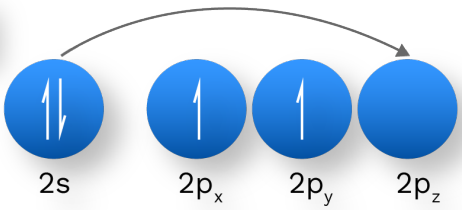
Nomenclature

Carbon ($_6C^{12}$)

Atomic number : 6

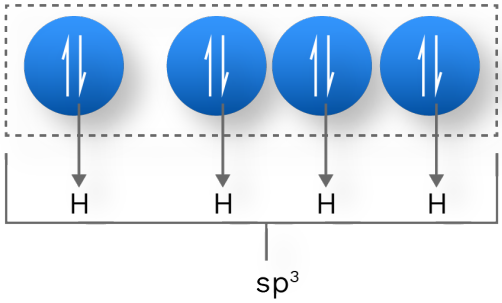
Electronic configuration : $1s^2$, $2s^2$, $2p^2$

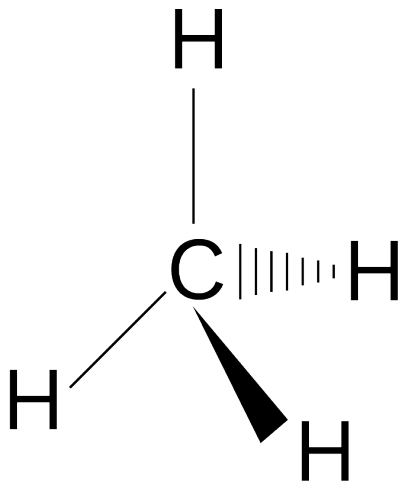
Ground state :

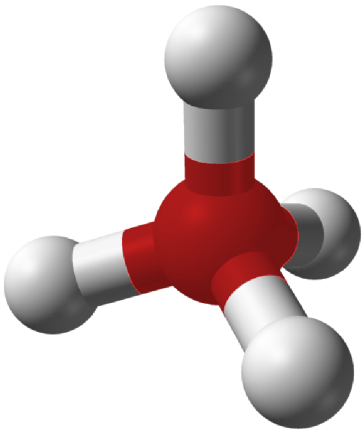


Excited state :

CH_4 Moleclue :







Organic Compound

Wohler prepared first man-made organic compound disapproving **Vital Force Theory** by preparing Urea. The following is the reaction showing the synthesis of Urea.

Definitions

Hydrocarbon and its derivatives are known as Organic Compound and Study of Organic Compound is called as Organic Chemistry.

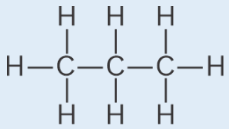
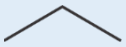
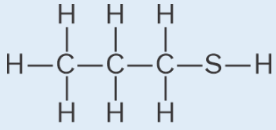
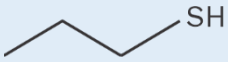
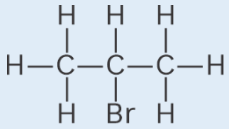
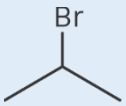
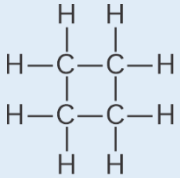
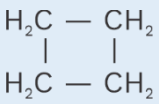
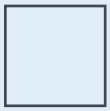
$$\underset{\text{Ammonium Chloride}}{NH_4Cl} + \underset{\text{Potassium Cyanate}}{KCNO} \xrightarrow{\Delta} \underset{\text{Ammonium Cyanate}}{NH_4CNO} + \underset{\text{Potassium Chloride}}{KCl}$$

$$\underset{\text{Ammonium Cyanate}}{NH_4CNO} \xrightarrow{\text{Heat}} \underset{\text{Urea}}{NH_2CONH_2}$$

Vital Force Theory/Berzelius Hypothesis :

It states that Organic Compounds can only be prepared in living body.

- **Structural Representation of Organic Compound**

STRUCTURAL FORMULA	CONDENSED FORMULA	BOND LINE FORMULA
	$CH_3CH_2CH_3$	
	$CH_3CH_2CH_2SH$	
	$CH_3CH(Br)CH_3$	
		

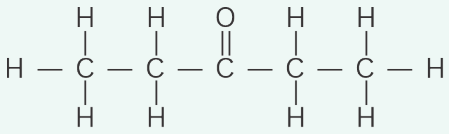
NCERT PrepUp 12.4 (Pg. 337)

Expand each of the following condensed formulas into their complete structural formulas.

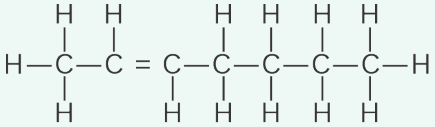
(a) $CH_3CH_2COCH_2CH_3$ (b) $CH_3CH{=}CH(CH_2)_3CH_3$

Solution

(a)



(b)



NCERT PrepUp 12.5 (Pg. 337)

For each of the following compounds, write a condensed formula and also their bond-line formula.

(a) $HOCH_2CH_2CH_2CH(CH_3)CH(CH_3)CH_3$ (b) $N{\equiv}C{-}\underset{\displaystyle OH}{\underset{|}{C}}H{-}C{\equiv}N$

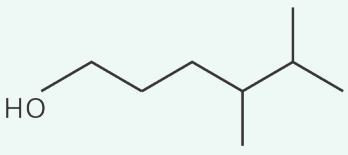
Solution

Condensed formula :

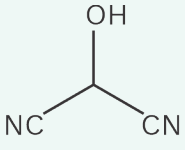
(a) $HO(CH_2)_3CH(CH_3)CH(CH_3)_2$ (b) $HOCH(CN)_2$

Bond-line formula:

(a)

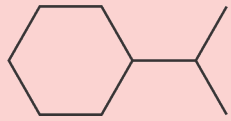


(b)

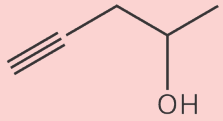


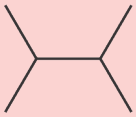
NCERT PrepUp 12.6 (Pg. 337)

Expand each of the following bond-line formulas to show all the atoms including carbon and hydrogen

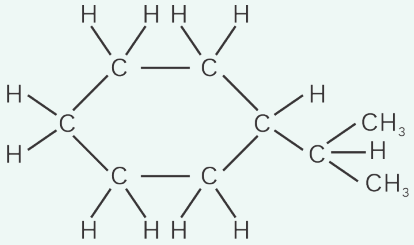
(a) 

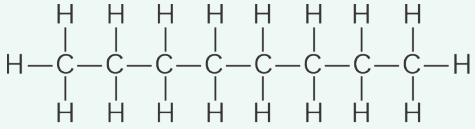
(b) 

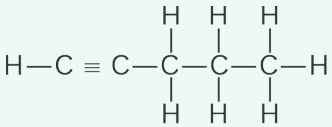
(c) 

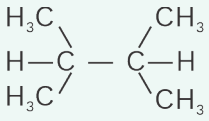
(d) 

Solution

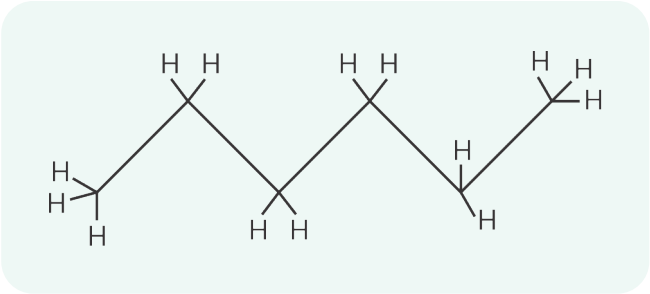
(a) 

(b) 

(c) 

(d) 

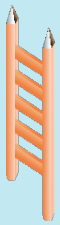
Catenation

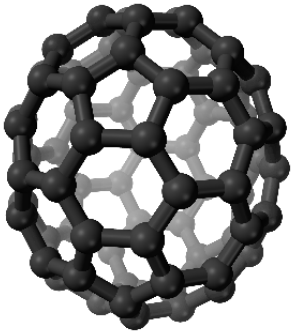


Zig-Zag fashion chain

Concept Ladder

Self-linking property of C-atoms is known as catenation (due to bond energy-strong bond)





Buckminster Fullerene

Rack your Brain

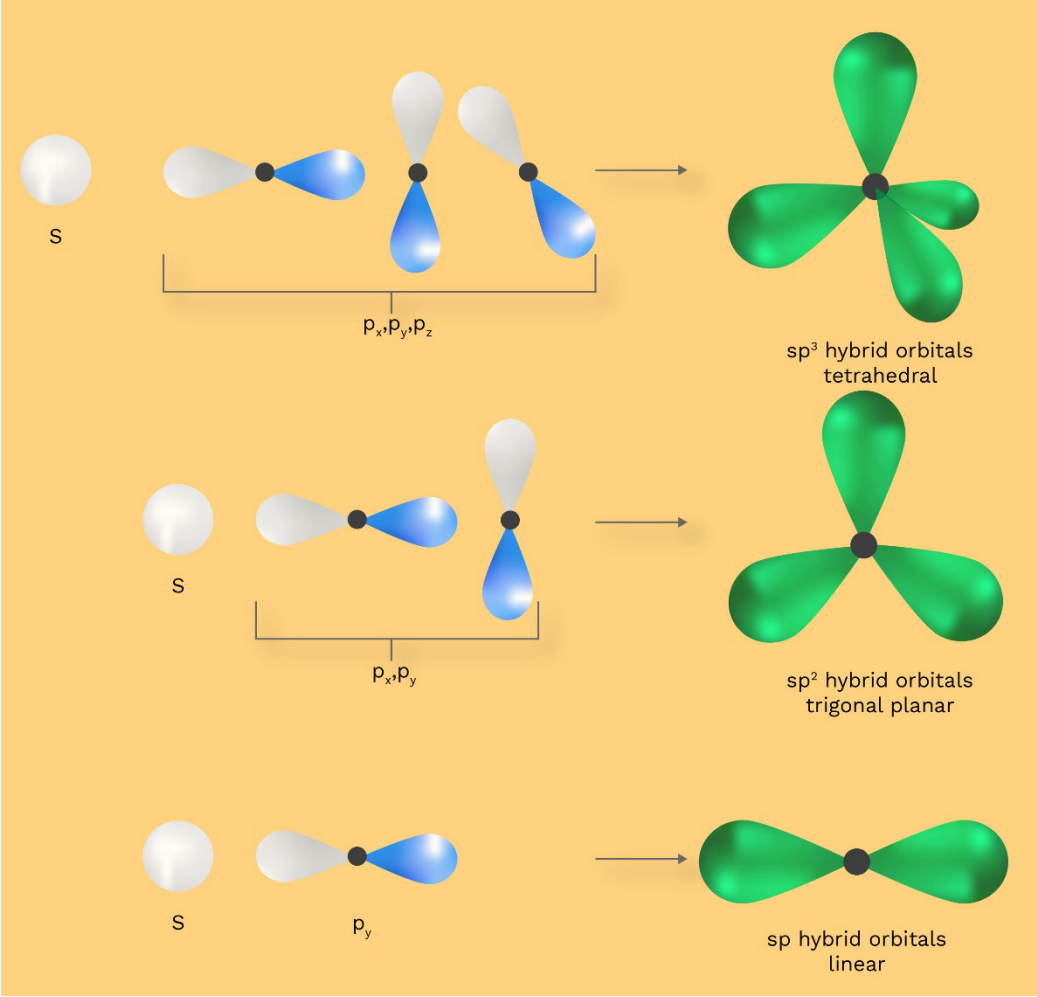
Why Carbon forms large number of compounds?

Hybridization

It is a phenomenon of mixing of atomic orbitals of different shape, size and energy to form new equivalent orbitals of same shape, size and energy is called hybridization.

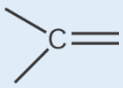
Types of Hybridization

(1) sp^3-Hybridization (Tetrahedral shape)
(2) sp^2-Hybridization (Trigonal planar)
(3) sp-Hybridization (Linear shape)

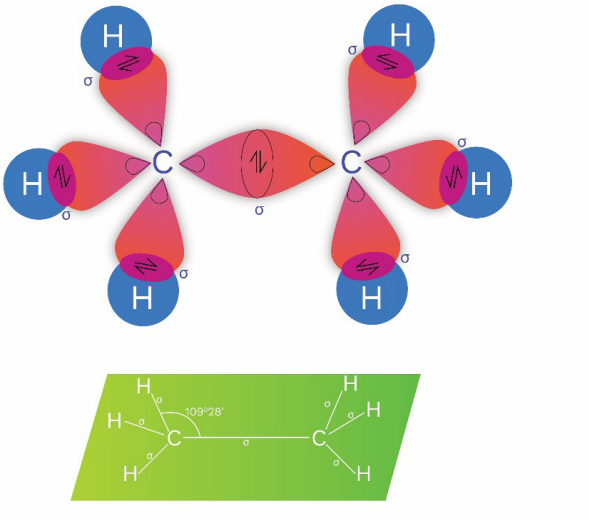


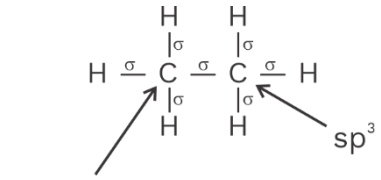
Tricks for Determination of Hybridization

Carbon always form 4 bonds

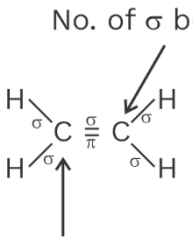
EXAMPLE	NO. OF SIGMA BONDS	HYBRIDIZATION	BOND ANGLE	SHAPE
	4	sp^3	109.28’	Tetrahedral
	3	sp^2	120°	Trigonal Planar
	2	sp	180°	Linear

(1) Ethane ($CH_3—CH_3$)





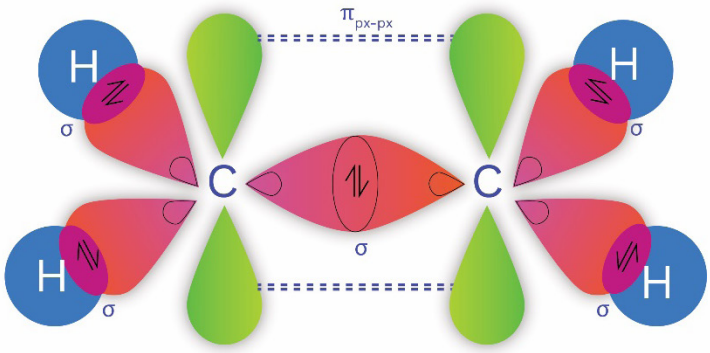
No. of σ bond = 4 → sp^3

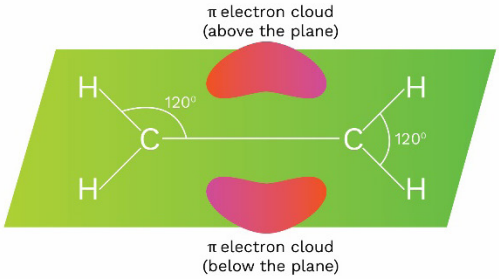


No. of σ bond = 3 → sp^2

(2) Ethene ($CH_2 = CH_2$)

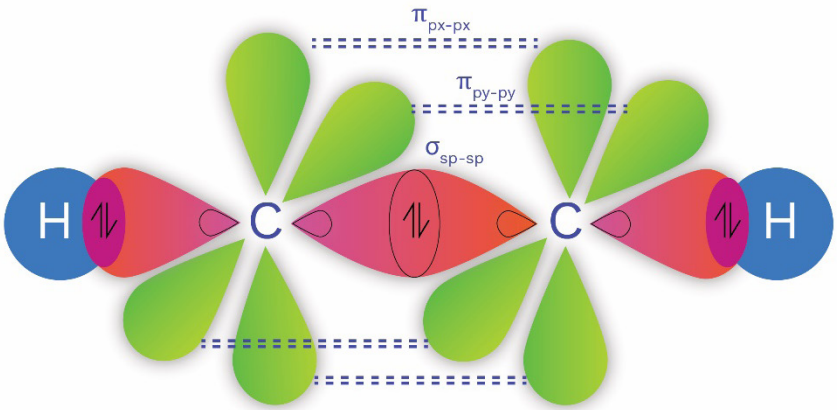
Ethene ($CH_2 = CH_2$)

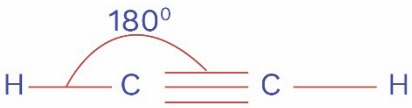


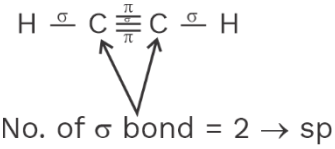


(3) Ethyne (CH ≡ CH)

Ethyne (CH≡CH)

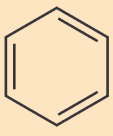






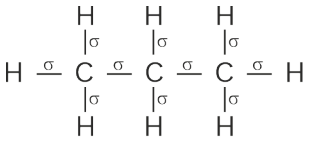
Q1 **Calculate Sigma and Pi Bond.**

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

(ii) 

A2

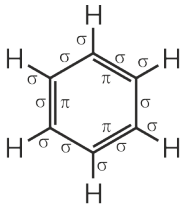
(i)



σ bond → 10

π bond → 0

(ii)



σ bond → 12

π bond → 3

NCERT PrepUp 12.1 (Pg. 335)

How many σ and π bonds are present in each of the following molecules?

(a) $HC{\equiv}CCH{=}CHCH_3$ (b) $CH_2{=}C{=}CHCH_3$

Solution

(a) $\sigma_{C-C} : 4; \sigma_{C-H} : 6; \pi_{C=C} : 1; C \equiv C : 2$

(b) $\sigma_{C-C} : 3; \sigma_{C-H} : 6; \pi_{C=C} : 2$

NCERT PrepUp 12.2 (Pg. 335)

What is the type of hybridisation of each carbon in the following compounds?

(a) CH_3Cl (b) $(CH_3)_2CO$ (c) CH3CN (d) $HCONH_2$ (e) $CH_3CH{=}CHCN$

Solution

(a) sp^3 (b) sp^3, sp^2 (c) sp^3, sp (d) sp^2 (e) sp^3, sp^2, sp^2, sp

NCERT PrepUp 12.3 (Pg. 335)

Write the state of hybridisation of carbon in the following compounds and shapes of each of the molecules.

(a) $H_2C{=}O$ (b) CH_3F (c) $HC{\equiv}N$.

Solution
(a) sp^2 hybridised carbon, trigonal planar;
(b) sp^3 hybridised carbon, tetrahedral;
(c) sp hybridised carbon, linear.

Degree of Carbon and Hydrogen

(1) 1° carbon atom – Only one electronic valency of carbon atom is satisfied by the other carbon atoms.

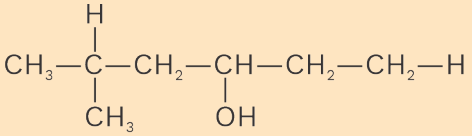
(2) 2° carbon atom – Two electronic valency of carbon are satisfied by the other carbon atoms.

(3) 3° carbon atom – Three electronic valency of carbon atom are satisfied by the other carbon atoms.

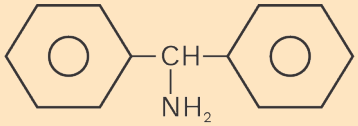
(4) 4° carbon atom – Four electronic valency are satisfied by the other carbon atom.

Q2 **Indicate the degree of Carbon and Hydrogen in the following.**

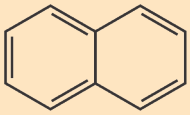
(i)



(ii)

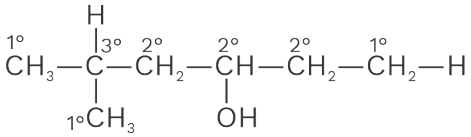


(iii)

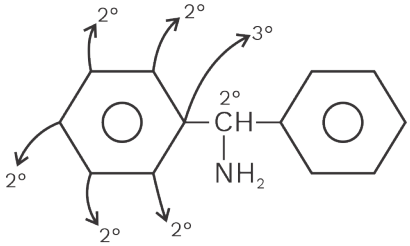


A2

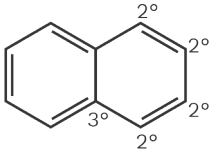
(i)



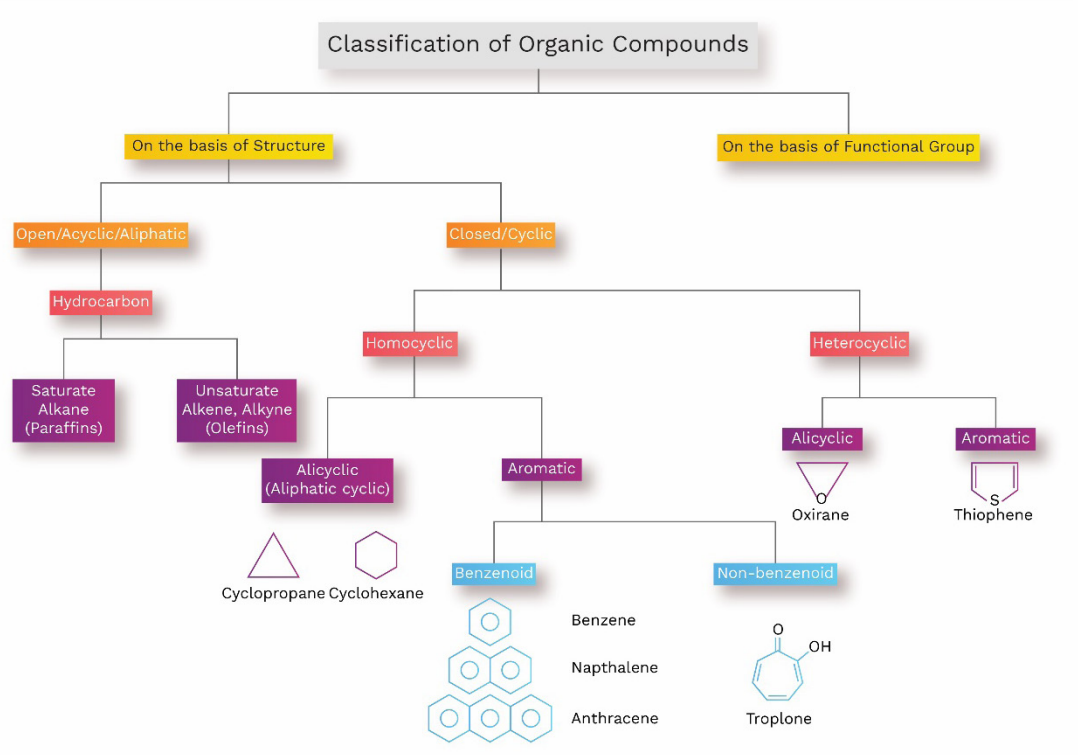
(ii)



(iii)



- **Classification of Organic Compound**



Previous Year's Questions

An organic compound X(molecular formula $C_6H_7O_2N$) has six carbon atoms in a ring system, two double bonds and a nitro group as substituent, X is

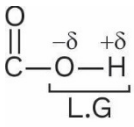
[NEET-1990]

(1) homocyclic but not aromatic
(2) aromatic but not homocyclic
(3) homocyclic and aromatic
(4) heterocyclic and aromatic

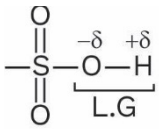
Concept Ladder

Alicyclic compounds are the combination of Aliphatic compounds enclosed in cyclic form.

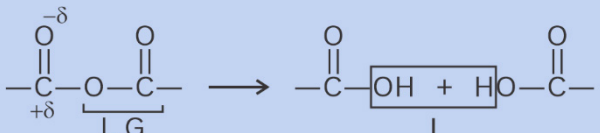
- **Functional Group**

(1) 

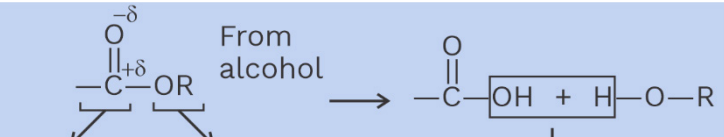
Carboxylic acid

(2) 

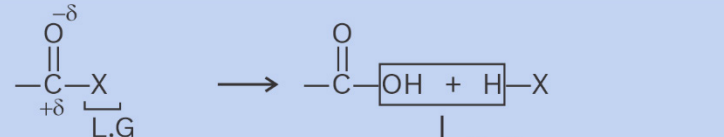
Sulphonic acid

(3) 

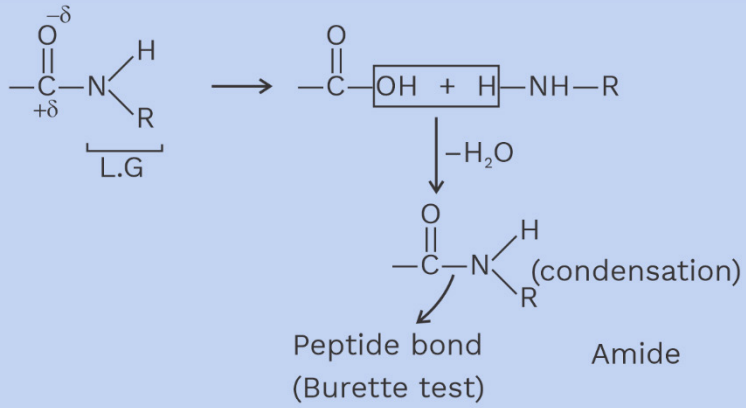
Anhydride

(4) 

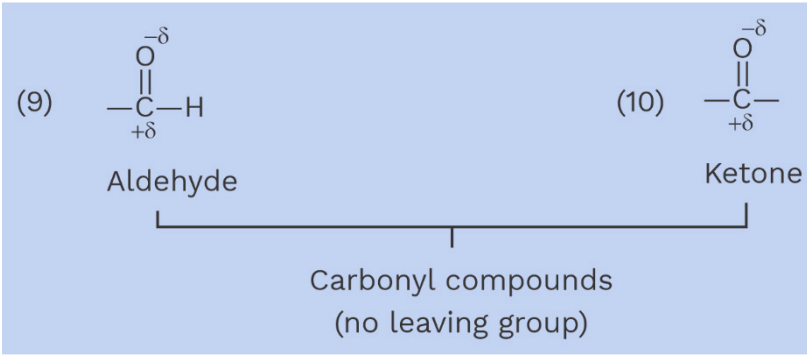
Ester

(5) 

Ester (condensation)

(6) 

(7) $-C \equiv N^-$ (Cyanide) (8) $N \equiv C -$ (Isocyanide)



(11) $-\overset{-\delta}{O}-\overset{+\delta}{H}$ (Alcohol) (12) —SH (Thioalcohol)
(13) $-NH_2$ (Amine) (14) —O— (Ether)

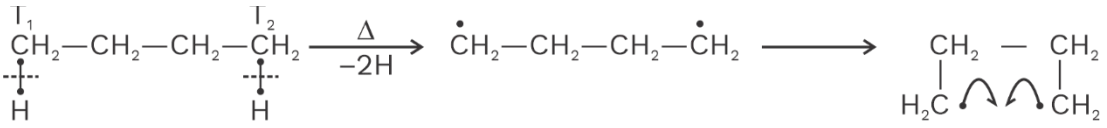
Concept Ladder

Homologous Series contains members having $-CH_2$ difference in formula for consecutive members and have same Chemical Properties but different Physical Properties.

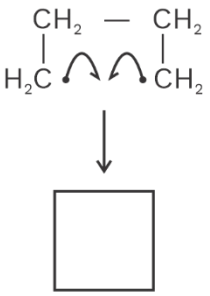
- **Homologous Series**

S. NO.	NAME OF SERIES	I-HOMOLOGUE	II-HOMOLOGUE
(i)	Alkane (C_nH_{2n+2})	CH_4	$CH_3–CH_3$
(ii)	Alkene (C_nH_{2n})	$CH_2=CH_2$	$CH_2=CH–CH_3$
(iii)	Alkyne (C_nH_{2n-2})	$HC\equiv CH$	$HC\equiv C–CH_3$
(iv)	Halo alkane ($C_nH_{2n+1}X$)	$CH_3–X$	$CH_3–CH_2–X$
(v)	Alcohol ($C_nH_{2n+2}O$)	$CH_3–OH$	$CH_3–CH_2–OH$
(vi)	Ether ($C_nH_{2n+2}O$)	$CH_3–O–CH_3$	$CH_3–O–CH_2–CH_3$
(vii)	Aldehyde ($C_nH_{2n}O$)	$H–CHO$	$CH_3–CHO$
(viii)	Ketone ($C_nH_{2n}O$)	$CH_3—CO—CH_3$	$CH_3—CO—CH_2—CH_3$
(ix)	Carboxylic acid ($C_nH_{2n}O_2$)	$H–COOH$	$CH_3–COOH$
(x)	Ester ($C_nH_{2n}O_2$)	$HCOOCH_3$	$HCOOCH_2CH_3$
(xi)	Amide ($C_nH_{2n+1}NO$)	$H–CONH_2$	$CH_3–CONH_2$
(xii)	Nitro alkane ($C_nH_{2n+1}NO_2$)	CH_3NO_2	$CH_3CH_2NO_2$
(xiii)	Amine ($C_nH_{2n+3}N$)	$CH_3–NH_2$	$CH_3–CH_2–NH_2$

- **Degree of Unsaturation (DU) or Index of H-deficiency**



M.F. → C_4H_{10}
G.F. → C_nH_{2n+2}



M.F. → C_4H_8
G.F. → C_nH_{2n}

Concept Ladder

(1) 1 Ring = 2H = 1 H_2, DU = 1
(2) 1 Double bond = 2H = 1H_2, DU = 1
(3) 1 Triple bond = 4H = 2H_2, DU = 2

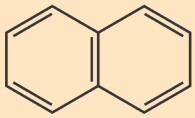
Q3 **Calculate Degree of Unsaturation.**
C_2H_2, C_2H_4, C_3H_6, C_4H_6, C_6H_6, $C_{10}H_{10}$

A3

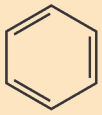
M.F	Alkane	
C_2H_2	C_2H_6	$4H \Rightarrow 2H_2$, DU = 2
C_2H_4	C_2H_6	$2H \Rightarrow 1H_2$, DU = 1
C_3H_6	C_3H_8	$2H \Rightarrow 1H_2$, DU = 1
C_4H_6	C_4H_{10}	$2H \Rightarrow 1H_2$, DU = 1
C_6H_6	C_6H_{14}	$8H \Rightarrow 4H_2$, DU = 4
$C_{10}H_{10}$	$C_{10}H_{22}$	$12H \Rightarrow 6H_2$, DU = 6

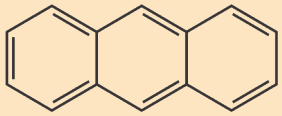
Q4 **Calculate Degree of Unsaturation.**

(i) 

(ii) 

Napthalene

(iii) 

(iv) 

Anthracene

A4 (i) DU = 3 (ii) DU = 7
(iii) DU = 4 (iv) DU = 10

- **Acyclic Alkane**

$$DU = \frac{\left(\begin{array}{c}\text{No. of H-atoms in}\\ \text{acyclic alkane}\end{array}\right) - \left(\begin{array}{c}\text{No. of H-atoms in}\\ \text{given compound}\end{array}\right)}{2}$$

DU tells total number of double and triple bonds in a compound.

- **Calculation of DU in Heteroatom containing compound Alkane**

(1) $C_4H_{10}O$ Alkane
$C_4H_{10} \Rightarrow C_4H_{10}$, DU = 0

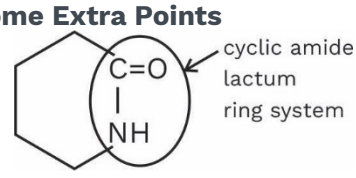
(2) C_4H_8O C_4H_{10}, DU = 1

(3) $CH \equiv C - \underset{\underset{C \equiv N}{|}}{C} = \overset{\overset{O}{\|}}{C} - OH$, DU = 5

Concept Ladder

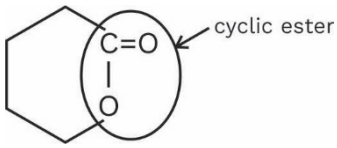
Deficiency of H_2 molecule in given compound with respect to acyclic alkane is DU.

- **Some Extra Points**

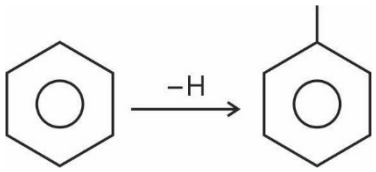
(1) 

Nylon ≡ Amide
E.g. Caprolactam = Nylon-6

(2)



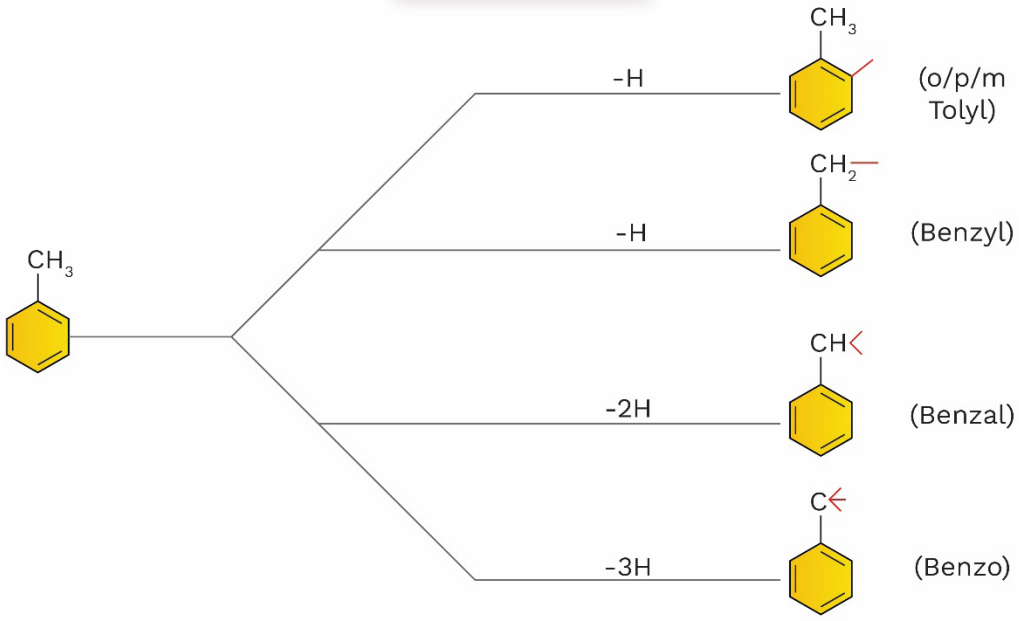
(3)



Phenyl / Ph / ϕ
Ar / Aryl

(4)

Aromatic Radical



E.g.

Benzyl amide Benzyl chloride

(5) $CH_2 = CH - H \xrightarrow{-H} CH_2 = CH -$

Alkene Vinyl

E.g.

$CH_2 = CH - Cl$

Vinyl chloride

(6) $CH_2 = CH - CH_2 - H \xrightarrow{-H} CH_2 = CH - CH_2 -$

Allyl

E.g.

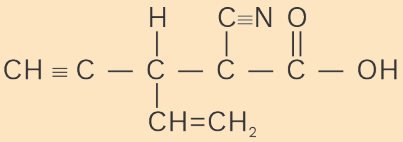
$CH_2 = CH - CH_2 - OH$

Allylic alcohol

(7) $CH_4 \xrightarrow{-H} CH_3 - \xrightarrow{-H} -CH_2- \xrightarrow{-H} -\underset{|}{C}H-$

Methane — Methyl — Methylene or Methylidene — Methylidyne

Q5

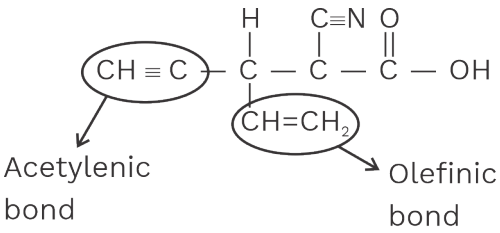


Calculate :

(1) DU **(2) No. of double bond** **(3) No. of triple bond**

(4) No. of Acetylenic bond **(5) No. of Olefinic bond**

A5



(1) DU = 6

(2) No. of double bond = 2

(3) No. of triple bond = 2

(4) No. of Acetylenic bond = 1

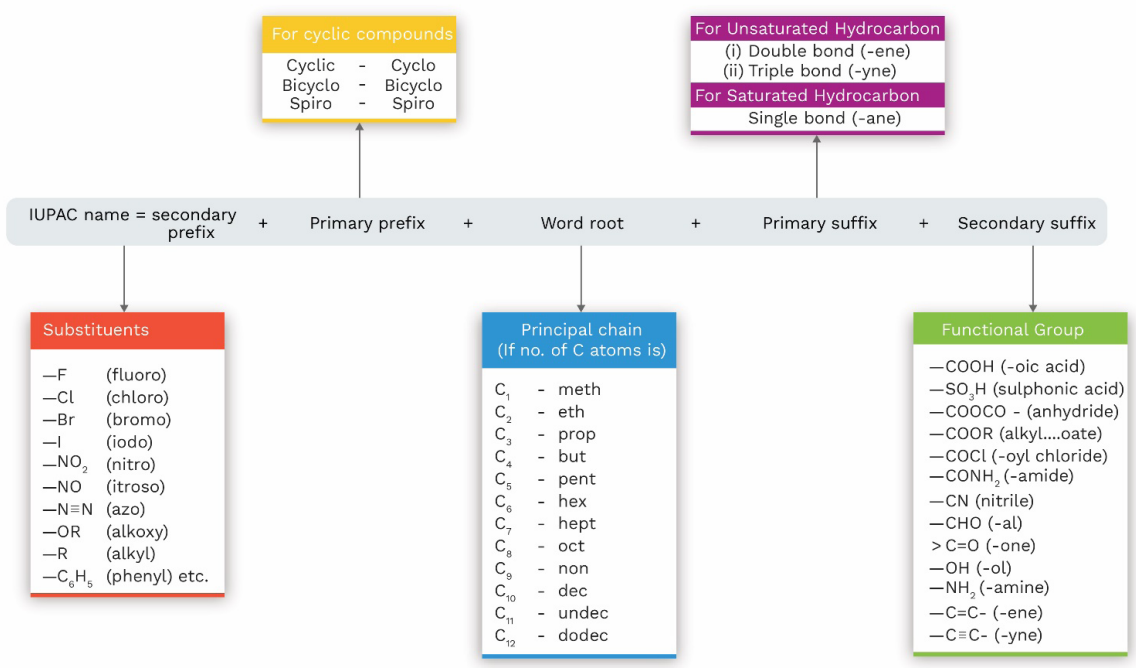
(5) No. of Olefinic bond = 1

Rack your Brain

What is the % of Carbon in Human Body?

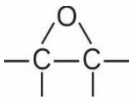
IUPAC Naming

1. Format of IUPAC



2. Selection of Principle Functional Group

If compound is having a single functional group, then it is considered as the principle functional group of that compound.

Exception : —O—  —X —NO_2

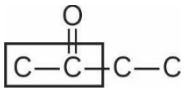
ether cyclic ether halogen nitro

If compound having more than one functional group then select PFG according to given IUPAC series.

In this case rest of functional group behave as substituents & their prefix are used.

3. Selection of Principle C-chain (PCC)

If PFG having carbon then it considered as a first Carbon of PCC (except ketone).



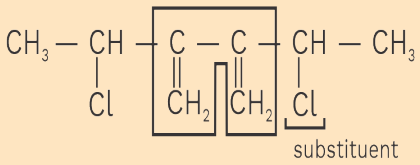
If PFG not having carbon then consider that carbon which to PFG is directly attached. In this case that C-atom covered by both side of other C-atom. (including ketone)

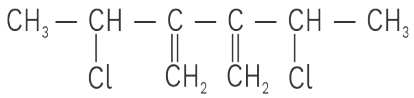
Concept Ladder

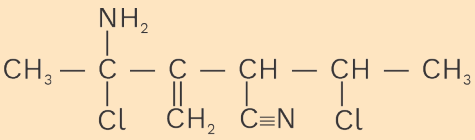
The sum of Locants Rule is preferred over lowest sum of locants irrespective of length of carbon chain.

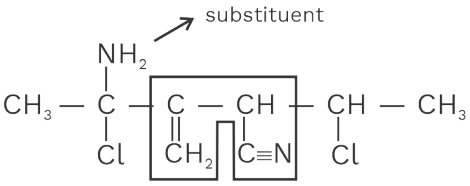
Principle FG > Multiple bond (= or º) > No. of C- atoms in PCC > No. of substituents

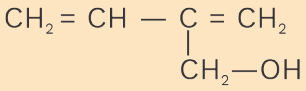
Q6 **Select the longest chain of carbon atom.**

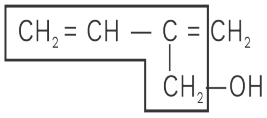
(1) 

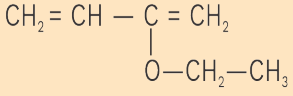
A6 (1) 

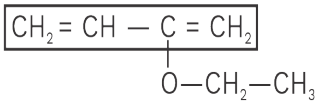
Q7 

A7 

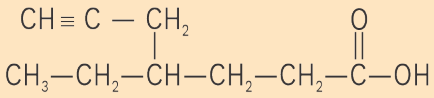
Q8 (3) 

A8 (3) 

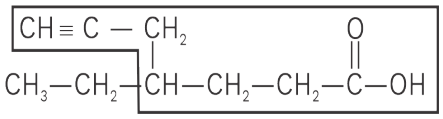
Q9 (4) 

A9 (4) 

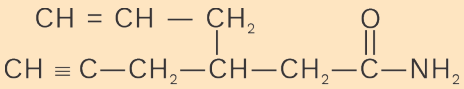
Q10 (5)



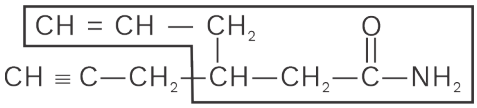
A10 (5)



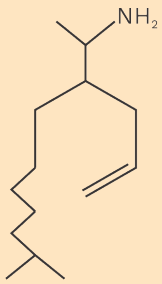
Q11



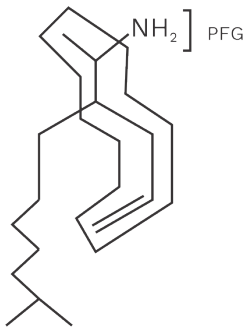
A11



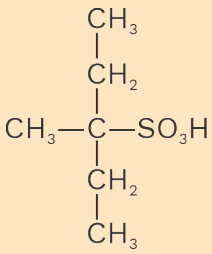
Q12



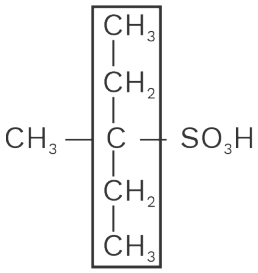
A12



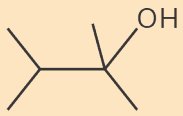
Q13



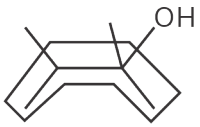
A13



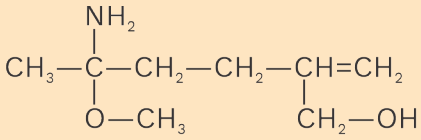
Q14



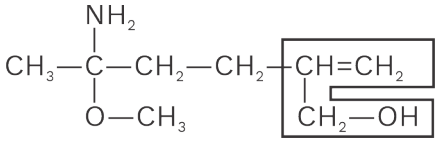
A14



Q15

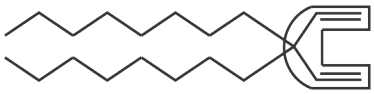


A15

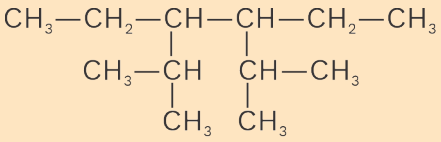


Q16

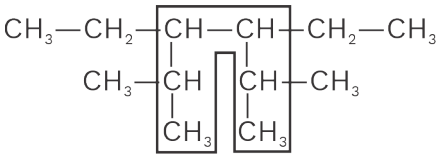
A16



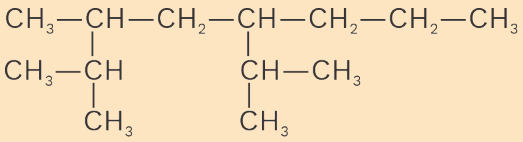
Q17



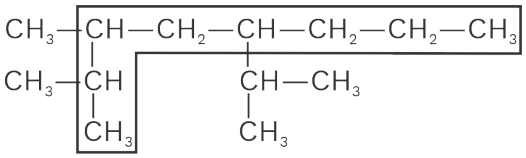
A17



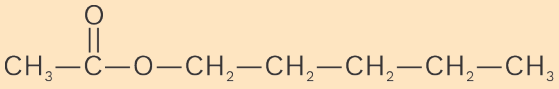
Q18



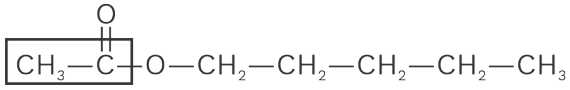
A18

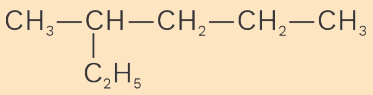


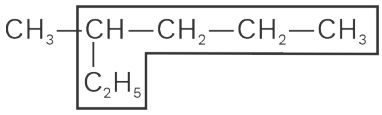
Q19



A19



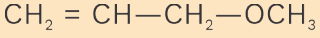
Q20 

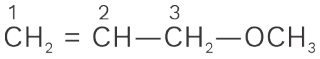
A20 

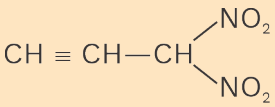
4. Numbering in Selected PCC

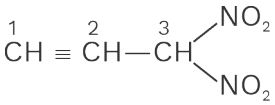
If PFG having carbon then it considered as a first Carbon of PCC (except ketone).

PFG > Multiple (= or º) > Locant rule > Alphabetical order

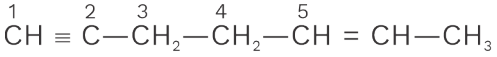
Q21 

A21 

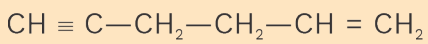
Q22 

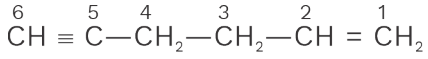
A22 

Q23

A23 

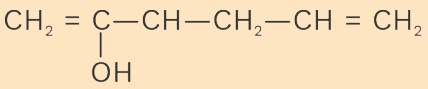
(Unsymmetrical)

Q24 

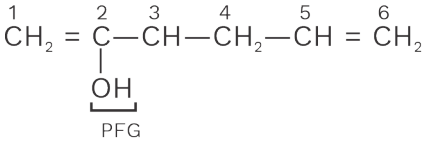
A24 

(Symmetrical)

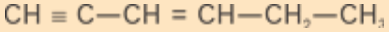
Q25



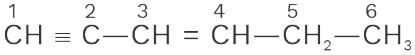
A25



Q26

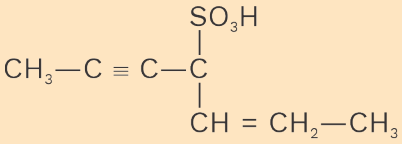


A26

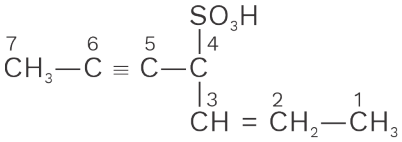


(Unsymmetrical)

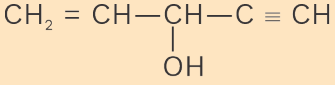
Q27



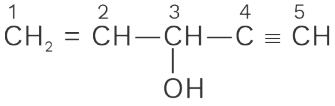
A27



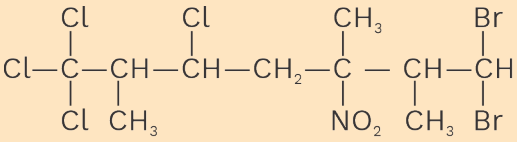
Q28



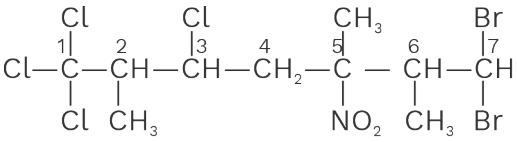
A28



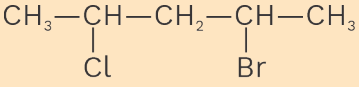
Q29



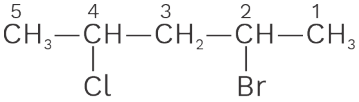
A29



Q30



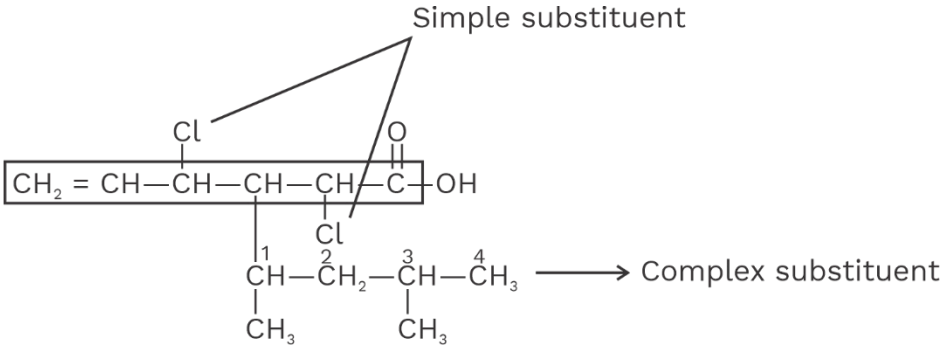
A30



5. Use of numerical prefix

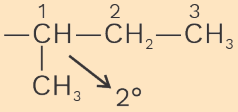
di, tri ..... is used for simple substituents.

bis, tris, tetrakis used for complex substituents.



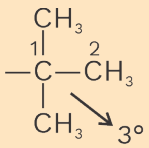
Substituted substituent is known as complex substituent.

Q31 **Write the IUPAC name of complex substituent.**



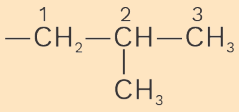
A31 1-Methyl propyl or sec-butyl

Q32



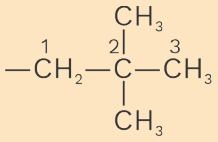
A32 1-dimethyl ethyl or tert-butyl

Q33



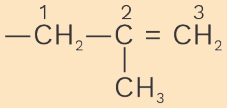
A33 2-Methyl propyl or iso-butyl

Q34



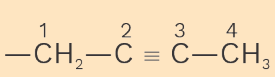
A34 2,2-dimethyl propyl or neo-pentyl

Q35

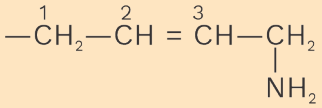


A35 2-Methyl-prop-2-enyl

Q36

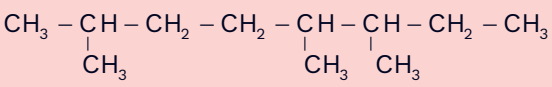


A36 But-2-ynyl

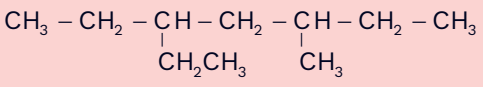
Q37 

A37 4-Amino-but-2-enyl

NCERT PrepUp 12.7 (Pg. 343)
Structures and IUPAC names of some hydrocarbons are given below. Explain why the names given in the parentheses are incorrect.

(a) 

2,5,6 – Trimethyloctane
[and not 3,4,7-Trimethyloctane]

(b) 

3-Ethyl-5-methylheptane
[and not 5-Ethyl-3-methylheptane]

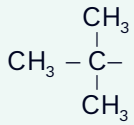
Solution
(a) Lowest locant number, 2,5,6 is lower than 3,5,7,
(b) substituents are in equivalent position; lower number is given to the one that comes first in the name according to alphabetical order.

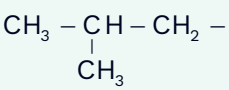
Previous Year's Questions

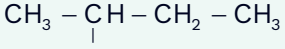
Previous Year Question's
The structure of isobutyl group in an organic compound is

[NEET-2013]

(1)

(2) 

(3) 

(4) 

Concept Ladder

MIC (Methyl Isocyanate) is extremely poisonous gas, which related to Bhopal Gas tragedy in 1984.

Rack your Brain

Why sp-hybridization is more electronegative as compared to sp^2 and sp^3-hybridization?

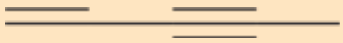
6. Alphabetical order of Substituents

In case of simple substituents :

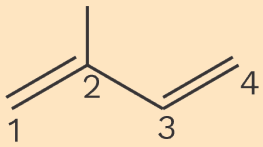
Cyclo, iso, neo are considered in alphabetical order rest all like di, tri, sec, tert are avoided.

In case of complex substituent :

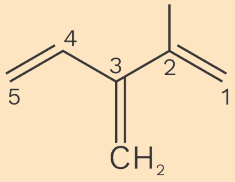
First alphabet decide alphabetical order.

Q38 

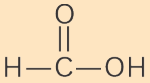
A38 Pent-1-en-3-yne

Q39 

A39 2-Methyl-buta-1,3-diene

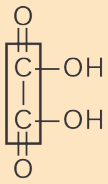
Q40 

A40 2-Methyl-3-methylidene-penta-1,4-diene

Q41 

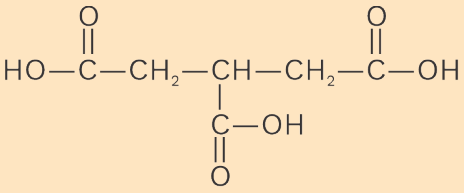
A41 Methanoic Acid

Q42



A42 Ethan-3,2-dioic acid [Oxalic acid]

Q43

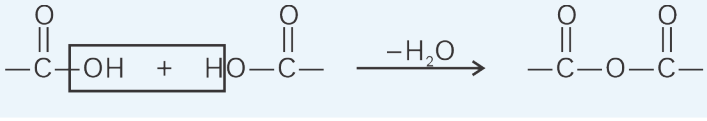


A43 Propane-1,2,3-tricarboxylic acid

- **Special Rule**

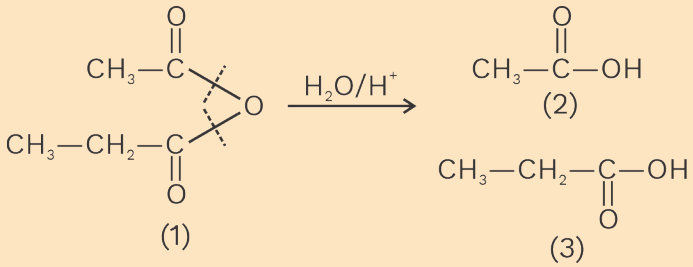
F.G.	SUFFIX
—COOH	Carboxylic acid
—SO_3H	Sulphonic acid
—COOR	Alkyl carboxylate
—COX	Carboxyl halide
—$CONH_2$	Carboxamide
—CºN	Carbonitrile
—CHO	Carbaldehyde

7. IUPAC name of Anhydride



IUPAC of Anhydrides always given w.r.t. their respective acids & follow alphabetical order rule.

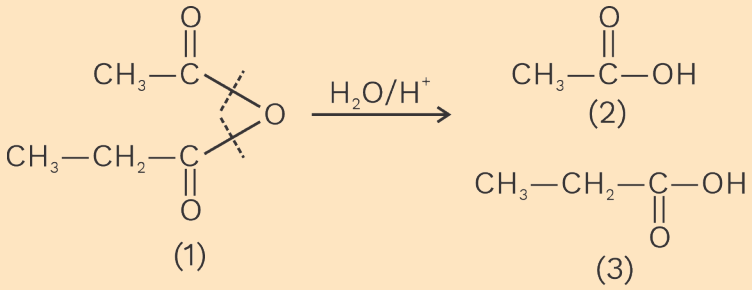
Q44



A44

(1) Ethanaoic-Propanoic anhydride
(2) Ethanoic acid
(3) Propanoic acid

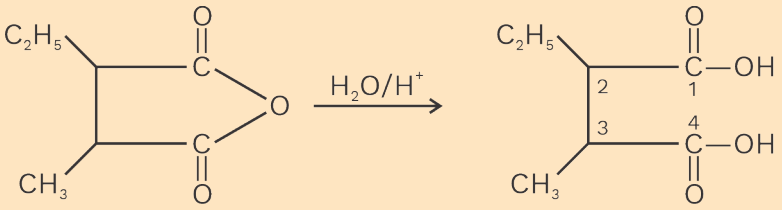
Q45



A45

(1) Methanoic anhydride
(2) Ethanoic acid
(3) Propanoic acid

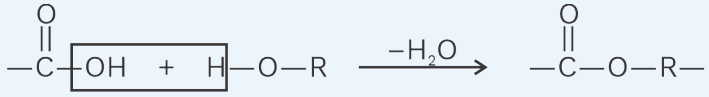
Q46



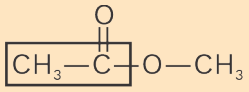
(1) (2)

A46 (1) 2-Ethyl-3-methyl-butan-1,4-dioic anhydride
(2) 2-Ethyl-3-methyl-but-1,4-dioic acid

8. IUPAC name of ester

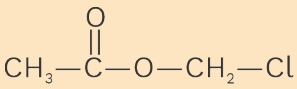


Q47



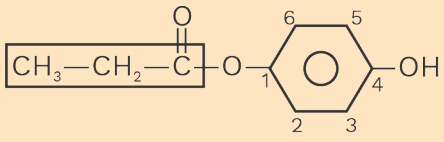
A47 Methyl ethanoate

Q48



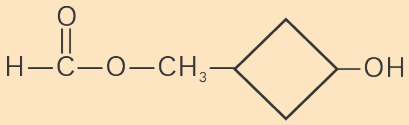
A48 Chloromethyl ethanoate

Q49



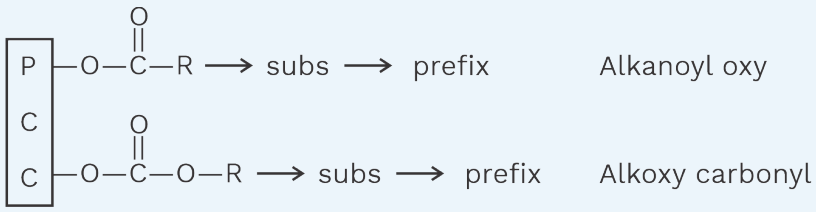
A49 4-Hydroxy-phenyl-propanote

Q50

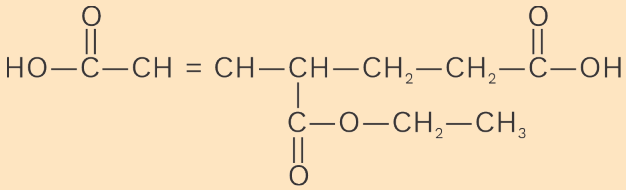


A50 4-Hydroxy cyclobutylmethyl Methanoate

9. Ester as a Substituent

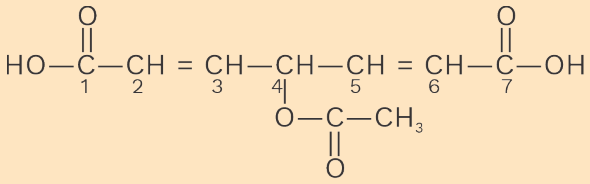


Q51



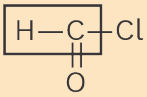
A51 4-Ethoxy-carbonyl-hept-2-en-1,7-dioic acid

Q52

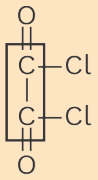


A52 4-Ethoxy-oxy-hepta-2,5-diene-1,7-dioic acid

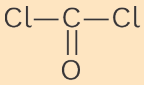
Q53



A53 Methanoyl chloride

Q54 

A54 Ethan-1,2-dioylchloride

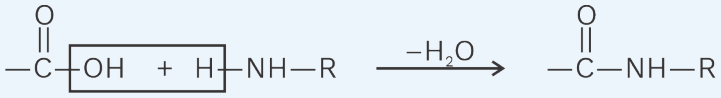
Q55 

A55 Chloro methanoyl chloride [Phosgene gas]

Q56 **CCl_4**

A56 1,1,1,1-tetrachloro methane

10. IUPAC name of Amide

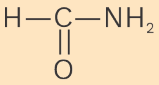


Q57 **$CHCl_3$**

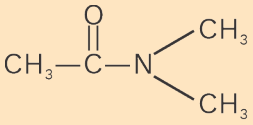
A57 1,1,1-trichloro methane (chloroform)

Q58 **CHI_3**

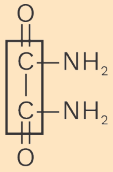
A58 1,1,1-triiodo methane

Q59 

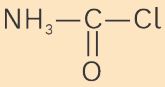
A59 Methanamide

Q60 

A60 N,N-dimethylethanamide

Q61 

A61 Ethan-1,2-diamide

Q62 

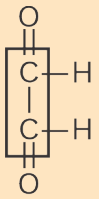
A62 Aminomethanoyl chloride

Q63 

A63 Ethan-1,2-dinitrile

Q64 

A64 Formaldehyde

Q65 

A65 Ethan-1,2-dial

Q66 $CH_3—C(=O)—CH_2—CH_3$

A66 Butan-2-one

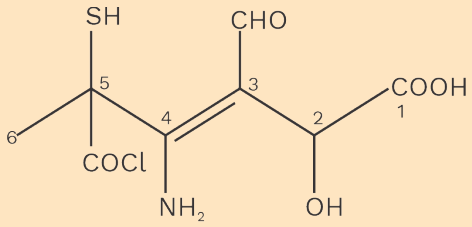
Q67 $CH_3—C(=O)—CH_2—CH_3$

A67 Butan-2-one

Q68 $CH_3—C(=O)—CH_2—CH_2—OH$

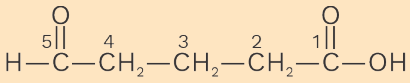
A68 4-hydroxy-butane-2-one

Q69



A69 4-Amino-5-chloroformyl-3-formyl 2-hydroxy-5-mercapto-hex-3-enoic acid

Q70

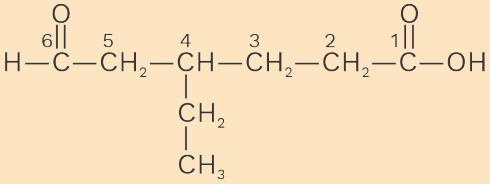


5-oxo-pentanoic acid

A70 5-oxo-pentanoic acid

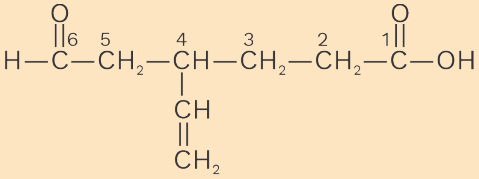
Special case for aldehyde & ketone

Q71



A71 4-Ethyl-6-oxo-hexan-1-oic acid

Q72



A72 4-Ethyl-6-formyl hexan-1-oic acid

Q73 $CH_3 - CH_2 - CH_2 - O - CH_3$

A73 1-Methoxy propane

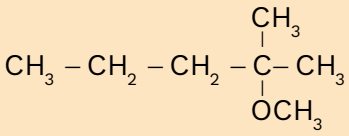
11. Naming of Ether

Ether can never be PFG. It always behaves as a substituent & alkoxy prefix is used.

Note : All ethers are polar aprotic solvent

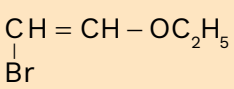
R-O-R

Q74



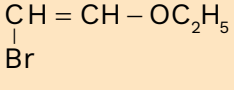
A74 2-Methoxy-2-methyl pentane

Q75



A75 1-Bromo-2-ethoxy ethene

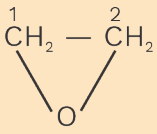
Q76



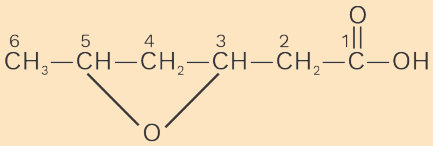
A76 1-Ethoxy-methan-1-ol

12. IUPAC name of cyclic ether

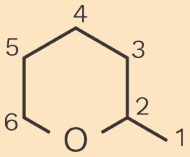
In case of cyclic ether to give IUPAC name compound heated as a open chain compound & this case epoxy prefix used.

Q77 

A77 Epoxy ring system
1,2-epoxy ethane

Q78 

A78 Epoxy ring system
3,5-epoxy hexanoic acid

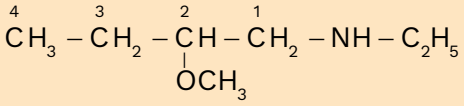
Q79 

A79 2,6-epoxy hexane

Q80 $(CH_3)_3\ddot{N}$

A80 N,N,N-tri methyl amine

Q81

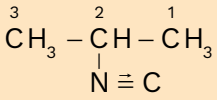


A81 N-Ethyl-2-Methoxy-butan-1-amine

13. IUPAC name of Isocyanide

In case of isocyanide even C-atom present in isocyanide, still we select PCC assuming that there is no carbon in it.

Q82



A82 Propan-2-isonitrile (old system)
2-carbylamino propane (new system)

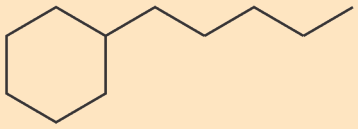
IUPAC name of Cyclic compounds

Rule 1 : If given compound is combination of open & closed chain hydrocarbon part then their principal part is selected according to given IUPAC series.

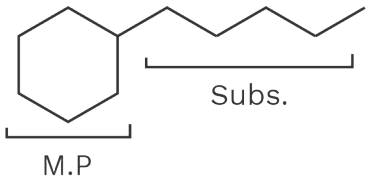
If C-atom equal same-same

[PFG > M.B. > No. of C-atoms in PCC > Ring]

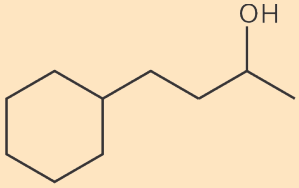
Q83



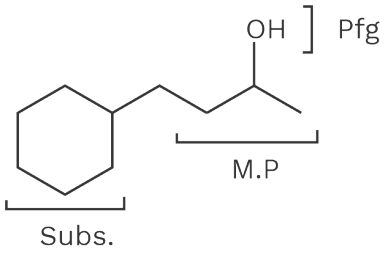
A83



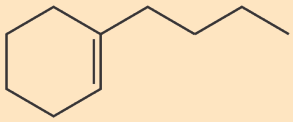
Q84



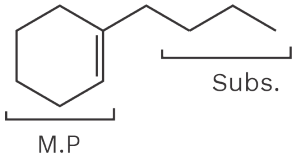
A84



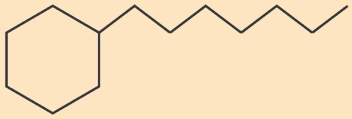
Q85



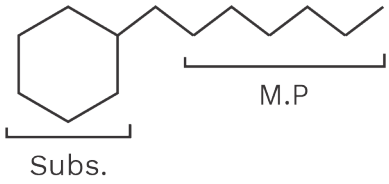
A85



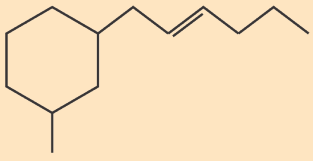
Q86



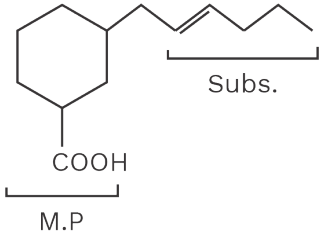
A86



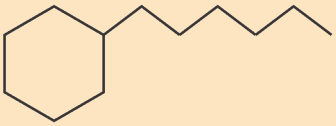
Q87



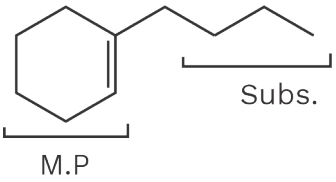
A87



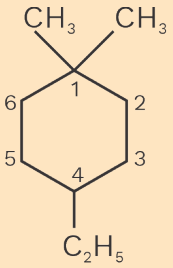
Q88



A88



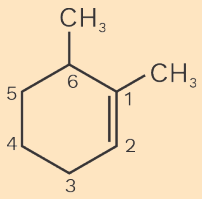
Q89



A89 4-Ethyl-1,1-dimethyl cyclohexane

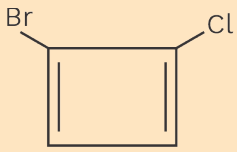
Rule 2 : If PFC directly attached to C-atom of ring then it is considered as a part of ring, not a separate part, but in case of ketone, it may present inside a ring.
In case of cyclic compound 'cyclic' prefix used.

Q91



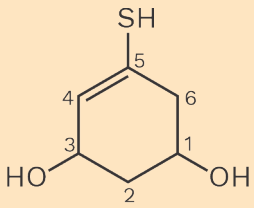
A91 1,6-dimethyl cyclohex-1-ene

Q92



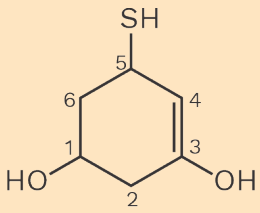
A92 1-Bromo-4-chloro cyclobut-1,3-diene

Q93



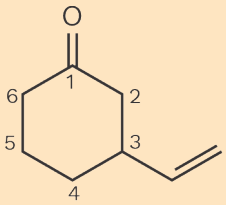
A93 5-Mercapto cyclohex-4-ene-1,3-diol

Q94



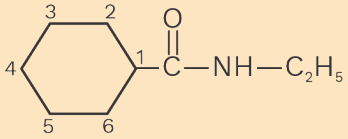
A94 5-Mercapto cyclohex-3-ene-1,3-diol

Q95



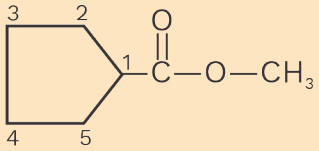
A95 3-Vinyl cyclo hexan-1-one

Q96



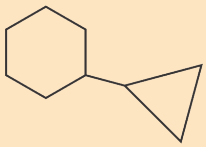
A96 N-ethyl cyclohexan-1-carboxamide

Q97



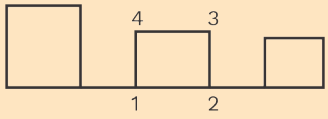
A97 Methyl cyclopentan carboxylate

Q98



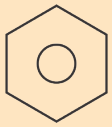
A98 1-Cyclopropyl cyclohexane

Q99

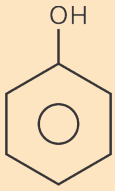


A99 1,2-dicyclobutyl cyclobutane

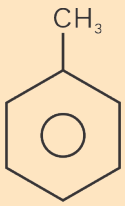
IUPAC name of Aromatic Compound
Rule 1 : Common name of some compounds has been written in IUPAC system.

Q100 

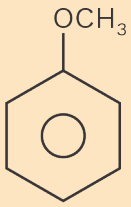
A100 Benzene

Q101 

A101 Phenol

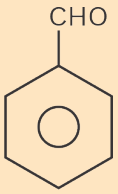
Q102 

A102 Toluene

Q103 

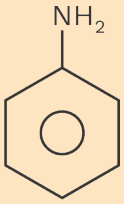
A103 Anisole

Q104



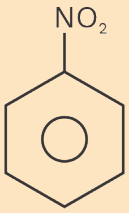
A104 Benzaldehyde

Q105



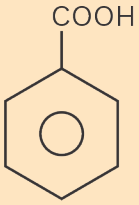
A105 Aniline

Q106



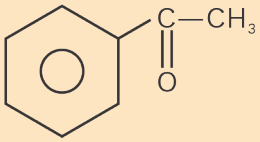
A106 Nitrobenzene

Q107



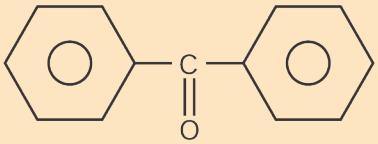
A107 Benzoic acid

Q108



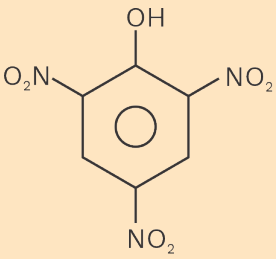
A108 Acetophenone

Q109



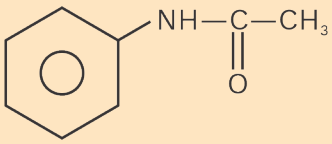
A109 Benzophenone

Q110



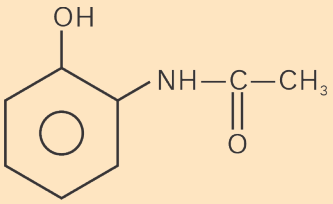
A110 Picric Acid

Q111



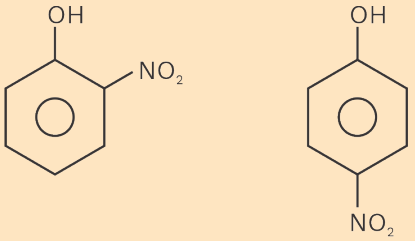
A111 Acetanilide

Q112



A112 Acetaminophen

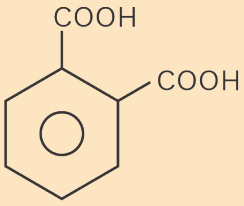
Q113



A113 O-nitrophenol, p-nitrophenol
Hint : Separation by steam distillation method

Rule 2 : If more than one principle functional group are present then suffix is used according to IUPAC rule.

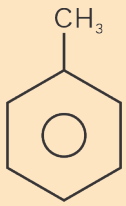
Q114



A114 Benzene-1,2-dicarboxylic acid

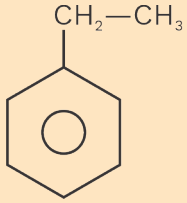
Rule 3 : If given compound is combination of open chain & closed chain hydrocarbon part then except ethyl & methyl benzene open chain part is considered as main part. In this case benzene behaves as a substituent & phenyl propene used.

Q115



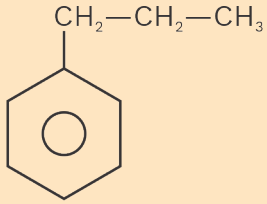
A115 Methyl benzene

Q116



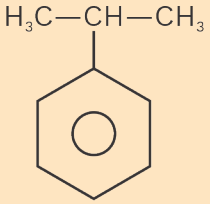
A116 Ethyl benzene

Q117



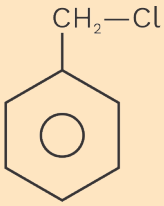
A117 1-Phenyl propane

Q118



A118 2-Phenyl propane

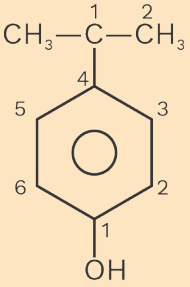
Q119



A119 1-Chloro-1-phenyl methane

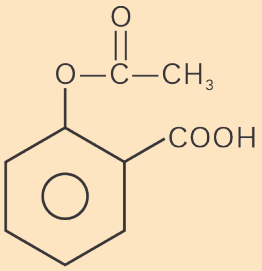
Rule 4 : If any part having functional group then it is considered as main part.

Q120



A120 4[1-Methyl ethyl] Phenol-1-ol
OR 4-Isopropyl Benzene-1-ol

Q121

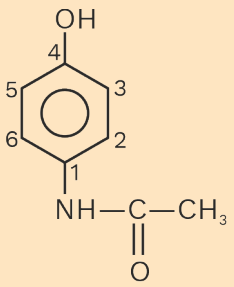


A121 Aspirin
Acetyl Salicylic acid (Chemical name)
Or 2-Ethanoyl-oxy-benzene carboxylic acids

Use of Aspirin
(i) Analgesic (pain)
(ii) Antipyretic
(iii) Anti coagulation
(iv) Anti inflammatory

Aspirin
Paracetamol } alcohol addicts should not used it (causes peptic ulcers)

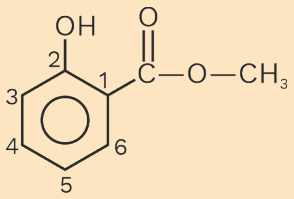
Q122



A122 Paracetamol (PCM)
N-(4-hydroxyphenyl) ethanamide

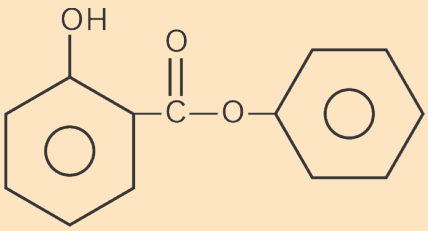
Use of Paracetamol :
(i) Analgesic
(ii) Antipyretic
(iii) Anti inflammatory

Q123



A123 Methyl salicylate
(Oil of winter green)
Use — Joint pain
Methyl-2-hydroxy benzene carboxylate

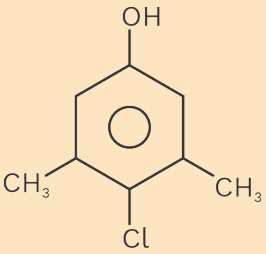
Q124



A124

Salol
Use — Antiseptic
Action — Astrigent
Phenyl-2-hydroxy benzene carboxylate

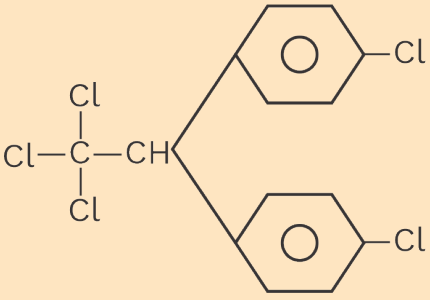
Q125



A125

Chloroxylenol
Dettol — Chloroxylenol + Terpinol
Use — Antiseptic
4-Chloro-3,5-dimethyl benzen-1-ol

Q126

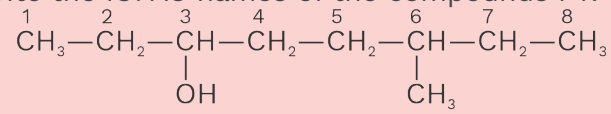


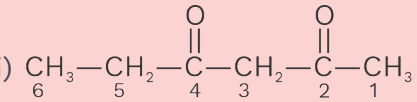
A126

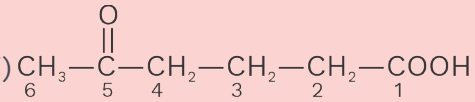
DDT
Non-biodegradable
1,1,1,-Trichloro-2,2-Bis[4-chlorophenyl]ethane

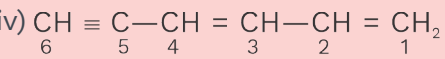
NCERT PrepUp 12.8 (Pg. 344)

Write the IUPAC names of the compounds i-iv from their given structures.

(i) 

(ii) 

(iii) 

(iv) 

Solution

(i)

- The functional group present is an alcohol (OH). Hence the suffix is '-ol'.
- The longest chain containing -OH has eight carbon atoms. Hence the corresponding saturated hydrocarbon is octane.
- The -OH is on carbon atom 3. In addition, a methyl group is attached at 6th carbon.

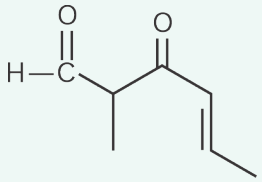
Hence, the systematic name of this compound is 6-Methyloctan-3-ol.

(ii) Hexane-2,4-dione

(iii) 5-Oxo-hexanoic acid

(iv) Hex-1-en-5-yne

Previous Year's Questions

The IUPAC name of the compound  is _____.

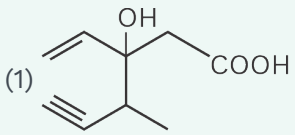
[NEET-2017]

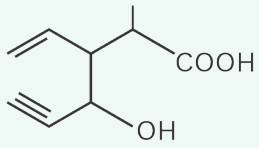
(1) 5-formylhex-2-en-3-one
(2) 5-methyl-4-oxohex-2-en-5-al
(3) 3-keto-2-methylhex-5-enal
(4) 3-keto-2-methylhex-4-enal

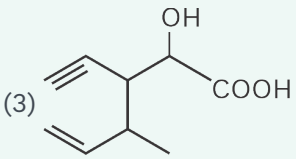
Previous Year's Questions

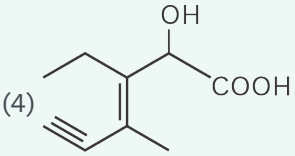
Structure of the compound whose IUPAC name is 3-ethyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid is

[NEET-2013]

(1) 

(2) 

(3) 

(4) 

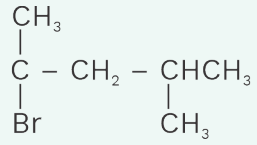
Previous Year's Questions

Which nomenclature is not according to IUPAC system?

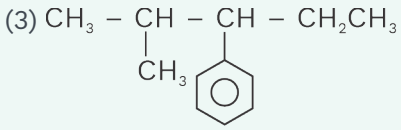
[NEET-2012]

(1) $Br - CH_2 - CH = CH_2$

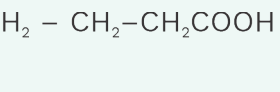
1-Bromoprop-2-ene

(2) 

4-Bromo-2, 4-dimethylhexane

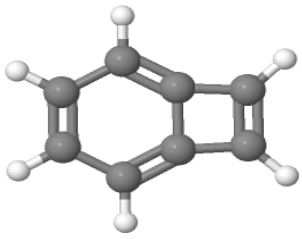
(3) 

2-Methyl-3-phenylpentane

(4) 

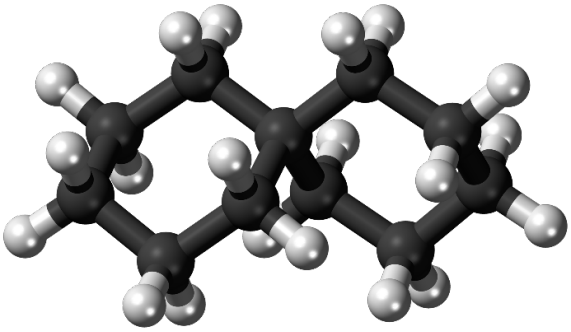
5-Oxohexanoic acid

- **Bicyclo Compounds**



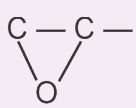
Bicyclo [4.2.0] octane

- **Spiro Compounds**



Spiro [5.5] decane

Chaapter Summary

- A carbon atom can share 4 electrons with other carbons & can form multiple bond. The bonds formed are single, double and triple by sharing of 2, 4 & 6 electrons respectively.
- Priority order of functional group :
- $-COOH > -SO_3H > -COOR > -COX > -CONH_2 > -CN > -NC > -CHO > \rangle C=O > -OH > -SH > -NH_2 > -OR >$  $> -C\equiv C- > -N=N- > -NO_2 > -NO > -X$
- IUPAC name = sec. prefix + primary prefix + word root + primary suffix + sec. suffix.
- IUPAC system of nomenclature is valid for various types of organic compounds such as : Complex branched chain, cyclic compound, polyfunctional groups compounds, bicyclo and spiro compounds.
- If a hydrocarbon has both double and triple bond, it is named as alkyne. While numbering of double bond is preferred over triple bond.
- If more than two carbon containing functional groups are directly attached to unbranched alkane then that carbon chain is considered as principle carbon chain and we use special 2° suffix.
- When two similar functional groups are present at the ends of chain, then carbon of both functional groups is counted in chain.
- When two different carbon containing functional groups are present at the ends of carbon chain, only one carbon atom of principal functional groups is considered in parent chain.
- If two atoms or group of atoms of same priority occupy identical positions from either end of the parent chain, the lower number must be given to atom/group which comes first in alphabetic order.
- Bicyclo compounds contain two fused or infused rings.
- Spiro compounds contain one common carbon.