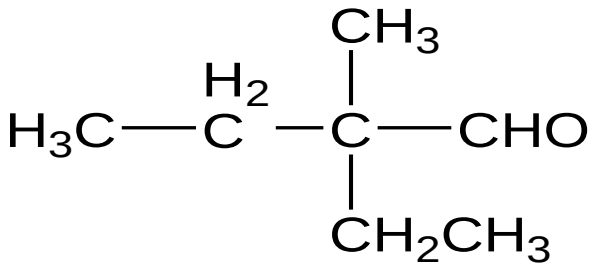
9) 

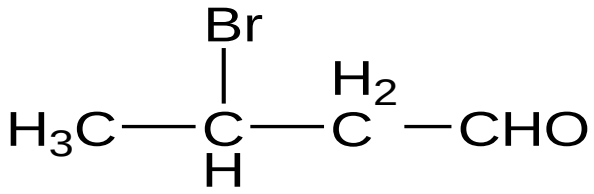
10) 

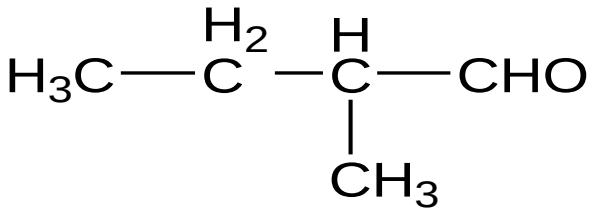
11) 

6)  4-methyl pent 2-ene

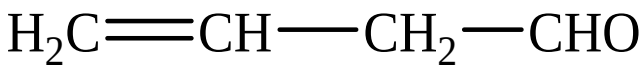
7)  1-bromo pent 2-ene

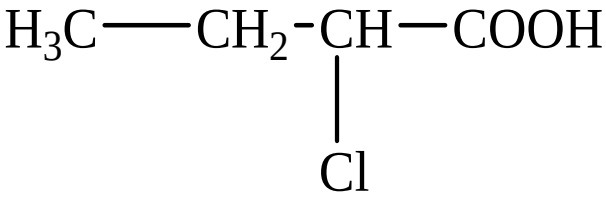
8)  2-ethyl , 2-methyl butanal

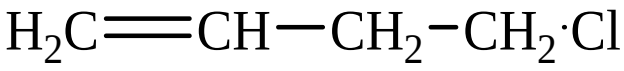
9)  3-bromo butanal

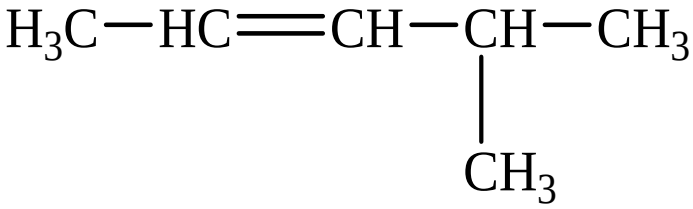
10)  2-methyl butanal

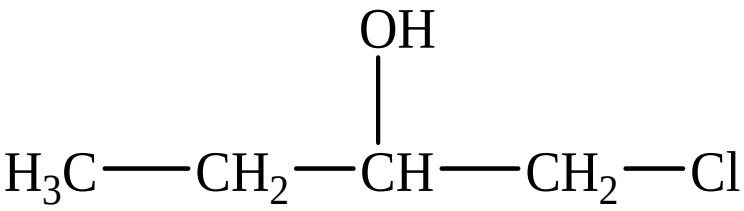
11)  but 2-enal

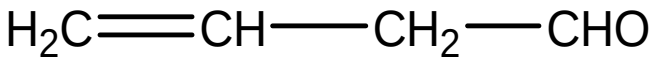
12) 

13) 

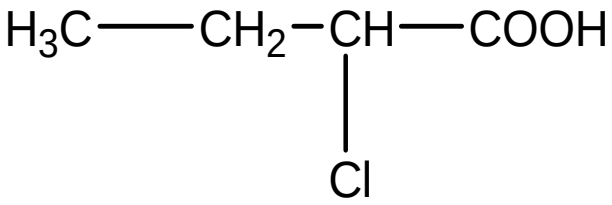
14) 

15) 

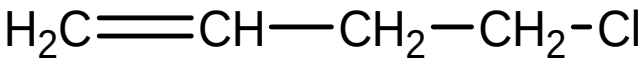
16) 

12) 

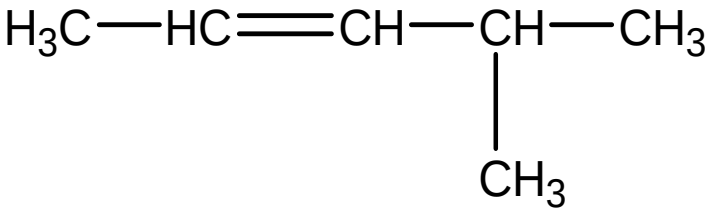
But-3-enal

13) 

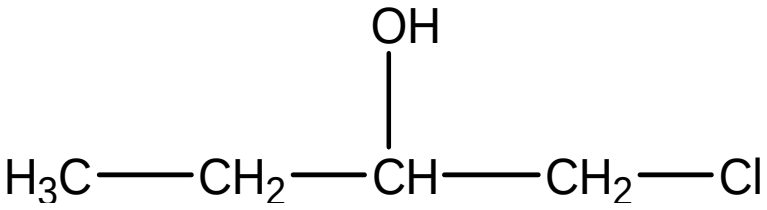
2-chloro benzoic acid

14) 

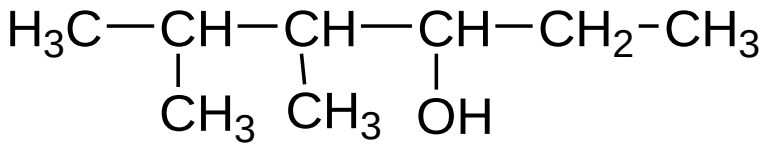
4-chloro but-1-ene

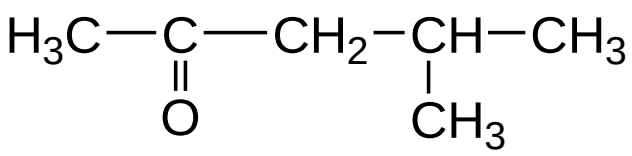
15) 

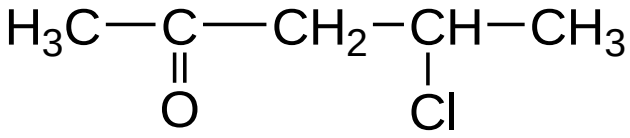
4-methyl pent-2-ene

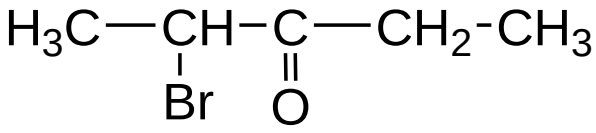
16) 

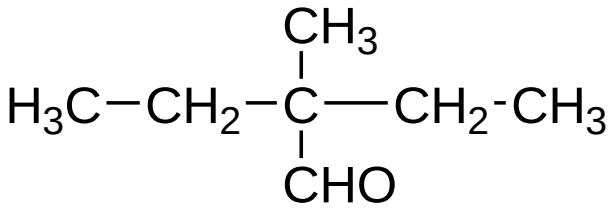
1-chloro butan-2-ol

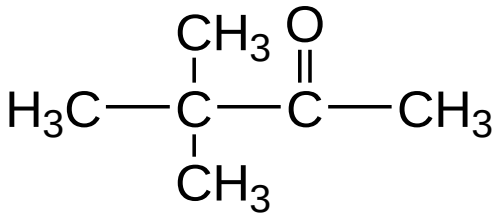
17) 

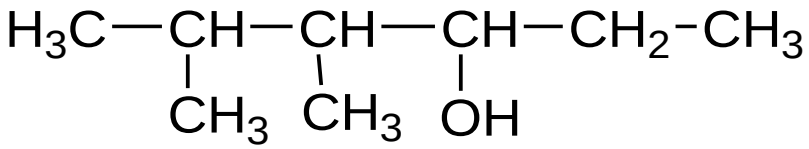
18) 

19) 

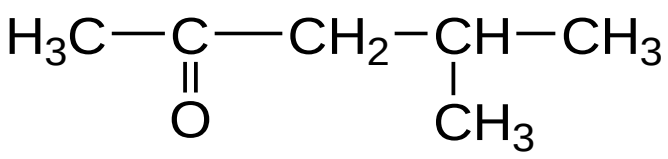
20) 

21) 

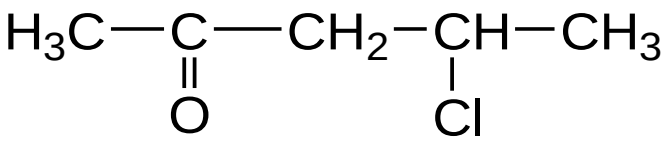
22) 

17) 

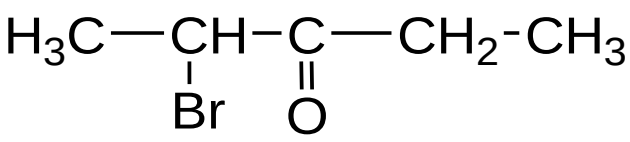
4,5-dimethyl hexan-3-ol

18) 

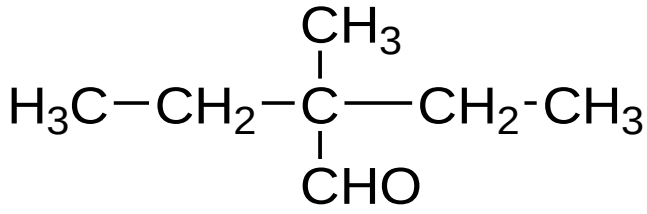
4-methyl pentan-2-one

19) 

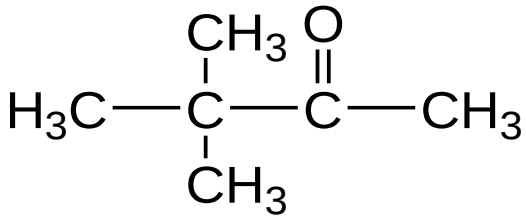
4-chloro pentan-2-one

20) 

2-bromo pentan-3-one

21) 

2-ethyl-2-methyl butanal

22) 

3,3-dimethyl butan-2-one

Thank You ……..