UNIT : 20 BASIC PRINCILPLES OF ORGANIC CHEMISTRY

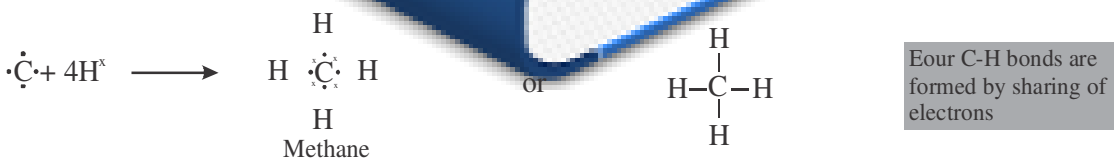
Important Points

- The basic constituent of organic compound is carbon.
- The basic organic copounds in organic chemistry are Hydrocarbon,
- Hydrocarbon compounds comprise of carbon and Hydrogen.
- Variety of organic compound are obtained by subtitution of one or more hydrogen atom of hydrocarbon by element like nitrogen, oxygen, sulpher and halogen OR by functional group.
- So, organic chemistry consists of hydrocarbon and large variety of compounds obtained from the subsitution of their hydrogens.

Tetravalency of Carbon :

The atomic number of carbon is 6 and hence, the number of electron in carbon is 6, so the electronic configuration is $1s^2\ 2s^2\ 2p_x^1, 2p_y^1\ 2p_z^0$. Here the number of electrons in its outermost orbit are four. In order to attain a stable electronic configuration like inert gs carbon atom should either lose four electrons or gain four electrons. To achive this, a very large amount of energy is required. Consequently it cannot form C^{4+} or C^{4-} ion. However, the carbon atom shares four electrons with some elements and forms four covelentbonds.

Thus a carbon atom forms four covalent bonds in its compounds. For example, a molecule of methane (CH_4) is formed when four electrons of carbon are shared with four hydrogen atoms as shwon below :

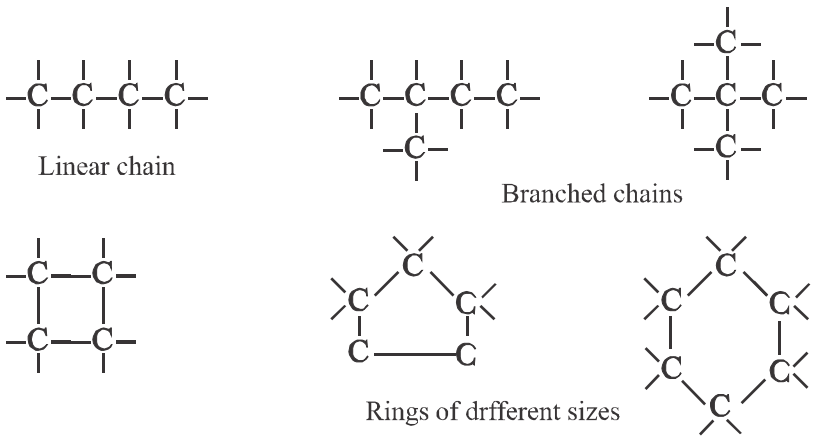


In a similar manar carbon can complete its octet by sharing its valence electrons with the electrons of atoms as well. This charactersitc of carbon atom by virtue of which it forms four covalent bonds is generally referred to as tetracovalency of carbon.

Catenation : a unique property of carbon :

One of the remarkable property of carbon atom is its unique capacity to form bonds with other carbon atoms. This property of forming bonds with atoms of the same element is called catenation. Carbon shows maximum catenation in its group (group 14) in the periodic table. This is because of the larger strength of carbon to carbon bond as compared to that of other atoms. For example, C-C bond is very strong (335 kJ mol^{-1}) in comparison to Si-Si bond (220 kJ mol-1) or Ge-Ge bond (167 kJ mol-1). As a result, carbon atoms can link with each other to form either linear

chains of various lengths of branched chains and even rings of different sizes as shown below :

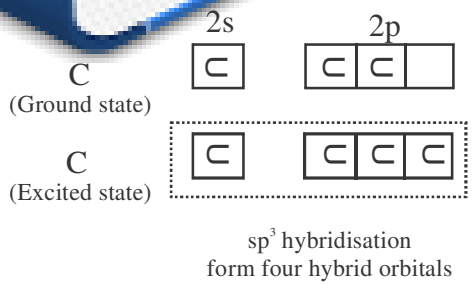


12.3. HYBRIDISATION AND SHAPES OF MOLECULES :

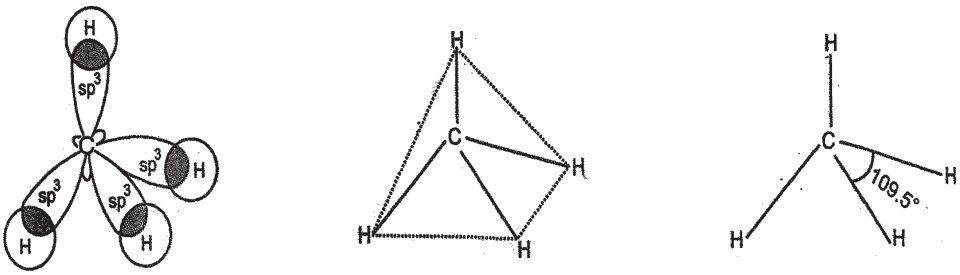
We have studied in unit 4 that carbon atom forms four equivalent tetrahedral bonds because of hybridisation of its valence orbitals. This can explain the shapes of organic molecules. Let us recall the shapes of simple organic molecules on the basis of concept of hybridisation.

1. sp^3 Hybridisation and shapes of alkanes

The carbon atoms in alkanes involve sp^3 hybridisation. As a result, the four bonds formed by each carbon atom are directed towards the corners of a regular tetrahedron. For example, in case of methane (CH_4), the carbon atom involves sp^3 hybridisation and forms four sp^3 hybrid orbitals. Each of these forms sigma bond by overlapping with 1s - orbitals of hydrogen. The four bonds are directed towards the corners of a regular tetrahedron as shown in Fig. The H-C-H bond angle in this molecule is $109^0 28$ (or 109.5^0)



sp^3 hybridisation
form four hybrid orbitals



The structure of methane molecule is also shown in Fig.____

In ethane (H3C-CH3) molecule, each carbon atom undergoes sp3 hybridisation. One of the four sp3 hybridorbitals of one carbon atom overlaps axially with simillar orbital of the other carbon atom to form C-C sigma bond. The remaining three hybrid orbitals belonging to both the carbon atoms overlap axially with the half filled orbitals of Hydrogen atoms to form C-H sigma bonds as shown in Fig.___

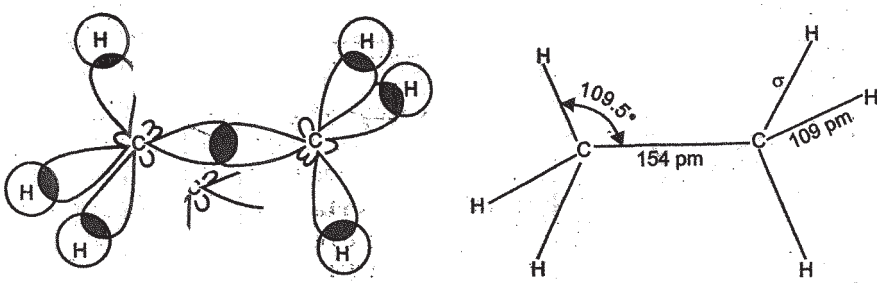
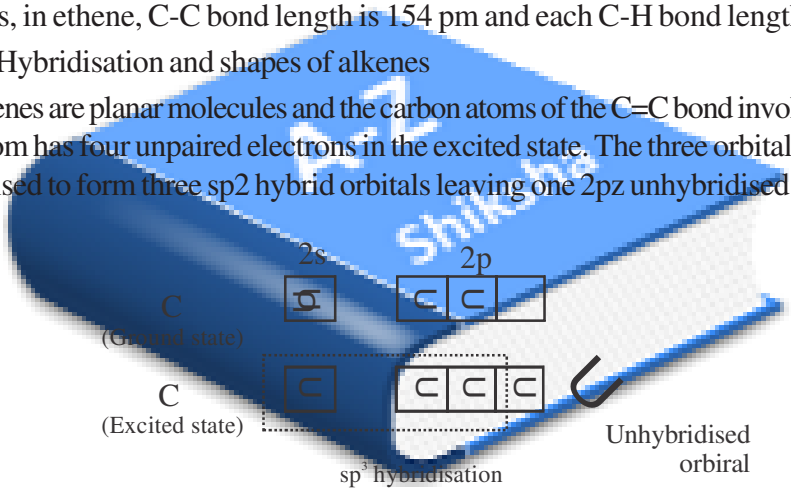


Fig. 12.2 Shape of ethane.

Thus, in ethene, C-C bond length is 154 pm and each C-H bond length is 109 pm.

2. sp2 Hybridisation and shapes of alkenes

Alkenes are planar molecules and the carbon atoms of the C=C bond involve sp2-hybridisation. Carbon atom has four unpaired electrons in the excited state. The three orbitals (one 2s and two 2p) get hybridised to form three sp2 hybrid orbitals leaving one 2pz unhybridised orbital.



For example in the case of ethylene one sp2 hybrid orbital of one carbon atom overlaps with sp2 hybrid orbital of the other carbon atom to form C-C sigma bond. The remaining two sp2 - hybrid orbitals of both the carbon atoms overlap with 1 s-orbitals of two hydrogen atoms to form C-H sigma bonds.

The unhybridised orbital (shown dotted) participates in the formation of pi bond. The orbital structure of ethylene has been shown in fig._____

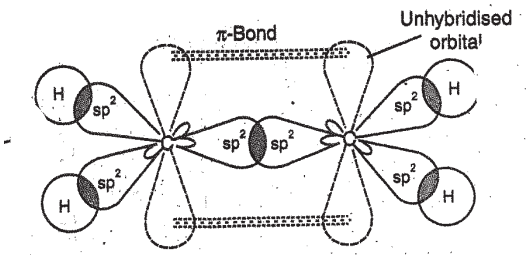
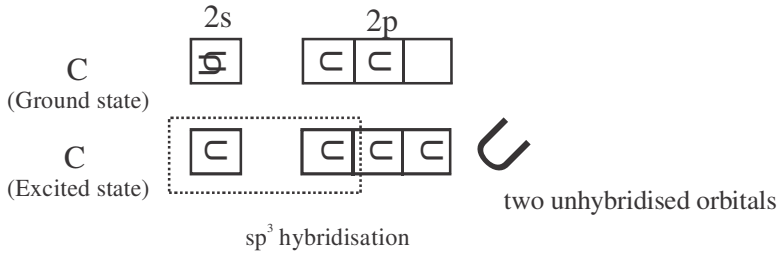


Fig. 12.3. Orbital structure of ethylene.

3. sp Hybridisation and shape of alkynes :

The two carbon atoms constituting the triple bond are sp-hybridised. In this, carbon undergoes sp-hybridisation forming two sp-hybrid orbitals. The two 2p-orbitals (2p, and 2pz) remain unhybridised.



For example, in the case of acetylene, one sp-hybrid orbital of one carbon atom overlaps with sp-hybridorbital of the second carbon atom and forms C-C sigma bond. The remaining sp-hybridorbital of each C-atom forms sigma bond with H-atom. Each of the unhybridised orbitals of one carbon atom forms bond with the second carbon atom so that there are two bonds in acetylene molecule. The structure of acetylene (ethyne) is shown in Fig. 12.4

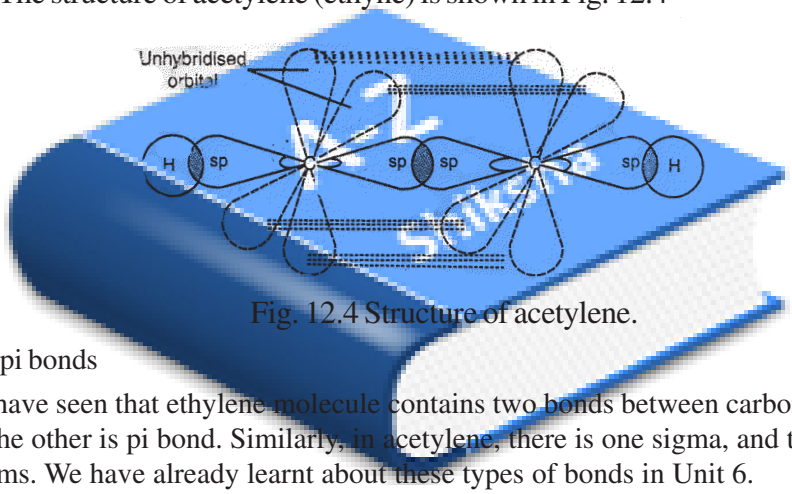


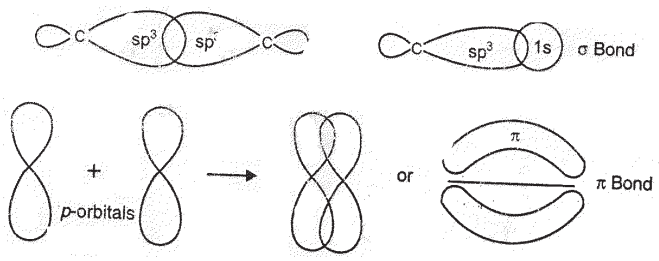
Fig. 12.4 Structure of acetylene.

Sigma and pi bonds

We have seen that ethylene molecule contains two bonds between carbon atoms, one is sigma bond and the other is pi bond. Similarly, in acetylene, there is one sigma, and two pi bonds between carbon atoms. We have already learnt about these types of bonds in Unit 6.

Sigma bond is formed by the end to end overlapping of bonding orbitals along the internuclear axis. This overlapping is known as head on overlap or axial overlap. For example, the overlapping of sp2 hybrid orbitals of two carbon atoms in ethylene or sp hybrid orbitals of two carbon atoms in acetylene.

Pi bond is formed by the sidewise overlapping and the half filled atomic orbitals of bonding atoms. This overlap is known as sidewise overlap or lateral overlap. In this case the atomic orbitals overlap in such a way that their axes remain parallel to each other and perpendicular to the internuclear and below the plane of the participating atoms.



Sigma bonds are stronger bonds than bonds because during the formation of bond, the overlapping of orbitals takes place to a larger extent.

Important features of Bonds : As already discussed, the double bond in ethylene molecule consists of a bond and a bond. The bond has some important features as listed below :

1. In ethylene, as discussed earlier, the two 2p (unhybridised) orbitals participating in the bond are parallel to each other. For the proper sidewise overlap of these 2p-orbitals, all the atoms in C2H4 molecule must be in same plane. Thus, the formation of bond restricts the molecule into a plannar shape. Therefore, ethylene is a flat or planar molecule.

2. Due to the bond formed by sidewise overlap of 2p-orbitals, the rotation of one CH2 fragment with respect to other will be hindered. The rotation of one carbon atom throug h 900 will break the bond because in that case, the unhybridised 2p-orbitals become perpendicular to each other and no sidewise overlap is possible. Hence, to rotation about the double bond is restricted or hindered. As a result, there are two distinct forms of molecules such as $C_2H_2Cl_2$ as shown ahead :

7.5 Functional Groups :

An atom or group of atoms that determines the characteristic reaction of an organic compound is known as functional group. In alkane hydrocarbons due to their saturation they do not contain functional group for their characteristic reaction. The different compounds have the same functional group under similar reactions.

Class of compound	**Functional group**	**IUPAC group prefix/suffix**	**Examples**	**TUPAC Name**
Alkane	R-H	-/ ane	CH_3-CH_3 CH_3-CH_2-CH_3 CH_3-CH_2-CH_2-CH_3	Ethane Propane Butane
Alkane	C=C	-/ ene	CH_2=CH_2 CH_3CH=CH_2 CH_3CH_2CH=CH_2 CH_3CH=CH-CH_3	Eshene Propane But-1-yne But-2-yne
Alkyne	-C = C-	-/ yne	HC = CH CH_3-C=CH CH_3CH_2C=CH CH_3C=C CH_3	Ethyne Propyne But-1-ene But-2-ene
Halide	-X (-F,-CI,-Br,-I)	halo/-	CH_3CH_2 CH_2CI CH_3CH CH_3 CI CH_3CHCH_2 CH_2CH_3 CI	1-Chloropropane 2-Chloropropane 1-Chloropentane
Ether	-OH	alkoxy/-	CH_3OH CH_3CH_2OH $CH_3CH_2CH_2OH$ CH_3CHCH_2 OH	Methanol Ethanol Propan-1-ol Propan-2-ol

Class of compound	Functional group	IUPAC group prefix/suffix	Examples	TUPAC Name
Ether	-O-	alkoxy/-	CH_3-O-CH_3 CH_3-O-CH_2CH_3 CH_3-CH_2-O-CH_2-CH_3	Methoxy methane Methoxy ethane Ethoxy ethane
Aldehyde	-CHO	-/ al	HCHO CH_3CHO CH_3CH_2CHO	Methanal Ethanal Propanal
Ketone	-CO-	-/one	CH_3COCH_3 $CH_3COCH_2CH_3$ $CH_3CH_2COCH_2CH_3$	Propanone Butan-1-one Pentan-3-one
Carboxylic Acid	-COOH	-/oic Acid	HCOOH CH_3COOH CH_3CH_2COOH	Methanoic acid Ethanoic acid Propanoic acid
Estar	-COOR	-/oate	$HCOOCH_3$ CH_3COOCH_3 $CH_3COOCH_2CH_3$	Methyl methanoate Methyl ethanoate Ethyl ethanoate
Amide	-$CONH_2$	-/ amide	CH_3CONH_2 $CH_3CH_2CONH_2$	Ethanamide Propanamide
Amine	-NH_2	(1^0)-/ amine (Primary)	CH_3NH_2 $CH_3CH_2NH_2$ $CH_3CH_2CH_2NH_2$ $CH_3CH\ CH_3$ NH_2	Methanamine Ethanamine 1-Propanamine OR Propan-1-amine Propan-2-amine
	-NH-	(2^0)-/ amine (Primary)	CH_3NHCH_3 $CH_3CH_2NHCH_3$	N-methyl methanamine N-methyl ethanamine
	-N-	(3^0)-/amine (Tertiary)	$CH_3NCH_2CH_3$ CH_3 $CH_3N\ CH_3$	N-N dimethyl ethamine N-N dimethyl methamine
Nitro	-NO_2	nitro/-	$CH_3CH_2NO_2$ $CH_3CH_2CH_2NO_2$ CH_3CHCH_3 NO_2	Nitroethane 1-Nitropropane 2-Nitropropane
Cynide OR Nitrile	-C=N	-/ nitrile	CH_3CN CH_3CH_2CN $CH_3CH_2CH_2CN$	Ethane nitrile Propane nitrile Butane nitrile

7.6 Homologus Series

A series of organic compounds having same functional group in which two successive members differ from each other by fixed number of carbon and hydrogen (CH_2). Such series of organic compounds is known as homologus series. Almost all types of organic compounds form homologus series and they have similar chemical characteristics e.g. CH_4, C_2H_6, C_3H_6, C_3H_8 etc.

7.6.1. Characteristics of Homologus series :

(1) The elements and functional group present in compound of a homologus series are same.

(2) Each member of the series can be expressed by common molecular formula. For example, each member of alkane series can be indicated by a common formula C_nH_{2n+2}.

(3) The difference between the molecular formula of two successive members of the series will be of CH_2.

(4) The difference between the molecular weights of two successive members of a series will be of 14 amu (u).

(5) The name of each member of a series begins either with a common prefix orsuffix.

(6) The chemical reactions of each member of series are same are same if the functional group present in them is same and their methods of preparation are also the same.

(7) As the number of carbon and hydrogen atoms increase with member of a given series the molecular mass of the members increases. Hence there will be gradual change in the properties of the members which depend upon their molecular mass which include boliling point, melting point, density, solubility etc. The characteristics homologous series of alkane compounds are given in table 7.2.

Characteristics of homologous series of alkanes.

Name of Alkane	Molecular formula	Molecular mass gram/mole	Melting poing^{0}K	Bolling polint^{0}K	State
Methane	CH_4	16	91	109	gas
Ethane	C_2H_6	30	87	184	gas
Propane	C_3H_8	44	83	231	gas
Butane	C_4H_{10}	58	135	272.5	gas
Pentane	C5H12	72	143	309	gas, liquid

7.7 Isomerism

The organic compounds having the same molecular formula but different structures are called isomers. This phemenon is called isomerism. The isomers have been classified mainly in two types depending upon their differences in structural aspects :

(1) Structural isomerism

(2) stereo isomerism

7.7.1. Structural Isomerism : Structural isomerism is a result of different arrangements of atoms or groups of atoms in molecules or organic compounds having same molecular formula. Hence, the organic compounds having same molecular formula but different structures are called structural isomers and and phenomenon as structural isomerism. There are five different types of structural isomerism :

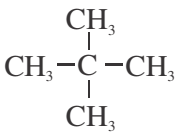
(1) Skeletal or chain isomerism (2) Position isomerism (3) Functional group isomerism (4) Metamerism (5) Tautomerism.

(1) Skeletal or chain isomerism : The organic compounds having same molecular formula but arrangement of carbon atoms in a linear or branch are different ; such type of isomerism is called chain isomerism. Methane, ethane and propane do not exhibit chain isomeism but butane has two isomers. Pentane has three isomers, hexane has give isomers. For example three isomers of pentane are given below.

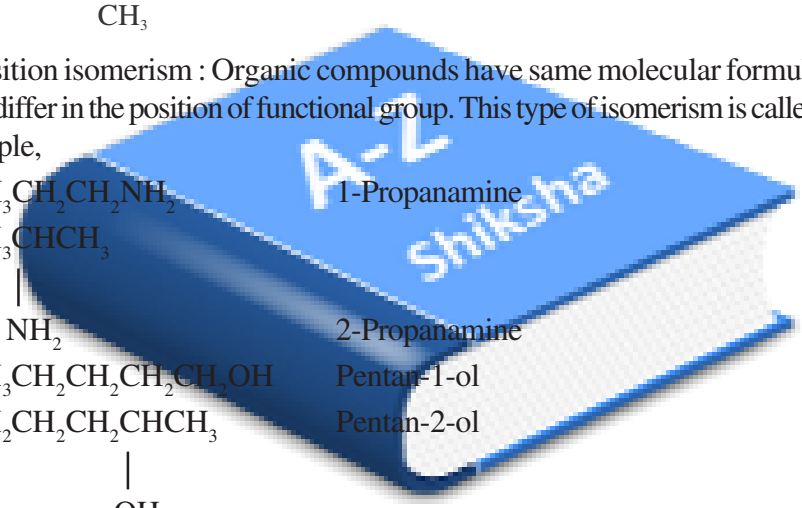
(i) n-pentane $CH_3CH_2CH_2CH_2CH_3$

(ii) 2-methyl butane

(iii) 2,2 dimethyl propane



(2) Position isomerism : Organic compounds have same molecular formula and similar carbon chain but differ in the position of functional group. This type of isomerism is called position isomerism. For example,

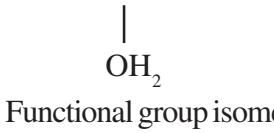


(i) $CH_3CH_2CH_2NH_2$ 1-Propanamine

2-Propanamine

(ii) $CH_3CH_2CH_2CH_2CH_2OH$ Pentan-1-ol

Pentan-2-ol



Pentan-3-ol

(3) Functional group isomerism : The organic compounds having the same molecular formula but different functional groups are called functional isomers and this phenomenon is called functional group isomerism ; for example,

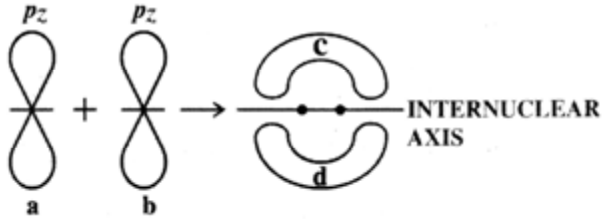
(i)	$CH_3CH_2CH_2OH$	CH_3-O-CH_2CH_3
	propan-1-ol	methoxy ethane
(ii)	CH_3CH_2CHO	CH_3-CO-CH_3
	propanal	propanone
(iii)	CH_3CH_2COOH	CH_3-COO-CH_3
	propanoic acid	methyl ethanoate

M.C.Q.

1. Which type of bond can carbon form?
   (a) ionic (b) covalent (c) metallic (d) vanderwals
2. Why carbon cannot form C^{+4} or C^{-4} ion ?
   (a) require high ionization enthalpy (b) require high electron gain enthalpy
   (c) both a and b (d) High electron negativity
3. In which state C can show tetra valency ?
   (a) ground state (b) transition state (c) excited state (d) all the above
4. How many unpaired electrons are present in ground state?
   (a) 1 (b) 2 (c) 3 (d) 4
5. How many unpaired electrons are present in excited state?
   (a) 1 (b) 2 (c) 3 (d) 4

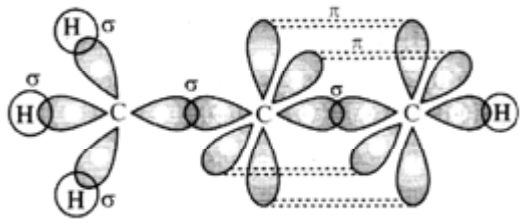
Shape of molecules

6. Which molecule has longest carbon chain ?
   (a) Neopentane (b) Isopentane (c) Neohexane (d) n- pentane
7. Which molecule all the least C-C distance ?
   (a) C_2H_6 (b) C_2H_4 (c) C_2H_2 (d) C_4H_8
8. What is the value of C – C bond length in ethyne ?
   (a) 154 pm (b) 139 pm (c) 134 pm (d) 120 pm
9. π - bonding can occur by the overlapping of _____ .
   (a) s - orbitals (b) p-orbitals (c) sp^2 – orbitals (d) sp – orbitals
10. Look at the figure given below and select the right option.



   (a) a and b are sp^3 orbitals and their side wise overlapping forms two π - bonds.
   (b) c and d are two π - bonds concentrated around bond axis.
   (c) c and d are two electron clouds of one π - bond and it is formed by the side wise overlap between two p_z orbitals.
   (d) c and d are two σ - bonds formed by the lateral overlap of two p_z orbitals.
11. In C_6H_6 and C_2H_4, the $\angle H-C-H$ and are respectively _____ .
   (a) 120°, 120° (b) 120°, 90° (c) 120°, 109°28' (d) 180°, 190°28'

12. Which of the following is incorrect for the following structure



(1) C having $-CH_3$ bond in the molecule is in sp^3 hybridisation and so all the sp^3 hybride orbital and used in σ - bonds.

(2) That 4C – H and 2C – C type bonds are present in the molecule.

(3) The molecule becomes planar triangular because of two σ bonds having sp hybridization two bonds in which bond angle is 120^o.

(4) The H-C-C angle is 109^o 28' because of sp^3 hybridization of $-CH^3$ group in C in the whole molecule but the other two C with it are in sp hybridation and so linear and joined by triple bond.

(a) 1 (b) 2 (c) 3 (d) 4

Hybridization

13. The compound in which carbon uses only its sp^3 hybrid orbitals for bond formation is

(a) HCOOH (b) $(NH_2)_2CO$ (c) $(CH_3)_3$ COH (d) $(CH_3)_3$ CHO

14. The bond between carbon atom (1) and carbon atom (2) in compound N = C – CH = CH_2 involves the hybridised carbon as

(a) sp^2 and sp^2 (b) sp^3 and sp (c) sp and sp^2 (d) sp and sp

15. Number of electrons in cyclobutadienyl anion $(C_4H_4)^{-2}$ is

(a) 2 (b) 4 (c) 6 (d) 8

16. Homolytic fission of C - C bond in ethane gives an intermediate in which carbon is

(a) sp^3 hybridized (b) sp^2 hybridized (c) sp hybridized (d) sp^2d hybridized

17. A straight chain hydrocarbon has the molecular formula C_8H_{10}. The hybridisation for the carbon atoms from one end of the chain to the other are respectively sp^3, sp^2, sp^2, sp^3, sp^2, sp^2, sp and sp. The structural formula of the hydrocarbon would be

(a) $CH_3-C\equiv C-CH_2-CH=CH-CH=CH_2$

(b) $CH_3-CH_2-CH=CH-CH_2-C\equiv C-CH=CH_2$

(c) $CH_3-CH=CH-CH_2-C\equiv C-CH=CH_2$

(d) $CH_3-CH=CH-CH_2-CH=CH-C\equiv CH$

18. The enolic form of acetone contains

(a) 8σbonds, 2π-bonds and 1 lone pairs (b) 9σbonds, 1π bond and 2 lone pairs

(c) 9σ-bonds, 2π-bonds and 1 lone pairs (d) 10σ-bonds, 1π-bonds and 1 lone pairs

19. During the addition reaction of ethane, whichtype of change in hybridization of carbon atom takes place ?

(a) sp^2 to sp^3 (b) sp^3 to sp^2 (c) sp to sp^2 (d) sp^3 to sp

20. When the hybridization state of carbon changes from sp^3 to sp^2 and finally to sp, the angle between the hybridized orbitals

(a) decreases (b) increases and decreases

(c) is not affected (d) increases progressively

21. Match the following : (More than one option in column - II may match with single option in column-I). Match the hybridization state of below listed carbon atoms.

$CH_2 = C = CH - CH_2 - C$? $C - CH_2 - NH_2$

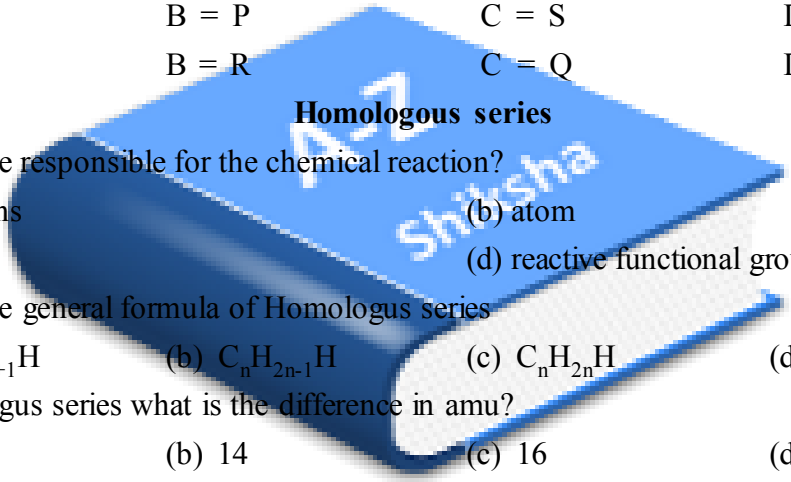
Column - I **Carbon atoms**	**Column - II** **Hybridization state**
(A) C_1	(P) sp
(B) C_2	(Q) sp^2
(C) C_5	(R) sp^3
(D) C_6	(S) dsp^2

(a) A = R B = P C = Q D = P

(b) A = P B = P C = Q D = R

(c) A = R B = P C = S D = P

(d) A = S B = R C = Q D = P



Homologous series

22. What is the responsible for the chemical reaction?

(a) electrons (b) atom

(c) proton (d) reactive functional groups

23. What is the general formula of Homologus series

(a) $C_nH_{2n+1}H$ (b) $C_nH_{2n-1}H$ (c) $C_nH_{2n}H$ (d) $C_nH_{2n+2}H$

24. In homologus series what is the difference in amu?

(a) 12 (b) 14 (c) 16 (d) 18

25. As number of C atom in homologus series increases Then which of the following will increases?

(a) B.P/M.P (b) solubility (c) density (d) all

26. Which of the following exist in gas and liquid State?

(a) ethane (b) propane (c) butane (d) pentane

27. Among the following, which isnot an example of a homologous series ?

(a) $CH_3OH, CH_3CH_2OH, CH_3CH_3CH_3OH$

(b) $CH_4, C_2H_6, C_3H_8, C_4H_{10}$

(c) $CH_3CHO, CH_3CH_2CHO, CH_3CH_2CH_2CHO$

(d) $CH_3COOH, CH_3COOCH_3, CH_3COOCH_2CH_3$

28. In homologous series :

(a) Molecular formula is same (b) Structural formula is same

(c) Physical properties are same (d) General formula is same

29. Which of the following is the first member of ester homologous series ?
(a) Ethyl ethanoate (b) Methyl ethanoate
(c) Methyl methanoate (d) Ethyl methanoate

30. Which of the following is the triad of a homologous series -
(a) CH_3NH_2, $(CH_3)_2NH$, $(CH_3)_3N$ (b) C_2H_5OH, $(CH_3)_2CHOH$, $(CH_3)_3COH$
(c) Both the above (d) $CH_2 = CH_2$, $CH_3 - CH = CH_2$, $C_2H_5 - CH = CH_2$

31. What is not true about homologous series ?
(A) All the members have similar chemical properties
(B) They have identical physical properties
(C) They can be represented by a general formula
(D) Adjacent members differ in molecular mass by 1

Isomerism Structural and sterioisomers

32. The total possible number of chain isomers for the molecular formula C5H12 would be –
(A) 3 (B) 2 (C) 4 (D) 5

33. 2-chlorobutane & 3-chlorobutane are-
(A) Positional isomers (B) Chain isomers (C) Geometrical (D) None

34. Which one of the following pairs are called position isomers –
(a) CH_2 (OH) CH_2COOH & CH_3 - CH (OH) COOH
(B) C_2H_5OH & CH_3OH (c) $(C_2H_5)_2CO$ & $CH_3COCH_2CH_2CH_3$
(D) All the above

35. Which of the following are isomers -
(A) Ethanol and ethoxy ethane (B) Methanol and methoxy methane
(C) Propanoic acid and ethyl acetate (D) Propionaldehyde and acetone

36. How many aliphatic carbonyl compounds are possible having the molecular formula $C_5H_{10}O$ –
(A) 4 (B) 5 (C) 6 (D) 7

37. The formula $C_4H_8O_2$ represents –
(A) Only an acid (B) Only an ether
(C) Only an alcohol (D) Both ether and alcohol

38. The number of ether metamers represented by the formula $C_4H_{10}O$ is -
(A) 4 (B) 3 (C) 2 (D) 1

39. The phenomenon involving the migration of a proton to give two structural isomers in equilibrium with each other is known is –
(A) Matamerism (B) Tautomerism (C) Cis trans isomerism (D) Stereo isomerism

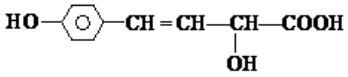
40. In keto-enol tautomerism of dicarbonyl compounds, the enol form is preferred in contrast to the keto-form, this is due to
(A) Presence of carbonyl group on each side of $-CH_2-$
(B) Resonance stabilization of enol form
(C) Presence of methylene group
(D) Rapid chemical exchange.

41. The maximum number of structural isomers (acyclic and cyclic) possible for C_4H_6 are
(a) 4 (b) 5 (c) 6 (d) 7

42. The structures $(CH_3)_3-$ CBr and $CH_3(CH_2)_3$ Br present
(a) chain isomerism (b) position isomerism (c) functional isomerism (d) both (a) and (b)

43. The maximum number of isomers of an alkene with molecular formula C_4H_8 is
(a) 2 (b) 3 (c) 4 (d) 5

44. A compound which is not isomeric with diethyl ether is



(a) n-propyl methyl ether (b) 1-butanol
(c) 2 methyl-2-propanol (d) butanone

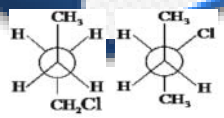
45. The compound will show
(a) geometrical isomerism (b) optical isomerism
(c) geometrical and optical isomerism (d) neither geometrical nor optical isomerism

46. Which of the following will exhibit optical isomerism?
(a) CH_3CH_2 COOH (b) CH_3 CH OH COOH
(c) CH_3 CHOH CH_3 (d) CH_3CH_2 CH_2 OH

47. The compound $C_4H_{10}O$ can show
(a) metamerism (b) functional isomerism
(c) position isomerism (d) all types

48. How many cyclic isomers of C_5H_{10} are possible?
(a) 4 (b) 3 (c) 2 (d) 5

50. The pair of structures given below represent



(a) enantiomers (b) diastereomers (c) structural isomers (d) none of the above

51. Which of the following compounds can be optically active?
(a) propionic acid (b) 2-chloropropionic acid
(c) 3-chloropropionic acid (d) chloropropionic anhydride

52. Which one of the following can exhibit cis-trans isomerism?
(a) CH_3—CHCl—COOH (b) H—C ≡ C—Cl
(c) ClCH = CHCl (d) $ClCH_2$—CH_2Cl

53. Compound having open chain is -
(A) Pentane (B) Isopentane (C) Neopentane (D) All the above

54. In unsaturated compound have –
(A) Carbon - carbon double bond (B) Carbon - carbon tripel bond
(C) Carbon - carbon double and triple bond (D) Carbon - oxygen double bond

55. Which is an acyclic compound :

(A) Methane (B) Benzene (C) Pyrrole (D) Cyclobutane

56. Match the following :

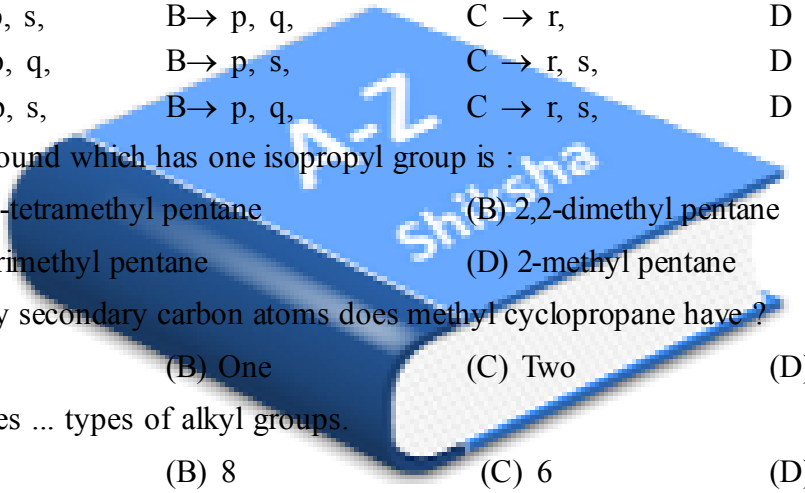
	I Compounds	II Class of compounds
(A)		(p) Saturated compound
(B)		(q) Heterocyclic compound
(C)		(r) Unsaturated compound
(D)		(s) Hydrocarbon

(A) A→ p, s, B→ p C → r, s D → q

(B) A→ p, s, B→ p, q, C → r, D → s

(C) A→ p, q, B→ p, s, C → r, s, D → p

(D) A→ p, s, B→ p, q, C → r, s, D → p



57. The compound which has one isopropyl group is :

(A) 2,2,3,3-tetramethyl pentane (B) 2,2-dimethyl pentane

(C) 2,2,3-trimethyl pentane (D) 2-methyl pentane

58. How many secondary carbon atoms does methyl cyclopropane have ?

(A) None (B) One (C) Two (D) Three

59. C_5H_{12} gives ... types of alkyl groups.

(A) 5 (B) 8 (C) 6 (D) 4

60. The total number of secondary H-atoms in the structure given below are : $(CH_3)_2CHCH_2C_2H_5$

(A) 1 (B) 4 (C) 3 (D) 2

61. iso-octane contains

(A) 5 primary. one secondary. & two tertiary. C atoms.

(B) 4 prim. 2 sec. & one ter. C atoms.

(C) 5 (1^oC). one (2^oC), one (3^oC) & one (4^oC) atoms.

(D) 4 (1^oC). two (2^oC), one (3^oC) & one (4^oC) atoms.

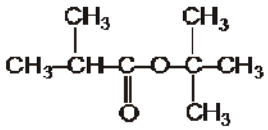
62. Which of the following radicals are bivalent ?

(a) Ethylidene (b) Vinylidene (c) Benzyl (d) Methylidyne

(A) a , d (B) a , b , d (C) a , b (D) a, b, c

Trivials name

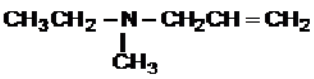
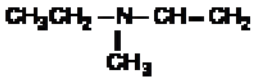
63. The common name of given ester is -

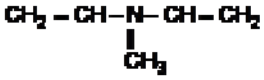
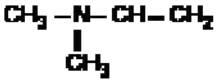


(A) neo butyl iso butyrate (B) t-butyl n- butyrate

(C) t- butyl iso butyrate (D) iso butyl iso butyrate

64. Ethyl methyl vinyl amine has the structure -

(A)  (B) 

(C)  (D) 

65. The derived name of $(CH_3)_4C$ is –

(A) Tetramethylmethane (B) 2,2-Dimethylpropane

(C) Neopentane (D) None of these

66. The structural formula of isopropyl carbinol is–

(A) $(CH_3)_2$ CHOH (B) CH_3–CHOH–CH_2–CH_3

(C) $(CH_3)_2$ CH.CH_2OH (D) $(CH_3)_3$COH

67. The derived name of iso-valeric acid is.

(A) Ethyl methyl acetic acid (B) iso-propyl acetic acid

(C) trimethyl acetic acid (D) all are

68. Derived name of CH_2=CH–CH_2CO–CH_3 is –

(A) 1-Pentene-1-one (B) Allyl methyl ketone (C) 4-Pentene-2-one (D) Vinyl acetone

69. CH_3–CH(CH_3)CH_2–C≡C–CH=CH_2 its derived name is

(A) 6-methyl-1-heptenyne-3 (B) iso-butyl vinyl acetylene

(C) iso hexynyl ethylene (D) None

IUPAC NAME

70. The correct decreasing order of priority for the functional groups of organic compounds in the IUPAC system of nomenclature is

(A) –SO_3H, –COOH, –$CONH_2$, –CHO (B) –CHO, –COOH, –SO_3H, –$CONH_2$

(C) –$CONH_2$, –CHO, –SO_3H, –COOH (D) –COOH, –SO_3H, –$CONH_2$, –CHO

71. I.U.P.A.C. name of $(CH_3)_2$CH–CH_2–CH_2Br is

(A) 1-bromo pentane (B) 2-methyl-4-bromo pentane

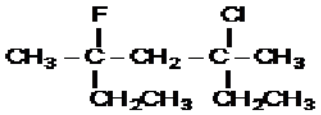
(C) 1-bromo-3-methyl butane (D) 2-methyl-3-bromo propane

72. Which one of the following I.U.P.A.C. name is correct ?

(A) 2-Methyl-3-ethyl pentane (B) 2-Ethyl-3-methyl pentane

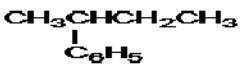
(C) 3-Ethyl-2-methyl pentane (D) 3-Methyl-2-ethyl pentane

73. The IUPAC name of this compound is :



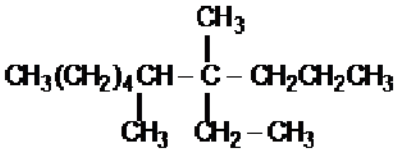
(A) 2-fluoro-4-chloro-2,4-diethyl pentane (B) 3-fluoro-5-chloro-3-methyl-5-ethyl hexane
(C) 3-chloro-5-fluoro-3,5-dimethyl heptane (D) 3,5-dimethyl-5-fluoro-3-chloro heptanes

74. The IUPAC name of the compound is:



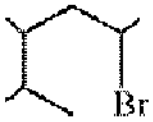
(A) 2-cyclohexyl butane (B) 2-phenyl butane
(C) 3-cyclohexyl butane (D) 3-phenyl butane

75. What is the correct IUPAC name for the following compound ?



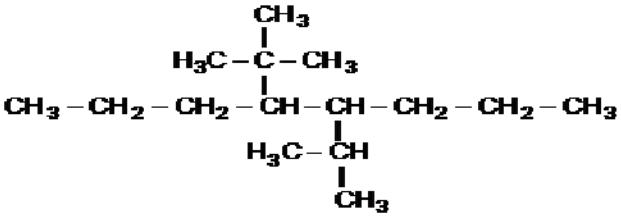
(A) 3,4 - Dimethyl -3-n - propyl nonane (B) 6, 7 - Dimethyl -2- n- propyl nonane
(C) 6,7- Dimethyl -7- ethyl decane (D) 4- Ethyl- 4, 5 - dimethyl decane

76. The IUPAC name of is -



(A) 2-bromo-4-isopropylpentane (B) 2, 3-dimethyl-5-bromohexane
(C) 2-bromo-4, 5-dimethylhexane (D) 5-bromo-2, 3-dimethylhexane

77. Give the IUPAC name of

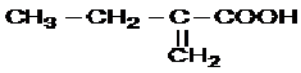


(A) 4-isopropyl-5-ter. butyl octane (B) 4-ter. butyl-5-isopropyl octane
(C) 2-methyl-3-propyl-4-ter. butyl heptane (D) 2, 2-dimethyl-3-propyl-4-isopropyl heptanes

78. The IUPAC name of the compound Br (Cl) CH.CF3 is :

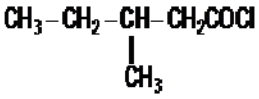
(A) haloethane (B) 1, 1, 1- trifluoro-2-bromo-2- chloroethane
(C) 2-bromo-2-chloro-1, 1, 1- trifluoroethane (D) 1-bromo-1-chloro-2, 2, 2- trifloro ethane

79. The correct IUPAC name of is :



(A) 2-methyl butanoic acid
(B) 2-ethyl- 2-propenoic acid
(C) 2- carboxy-1- butene
(D) None of the above

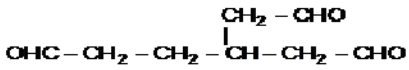
80. The correct IUPAC name of :



(A) 3-methyl pentanoyl chloride
(B) 3-methyl butanoyl chloride
(C) 1-chloro-3-ethyl butanone
(D) 1-chloro-3-methyl pentanone

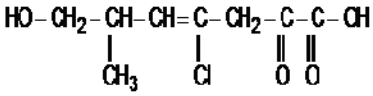
81. The IUPAC name of N ? C $-CH_2-CH_2-OH$ is;
(A) 1-hydroxy ethanenitrile
(B) 3-hydroxy propanenitrile
(C) 2-hydroxy ethyl cyanide
(D) 1-hydroxy-2-cyanoethane

82. The IUPAC name of is :



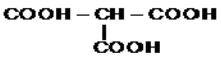
(A) 4, 4-di(formylmethyl) butanal
(B) 2-(formylmethyl) butane-1,4-dicarbaldehyde
(C) hexane-3-acetal-1, 6-dial
(D) 3-(formylmethyl) hexane-1, 6-dial

83. The suffix of the principal group, the prefixes for the other groups and the name of the parent in the structure are given by the set :



(A) -oic acid, chloro, hydroxy, oxo, methyl, 4-heptene
(B) -oic acid, chloro, hydroxy, methyl, oxo, 4-heptene
(C) -one, carboxy, chloro, methyl, hydroxy, 4-heptene
(D) -one, carboxy, chloro, methyl, hydroxy, 4-heptene

84. The IUPAC name of compound

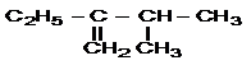


(A) Tricarboxy methane
(B) Propane trioic acid
(C) Tributanoic acid
(D) 2- carboxy propanedioic acid

85. The IUPAC name of is -

(A) 4-oxo-2-pentanol
(B) 4-hydroxy-2-pentanone
(C) pentane-4-ol-2-one
(D) pentane-2-one-4-ol

86. The I.U.P.A.C name of the compound having structure is



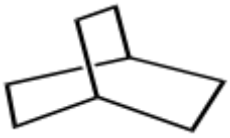
(A) 3-methyl-2-ethyl butene-1
(B) 2-ethyl-3-methyl butene-1
(C) 3-ethyl-3-methyl butene-1
(D) ethyl isopropyl ethane

87. The correct IUPAC name of 2-ethyl-3-pentyne is :

(A) 3-methyl hexyne-4 (B) 4-ethyl pentyne-2

(C) 4-methyl hexyne-2 (D) None of these

88. The name of the compound is -



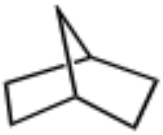
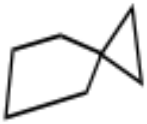
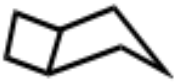
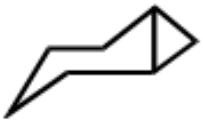
(A) bicyclo [2.2.1] octane

(B) bicyclo [1.1.1] octane

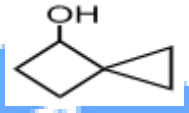
(C) 1, 4-bismethylenecyclohexane

(D) bicyclo [2.2.2] octane

89. Which of the following structures represents bicyclo [3.2.0] heptane -

(A)  (B)  (C)  (D) 

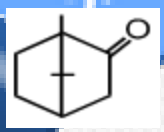
90. The IUPAC name of is -



(A) bicyclo [3.2.0] hexan-2-ol (B) spiro [3.2] hexan-1-ol

(C) spiro [3.2] hexan-4-ol (D) spiro [2.3] hexan-4-ol

91. The IUPAC name of camphor is -



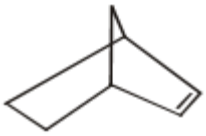
(A) 6-oxo-1,2,2- trimethyl bicyclo [2,2,1] heptane

(B) 1,7,7-trimethyl bicyclo [2,2,1] heptan-2-one

(C) 1,5,5-trimethyl bicyclo [2,1,1] hexan-2-one

(D) 1,7,7-trimethyl bicyclo [2,1,2] heptan-2-one

92. The IUPAC name of compound is -



(A) Bicyclo [2.2.1] hept-2-ene (B) Bicyclo [2.2.1] hept-5-ene

(C) Bicyclo [2.1.2] hept-2-ene (D) Bicyclo [1.2.2] hept-2-ene

93. The IUPAC name of compound is -

(A) Spiro [5.3] nonane (B) Spiro [3.5] nonane

(C) Spiro [5.4] nonane (D) Spiro [4.5] nonane

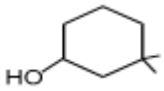
94. Write the correct IUPAC name of the following bond line formula :

(A) N-Methyl N-Ethyl propanamine
(B) N-Ethyl N-methyl propane 1-amine
(C) N-Methyl N-propyl ethan 1-amine
(D) N-Ethyl N-propyl N-methyl amine

95. The IUPAC name of CH3COCH(CH3)2 is –

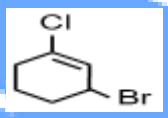
(A) 4-methylisopropyl ketone
(B) 3-methyl-2-butanone
(C) Isopropylmethyl ketone
(D) 2-methyl-3-butanone

96. The IUPAC name of the compound



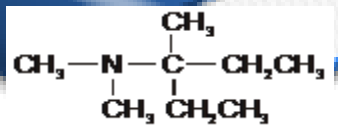
(A) 3,3 -dimethyl-1-hydroxy cyclohexane
(B) 1, 1 – dimethyl–3– hydroxy cyclohexane
(C) 3,3-dimethyl-1-cyclohexanol
(D) 1,1 - dimethyl - 3- cyclohexanol

97. The IUPAC name of the compound shown below is -



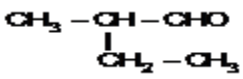
(A) 6-bromo-2-chlorocyclohexene
(B) 3-bromo-1-chlorocyclohexene
(C) 1-bromo-3-chlorocylohexene
(D) 2-bromo-6-chlorocycohex-1-ene

98. IUPAC name of the compound is



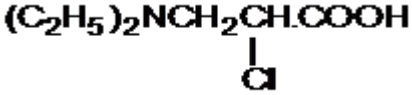
(A) 3-dimethyl amino-3-methyl pentane
(B) 3(N,N-trimethyl) 3 - amino pentane
(C) 3, N, N -trimethyl pentane
(D) 3, N, N-(dimethyl amino)-3-methyl pentane

99. Choose the correct IUPAC name for



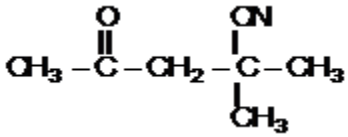
(A) Butan-2-aldehyde
(B) 2-Methylbutanal
(C) 3-Methylisobutyraldehyde
(D) 2-Ethylpropanal

100. The IUPAC name of the compound is :



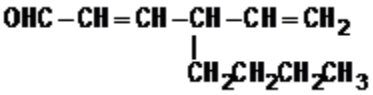
(A) 2- chloro-4- N-ethylpentanoic acid
(B) 2- chloro-3- (N, N-diethyl amino)-propanoic acid
(C) 2- chloro-2- oxo diethylamine
(D) 2- chloro-2-carboxy-N-ethyl ethane

101. The IUPAC name of the compound is :



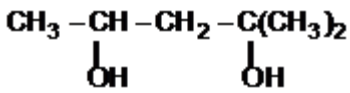
(A) 4- cyano-4-methyl -2- oxo pentane
(B) 2-cyano-2-methyl-4-oxo pentane
(C) 2, 2-dimethyl -4- oxo pentanenitrile
(D) 4- cyano-4-methyl-2-pentanone

102. IUPAC name of is :



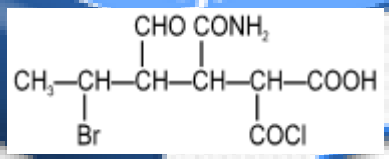
(A) 4-butyl-2,5-hexadien-1-al
(B) 5-vinyloct-3-en-1-al
(C) 5-vinyloct-5-en-8-al
(D) 3-butyl-1,4-hexadien-6-al

103. The IUPAC name of is :



(A) 2-methyl-2,4-dihydroxy propane
(B) 2,2-dimethyl-4-hydroxy butanol
(C) 2-methyl-2,4-pentane diol
(D) 2-hydroxy-4,4-dimethyl butanol-4

104. The IUPAC name of the given compound is -

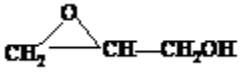


(A) 2-Bromo-4-carbamoyl-5-chloroformyl-3-formylhexanoic acid
(B) 5-Bromo-3-carbamoyl-2-chloroformyl-4-formylhexanoic acid
(C) 4-Formyl-2-chloroformyl-5-carbamoyl-5-bromohexanoic acid
(D) 2-Chloroformyl-3-carbamoyl-4-formyl-5- bromohexanoic acid

105. The structure of 4-methylpentene-2 is

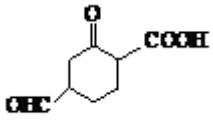
(a) $(CH_3)_2CH—CH_2CH = CH_2$
(b) $(CH_3)_2CH—CH = CH—CH_3$
(c) $(CH_3)_2CH—CH_2—CH = CH_2$
(d) $(CH_3)_2C = CHCH_2CH_3$

106. The IUPAC name of the compound



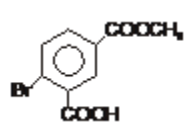
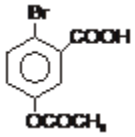
(a) 1, 2 - epoxy - 3 propanol
(b) 1, 2 - oxa - 3 - propanol
(c) 2, 3 - epoxy - 1 - propanol
(d) 2, 3 - epoxy allyl alcohol

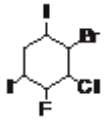
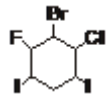
107. The correct IUPAC name of the compound

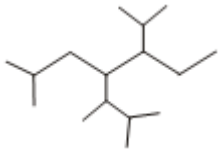


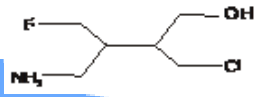
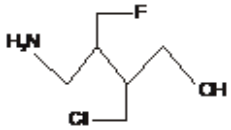
(a) 5 - carboxy - 3 - oxocyclohexane carboxaldehyde
(b) 2 - carboxy - 5 - formylcyclohexane
(c) 4 - formyl - 2 - oxocyclohexane carboxylic acid
(d) 4- carboxy - 3 – oxocyclohexanal

108. Which of the following pair/s have same IUPAC naming

(A)  & 

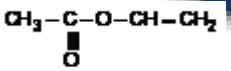
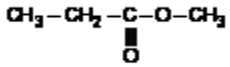
(B)  & 

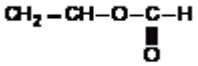
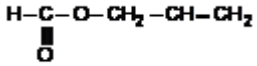
(C)  & 

(D)  & 

109. The general molecular formula of nitroalkanes is :
(a) CnH_2nNO_2 (b) $Cn + 1\ H_2n + 3\ NO_2$
(c) $Cn + 1\ H_2n\ NO_2$ (d) $Cn + 1\ H_2n + 2\ NO_2$

110. Formula of vinyl methanoate is:

(A)  (B) 

(C)  (D) 

111. The IUPAC name of the compound

(a) 4 - methyl cyclopent - 1 - en - 2 - ol (b) 5 - methyl cyclopent - 2 - en - 1 - ol
(c) 2 - methyl cyclopent - 4 - en - 1 - ol (d) 3 - methyl cyclopent - 1 - en - 2 – ol

Reasoning

(A) If both Statement- I and Statement- II are true, and Statement - II is the correct explanation of Statement– I.

(B) If both Statement - I and Statement - II are true but Statement - II is not the correct explanation of Statement – I.

(C) If Statement - I is true but Statement - II is false.

(D) If Statement - I is false but Statement - II is true.

112. Statement I : Ethane and propane are homologues.
Statement II: Ethane and propane belongs to same general formula.
(A) A (B) B (C) C (D) D

113. Statement I : The general IUPAC name of esters is alkyl alkanoate.
Statement II: The simplest ester is HCOOCH3
(A) A (B) B (C) C (D) D

114. Statement I :  is called cyclohexancarbonitrile.
Statement II : It is an aromatic compound.
(A) A (B) B (C) C (D) D

115. Statement I : The IUPAC name of $CH_3–CH=CH–C\equiv C–H$ is pent-3-en-1-yne and not pent-2-en-4-yne.
Statement II : Lowest locant rule for multiple bond is preferred.
(A) A (B) B (C) C (D) D

116. Statement I : The IUPAC name for the compound $C_6H_5COOCH_2CH_2COOH$ is 3-benzoyloxy propanoic acid.
Statement II : $C_6H_5CH_2O$ is called benzoyloxy group.
(A) A (B) B (C) C (D) D

117. STATEMENT -1 4-Methylphenol and phenylmethanol are functional isomers.
STATEMENT -2 Isomeric alcohols and phenols have different chemical properties and therefore they are functional isomers
(A) A (B) B (C) C (D) D

Fission Freeradical Carbocation and anion Electrolf\phillic ion and nucleophilic ion

118. Which of the following statements is wrong ?
(A) a tertiary free radical is more stable than a secondary free radical
(B) a secondary free radical is more stable than a primary free radical
(C) atertiary carbonium ion is more stable than a secondary carbonium ion
(D) a primary carbonium ion is more stable than a secondary carbonium ion

119. Carbon free radicals are -
(A) Diamagnetic (B) Paramagnetic (C) Ferromagnetic (D) Non magnetic

120. Arrange the following nucleophiles in the order of their nucleophilic strength –
(A) $OH– > CH_3COO– > OCH > C_6H_5O–$
(B) $CH_3COO– < C_6H_5O– < OCH < OH–$
(C) $C_6H_5O– < CH_3COO– < CH_3O– < OH–$
(D) $CH_3COO– < C_6H_5O– < OH–< CH_3O$

121. The nucleophilicities of CH3–, NH2–, OH– and F– decrease in the order -
(A) $CH_3– > NH_2– > OH– > F–$
(B) $OH– > NH_2– > CH_3– > F–$
(C) $NH_2– > OH– > CH_3– > F–$
(D) $CH_3– > OH– > F– > NH_2–$

122. Which of the following is the strongest nucleophile -
(A) OH^- (B) CH_3OH (C) CH_3S^- (D) CH_3O^-

123. Which of the following contains three pairs of electrons in the valence shell?
(a) carbocations (b) carbanions (c) free radicals (d) none of these

124. Heterolysis of carbon-chlorine bond produces
(a) two free radicals (b) two carbonium ions
(c) two carbanions (d) one cation and one anion

125. The reaction $(CH_3)_3\ C— Br \rightarrow (CH_3)C^+ + Br^-$ is an example of
(a) homolytic fission (b) heterolytic fission
(c) cracking (d) none of the above

126. Which of the following has the highest nucleophilicity?
(a) F^- (b) OH^- (c) CH_3^- (d) NH_2^-

127. Which species represents the electrophile in aromatic nitration?
(a) NO_2^- (b) NO_2^+ (c) NO_2 (d) NO_3^-

128. The most stable carbonium ion among the following is
(a) $C_6H_5\ C^+\ HC_6\ H_5$ (b) $C_6H_5\ C^+\ H_2$
(c) $CH_3\ ^+CH_2$ (d) $C_6H_5\ CH_2\ C^+H_2$

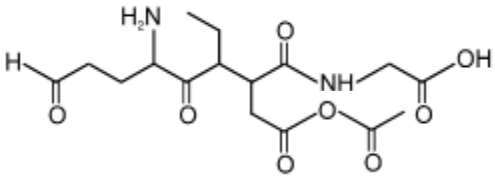
129. Which of the following is the least stable carbanion?
(a) $HC \equiv C^-$ (b) $(C_6\ H_5)_3\ C^-$ (c) $(CH_3)_3\ C^-$ (d) CH_3^-

130. Which of the following is the most stable free radical?
(A) $C_6H_5\dot{C}H_2$ (B) $C_6H_5\dot{C}HCH_3$ (C) $CH_3\dot{C}H_2$ (D) $CH_3\dot{C}HCH_3$

131. Which of the following is the most stable carbocation (carbonium ion)?
(a) $CH_3\ CH_2^+$ (b) $(CH_3)_2\ C^+H$ (c) $(CH_3)_3\ C^+$ (d) $C_6H_5\ C^+\ H_2$

132. What is the decreasing order of stability of the following ions?
(i) $CH_3—C^+H—CH_3$ (ii) $CH_3—C^+H—OCH_3$ and (ii) $CH_3—C^+H—COCH_3$
(a) i > ii > iii (b) ii > iii > i (c) iii > i > ii (d) ii > i > iii

133. Find the no. of functional groups and no. of chiral centres respectively –



(A) 5, 4 (B) 8, 3 (C) 6, 3 (D) 6, 2

Inductive effect Electromeric effect Resonance and hyperconjugation

134. Decreasing – I power of given groups is -
(a) CN (b) NO_2 (c) $– NH_2$ (d) F
(A) b > a > d > c (B) b > c > d > a (C) c > b > d > a (D) c > b > a > d

135. The reaction $C_2H_5Br + KOH\ ?\ C_2H_5OH + KBr$ is an example of
(a) free radical substitution (b) electrophilic substitution
(c) nucleophilic substitution (d) rearrangement reaction

136. Which of the following reactions is an example of elimination reaction?

(a) nitration of benzene (b) chlorination of methane

(c) dehydration of ethanol (d) none of these

137. Which of the following will react most readily with bromine?

(a) $CH \equiv CH$ (b) $CH_2 = CH_2$ (c) $CH_3CH = CH_2$ (d) $CH_3CH_2CH_3$

138. Propyne and propene can be distinguished by

(a) conc.H_2SO_4 (b) Br_2 in CCl_4 (c) dil. $KMnO_4$ (d) $AgNO_3$ in ammonia

139. Which of the following has the smallest heat of hydrogenation per mole?

(a) 1 - butene (b) trans - 2 - butene (c) cis - 2 - butene (d) 1, 3, butadiene

140. The type of delocalisation involving sigma bond orbitals is called

(a) inductive effect (b) hyperconjugation (c) electromeric effect (d) mesomeric effect

141. Arrangement of $(CH_3)_3C–$, $(CH_3)_2CH–$, $CH_3 – CH_2 –$ when attached to benzyl or an unsaturated group in increasing order of inductive effect is

(a) $(CH_3)_3C – < (CH_3)_2CH – < CH_3–CH_2$ (b) $CH_3–CH_2 – < (CH_3)_2CH – < (CH_3)_3C –$

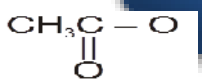
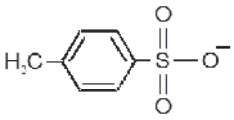
(c) $(CH_3)_2–CH – < (CH_3)_3C – < CH_3–CH_2$ (d) $(CH_3)_3C – < CH_3–CH_2 – < (CH_3)_2CH –$

142. The correct order of increasing basic nature for the bases NH3, CH3NH2 and (CH3)2NH is:

(a) $CH_3NH_2 < NH_3 < (CH_3)_2NH$ (b) $(CH_3)_2NH < NH_3 < CH_3NH_2$

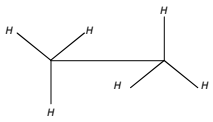
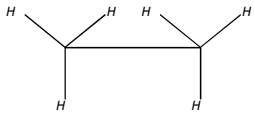
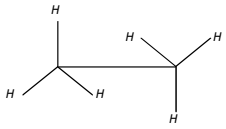
(c) $NH_3 < CH_3NH_2 < (CH_3)_2NH$ (d) $CH_3NH_2 < (CH_3)_2NH < NH_3$

143. The decreasing order of nucleophilicity among the nucleophiles

(1)  (2) CH_3O^- (3) CN^- (4) 

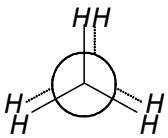
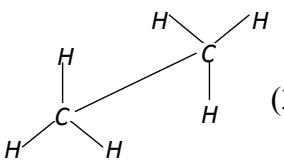
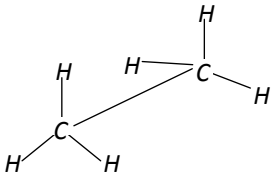
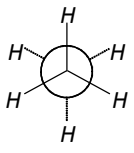
(a) (1), (2), (3), (4) (b) (4), (3), (2), (1) (c) (2), (3), (1), (4) (d) (3), (2), (1), (4)

144. Which one of the following represents eclipsed form of ethane

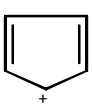
(A)  (B)  (C)  (D) None of these

(a) 1 and 4 (b) 3 and 4 (c) 2 and 4 (d) 1 and 3

145. Which are the staggered forms of ethane

(1)  (2)  (3)  (4) 

146. Among the following the aromatic compound is

(A)  (B)  (C)  (D) 

147. Which of the following gives most stable carbocation by dehydration

(A) $(CH_3)_2CHOH$ (B) $(CH_3)_3C\cdot OH$

(C) $CH_3\cdot CH_2-OH$ (D) $CH_3-CH_2-O-CH_2-CH_3$

148. How many carbon atoms in the molecule are asymmetric

(a) 1 (b) 2 (c) 3 (d) None of these

149. Which of the following compounds will show metamerism

(a) $CH_3COOC_2H_5$ (b) $C_2H_5-S-C_2H_5$ (c) CH_3-O-CH_3 (d) $CH_3-O-C_2H_5$

150. The C - C bond length of the following molecules is in the order

(a) $C_2H_6 > C_2H_4 > C_6H_6 > C_2H_2$ (b) $C_2H_2 < C_2H_4 < C_6H_6 < C_2H_6$

(c) $C_2H_6 > C_2H_2 > C_6H_6 > C_2H_4$ (d) $C_2H_4 > C_2H_6 > C_2H_2 > C_6H_6$

151. In the reaction a chiral centre is produced. This product would be

(a) Laevorotatory (b) Meso compound (c) Dextrorotatory (d) Racemic mixture

152. Cyclic hydrocarbon molecule 'A' has all the carbon and hydrogen in a single plane. All the carbon-carbon bonds are of same length less than 1.54Å, but more than 1.34Å. The bond angle will be

(a) $109^o28'$ (b) 100^o (c) 180^o (d) 120^o

ANSWER KEY

1	b	26	d	51	b	76	b	101	c	126	c	151	d
2	c	27	d	52	c	77	b	102	a	127	b	152	d
3	c	28	d	53	d	78	c	103	c	128	a		
4	b	29	c	54	c	79	b	104	b	129	c		
5	d	30	d	55	a	80	a	105	b	130	b		
6	d	31	b	56	d	81	b	106	c	131	c		
7	c	32	a	57	d	82	d	107	c	132	d		
8	d	33	a	58	c	83	b	108	d	133	c		
9	b	34	c	59	b	84	d	109	b	134	a		
10	c	35	d	60	b	85	b	110	c	135	c		
11	a	36	d	61	c	86	b	111	b	136	c		
12	c	37	a	62	c	87	c	112	b	137	c		
13	c	38	b	63	c	88	d	113	b	138	d		
14	c	39	b	64	b	89	c	114	c	139	b		
15	d	40	b	65	a	90	d	115	a	140	b		
16	b	41	d	66	c	91	a	116	c	141	b		
17	d	42	d	67	b	92	a	117	c	142	c		
18	c	43	c	68	b	93	b	118	d	143	c		
19	c	44	d	69	b	94	b	119	b	144	b		
20	d	45	c	70	d	95	b	120	b	145	c		
21	a	46	c	71	c	96	c	121	a	146	a		
22	d	47	d	72	c	97	b	122	c	147	b		
23	a	48	d	73	c	98	d	123	a	148	b		
24	b	49	a	74	b	99	b	124	d	149	b		
25	d	50	c	75	d	100	b	125	b	150	c		