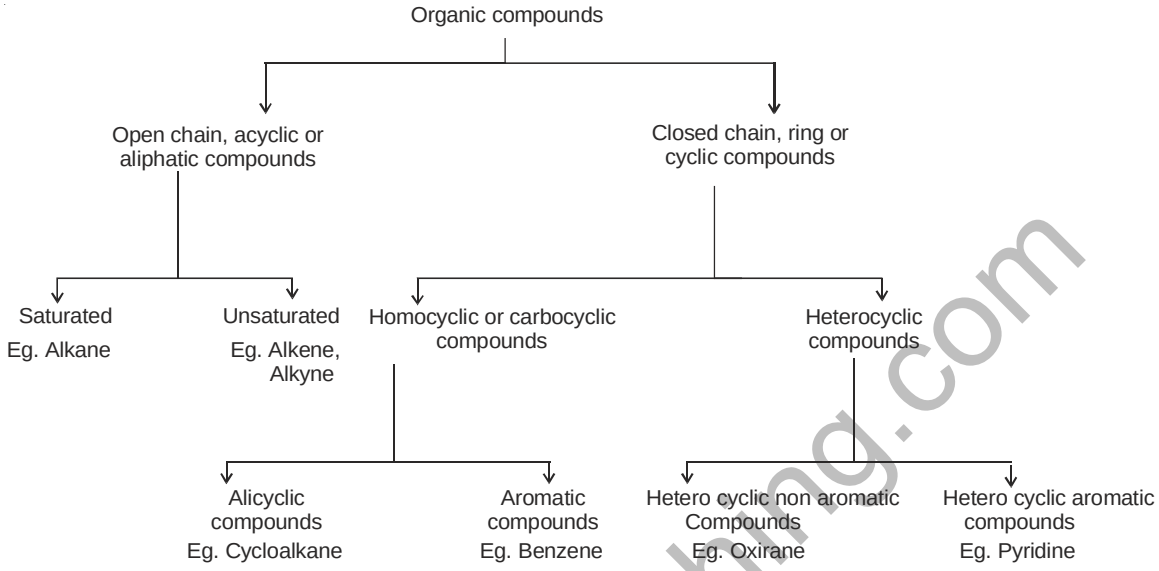
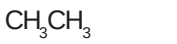
Classification & Nomenclature

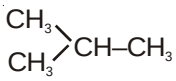
1. CLASSIFICATION OF ORGANIC COMPOUNDS



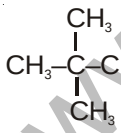
1. Acyclic or open-chain compounds

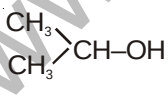
These are the compounds in which the carbon atoms are linked to each other in such a manner that the molecule is having an open-chain structure. The chain of the carbon atoms may be straight or branched. These compounds are also called as **aliphatic compounds**. Eg.

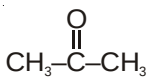

(ethane)


(isobutane)


(methylamine)


(neo pentane)


(isopropyl alcohol)


(acetone)

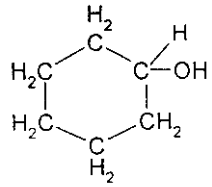
2. Cyclic or closed-chain compounds

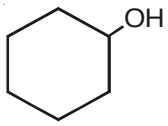
These are the compounds in which carbon atoms are linked to each other or to the atoms of other elements in a manner that a ring structure is formed. The compounds with only one ring of atoms in the molecule are known as **monocyclic** but those with more than one ring of atoms are termed as **polycyclic**. These are further divided into two subgroups **(a) Homocyclic or carbocyclic, (b) Heterocyclic**.

(a) Homocyclic or carbocyclic :

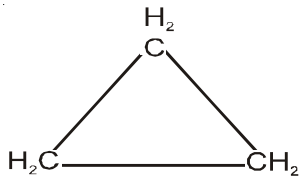
These are the compounds which contain rings of three or more carbon atoms. The homocyclic compounds may be alicyclic or aromatic depending on whether they resemble aliphatic compounds or not.

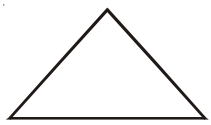
(i) Alicyclic Compounds



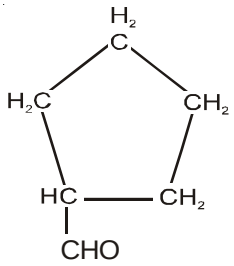
or 

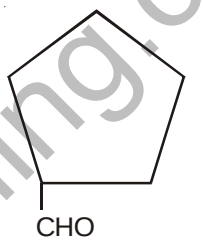
cyclohexyl alcohol (monocyclic)



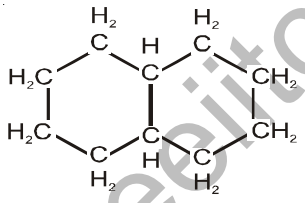
or 

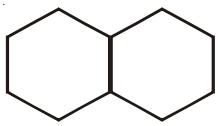
cyclopropane (monocyclic)



or 

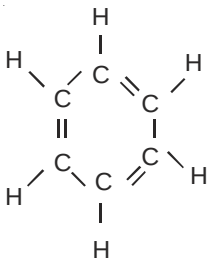
cyclopentane carbaldehyde (monocyclic)



or 

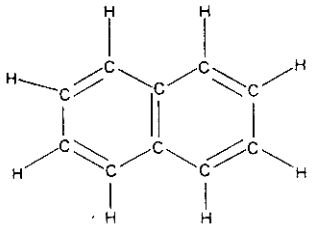
decalin (polycyclic)

(ii) Aromatic compounds : A common and easy (though not very correct) definition say "*These compounds consist of at least one benzene ring, i.e., a six-membered carbocyclic ring having alternate single and double bonds.*" Strictly speaking these are called benzenoid aromatics. Eg.

The very popular benzene : 

or  ; or  (shortcut representation)

The compounds may also contain more than one rings. Eg.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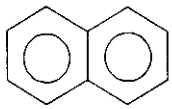
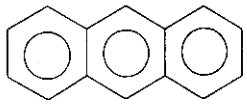
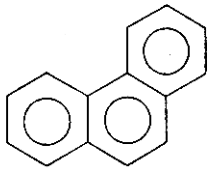
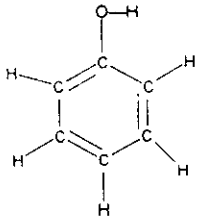




naphthalene (bicyclic aromatic compound) anthracene phenanthrene (tricyclic aromatic compound)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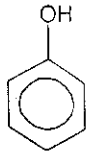
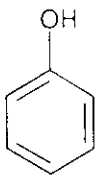
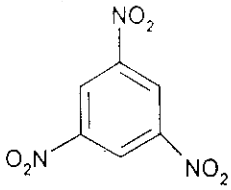
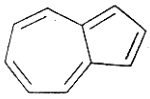

Phenol
or

;

The deadly TNT

Although the word aromatic is derived from Greek word *'aroma'* (sweet smell), aromatic compounds now include a much wider class of compounds, not necessarily very sweet smelling ones. You will find non-benzenoid aromatics as well, the aromatic compounds without a benzene ring!

Examples of non-benzenoid aromatics include beautiful blue-colored azulene and tropylium bromide

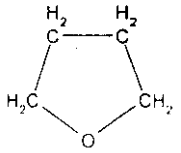

and


azulene trophylium bromide

(b) Heterocyclic compounds :

These are cyclic compounds having ring or rings built up of more than one kind of atoms. The most common other atoms (hetero-atoms) besides carbon are O, N and S. Eg.

(i) Non aromatic heterocyclic compounds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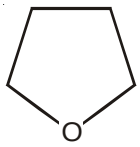
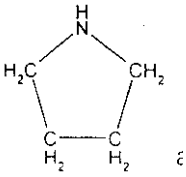


THF (Tetrahydrofuran)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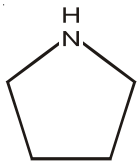
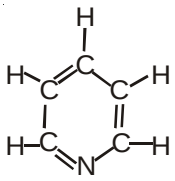


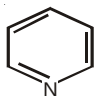
azacyclopentane

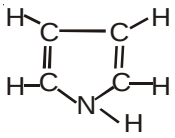
(ii) Heterocyclic aromatic compounds. Eg.



PYRIDINE

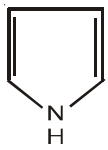
or

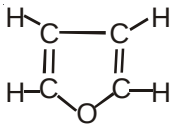




PYROLE

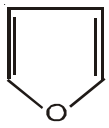
or

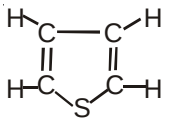




FURAN

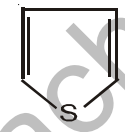
or





THIOPHENE

or

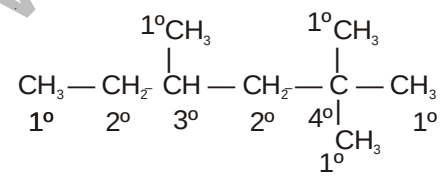


2. TRIVIAL NAMES

2.1 PRIMARY, SECONDARY AND TERTIARY CARBON ATOMS

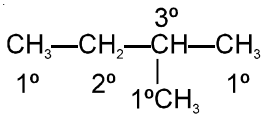
In trivial system of nomenclature, the carbon atoms are classified as: primary, secondary , tertiary and quarternary carbon atoms.

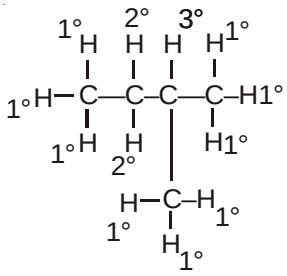
- C atom attached with one carbon atom in hydrocarbon chain is primary C atom or 1º carbon atoms.
- C atom attached with two carbon atoms in hydrocarbon chain is secondary (sec.) C atom or 2º carbon atom.
- C atom attached with three carbon atoms in hydrocarbon chain is tertiary (tert.) C atom or 3º carbon atom.
- C atom attached with four carbon atoms in hydrocarbon chain is quarternary C atom or 4º carbon atom.
- Consider following structure showing all four types of carbons.



2.2 PRIMARY, SECONDARY AND TERTIARY H ATOMS

- H atom attached on 1ºC atom are primary H atom or 1º H
- H atom attached on 2ºC are secondary H atom or 2ºH
- H atoms attached on 3ºC atom is tertiary H atom or 3ºH

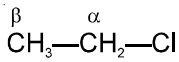


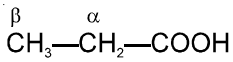


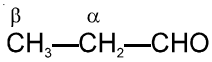
Reactivity order of primary, secondary and tertiary H atoms : Relative reactivity order 3º > 2º > 1º

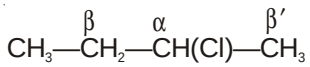
2.3 α-CARBON AND β-CARBON ATOMS

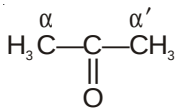
Carbon atom in the structure of compound to which a functional group is attached is known as α-carbon and the corresponding hydrogen is referred to as α-hydrogen. The carbon atom(s) adjacent to α-carbon is known as β-carbon (s).

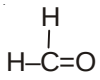








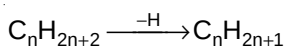




(no α–carbon and no α–hydrogen)

2.4 ALKYL GROUPS

The univalent groups or radicals obtained by the removal of one H atom from a molecule of paraffin. The symbol 'R' is often used to represent an alkyl group.



Hydrocarbon	Alkyl Group	Structure	Short–hand notation
methane	methyl	CH_3-	Me
ethane	ethyl	CH_3-CH_2-	Et
propane	*n*-propyl	$CH_3CH_2-CH_2-$	n-Pr, Pr^{α}, or Pr
propane	*iso*propyl	$CH_3-CH(CH_3)-$	iso Pr, Pr^{β}, Pr^{i}
Butane	n–butyl	$CH_2CH_2CH_2CH_2-$	n-Bu, Bu^{α} or Bu
Butane	sec. butyl	$CH_3CH_2CH(CH_3)-$	s-Bu, Bu^{β}, Bu^{s}
Butane	iso butyl	$(CH_3)_2CH-CH_2-$	iso Bu or Bu^{i}
Butane	tert. butyl	$(H_3C)_3C-$	t-Bu or Bu^{t}

1. Alkyl group -

When a hydrogen is removed fom saturated hydrocarbon then alkyl group is formed. It is represented by R & its general formula is C_nH_{2n+1}. A bond is vacant on alkyl group on which any functional group may come.

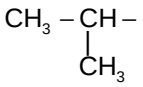
$CH_4 \xrightarrow[-H]{} CH_3 -$ Methyl

$CH_3 - CH_3 \xrightarrow[-H]{} CH_3 - CH_2 -$ ethyl

(a) C_3H has following two isomers -

(i) Normal propyl $CH_3-CH_2CH_2-$

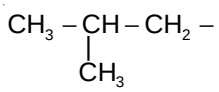
(ii) Isopropyl (1-methyl ethyl)



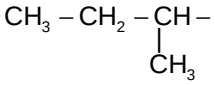
(b) C_4H_9 has following four isomers -

(i) n-butyl $H_3C - CH_2 - CH_2 - CH_2 -$

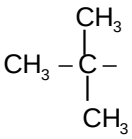
(ii) Iso butyl (2-methyl ethyl)



(iii) Secondary butyl (1-methyl propyl)



(iv) Tetiary butyl (1,1-dimethyl ethyl)

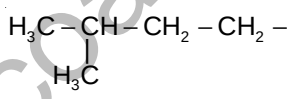


(c) C_5H_{11} has following eight isomers -

(i) $H_3C-CH_2-CH_2-CH_2-CH_2-$

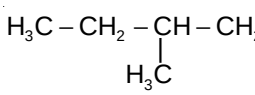
n-pentyl

(ii)



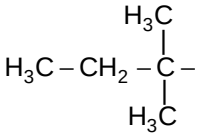
Isopentyl (3-methyl butyl)

(iii)



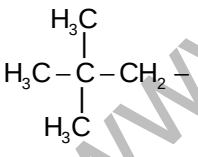
Active amyl (2-methyl butyl)

(iv)



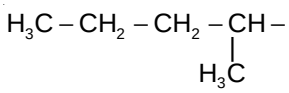
Tetiary pentyl (1,1-dimethyl propyl)

(v)



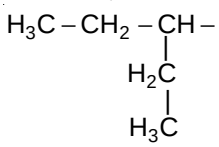
Neo pentyl (2,2-dimethyl propyl)

(vi)



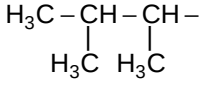
Active secondary amyl (1-methyl butyl)

(vii)



Secondary amyl (2-ethyl propyl)

(viii)



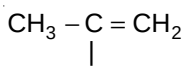
Active Isosecondary amyl (1,2-dimethyl propyl)

2 Alkenyl group -

$CH_2 = CH-$ Vinyl

$CH_2 = CH - CH_2 -$ Allyl

$CH_3-CH=CH-$ Propenyl (1-propenyl)



Isopropenyl (1-methyl-1-ethenyl)

3. Alkynyl group -

$CH \equiv C–$ Ethynyl

$CH \equiv C–CH_2–$ Propargyl (2-propynyl)

$CH_3–C \equiv C–$ Propynyl (1-propynyl)

4. Normal group -

(i) It is represented by 'n'

(ii) Straight chain of carbon atom is known as normal group

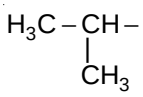
(iii) Free bond will come either on 1st carbon atom or on last carbon atom

n – butyl C – C – C – C –

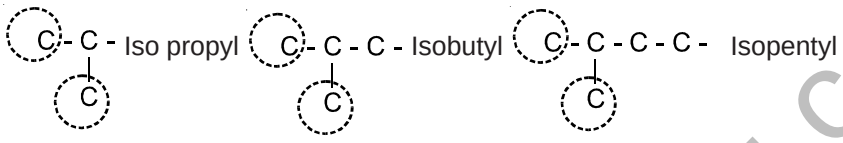
n – propyl C – C– C –

5. Iso group -

(i) It is represented by following structure -

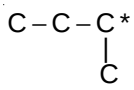


(ii) When two methyl groups are attached to the same carbon atom, group is named as iso

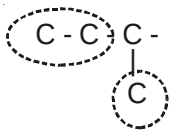


6. Secondary group -

(i) It is represented by following structure

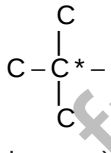


(ii) When ethyl & methyl groups attached to the terminal carbon atom, group is named as secondary

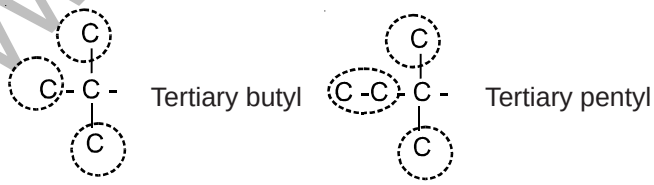
eg.  Secondary butyl

7. Tertiary group -

(i) It is represented by following structure -



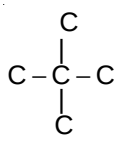
(ii) When three (alkyl groups) (similar or dissimilar) are attached to the same carbon atom,group is named as tertiary

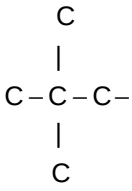


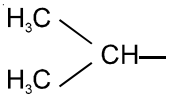
8. Neo group -

(i) When a carbon atom is attached to other four carbon atom group is named as neo group.

(ii) It is represeted by following structure



for eg.  Neopentyl

Note :  is known as an *iso*-alkyl group. It is also written as $(CH_3)_2CH$—

e.g. **$(CH_3)_2CH$**CH_3 : isobutane *$(CH_3)_2CH$**CH_2CH_3 : isopentane *$(CH_3)_2CH$**OH : isopropyl alcohol

SOME UNSATURATED GROUPS

$CH_2 = CH –$ vinyl (Ethenyl) $CH_2 = CH – CH_2 –$ allyl (2-propenyl)

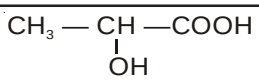
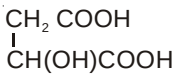
$CH \equiv C – CH_2 –$ propargyl (2-propynyl) $CH_3 – CH = CH – CH_2 –$ crotyl (2-butenyl)

3. NOMENCLATURE

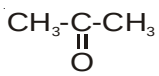
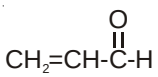
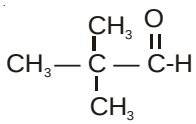
3.1 TRIVIAL SYSTEM

Initially organic compounds were named on the basis of source from which they were obtained.

For eg.

S.N.	Organic compound	Trivial Name	Source
1.	CH_3OH	Wood spirit or Methyl spirit	obtained by destructive distillation of wood.
2.	NH_2CONH_2	Urea	obtained from urine.
3.	CH_4	Marsh gas (fire damp)	It was produced in marsh places.
4.	CH_3COOH	Vinegar	obtained from acetum- i.e. vinegar.
5.		Oxalic acid	obtained from oxalis plant.
6.	HCOOH	Formic acid	obtained from formica [red ant].
7.		Lactic acid	obtained from sour milk or curd.
8.		Malic acid	obtained from apples.
9.	$CH_3CH_2CH_2COOH$	Butyric acid	obtained from butter.
10.	$CH_3(CH_2)_4COOH$	Caproic acid	obtained from goats.

Some typical compounds in which common and trivial names are also differerent.

S.No.	Compound	Trivial Name	Common Name
1.	CH_4	Marsh gas	Methane
2.	CH_3OH	Woodspirit	Methyl alcohol
3.	CH_3COOH	Vinegar	Acetic acid
4.		Acetone	Dimethyl ketone
5.		Acrolein	Acryl aldehyde
6.		Pivaldehyde	Tertiary valeraldehyde

(Common - Names R is termed as alkyl -**)**

S.N.	Compound	Name
1.	R – X	Alkyl halide
2.	R – OH	Alkyl alcohol
3.	R – SH	Alkyl thio alcohol
4.	$R - NH_2$	Alkyl amine
5.	R – O – R	Dialkyl ether
6.	R – S – R	Dialky thioether
7.	$R-\overset{\overset{O}{\|\|}}{C}-R$	Dialkyl ketone
8.	R – NH – R	Dialkyl amine
9.	$R-\overset{\overset{R}{\|}}{N}-R$	Trialkyl amine
10.	R – O – R’	Alkyl alkyl’ ether
11.	$R-\overset{\overset{O}{\|\|}}{C}-R'$	Alkyl alkyl’ ketone
12.	R – S – R’	Alkyl alkyl’ thio ether
13.	R – NH – R’	Alkyl alkyl’ amine
14.	$R-\overset{\overset{R''}{\|}}{N}-R'$	Alkyl alkyl’ alkyl’’ amine

* **Position of double bond -**

In an unsaturated hydrocarbon if the position of double is on 1st or last carbon then it’s prefix will be α(alpha) if it is on 2nd carbon it is termed as β(Beta) & the γ(gamma) & δ(delta) and so on.

eg. $H_2C = CH - CH_2 - CH_3$ α-butylene

$H_3C - CH = CH - CH_3$ β-butylene

$H_3C - CH_2 - CH = CH_2$ α-butylene

$H_2C = CH-CH_3$ or $H_3C-CH=CH_2$ (Both are same positions, propylene)

$H_3C-\overset{\overset{CH_3}{|}}{C}=CH_2$ Isobutylene

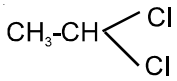
$CH_3-CH_2-CH=CH-CH_2-CH$ γ-hexylene

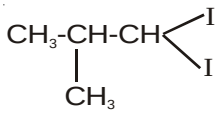
$CH_3-CH_2-CH_2-CH=CH-CH_2-CH_2-CH_3$ δ-octylene

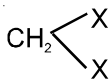
* **Common - Naming of dihalides -**

(i) When two same halogen atoms are attached to the same carbon such compounds are called **Gemdihalides**

(ii) Common names of such compounds are alkylidene halides

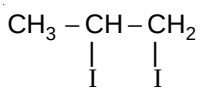
eg.  Ethylidene chloride

 Isobutylidene Iodide

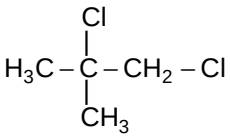
Exception  Methylidene halide (wrong)

Methylene halide (right)

(c) When two same halogen atoms are attached to adjacent carbon, these are called as vicinal dihalides. Common names of such compounds are alkylene halide.



Propylene Iodide

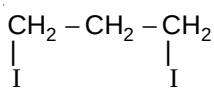


Isobutylene chloride

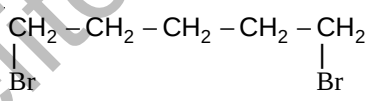
(d) When two same halogen atoms are attached at the two ends of a carbon chain its common naming will be polymethylene halide.

'poly' word indicates the number of $-CH_2-$groups.

$-CH_2-$	2	3	4	5	6
Poly	di	tri	tetra	penta	Hexa

e.q. 

Trimethylene Iodide



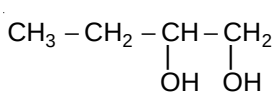
Pentamethylene Bromide

Exception -  dimethylene halide (wrong)

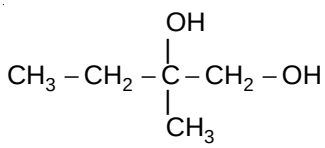
ethylene halide (right)

* **Common - Naming of di-hydroxy compounds -**

(i) When two–OH groups are attached to adjacent carbon's they are termed as alkylene glycol



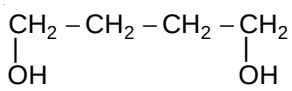
Butylene glycol

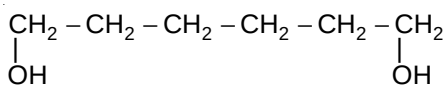


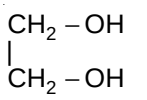
Active amylene glycol

(ii) When Two –OH group are attached at the two ends of a carbon chain. these compounds are named as polymethylene glycol.

Poly $\rightarrow$ Number of CH_2 groups.

e.g.  Tetra methylene glycol

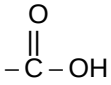
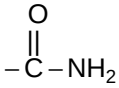
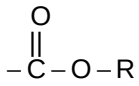
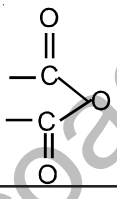
 Hexamethylene glycol

Exception  Dimethylene glycol (wrong)

Ethylene glycol (right)

* **Common - Naming of the functional group having carbon -**

Chart - I

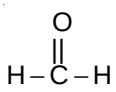
Functional	Suffix	Functional group	Suffix
	-aldehyde		-ic Acid
	-yl halide		-amide
-C ≡ N	-o-nitrile	–N ≡ C	-o-isonitrile
	-ate		-ic anhydride

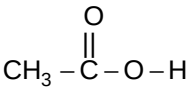
Prefix -

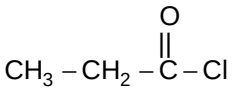
1. carbon → Form-
2. Carbon → Acet-
3. Carbon → Propion-
4. Carbon → Butyr → Normal, Iso
5 Carbon → Valer → Normal, Iso, Secondary, Tetiary

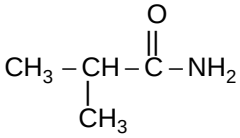
3C + (=) double bond = Acryl–

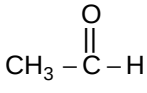
4 C + double bond = Croton–

eg.  Formaldehyde

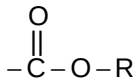
 Acetic Acid

 Propionyl chloride

 Isobutyr amide

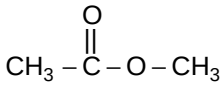
 Acetaldehyde

*** Nomenclature of Ester -**

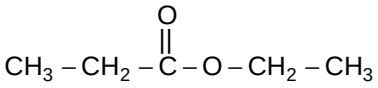


The group which is attached to the oxygen is written as alkyl & the remaining structure is named same as defined in chart - 1.

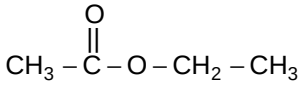
eg.



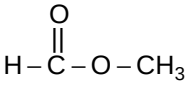
Methyl acetate



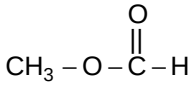
Ethyl propionate



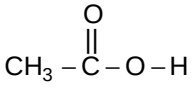
Ethyl acetate



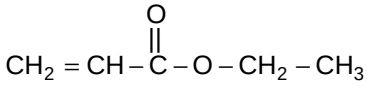
Methyl formate



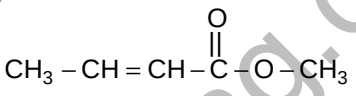
Methyl formate



Acetic acid

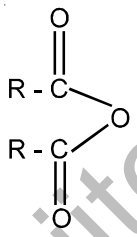


Ethyl acrylate



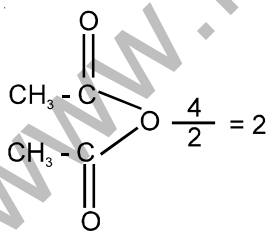
Methyl crotonate

*** Nomenclature of Anhydride -**

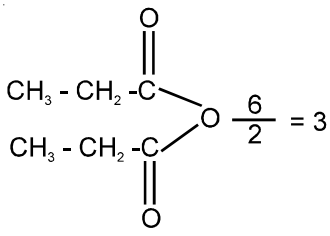


Rule - Add the total number of carbon atoms & divide it by 2, the substract will give you the number of C – atom. Now name it according to Chart - 1

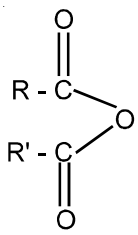
$$\frac{\text{Total}}{2} = \text{Substract} = \text{Number of C atom}$$



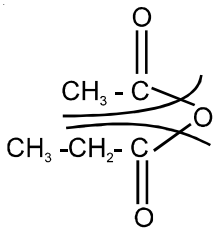
Acetic anhydride



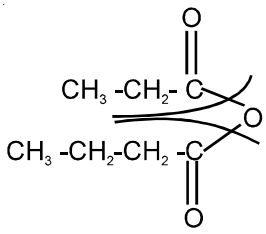
Propionic anhydride

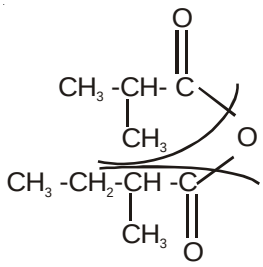
In 

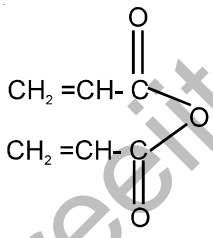
If R ≠ R', You need not to find out substract.

eg. 

Acetic propionic anhydride (right)
Propionic Acetic anhydride (wrong)
Divide it in two parts as above & name it by suffixing ic anhydride (alphabatically)

eg.  Butyric propionic anhydride

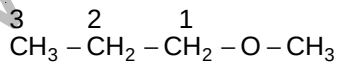
eg.  Isobutyric Secondary valeric anhydride

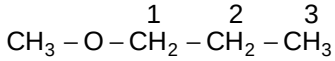
eg.  Acrylic anhydride

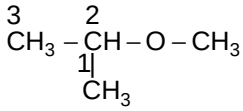
* **Nomenclature of Ether -**

The small allkyl group attached with oxygen is written as alkoxy in which oxygen is included & the longest chain of remaing carbons is selected.

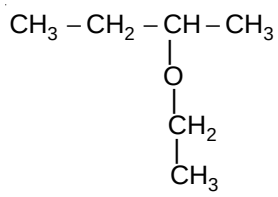
– O –, no. – alkoxy alkane

eg. 1.  1. methoxy propane

2.  1. methoxy propane

3.  2- methoxy propane

eg. Write the correct IUPAC name of the compound 3-ethoxy butane

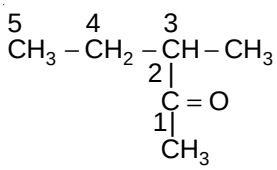


2-ethoxy butane

* **Nomenclature of keto group -**

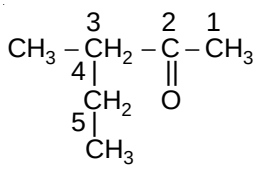
The carbon of a ketone is included in longest chain it never comes on first or last positions,whereas –CHO (Aldehyde group) comes at first & last position only.

eg.

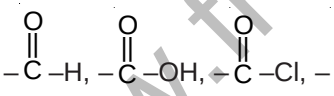


eg. Modify the following IUPAC name

2-ethyl butanone-3



3–methyl pentanone-2

Note -  are the group of which carbons are also included in the longest chain. If thease are alone in a compound they comes on first carbon, if double, comes on first & last position.

3.2 DERIVED SYSTEM

In derived system of nomenclature the structural formula of a compound is named as the derived of a parent compound.

Table I	
Alkane	methane
Alkene	ethylene
Alkyne	acetylene
Alkanol	carbinol
Alkanal	acetaldehyde
Alkanoic acid	acetic acid

Table II (Derive names of some alkanes)	
Trival name	**Derived System**
Ethane	Methylmethane
Propane	Dimethylmethane
n-Butane	Ethylmethylmethane
Isobutane	Trimethylmethane
Neopentane	Tetramethylmethane
Triptane	Isopropyltrimethylmethane

3.3 IUPAC SYSTEM

In 1950 IUPAC (International Union of Pure & Applied Chemistry) convention led out the following rules to name organic compounds.

Nomenclature according to IUPAC system involves the use of following terms.

(i) Word root (ii) Primary suffix (iii) Secondary suffix (iv) Prefix

3.3.1 WORD ROOT

The word root represents the number of carbon atoms in the parent chain.

Some (straight) unbranched chains and their Names

Name	Number of C-atoms	Structure
Methane	1	CH_4
Ethane	2	CH_3CH_3
Propane	3	$CH_3CH_2CH_3$
Butane	4	$CH_3(CH_2)_2CH_3$
Pentane	5	$CH_3(CH_2)_3CH_3$
Hexane	6	$CH_3(CH_2)_4CH_3$
Heptane	7	$CH_3(CH_2)_5CH_3$

Name	Number of C-atoms	Structure
Octane	8	$CH_3(CH_2)_6CH_3$
Nonane	9	$CH_3(CH_2)_7CH_3$
Decane	10	$CH_3(CH_2)_8CH_3$
Undecane	11	$CH_3(CH_2)_9CH_3$
Dodecane	12	$CH_3(CH_2)_{10}CH_3$
Tridecane	13	$CH_3(CH_2)_{11}CH_3$
Tetradecane	14	$CH_3(CH_2)_{12}CH_3$

3.3.2 (i) Primary Suffix : Primary suffix is used to indicate saturation or unsaturation in the carbon chain .

Some Primary Suffixes	
Nature of Carbon Chain	Primary Suffix
Saturated Carbon Chain	ane
Unsaturated Carbon chains	
One C = C bond	ene
Two C = C bonds	a diene
Three C = C bonds	a triene
One C ≡ C bond	yne
two C ≡ C bonds	a diyne
one C = C bond and one C≡C bond	ene–yne

3.3.2 (ii) Secondary Suffix : Secondary suffix is used to indicate the functional group in the organic compound.

Some Organic Families and Secondary Suffixes

Class of organic Compound	General formula	Functional Group	Suffix	IUPAC name of the family (word root + P suffix + sec. suffix)
Alcohols	R–OH	–OH	–ol	alkanol
Thioalcohols	R–SH	–SH	–thiol	alkanethiol
Amines	R–NH_2	–NH_2	–amine	alkanamine
Aldehydes	R–CHO	–CHO	–al	alkanal
Ketones	R–COR'	>C=O	–one	alkanone
Carboxylic acids	R–COOH	–COOH	–oic	alkanoic acid
Amides	R–$CONH_2$	–$CONH_2$	–amide	alkanamide
Acid chlorides	R–COCl	–COCl	–oyl	alkanoyl chloride
Esters	R–COOR'	–COOR'	–oate	alkyl alkanoate
Nitriles	R–C≡N	–C≡N	–nitrile	alkane nitrile

3.3.3 PREFIX : The part of the name which appears before the word root is called prefix. Different prefixes are used for different categories of groups present in molecule.

1. **Alkyl Groups :** Removal of H atom from the alkane gives rise to an alkyl group.

Some alkyl Groups and their Prefixes

Alkane	Alkyl Groups	Abbreviation	Prefix
CH_4	CH_3–	Me–	Methyl
C_2H_6	CH_3CH_2–	Et–	Ethyl
C_3H_8	$CH_3CH_2CH_2$–	*n*-Pr-	*n*-Propyl
C_3H_8	CH_3—CH(—)CH_3	*Iso*-Pr-	*Iso*propyl or (1-methyl ethyl)

2. Some functional groups are always indicated by the prefixes instead of secondary suffixes.

Functional Groups always represented by Prefixes

Functional Group	Prefix	Family	IUPAC name
–NO_2	Nitro	R–NO_2	nitroalkane
–OR	Alkoxy	R–OR'	alkoxyalkane
–Cl	Chloro	R–Cl	chloroalkane
–Br	Bromo	R–Br	bromoalkane
–I	Iodo	R–I	iodoalkane
–F	Fluoro	R–F	fluoroalkane
–N=O	Nitroso	R–NO	nitrosoalkane

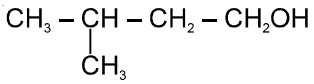
In poly functional compounds (compounds with more than one functional groups), one of the functional groups is treated as principal functional group and is indicated by the secondary suffix and other functional groups are represented by prefix..

Prefixes for functional groups in poly functional compounds	
Functional Groups	**Prefix**
–OH	Hydroxy
–CN	Cyano
–NC	Isocyano
–CHO	Formyl
–SH	Mercapto
–SR	Alkylthio
–COOH	Carboxy
–COOR	Alkoxy carbonyl
–COCl	Chloroformyl
$–CONH_2$	Carbamoyl
$–NH_2$	Amino
=NH	Imino
>C=O	Keto or Oxo

3. ARRANGEMENT OF PREFIXES, WORD ROOT AND SUFFIXES

The prefixes, word root and suffixes are arranged as follows while writing the name.

Prefix (es) + Word root + p.suffix + sec. suffix



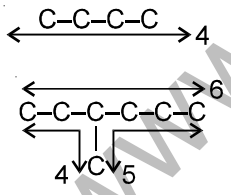
Methyl ..... but..... an.....ol

prefix — *word root* — *primary suffix* — *secondary suffix*

3.3.4 THE RULES : FOR SATURATED COMPOUNDS

1. Selection of longest chain :

The longest possible carbon chain is selected and the compound is named as derivative of hydrocarbon using word root.



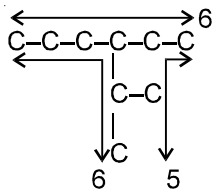
The chain of 6 carbon atoms is selected as the longest chain. Others are rejected.

✪ If more than one sets of longest possible chains are there, the selected longest chain should have :

(a) maximum number of side chains

(b) minimum number of branched side chains

6 atoms chain with two side chains or two unbranched side chains is selected



6 atoms chain with one side chain or one branched side chain is rejected

EXERCISE # 1

Based on charge

Q.1 On charging two metallic spheres of same mass -

[1] The mass of positively charged sphere increases

[2] The mass of both will remain same

[3] The mass of negatively charged sphere will increase

[4] None of the above

Q.2 The correct test for electrification is

[1] Attraction [2] Repulsion [3] Induction [4] Friction

Q.3 An electron at rest has a charge of 1.6×10^{-19}C. It starts moving with a velocity v = c/2, where c is the speed of light, then the new charge on it is -

[1] 1.6×10^{-19} Coulomb [2] $1.6 \times 10^{-19}\sqrt{1-\left(\frac{1}{2}\right)^2}$ Coulomb

[3] $1.6 \times 10^{-19}\sqrt{\left(\frac{2}{1}\right)^2-1}$ Coulomb [4] $\frac{1.6\times10^{-19}}{\sqrt{1-\left(\frac{1}{2}\right)^2}}$ Coulomb

Q.4 If 1000 electron are transferred from one sphere to another sphere of equal masses, then the difference in the mass of spheres will be -

[1] 1000 m_e [2] 2000 m_e [3] 1000m_p [4] 2000m_p

Q.5 When an insulated conducting sphere with 4 coulomb of charge, is placed quite close to the other uncharged sphere,then the charge produced on the other sphere in coulomb will be -

[1] –4 [2] +4 [3] –2 [4] +3

Based on permittivity

Q.6 The unit of electrical permittivity is -

[1] Farad/meter [2] Henery/metre [3] Volt/metre [4] Colomb/m^2

Q.7 Value of dielectric constant for metals is -

[1] One [2] More than one [3] Less than one [4] Infinite

Based on force

Q.8 If the medium of dielectric constant K is placed in place of vacuum between the two charges, then the force between them will now -

[1] Be lesser by K times [2] Increase K times [3] Remains same [4] Increase by K^2 times

Q.9 The coulomb's law can be vectorically represented as -

[1] $\vec{F} = k\frac{q_1q_2}{r^2}$ [2] $\vec{F} = k\frac{q_1q_2}{r^2}\vec{r}$ [3] $\vec{F} = k\frac{q_1q_2}{r^3}\vec{r}$ [4] $\vec{F} = k\frac{q_1q_2}{r}\vec{r}$

Q.10 A force F is acting between charges placed in vacuum. If the glass plate of dielectric constant K = 6 is now placed between them, the force now will be -

[1] 6F [2] F/6 [3] Zero [4] F/36

Q.11 A force of 12 N is acting between two charges of +2μC and + 6μC. If both the charges are increased in value bu –2μC, then the force will now be -

[1] Zero [2] 3 N (attraction force) [3] 8 N (repulsion force) [4] 4 N (repulsion force)

Q.12 Four similar charges each of 2μC are placed at x = 0, 2, 4 and 8cm on X-axis.The force exerted on the charge in newton at x = 2 cm will be -

[1] 0 [2] 5 [3] 10 [4] 10^{-2}

Q.13 The dielectric constant of pure water is 81, then its absolute permittivity (coulomb^2/N-m^2) will be -

[1] 8.85×10^{-12} [2] 9×10^{9} [3] 7.18×10^{-10} [4] $1/4\pi$

Q.14 Two charges of +1μC and +5μC are placed 4 cm apart, the ratio of the force exerted by both charges on each other will be -

[1] 1 : 1 [2] 1 : 5 [3] 5 : 1 [4] 25 : 1

Q. 15 The coulomb force between two charges q_1 and q_2 is $F = k\frac{q_1q_2}{r^2}$, where the value of k depends upon -

[1] Units only

[2] Medium between charges

[3] Both units as well as medium between charges

[4] Don't depend upon the units and medium between charges

Based on electric field

Q.16 One electron and one proton are placed on a uniform electric field, the ratio of their acceleration will be -

[1] Unity [2] Zero

[3] Ratio of mass of electron and proton [4] Ratio of mass of proton and electron

Q.17 Unit of electric field intensity is newton/coloumb.The other unit of this can be -

[1] Vm [2] Vm^2 [3] V/m [4] V/m^2

Q.18 Two point charges of 9e and e are placed at a distance of 'r'. At what distance another charge q be kept away from 9e charge on the line joining the charges so that the system remains in equilibrium -

[1] r/4 [2] r/2 [3] 3r/4 [4] r/3

Q.19 Two horizontal plates charged with +q and –q charge are having an area of A m^2. A charged drop of oil is suspended in equilibrium position between the plates, then the charge on the oil drop will be -

[1] mg/q [2] mg/A [3] mg ε_0 A/q [4] mA ε_0 /q

Q.20 The rupture of air medium occurs at $E = 3 \times 10^6$ volt/metre. The maximum charge that can be given to a sphere of radius 5 metre will be (in coulomb)

[1] 2×10^{-2} [2] 2×10^{-3} [3] 2×10^{-4} [4] 2×10^{-5}

Q.21 A charge Q is placed at the centre of a square.If electric field intensity due to charges at the corners of squares is E_1 and intensity at the midpoint of the side of square is E_2, then the ratio E_1/E_2 will be -

[1] $1/\sqrt{2}$ [2] $\sqrt{2}$ [3] 1/2 [4] 2

Q.22 Potential difference between two parallel plates is V volt. The distance between plates is d, the force exerted upon a test charge q placed midway between plates will be -

[1] qV/d [2] qd/V [3] V/qd [4] d/qV

Q.23 A body can be negatively charged by -

[1] Giving excess of electrons to it [2] Removing some electrons from it

[3] giving some protons to it [4] Removing some neutrons from it

Q.24 The tangent drawn at a point on a line of electric force shows the -

[1] Intensity of gravitational field [2] Intensity of magnetic field

[3] Intensity of electric field [4] Direction of electric field

Q.25 When no charge is confined with in the Gauss's surface, it implies that -

[1] E = 0 [2] $\vec{E}$ and $\vec{ds}$ are parallel

[3] $\vec{E}$ and $\vec{ds}$ are mutually perpendicular [4] $\vec{E}$ and $\vec{ds}$ are inclined at some angle

Q.26 If three electric dipoles are placed in some closed surface, then the electric flux emitting from the surface will be -

[1] Zero [2] Positive [3] Negative [4] None

Q.27 A charge q is placed at the centre of a closed cuboid.The flux emitting from any one face of the cube will be -

[1] $q/6\varepsilon_0$ [2] q/ε_0 [3] $q/2\varepsilon_0$ [4] $q/4\varepsilon_0$

Q.28 200 lines of force (M.K.S unit) are going outward the surface while 400 lines are entering (M.K.S unit) inward, then the total value of charge confined to the surface will be -

[1] -0.177×10^{-8} C [2] 0.177×10^{-8} C [3] $0.177 \times 10^{-8}/4\pi\varepsilon_0$ C [4] $-4\pi\varepsilon_0 \times 0.177 \times 10^{-8}$ C

Q.29 The total flux in Vm going out of the surface of area 1.4 m^2 inclined at an angle of 45º to the direction of uniform electric field of 0.3 V/m will be -

[1] 0.3 [2] 0.153 [3] 6.5 [4] 3.3

Q.30 The electric field intensity at a distance 'r' from an infinite linear charge of charge per unit length λ will be proportional to -

[1] 1/r [2] r [3] $1/r^2$ [4] r^2

Q.31 Electric field intensity at an internal point of uniformly charged insulating sphere is E, it depends on distance r from centre by the relation -

[1] $E \propto r$ [2] $E \propto r^2$ [3] $E \propto 1/r$ [4] $E \propto 1/r^2$

Q.32 A charge Q is uniformly distributed all over the each of two spheres of radii R_1 and R_2. A point is located outside and at distance r from the centre of the sphere.The ratio of electric field intensity (E_1/E_2) at that point due to first and second sphere will be -

[1] 1 [2] R_1^2/R_2^2 [3] R_2^2/R_1^2 [4] R_2^3/R_1^3

Q.33 Two spheres of radii 2cm and 4cm are charged equally, then the ratio of charge density on the surface of the spheres will be -

[1] 1 : 2 [2] 4 : 1 [3] 8 : 1 [4] 1 : 4

Q.34 A charged water drop of radius 0.1 μm is under equilibrium in some electric field. The charge on the drop is equivalent to electronic charge. The intensity of electric field is ($g = 10\ ms^{-2}$)

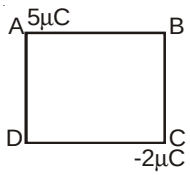
[1] 1.61 NC^{-1} [2] 26.2 NC^{-1} [3] 262 NC^{-1} [4] 1610 NC^{-1}

Q.35 There exists an electric field of 1 volt/m near an infinite charged metal plate, then the value of charge density in C/m^2 on the surface will be -

[1] $4\pi\varepsilon_0$ [2] ε_0 [3] $\sqrt{\varepsilon_0}$ [4] $\sqrt{4\pi\varepsilon_0}$

Based on Potential

Q.36 As shown in the figure, two point charges of value 5μC and –2μC are placed at the two opposite corners A and C of a square.The potential difference between the other two corners of square in volt will be -



[1] 7 [2] 3 [3] 0 [4] 10

Q.37 The potential of a charged drop is V. This drop is divided into n smaller drops, then each drop will have the potential as

[1] $n^{-1}V$ [2] $n^{2/3}V$ [3] $n^{3/2}V$ [4] $n^{-2/3}V$

Q.38 A non-conducting sphere of radius R is uniformly charged with charge 'q'. The potential at a distance 'r' from its centre (r < R) will be

[1] $kq(3R^2 - r^2)/2R^3$ [2] $kq(R^2 - r^2)R^3$ [3] kqr/R [4] Zero

Based on Electric dipole

Q.39 The value of potential energy when an electric dipole of dipole moment p is placed parallel to an electric field $\vec{E}$ is

[1] pE [2] p/E [3] 2pE [4] –pE

Q.40 An electric dipole of dipole moment $\vec{p}$ is placed in an electric field $\vec{E}$. Angle between $\vec{p}$ and $\vec{E}$ is q.For what value of θ, the energy of the dipole is maximum

[1] Zero [2] π/4 [3] π/2 [4] π

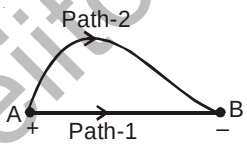
Q.41 The torque acting on an electric dipole of dipole moment $\vec{P}$ in an electric field $\vec{E}$ is

[1] $\vec{P} \cdot \vec{E}$ [2] $\vec{P} \times \vec{E}$ [3] Zero [4] $\vec{E} \times \vec{P}$

Q.42 The electric field on the equatorial position of a electric dipole having dipole moment P

[1] $\frac{1}{4\pi\varepsilon_0} \cdot \frac{2p}{r^3}$ [2] $\frac{1}{4\pi\varepsilon_0} \cdot \frac{p}{r^3}$ [3] $\frac{1}{4\pi\varepsilon_0} \cdot \frac{p}{r^2}$ [4] $\frac{1}{4\pi\varepsilon_0} \cdot \frac{2p}{r^2}$

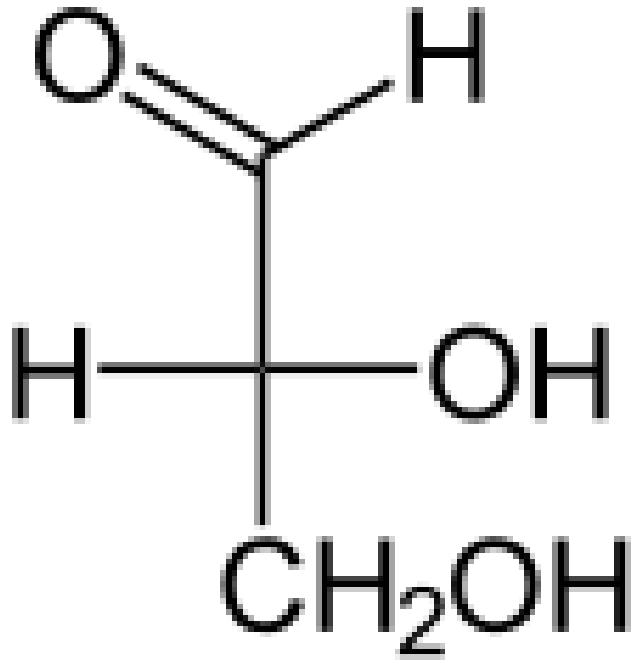
Q.43 According to the figure a positive charge is situated at A and a negative charge is situated at B. Work done in carrying a test charge q from A to B along path one and along path two will be related



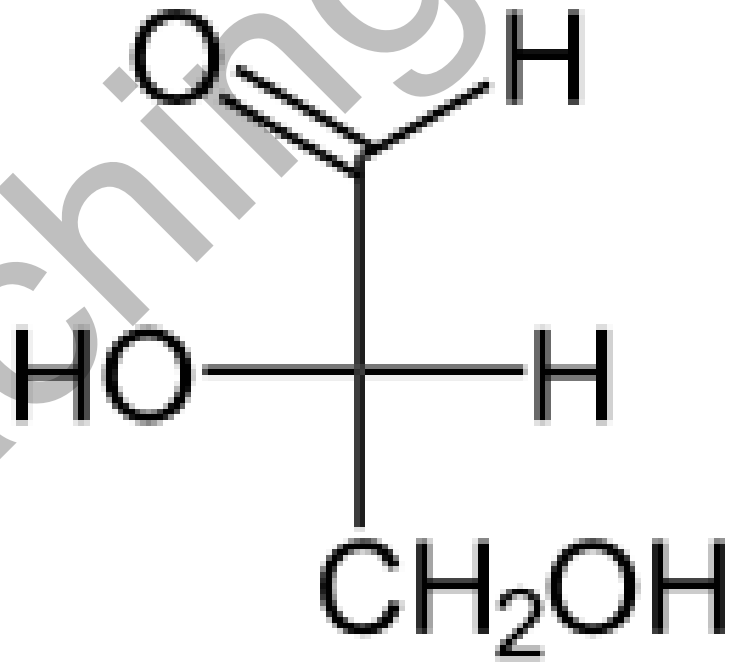
[1] $W_1 > W_2$ [2] $W_2 > W_1$ [3] $W_1 = W_2$ [4] $W_1 = W_2 = 0$

ANSWER KEY **EXERCISE # 1**

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	3	2	1	2	1	1	4	1	3	2	1	3	3	1	3
Qus.	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	4	3	3	3	2	3	1	1	4	3	1	1	1	1	1
Qus.	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**		
Ans.	1	1	2	3	2	3	4	1	4	4	2	2	3		



D-Glycerin-aldehyd



L-Glycerin-aldehyd