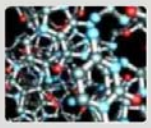
CHEMISTRY




THEORY


EXAMPLES


EXERCISES


SOLUTION & TIPS

CLASSIFICATION & NOMENCLATURE

CAREER POINT

TOTAL LEARNING SOLUTION PROVIDER

Where **Care** *leads to* **Career**

CLASSIFICATION & NOMENCLATURE

1. KEKULE'S PRINCIPLE :

- Carbon has four valencies.
- Carbon has a property of catenation. It can make a large chain with addition of other carbons.
- A carbon atom can share 2, 4 or 6 electrons with other carbons & can form single, double or triple bond.
- For a carbon atom, it is not possible to make more than 3 bonds with adjacent carbon atom because a carbon atom complete its octet from overlapping which consists directional property.

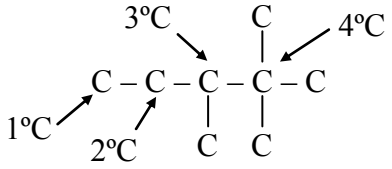
2. THE FOUR VALENCIES OF CARBON ATOM CAN BE REPRESENTED BY FOLLOWING WAY :

Structure	σ bonds	π bonds	Hybridisation	Shape	Bond Angle	No. of Bond angles
$-\overset{\vert}{\underset{\vert}{C}}-$	4	0	sp^3	Tetrahedral (Non planar)	109º28'	6
$-\overset{\vert}{\underset{\vert}{C}}=$	3	1	sp^2	Planar (Trigonal)	120º	3
$-C\equiv$	2	2	sp	Linear	180º	1
$=C=$	2	2	sp	Linear	180º	1

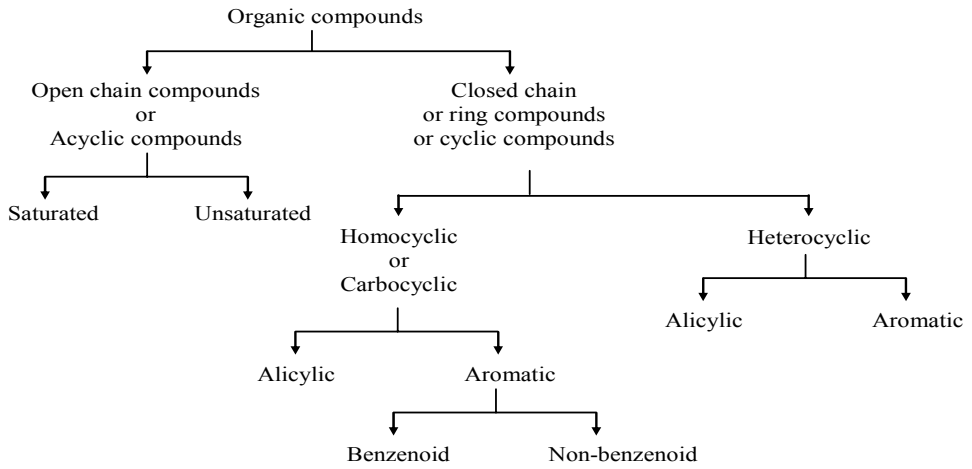
3. CLASSIFICATION OF CARBON :

There are four types of carbon present in organic compounds. The carbon which is directly attached with one, two, three and four carbon atoms are known as primary, secondary, tertiary and quarternary carbon atom respectively.

On the basis of carbon atom, hydrogen atoms bonded with 1º, 2º or 3º are named as primary, secondary or tertiary hydrogen atom respectively.



4. CLASSIFICATION OF ORGANIC COMPOUNDS :



SPECIAL POINTS :

- Saturated compounds having carbon-carbon single bonds.

  e.g. CH_4, $CH_3–CH_3$, $CH_3–CH_2–CH_3$

- Unsaturated compounds having atleast one carbon-carbon multiple bond (= or ≡)

  e.g. $CH_2=CH_2$, $HC\equiv CH$, $HC\equiv C–CH_3$, $H_2C=CH–CH_3$, $CH_2=C=CH_2$, $CH_2=CH–C\equiv CH$, $HC\equiv C–C\equiv CH$

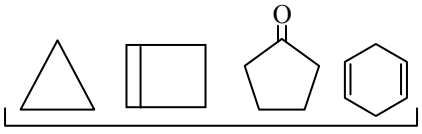
- Homocyclic compounds having similar types of atoms in the complete cycle. Whereas heterocyclic compounds having atleast one different atom (O, S, N) in the cycle.

- Alicyclic = Aliphatic + homo/hetero cyclic

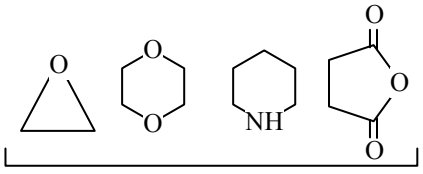
  ⇓

  (Alipher = Fats)

e.g.



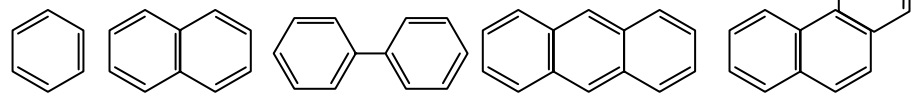
Homocyclic



Heterocyclic

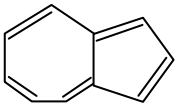
- Aromatic compounds having sweet smell (aroma), cyclic resonance and follow Huckle's rule ($4n + 2 = \pi$ electrons)

  e.g. Benzenoid compounds :



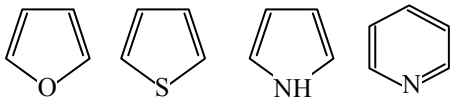
Benzene Naphthalene Biphenyl Anthracene Phenanthrene

e.g. Non-Benzenoid compounds :



Azulene

e.g. Heterocyclic compounds :



Furan Thiophene Pyrrole Pyridine

5. HOMOLOGOUS SERIES :

The organic compounds which are structurally similar having same functional groups, combinedly gives a series known as homologous series and the members as homologues. The homologous series is characterised by :

(i) The two adjacent members are differ by a $– CH_2 –$ group or 14 atomic mass unit.

(ii) All the members of a series have same general formula, general methods of preparation and similar chemical properties due to same functional group.

(iii) The homologues shows difference in physical properties due to change in molecular mass and structural arrangement of molecule.

SOME STANDARD HOMOLOGOUS SERIES ARE :

S.No.	Name of Series	General Formula	I-homologue	II-homologue
1.	Alkane	C_nH_{2n+2}	CH_4	$CH_3–CH_3$
2.	Alkene	C_nH_{2n}	$CH_2=CH_2$	$CH_2=CH–CH_3$
3.	Alkyne	C_nH_{2n-2}	$HC\equiv CH$	$HC\equiv C–CH_3$
4.	Halo alkane	$C_nH_{2n+1}X$	$CH_3–X$	$CH_3–CH_2–X$
5.	Alcohol	$C_nH_{2n+2}O$	$CH_3–OH$	$CH_3–CH_2–OH$
6.	Ether	$C_nH_{2n+2}O$	$CH_3–O–CH_3$	$CH_3–O–CH_2–CH_3$
7.	Aldehyde	$C_nH_{2n}O$	H–CHO	$CH_3–CHO$
8.	Ketone	$C_nH_{2n}O$	$CH_3–\overset{\overset{O}{\|}}{C}–CH_3$	$CH_3–\overset{\overset{O}{\|}}{C}–CH_2–CH_3$
9.	Carboxylic acid	$C_nH_{2n}O_2$	H–COOH	$CH_3–COOH$
10.	Ester	$C_nH_{2n}O_2$	$H–\overset{\overset{O}{\|}}{C}–O–CH_3$	$H–\overset{\overset{O}{\|}}{C}–O–CH_2CH_3$ or $CH_3–\overset{\overset{O}{\|}}{C}–O–CH_3$
11.	Amide	$C_nH_{2n+1}NO$	$H–CONH_2$	$CH_3–CONH_2$
12.	Nitro alkane	$C_nH_{2n+1}NO_2$	$CH_3–N(=O)–O$	$CH_3–CH_2–N(=O)–O$
13.	Amine	$C_nH_{2n+3}N$	$CH_3–NH_2$	$CH_3–CH_2–NH_2$

6. NOMENCLATURE OF ORGANIC COMPOUNDS :

Mainly three system are adopted for naming of an organic compound :

(a) Common Name or Trivial Name System

(b) Derived Name System

(c) IUPAC Name or Jeneva Name System

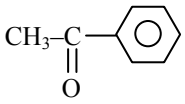
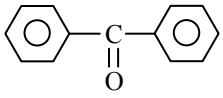
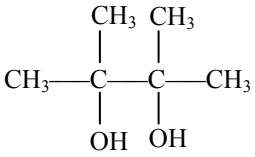
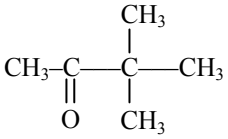
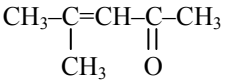
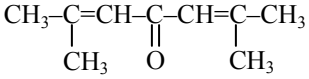
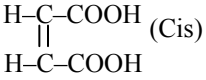
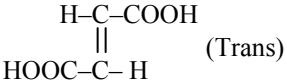
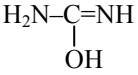
6.1 SOME COMMON NAMES BASED ON SOURCE :

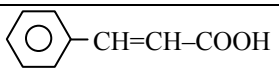
S.No.	Compound	Common Name	Source
1.	CH_4	Marsh gas (Fire damp)	Marshy places
2.	CH_3OH	Wood spirit (Carbinol)	Destructive distillation of wood
3.	CH_3CH_2OH	Grain alcohol	Grain
4.	$NH_2–\overset{\overset{O}{\|}}{C}–NH_2$	Urea (Carbamide)	Urine
5.	HCOOH	Formic acid	Formica (Red ants)

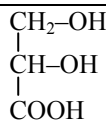
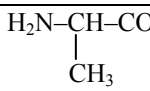
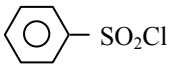
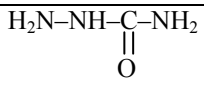
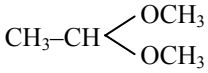
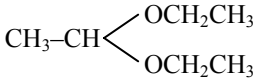
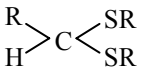
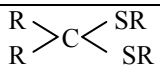
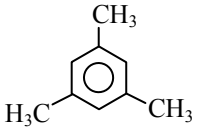
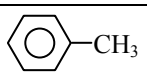
S.No.	Compound	Common Name	Source
6.	CH_3COOH	Acetic acid	Acetum (Vinegar)
7.	HOOC–COOH	Oxalic acid	Oxalis plant
8.	$CH_3–\underset{\displaystyle OH}{\underset{\vert}{CH}}–COOH$	Lactic acid	Lactum (Milk)
9.	$CH_3CH_2CH_2COOH$	Butyric acid	Butter
10.	$HO–\underset{\displaystyle HO–CH–COOH}{\underset{\vert}{CH}}–COOH$	Tartaric acid	Tamarind
11.	$HO–\underset{\displaystyle CH_2–COOH}{\underset{\vert}{CH}}–COOH$	Malic acid	Malum (Apple)
12.	$\begin{array}{l} CH_2–COOH \\ \vert \\ HO–C–COOH \\ \vert \\ CH_2–COOH \end{array}$	Citric acid	Citron (Lemon)

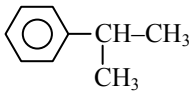
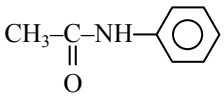
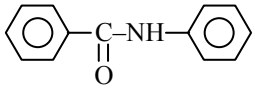
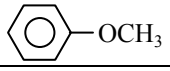
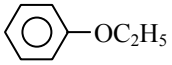
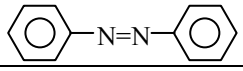
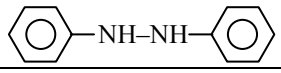
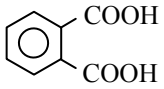
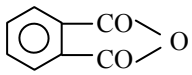
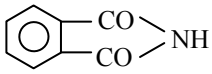
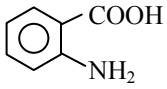
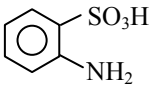
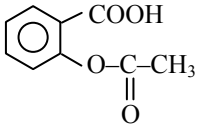
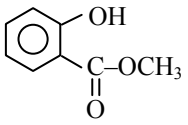
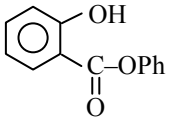
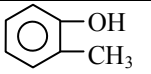
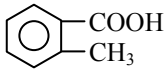
6.2 SOME STANDARD COMMON NAMES (TO BE REMEMBER) :

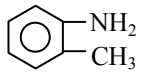
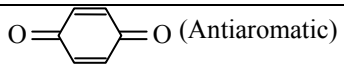
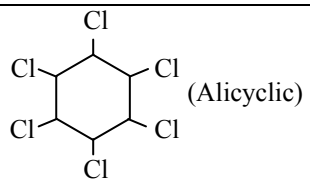
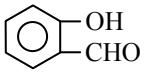
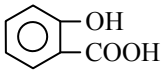
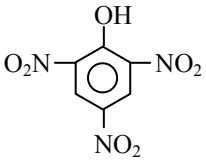
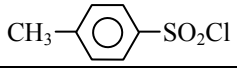
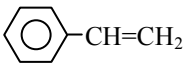
S.No.	Common Name	Structure Formula
1.	Isoheptane or Triptane	$\begin{array}{l} \quad\quad CH_3 \\ \quad\quad\vert \\ CH_3–CH–C–CH_3 \\ \quad\vert\quad\vert \\ \quad CH_3\ CH_3 \end{array}$
2.	Isooctane	$\begin{array}{l} \quad\quad\quad\quad CH_3 \\ \quad\quad\quad\quad\vert \\ CH_3–CH–CH_2–C–CH_3 \\ \quad\quad\vert\quad\quad\quad\vert \\ \quad CH_3\quad\quad CH_3 \end{array}$
3.	Ethylene	$H_2C = CH_2$
4.	Acetylene	$HC \equiv CH$
5.	Allylene	$HC{\equiv}C–CH_3$
6.	Crotonylene	$CH_3–C{\equiv}C–CH_3$
7.	Allene	$CH_2{=}C{=}CH_2$
8.	Ketene	$CH_2{=}C{=}O$
9.	Acetone or Dimethyl Ketone	$\begin{array}{l} CH_3–\underset{\displaystyle\Vert}{C}–CH_3 \\ \quad\quad O \end{array}$
10.	Pavaldehyde	$\begin{array}{l} \quad\quad CH_3 \\ \quad\quad\vert \\ CH_3–C–CHO \\ \quad\quad\vert \\ \quad\quad CH_3 \end{array}$
11.	Chloral	$Cl_3C–CHO$

S.No.	Common Name	Structure Formula
12.	Acrolein or Acryl aldehyde	$CH_2=CH-CHO$
13.	Acetophenone or Methyl phenyl Ketone	
14.	Benzophenone or Diphenyl Ketone	
15.	Pinacol	
16.	Pinacolone	
17.	Mesityl oxide (Dimer of acetone)	
18.	Phorone (Trimer of acetone)	
19.	Oxalic acid	HOOC–COOH
20	Malonic acid	$HOOC-CH_2-COOH$
21.	Succinic acid	$HOOC-(CH_2)_2-COOH$
22.	Gluteric acid	$HOOC-(CH_2)_3-COOH$
23.	Adipic acid	$HOOC-(CH_2)_4-COOH$
24.	Pimelic acid	$HOOC-(CH_2)_5-COOH$
25.	Maleic acid	 (Cis)
26.	Fumeric acid	 (Trans)
27.	Cyanic acid	HO–C≡N
28.	Isocyanic acid (Tautomer of cyanic acid)	O=C=NH
29.	Isourea (Tautomer of urea)	

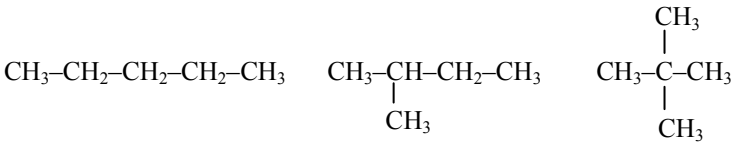
S.No.	Common Name	Structure Formula
30.	Chloroform (Anaesthatic agent)	$CHCl_3$
31.	Chloropicrin (Nitro Chloroform)	$Cl_3C–NO_2$
32.	Chloretone (Chloroform + acetone)	$CH_3–\underset{\displaystyle OH}{\overset{\displaystyle CCl_3}{\underset{|}{\overset{|}{C}}}}–CH_3$
33.	Pyrene (Fire - extinguisher)	CCl_4
34.	Westrosol or Triclene	$\begin{matrix}Cl\\Cl\end{matrix}\!\!>\!C=C\!<\!\!\begin{matrix}H\\Cl\end{matrix}$
35.	Westron	$\begin{matrix}Cl\\Cl\end{matrix}\!\!>\!CH-CH\!<\!\!\begin{matrix}Cl\\Cl\end{matrix}$
36.	Tetraclene or Perclene	$\begin{matrix}Cl\\Cl\end{matrix}\!\!>\!C=C\!<\!\!\begin{matrix}Cl\\Cl\end{matrix}$
37.	Isoprene	$CH_2=\underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}}–CH=CH_2$
38.	Chloroprene (Monomer of Neoprene Polymer)	$CH_2=\underset{\displaystyle Cl}{\overset{\displaystyle |}{C}}–CH=CH_2$
39.	AAE (Aceto acetic ester) or EAA (Ethyl aceto acetate)	$CH_3–\overset{\displaystyle O}{\overset{\displaystyle ||}{C}}–CH_2–\overset{\displaystyle O}{\overset{\displaystyle ||}{C}}–OC_2H_5$
40.	Acrylic acid	$CH_2=CH–COOH$
41.	Crotonic acid	$CH_3–CH=CH–COOH$
42.	Cinnamic acid	
43.	Glycol	$\begin{matrix}CH_2–OH\\\vert\\CH_2–OH\end{matrix}$
44.	Glycerol	$\begin{matrix}CH_2–OH\\\vert\\CH–OH\\\vert\\CH_2–OH\end{matrix}$
45.	Phosgene or Carbonyl chloride	$Cl–\overset{\displaystyle O}{\overset{\displaystyle ||}{C}}–Cl$
46.	Glyceraldehyde	$\begin{matrix}CH_2–OH\\\vert\\CH–OH\\\vert\\CHO\end{matrix}$

S.No.	Common Name	Structure Formula
47.	Glyceric acid	
48.	Glyoxal	
49.	Glycine	$H_2N–CH_2–COOH$
50.	α-Alanine	
51.	Tilden reagent	Cl–N=O
52.	Grignard reagent	R–MgX
53.	Frankland reagent	R–Zn–R
54.	Hinsberg reagent (used in N-compounds)	
55.	Mustard Gas (Explosive used in I-world war)	$Cl–CH_2–CH_2–S–CH_2–CH_2–Cl$
56.	Lewisite (Explosive used in II-world war)	$Cl–CH=CH–AsCl_2$
57.	Semicarbazide	
58.	Schiff's Base or Anil	R–CH=N–R
59.	Methylal	
60.	Ethylal	
61.	Mercaptal	
62.	Mercaptol	
63.	Mercaptan	R–SH
64.	Mercaptide	R–S–R
65	Mesitylene	
66.	Toluene	

S.No.	Common Name	Structure Formula
67.	Cummene or Isopropyl benzene	
68.	Acetanilide	
69.	Benzanilide	
70.	Anisole	
71.	Phenetole	
72.	Azo benzene	
73.	Hydrazo benzene	
74.	Phthalic acid	
75.	Phthalic anhydride	
76.	Phthalimide	
77.	Anthranilic acid	
78.	Sulphanilic acid (Forms zwitter ion)	
79.	Aspirin (Analgesic)	
80	Salol (Antiseptic)	
81	Oil of wintergreen	
82.	o-Cresol	
83.	o-Toluic acid	

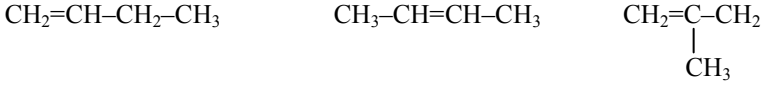
S.No.	Common Name	Structure Formula
84.	o-Toluidene	
85.	p-Benzoquinone	 (Antiaromatic)
86.	Gammexane or Lindane or BHC (Benzene hexachloride)	 (Alicyclic)
87.	Salicylaldehyde	
88.	Salicylic acid	
89.	Picric acid	
90.	Tosyl chloride	
91.	Styrene	
92.	o-Xylene	

6.3 SYSTEMATIC COMMON NAMES OF HYDROCARBON :



n-Pentane Isopentane Neopentane

n-Butane Isobutane



α-Butylene β-Butylene Isobutylene

SPECIAL POINTS :

- prefix **"n"** is used for unbranched carbon chain.
- prefix **"iso"** is used when one methyl group is attached on 2^{nd} carbon from either terminal
- prefix **"neo"** is used when two methyl groups are attached on 2^{nd} carbon from either terminal.
- Prefix **"α/β"** is used to locate the position of double bond.

6.4 RADICALS :

COMMON NAMES OF HYDROCARBON RADICALS

n-Propyl $CH_3–CH_2–CH_2–$

Iso propyl $CH_3–\underset{\displaystyle CH_3}{\underset{|}{CH}}–$

n-butyl $CH_3–CH_2–CH_2–CH_2–$

Isobutyl $CH_3–\underset{\displaystyle CH_3}{\underset{|}{CH}}–CH_2–$

s-butyl $CH_3–CH_2–\underset{\displaystyle CH_3}{\underset{|}{CH}}–CH_3$

t-Butyl $\underset{\displaystyle CH_3}{\underset{|}{CH_3–C–}}\underset{\displaystyle CH_3}{\underset{|}{}}$

n-Pentyl $CH_3–CH_2–CH_2–CH_2–CH_2–$

s-Pentyl $CH_3–CH_2–\underset{\displaystyle CH_3}{\underset{|}{CH}}–CH_2–CH_3$

Active s-pentyl $CH_3–\underset{\displaystyle CH_3}{\underset{|}{CH}}–CH_2–CH_2–CH_3$

Isopentyl $CH_3–\underset{\displaystyle CH_3}{\underset{|}{CH}}–CH_2–CH_2–$

Active isopentyl $CH_3–\underset{\displaystyle CH_3}{\underset{|}{CH}}–\underset{\displaystyle CH_3}{\underset{|}{CH}}–CH_3$

Neopentyl $\underset{\displaystyle CH_3}{\underset{|}{CH_3–C–}}\underset{\displaystyle CH_3}{\underset{|}{CH_2–}}$

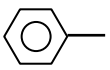
t-Pentyl $\underset{\displaystyle CH_3}{\underset{|}{CH_3–C–}}\underset{\displaystyle CH_3}{\underset{|}{CH_2–CH_3}}$

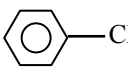
Active pentyl $–CH_2–\underset{\displaystyle CH_3}{\underset{|}{CH}}–CH_2–CH_3$

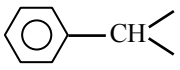
Vinyl $CH_2=CH–$

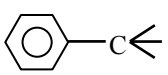
Allyl $CH_2=CH–CH_2–$

Propargyl $HC\equiv C–CH_2–$

Phenyl  or Ph–

Benzyl 

Benzal or Benzylidene 

Benzo or Benzylidyne 

6.5 COMMON NAMES OF HYDROCARBON DERIVATIVES :

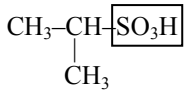
For systematic common names of these compounds we are dividing whole functional groups in following two systems :

6.5.1 SYSTEM - I :

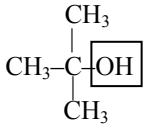
In this system prefix is decided by hydrocarbon radical (as discussed above) and suffix is given by following table:

S. No.	Functional Group	Suffix
1	$-SO_3H$	sulphonic acid
2	–OH	alcohol
3	–SH	thioalcohol
4	$-NH_2$ /–NH– / $-\overset{|}{N}-$	amine
5	–O–	ether
6	–S–	thioether
7	–X	halide
8	$-\overset{\|\|}{C}-$ O	ketone
9	– C≡N	cyanide
10	– N⇇C	isocyanide

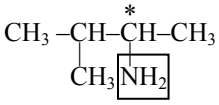
e.g.



Isopropyl sulphonic acid

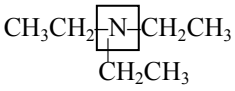


t-Butyl alcohol

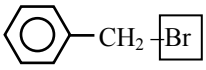


Active isopentyl amine
or
Active isoamyl amine

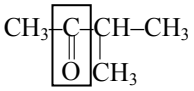
Ethyl methyl ether



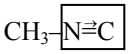
Triethyl amine



Benzyl bromide

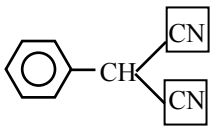


Isopropyl methyl ketone



Methyl isocyanide

Propargyl vinyl thioether



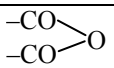
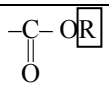
Benzal (di) cyanide

6.5.2 SYSTEM II :

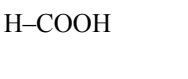
In this system prefix is decided by total number of carbon atoms in the compound

If total carbon ⇒	One	Two	Three	Four	Five
Prefix ⇒	Form	Acet	Propion	Butyr	Valer

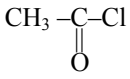
And suffix is given by following table :

S. No.	Functional Group	Suffix
1	—COOH	ic acid
2		ic anhydride
3		Alkyl …… oate
4	–COX	yl halide
5	$-CONH_2$	amide
6	–CHO	aldehyde
7	– C≡N	onitrile
8	– N⁼C	oisonitrile

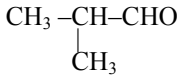
e.g.



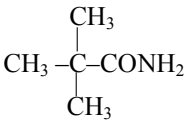
Formic acid



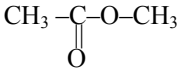
Acetyl chloride



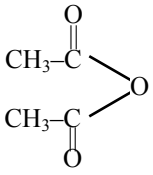
Isobutyraldehyd



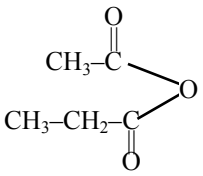
Neovaleramide



Methyl acetate



Acetic anhydride



Acetic propionic anhydride

SPECIAL POINTS :

- Prefix **"Acryl"** is used for the compounds which have total three carbon atoms and double bond is on 2nd carbon. (only for system II groups)

  e.g $CH_2 = CH–COOH$ Acrylic acid

  $CH_2 = CH–CHO$ Acryl aldehyde

  $CH_2=CH–CONH_2$ Acrylamide

- Prefix **"Croton"** is used for the compounds which have total four carbon atoms and double bond is on 2nd carbon (only for system II groups)

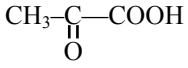
  e.g $CH_3–CH = CH–COOH$ Crotonic acid

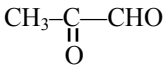
  $CH_3–CH = CH – CHO$ Croton aldehyde

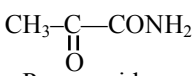
  $CH_3–CH = CH – COCl$ Crotonyl chloride

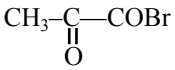
☛ Prefix **"Pyruv"** is used when $CH_3-\overset{\overset{O}{\|}}{C}-$ is directly attached with (system II) functional groups.

e.g.


Pyruvic acid

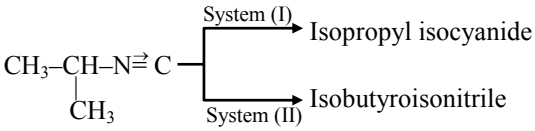

Pyruvaldehyde

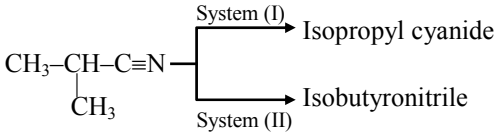

Pyruvamide

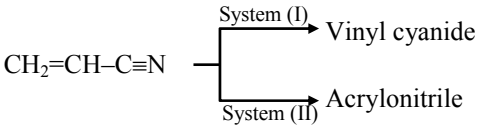

Pyruvyl bromide

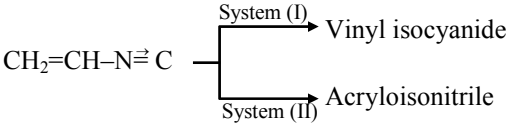
☛ –CN and –NC groups are considered in both systems.

e.g.







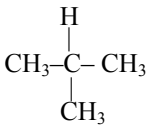


7. DERIVED NAME SYSTEM :

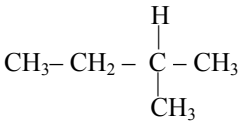
According to this system name of any compound is given according to the representative compound of the homologous series. This system is reserved for following homologous series :

Series	Name of Homologous series	Name of Representative compound	Structure of group
1	Alkane	Methane	$-\overset{|}{\underset{|}{C}}-$
2	Alkene	Ethylene	>C=C<
3	Alkyne	Acetylene	–C≡C–
4	Alkanol	Carbinol	$-\overset{|}{\underset{|}{C}}-$ OH
5.	Alkanal	Acetaldehyde	$-\overset{|}{\underset{|}{C}}-$ CHO
6.	Alkanoic acid	Acetic acid	$-\overset{|}{\underset{|}{C}}-$ COOH
7.	Alkanoyl halide	Acetyl halide	$-\overset{|}{\underset{|}{C}}-$ COX
8.	Alkanamide	Acetamide	$-\overset{|}{\underset{|}{C}}-$ $CONH_2$
9.	Alkanone	Acetone	$-\overset{|}{\underset{|}{C}}-\overset{\overset{O}{\|}}{C}-\overset{|}{\underset{|}{C}}-$

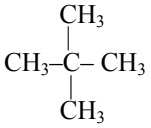
e.g.



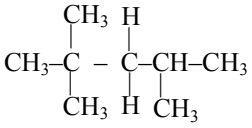
Trimethyl methane



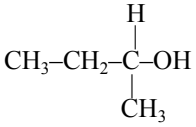
Ethyl dimethyl methane



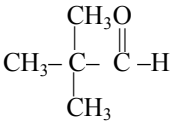
Tetramethyl methane



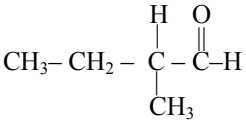
Tertiarybutyl Isopropyl methane



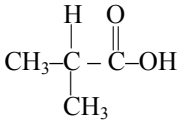
Ethylmethyl carbinol



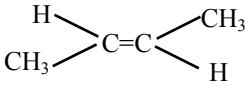
Trimethyl acetaldehyde



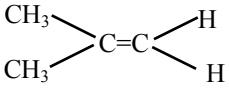
Ethylmethyl acetaldehyde



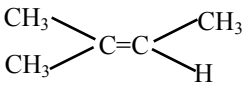
Dimethyl acetic acid



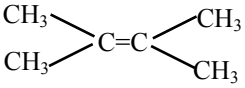
Symmetrical dimethyl ethylene



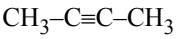
Unsymmetrical dimethyl ethylene



Trimethyl ethylene



Tetramethyl ethylene

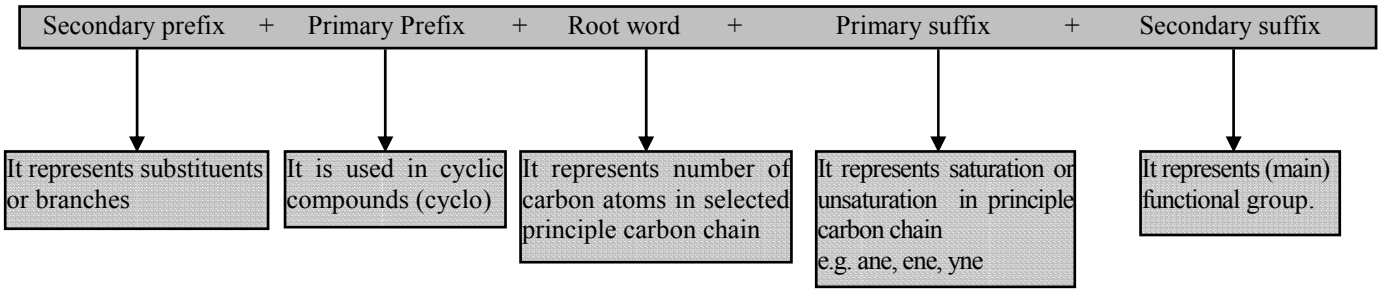


Dimethyl acetylene

8. IUPAC NAME SYSTEM OR GENEVA NAME SYSTEM :

(International union of pure and applied chemistry)

8.1 Parts and format of IUPAC name :



8.2 Rules for IUPAC nomenclature :

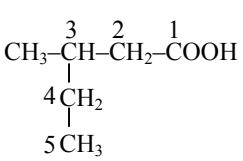
Rule – 1 : Select the longest continuous chain of carbon atoms which have maximum number of substituents, multiple bonds and functional groups.

Priority order : Functional group > Multiple bond (= or ≡) > Substituent

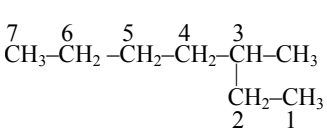
Rule – 2 : Selected principle carbon chain is numbered from the side where substituent or multiple bond or functional group is nearer (lowest possible number):

Priority order : Functional group > Double bond > Triple bond > Substituent

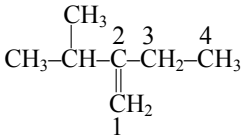
e.g.



3-Methyl pentanoic acid



3-Methyl heptane

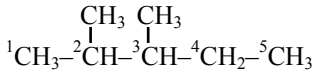


2-Isopropy but-1-ene
or
2-Methyl ethyl but-1-ene

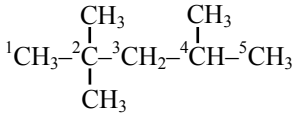
SPECIAL POINTS :

- If the compound contain more than one similar alkyl groups, their positions are indicated separately and an appropriate numerical prefix di, tri, tetra....., is attached to the name of the substituent. The positions of the substituents are separated by commas

e.g.

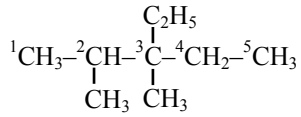


2,3 – Dimethyl pentane



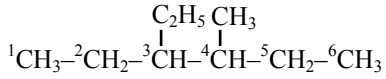
2,2,4- Trimethyl pentane

- If there is different alkyl subsitituents present in the compound, their names are written in the alphabetical order. However, the numerical prefixes such as di, tri etc, are not considered for the alphabetical order. For example ,



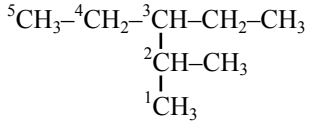
3 –Ethyl-2,3-dimethyl pentane

- If two different alkyl groups are located at the equivalent positions, then numbering in the carbon chain is done in such a way that the alkyl group which comes first in alphabetic order gets the lower position.



3 –Ethyl-4-methylhexane

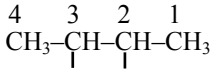
- If a compound has two or more chain of the same length, then principle chain is selected in such a way that greater number of substituent works as prefix.



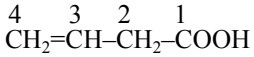
3 –Ethyl -2- methyl pentane

- In case some functional group (other than C=C and C ≡ C) is present in molecule, it is indicated by adding secondary suffix after the primary suffix. The terminal 'e' of the primary suffix is generally removed before adding the secondary suffix. The terminal 'e' of the primary suffix is removed if it is followed by a suffix begining with 'a', 'i', 'o', 'u' or 'y' .

e.g.



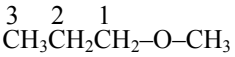
3-Methyl butan-2-ol



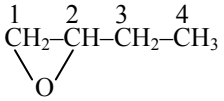
But-3-enoic acid

- **Some of functional group always works as prefix**

Functional group	Prefix name
– X	Halo
– OR	Alkoxy
–C–C– (O)	Epoxy
– NO_2	Nitro
– NO	Nitroso



1-Methoxy propane

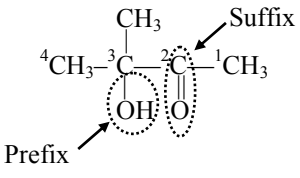


1, 2-Epoxy butane

If the molecule contains more than one dissimilar functional groups, the numbering of the parent chain is done in such a way that the functional group of higher priority gets the lower number. **The order of priority** of various groups for the sake of numbering is given in following table :

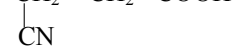
S.No.	Functional group	Prefix	Suffix
1	–C(=O)–OH	carboxy	oic acid
2	$-SO_3H$	sulpho	sulphonic acid
3	–C(=O)–O–C(=O)–	×	oic anhydride
4	–C(=O)–O–R	alkoxy carbonyl or carbaloxy	alkyl ..... oate
5	–C(=O)–X	halo formyl or halo carbonyl	oyl halide
6	–C(=O)–NH_2	carbamoyl or amido	amide
7	C ≡ N	cyano	nitrile
8	– N ⩲ C	carbyl amino or isocyano	isonitrile
9	–C(=O)–H	formyl or oxo	al
10	–C(=O)–	keto or oxo	one
11	– OH	hydroxy	ol
12	– SH	mercapto	thiol
13	$-NH_2$	amino	amine
14	– O –	alkoxy	×
15	C = C	×	ene
16	C ≡ C	×	yne
17	– X	halo	×
18	$-NO_2$	nitro	×

e.g.



3-Hydroxy-3-methylbutan -2- one

2-keto propanal



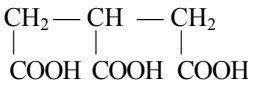
3-cyano propanoic acid

8.3 Sometimes a special suffix is used for given functional groups :

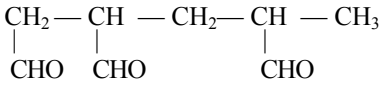
S.No.	Functional group	Suffix
1	–COOH	Carboxylic acid
2	–COOR	Alkyl …. carboxylate
3	–COX	Carbonyl chloride
4	$–CONH_2$	Corboxamide
5.	–CN	Carbonitrile
6.	–NC	Carbo isonitile
7.	–CHO	Carbaldehyde

☛ It is used in acylic compounds when 3 or more functional groups are presents.

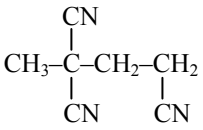
e.g.



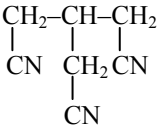
Propane –1,2,3,-tricarboxylic acid



Pentane –1,2,4,-tricarbaldehyde

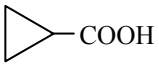


Butane-1,3,3-tricarbonitrile

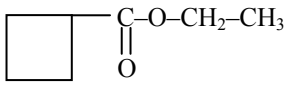


3-Cyanomethyl pentane-1,5-dinitrile

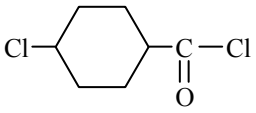
☛ It is used in cyclic compound when functional group is directly attached to the cycle.

e.g. 

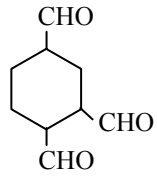
Cyclopropane carboxylic acid



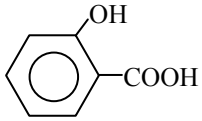
Ethyl cyclobutane carboxylate



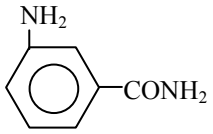
4-Chloro cyclohexane carbonyl chloride



Cyclohexane-1,2,4-tricarbaldehyde



2-Hydroxy benzene carboxylic acid
or
2-Hydroxy benzoic acid



3-Amino benzene carboxamide
or
3-Amino benzamide

8.4 IUPAC NOMENCLATURE ALICYCLIC COMPOUNDS :

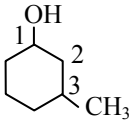
☛ Names of alicyclic compounds are given by putting another prefix 'cyclo' before the root word which depends upon the number of carbon atoms in the ring. The suffixes ane, ene or yne are written depending upon saturation or unsaturation in the ring.

- If some substituent or functional group is present, it is indicated by some appropriate prefix or suffix and its position is indicated by numbering the carbon atoms of the ring. The numbering is done in such a way so as to assign least possible number to the functional group or substituent in accordance with the rules already discussed.

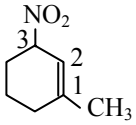
e.g.


Cyclohexane

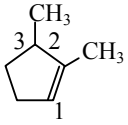

Cyclopentene



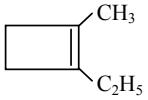
3-Methylcyclo-hexanol



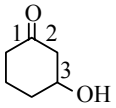
1-Methyl-3-Nitrocyclohexene



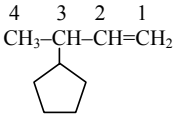
2,3-Dimethylcyclopentene



1-Ethy-2-Methylcyclobutene



3-Hydroxycyclohexanone

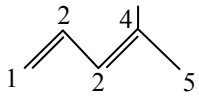


3-Cyclopentyl-1-butene

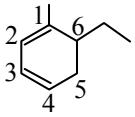
8.5. IUPAC NOMENCLATURE OF COMPOUNDS WITH BOND LINE FORMULA

In this representation of organic molecules, carbon and hydrogen atoms are not shown and the lines representing carbon – carbon bonds are drawn in zig-zag manner. A single line (–) represents a single bond, two parallel lines (=) represents a double bond and three parallel lines (≡) represent a triple bond. The only atoms specitically written are those that are neither carbon nor hydrogen bound to carbon. The intersection of lines represent carbon atoms carrying appropriate number of hydrogen atoms.

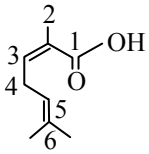
e.g.



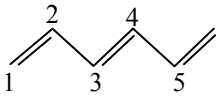
Methylpenta-1,3-diene



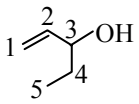
6-Ethyl-1-methylcyclohexa-1,3-diene



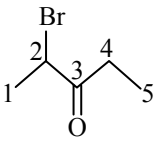
2,6-Dimethylhept-2,5-dien-oic acid



Hexa-1,3,5-triene



Pent-1-en-3-ol



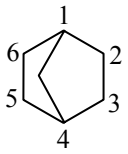
2-Bromopentan-3-one

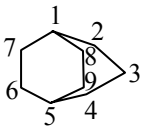
8.6 IUPAC NOMENCLATUERE OF BRIDGED BICYCLIC HYDROCARBONS

- Saturated bicyclic systems having two or more atoms in common are named by prefixing 'bicyclo' to the name of the cyclic parent hydrocarbon system containing the same total number of carbon atoms in the skeleton. The number of carbon atoms in each of the three bridges, connecting the two tertiary carbon atoms is indicated in parentheses, in descending order and arabic numerals are used to indicate the number of carbon atoms and the numbers are separated by full stops.

- The bicyclic system is numbered starting with one of the tertiary bridging cabon and proceeding through longest bridge to the second bridging carbon continuing back to the first bridging carbon through the second longest chain. Numbering is completed by numbering the shortest bridge beginning with the atom next to the first bridging carbon.

e.g.



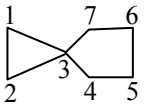


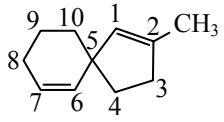
Bicyclo [2,2,1] heptane Bicyclo [3,2,2] Nonane

8.7. IUPAC NOMENCLATURE OF SPIRO BICYCLIC HYDROCARBONS

- Spiro bicyclic hydrocarbons contain two rings consisting of carbon atoms only and the two rings are linked by a common carbon. These compounds are named by placing prefix 'spiro' before the name of the acyclic parent hydrocarbon with same number of skeletal carbon atoms. The numbers of skeletal atoms linked to the spiro atom are indicated by arabic numbers, separately by a fullstop. The numbers are written in ascending order and enclosed in square brackets.
- Numbering of a spiro bicyclic hydrocarbon starts with a ring carbon next to the spiro atom and proceeds first through the smaller ring and then through the spiro atom and around the second ring. For example :

e.g.





Spiro [2,4] 2-Methylspiro [4, 5] deca-1, 6-diene