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Time : 3 Hour 20 Minute | STD 11 Science Chemistry
kd 90+ ch- 8 organic chemistry | Total Marks : 160

*** Choose The Right Answer From The Given Options.[1 Marks Each]** **[68]**

1. Homolyte fission leads to formation of:

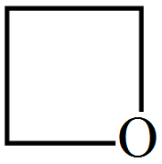
(A) Nucleophile. (B) Carbanion. (C) Free radical. (D) Arbocation.

2. Which functional group is present in a molecule of $CH_3OCH_2CH_3$?

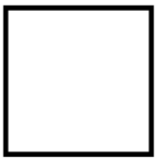
(A) Ether (B) Carboxyl (C) Aldehyde (D) Ester

3. Which of the following is a homocyclic alicyclic compound?

(A)



(B)



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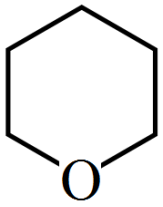
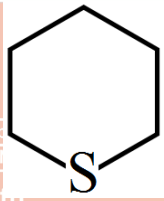


(D)



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4. The fragrance of flowers is due to the presence of some steam volatile organic compounds called essential oils. These are generally insoluble in water at room temperature but are miscible with water vapour in vapour phase. A suitable method for the extraction of these oils from the flowers is:

(A) Distillation. (B) Crystallisation.

(C) Distillation under reduced pressure. (D) Steam distillation.

5. $CH_3 - CH = CH - C \equiv CH$ has IUPAC name:

(A) pent - 2 - en- 4 - yne (B) pent - 4 - yn - 2 - ene

(C) pent - 1 - yn - 3 - ene (D) pent - 3 - en - 1 - yne

6. Passing H_2S gas into a mixture of Mn^{2+},Ni^{2+},Cu^{2+},Hg^{2+} ions in acidified aqueous solution precipitates:

(A) CuS and HgS (B) MnS and CuS

(C) MnS and NiS (D) NiS and HgS

7. The indicator which is used to find the strength of caustic soda solution with the help of oxalic acid is:

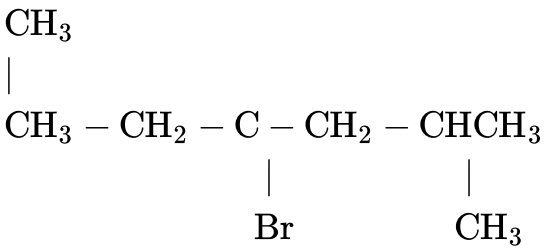
(A) Methyl orange (B) Phenolphthalein

(C) Potassium permanganate (D) None of the above

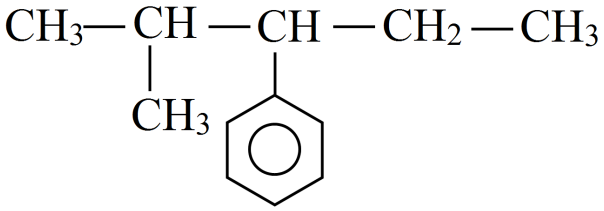
8. Which of the following is not in accordance to IUPAC system?

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

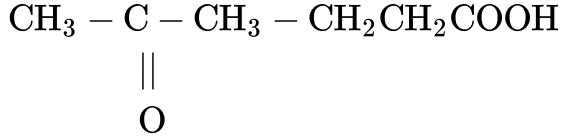
1-bromoprop 2-ene

(B) 

4-bromo-2, 4-dimethyle hexane

(C) 

2-methyl-3-phenylpentane

(D) 

5-oxohexanoic acid

9. The order of priority in IUPAC system:

(A) $-CONH_2, -CHO, -SO_3H, -COOH$

(B) $-COOH, -SO_3H, -CONH_2, -CHO$

(C) $-SO_3H, -COON, -CONH_2, -CHO$

(D) $-CHO, -COOH, -SO_3H, -CONH_2$

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10. Which is not the characteristic of $\pi-$bond?

(A) π bond is formed when a sigma bond already exists.

(B) π bonds are formed from hybrid orbitals.

(C) π bond may be formed by the overlapping of p orbitals.

(D) π bond results from lateral overlap of atomic orbitals.

11. The carbocation stability is:

$\overset{+}{C}H_3 < CH_3\overset{+}{C}H_2 < (CH_3)_2\overset{+}{C}H < (CH_3)_3\overset{+}{C}$

and alkyl radical stability is:

(A) $(CH_3)_2\dot{C}H < CH_3\dot{C}H_2 < CH_3CH_2\dot{C}H < (CH_3)_3\dot{C}$

(B) $(CH_3)_3\dot{C}H < (CH_3)_2CH\dot{C}H_2 < CH_3\dot{C}H_2 < CH_3CH_2\dot{C}H_2$

(C) $(CH_3)_3\dot{C}H < (CH_3)_2CH\dot{C}H_2 < CH_3CH_2\dot{C}H_2 < CH_3\dot{C}H_2$

(D) $CH_3\dot{C}H_2 < CH_3CH_2\dot{C}H_2 < (CH_3)_2CH\dot{C}H < (CH_3)_3\dot{C}H$

12. The trends in physical properties of compounds within a homologous series are due to:

(A) Change in size (B) Change in weight

(C) Functional group (D) Both a and b

13. The colour of bromine solution is:

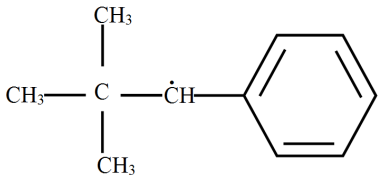
(A) Red (B) Purple (C) Green (D) Blue

14. Group showing strongest +M effect:

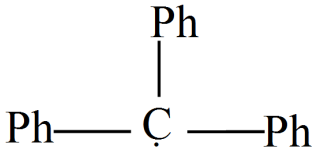
(A) $-NH_2$ (B) $-N(CH_3)_2$ (C) $-NHCH_3$ (D) $-O^-$

15. Consider the following compounds

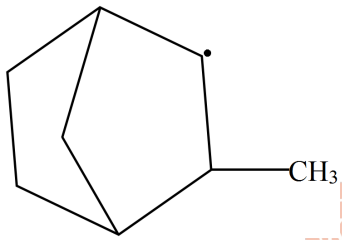
i.



ii.



iii.



Hyper conjugation occurs in:

(A) III (B) I and III (C) I (D) II

16. On complete combustion, 0.246g of an organic compound gave 0.198g of carbon dioxide and 0.1014g of water. The percentage composition of carbon and hydrogen in the compound respectively are:

	%C	%H
(a)	21.95	4.58
(b)	21.95	5.58
(c)	11.95	5.58
(d)	11.95	4.58

17. Which of the following statements is incorrect regarding the naming of complex compounds?

(A) NH^{2-}, will be named as 'amido'

(B) 'en' will be named as 'ethylenediamine'

(C) $C_2O_2S_2^{2-}$ will be named as 'dithio oxalato'

(D) CH^{3-} will be named as 'methyl'

18. In paper chromatography, chromatography paper contains water trapped in it, which acts as the:

(A) Mobile phase. (B) Stationary phase.

(C) Stationary medium. (D) None of these.

19. Which one of these shows least -I effect:

(A) $-OH_2^+$ (B) $-NH_3^-$ (C) $-NO_2$ (D) $-F$

20. Glycerol is purified by:

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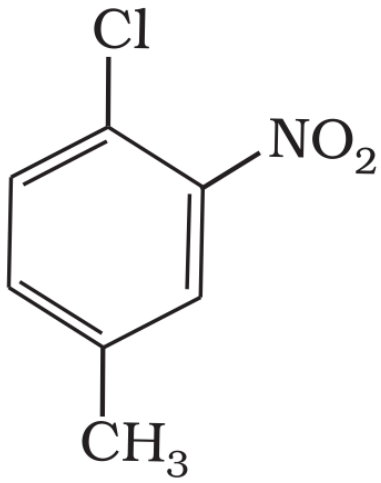
(A) Vacuum distillation.
(B) Simple distillation.
(C) Steam distillation.
(D) Fractional distillation.

21. The IUPAC name for,



(A) 1-Chloro-2-nitro-4-methylbenzene.
(B) 1-Chloro-4-methyl-2-nitrobenzene.
(C) 2-Chloro-1-nitro-5-methylbenzene.
(D) M-nitro-p-chlorotoluene.

22. The increasing order of stability of the following free radicals:

(A) $(C_6H_5)_3\dot{C} < (C_6H_5)_2\dot{C}H < (CH_3)\dot{C} < (CH_3)_2\dot{C}H$
(B) $(C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C} < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$
(C) $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_3\dot{C} < (C_6H_5)_2\dot{C}H$
(D) $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C}$

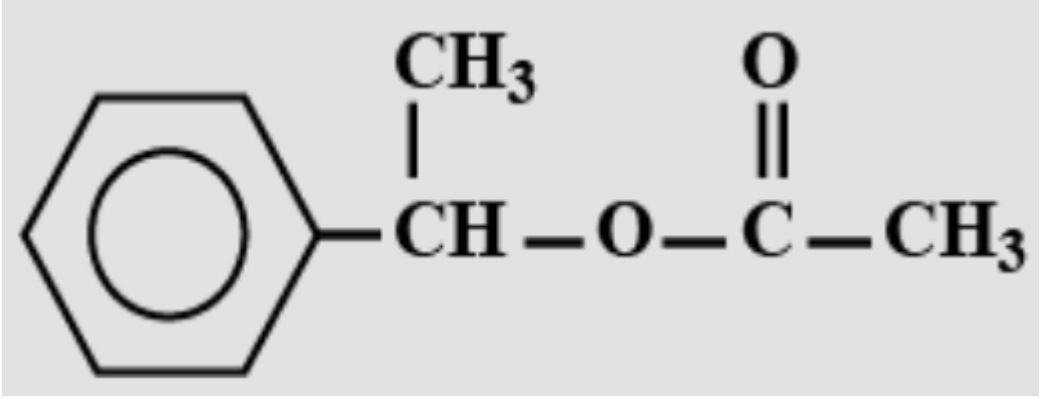
23. Dumas method is used for estimation of:
(A) Carbon
(B) Nitrogen
(C) Oxygen
(D) Sulphur

24. Which functional group is present in a molecule of CH_3Cl?
(A) Amine
(B) Halide
(C) Ether
(D) Ketone

25. The absorption of hydrogen by platinum is known as:
(A) Hydrogenation
(B) Reduction
(C) Dehydrogenation
(D) Occlusion

26. IUPAC name of $CH_3OC_2H_5$ is:
(A) Ethoxy methane
(B) Methoxy ethane
(C) Both (a) and (b)
(D) None of these

27. The IUPAC name is:



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(A) 1-phenyl-1-acetyloxyethane
(B) 1-acetoxyeihylbenzene
(C) 1-phenylethyl ethanoate
(D) 1-methylbenzyl acetate

28. Which of the following represents ketones?
(A) > C = O
(B) - OH
(C) - CHO
(D) - COOH

29. Groups that can show both +M and -M effect:
(A) vinyl
(B) phenyl
(C) -NO
(D) All of these

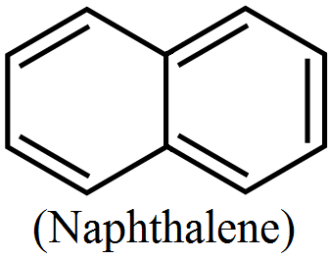
30. The number of sigma and pi bonds in a molecule of cyanogen are:
(A) 4, 3
(B) 3, 4
(C) 5, 2
(D) 3, 5

31. All members of a homologous series have the same:
(A) Chemical formula.
(B) Empirical formula.
(C) Boiling point.
(D) Melting point.

32. Which of the following is the correct IUPAC name?
(A) 3-Ethyl-4, 4-dimethylheptane.
(B) 4, 4-Dimethyl-3-ethylheptane.
(C) 5-Ethyl-4, 4-dimethylheptane.
(D) 4, 4-Bis (methyl)-3-ethylheptane.

33. Which one of the following can show +I effect?
(A) CBr_3
(B) CH_3
(C) CCl_3
(D) CHO

34. Which type of compound is shown by the following structure:



(Naphthalene)

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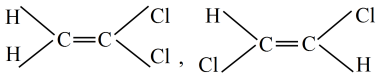
(A) Alicyclic compound.
(B) Benzenoid aromatic compound.
(C) Non-benzenoid aromatic compound.
(D) Acyclic compound.

35. The following compounds show:



(A) Configuration isomerism.
(B) Conformationat isomerism.
(C) Structural isomerism.
(D) Stereo isomerism.

36. The first three members of a homologous series are CH_4,C_2H_6,C_3H_8. The fifth member of this series will be:
(A) C_5H_{10}
(B) C_5H_{14}
(C) C_5H_{12}
(D) C_5H_8

37. Marsh gas is:
(A) C_6H_6
(B) CH_4
(C) C_2H_2
(D) CO

38. Among the following which has greatest -I effect?
(A) $-OH$
(B) $-NH_2$
(C) $-NO_2$
(D) $-F$

39. Correct IUPAC name for $H_3C-\underset{\underset{C_2H_5}{|}}{CH}-\underset{\underset{C_2H_5}{|}}{CH}-CH_3$ _____.

(A) 2- Ethyl-3-methylpentane.
(B) 3, 4- Dimethylhexane.
(C) 2-Sec-butylbutane.
(D) 2, 3-Dimethylbutane.

40. The order of -I effect of orbitals is:

(A) $sp^3 > sp^2 > sp$
(B) $sp > sp^2 > sp^3$
(C) $sp^2 > sp^3 > sp$
(D) $sp^2 > sp > sp^3$

41. The presence of carbon in an organic compound is detected by heating it with:

(A) Sodium metal to convert it to NaCN.
(B) CaO to convert it into CO which burns with a blue flame.
(C) CuO to convert it into CO_2 which turns lime water milky.
(D) Cu wire to give a bluish-green flame.

42. What is the correct order of decreasing stability of the following cations.

I. $CH_3 - \overset{+}{C}H - OCH_3$

II. $CH_3 - \overset{+}{C}H - OCH_3$

III. $CH_3 - \overset{+}{C}H - CH_2 - OCH_3$

(A) II > I > III
(B) II > III > I
(C) III > I > II
(D) I > II > III

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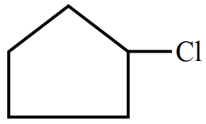
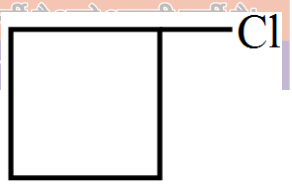
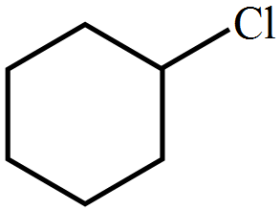
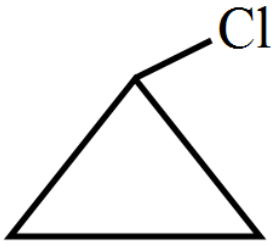
43. In cyclic compounds, the bond-line formula for chlorocyclohexane is represented by which of the following representations?

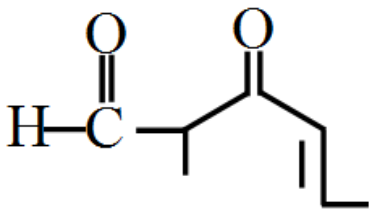
(A)


(B)


(C)


(D)


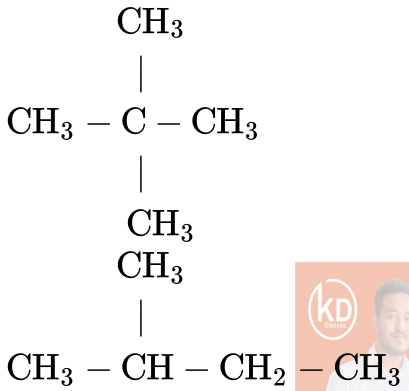
44. The IUPAC name of the compound



(A) 5-Formyl hex-2-en-3-one.
(B) 5-methyl-4-oxohex-2-en-5-al.
(C) 3-keto-2 methyl hex-5-enal.
(D) 3-keto-2-methyl hex-4-enal.

45. Generally pi bond is formed from the lateral overlap of:
(A) s−s orbitals
(B) p−p orbitals
(C) d−d orbitals
(D) Both B and C

46. Study the structures given below carefully and choose the type of isomerism they represent.



(A) Chain isomerism.
(B) Position isomerism.
(C) Functional isomerism.
(D) Metamerism.

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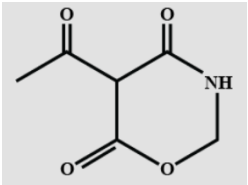
47. Carbon and hydrogen are detected by heating the organic compound with _____.
(A) Magnesium oxide
(B) Cupric oxide
(C) Zinc oxide
(D) Sulphur dioxide

48. Why does ethane have a higher boiling point than methane?
(A) Difference in size
(B) Functional group
(C) Difference in shape
(D) None of above

49. Nucleophile is a species that should have:
(A) A pair of electrons to donate.
(B) Positive charge.
(C) Negative charge.
(D) Electron deficient species.

50. Identify which functional group are not present in the given compound?



(A) Ketone (B) Ester (C) Amide (D) Ether

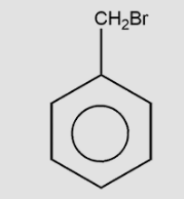
51. Give the functional group of the following.-OH
(A) Aldehydic group
(B) Alcoholic group
(C) Ketonic group
(D) Carboxylic group

52.

In Carius method of estimation of halogens, 250mg of an organic compound gave 141mg of AgBr. The percentage of bromine in the compound is (atomic mass Ag = 108 and Br = 80)

(A) 24 (B) 36 (C) 48 (D) 60

53. IUPAC name of the above compound is:



(A) Bromo methyl benzene (B) Phenyl methyl bromide

(C) Benzyl bromide (D) Benzal bromide

54. Transition state 2 is structurally most likely as:

Transition state 2 is structurally most likely as :

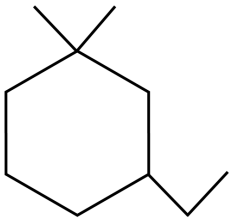
(A) Intermediate 1 (B) Transition state 3

(C) Intermediate 2 (D) Product

55. The functional group present in organic acid is:

(A) −OH (B) −CHO (C) −COOH (D) > C = O

56. What is the correct IUPAC name of the following?



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(A) 3-ethyl-1,1-dimethylcyclohexane. (B) 1-ethyl-3,3-dimethylcyclohexane.

(C) 1,1-dimethyl-3-ethylcyclohexane. (D) None of the above.

57. Which substance has the lowest boiling point?

(A) $CH_3CH_2CH_2CH_2OCH_3$ (B) $CH_3CH_2OCH_2CH_3$

(C) $CH_3CH_2CH_2CH_3$ (D) $CH_3CH_2C{=}OCH_3$

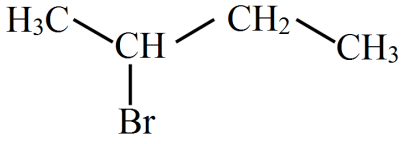
58. The number of structural isomers possible for the molecular formula = C_3H_9N is:

(A) 4 (B) 5 (C) 2 (D) 3

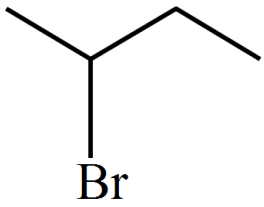
59. The correct way(s) of representing 2-bromobutane is/ are:

(A) $CH_3CHBrCH_2CH_3$

(B)



(C)



(D) All of the above

60. Pi bond is formed:

(A) By the overlapping of atomic orbitals on the axis of nuclei.

(B) By mutual sharing of p - electrons.

(C) By sideways overlapping of half filled p - orbitals.

(D) By overlapping of s-orbitals with p - orbital.

61. In Kjeldahl's method for estimation of nitrogen, $CuSO_4$ acts as:

(A) Oxidising agent. (B) Reducing agent.

(C) Catalytic agent. (D) Hydrolysis agent.

62. The bond that consist of an upper and a lower sharing of electron orbitals is called as:

(A) A pi bond (B) A sigma bond

(C) A hydrogen bond (D) An ionic bond

63. Which of the following pairs are members of a homologous series?

(A) CH_3OCH_3; CH_3CH_2OH (B) CH_3CHO; CH_3CH_2CHO

(C) CH_3CH_2COOH; CH_3COOCH_3 (D) $(CH_3)_2CHOH$; CH_3CH_2OH

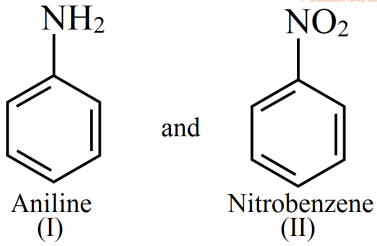
64. Successive members of homologous series differ from one another in their mass by:

(A) 10 units (B) 15 units (C) 20 units (D) 14 units

65. The principle involved in paper chromatography is:

(A) Adsorption (B) Partition (C) Solubility (D) Volatility

66. Consider the following compounds,



Aniline (I) Nitrobenzene (II)

Which of the following statements is/ are true regarding I and II?

(A) I shows +R-effect, whereas II shows -R-effect.

(B) I shows -R-effect, whereas II shows +R-effect.

(C) Both I and II show +R-effect.

(D) Both I and II show -R-effect.

67. In which of the following inductive effect is possible:

(A) Butane (B) Benzene (C) Cyclohexane (D) Butanal

68. $\sigma_{C-C} : 4;\ \sigma_{C-H} : 6;\ \pi_{C=C} : 1;\ \pi_{C\equiv C} : 2$ These number of σ and π-bonds are present in which of the following molecule?

(A) $CH \equiv C - CH = CH - CH_3$

(B) $CH_2 = C = CH - CH_3$

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(C) $CH_2 = CH - CH = CH_3$

(D) None of the above.

*** a statement of Assertion (A) is followed by a statement of Reason (R). [2]**

Choose the correct option.

69. **Note:** In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

Assertion (A): All the carbon atoms in H2C = C = CH2 are sp2 hybridised

Reason (R): In this molecule all the carbon atoms are attached to each other by double bonds.

i. Both A and R are correct and R is the correct explanation of A.
ii. Both A and R are correct but R is not the correct explanation of A.
iii. Both A and R are not correct.
iv. A is not correct but R is correct.

70. **Note:** In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question.

Assertion (A): Sulphur present in an organic compound can be estimated quantitatively by Carius method.

Reason (R): Sulphur is separated easily from other atoms in the molecule and gets precipitated as light yellow solid.

i. Both A and R are correct and R is the correct explanation of A.
ii. Both A and R are correct but R is not the correct explanation of A.
iii. Both A and R are not correct.
iv. A is not correct but R is correct.

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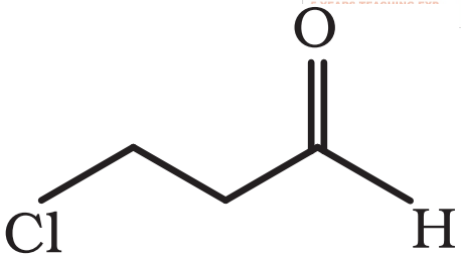
*** Answer The Following Questions In One Sentence.[1 Marks Each] [10]**

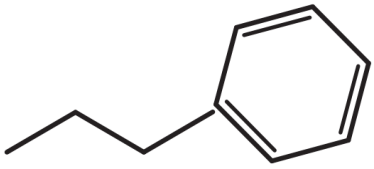
71. Give the IUPAC names of the following compounds:



72. The best and latest technique for isolation, purification and separation of organic compounds is:

a. Crystallisation.
b. Distillation.
c. Sublimation.
d. Chromatography.

73. Give the IUPAC names of the following compounds:



74. How can you separate a mixture of three immiscible liquids having different boiling points?

75. Identify the most electronegative element in CH_2FCl.

76. $CH_2 = \bar{C}H$ is more basic than $HC \equiv C^-$. Explain why?

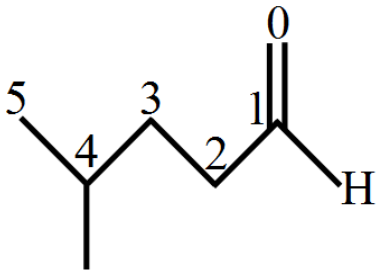
77. Why is benzylic free radical more stable than allylic free radical?

78. Give the IUPAC name of the following compound $CH_3 - \underset{\underset{Br}{|}}{CH} - \underset{\underset{O}{||}}{C} - \underset{\underset{CH_3}{|}}{CH} - CH_3$

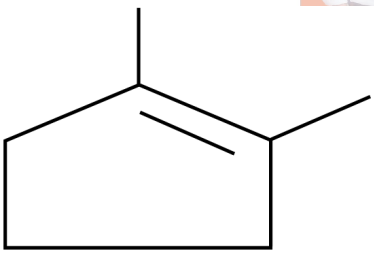
79. Give the IUPAC name of the following compound:
$CH_3 - CH_2 - \underset{\underset{CH_3}{|}}{CH} - \underset{\underset{O}{||}}{C} - H$

80. Give IUPAC name of following bond line formula:

i.



ii.



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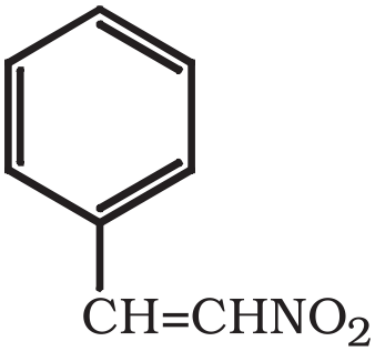
*** Given Section consists of questions of 2 marks each.** **[10]**

81. Identify the functional groups in the following compounds:



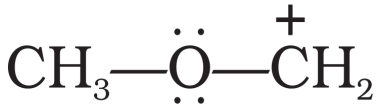
82. Give the common name of:
   i. Methanol olido.
   ii. Ethanol.
   iii. Ethoxyethane.

iv. Ethanoic acid.

v. 1, 4-dimethyl benzene.

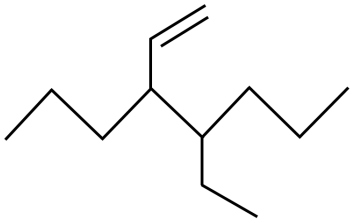
83. Why does SO_3 act as an electrophile?

84. "Stability of carbocations depends upon the electron releasing inductive effect of groups adjacent to positively charged carbon atom involvement of neighbouring groups in hyperconjugation and resonance."

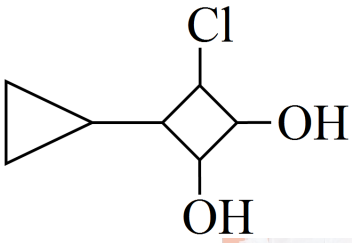
Draw the possible resonance structures for  and predict which of the structures is more stable. Give reason for your answer.

85. Give IUPAC names of the following structures.

i.



ii.



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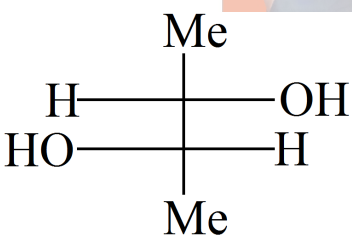
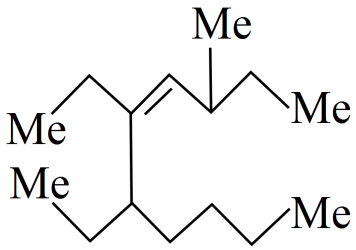
iii.



iv.



*** Given Section consists of questions of 3 marks each.** **[27]**

86. Which of the two: $O_2NCH_2CH_2O^-$ or $CH_3CH_2O^-$ is expected to be more stable and why?

87. For the following bond cleavages, use curved-arrows to show the electron flow and classify each as homolysis or heterolysis. Identify reactive intermediate produced as free radical, carbocation and carbanion.

$CH_3O - OCH_3 \rightarrow CH_3\dot{O} + \dot{O}CH_3$

88. Write bond line formulas for: Isopropyl alcohol, 2,3-Dimethylbutanal, Heptan-4- one.

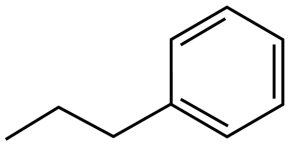
89. If a liquid compound decomposes at its boiling point, which method (s) can you choose for its purification. It is known that the compound is stable at low pressure, steam volatile and insoluble in water.

90. Name the electrophile/ nucleophile generated by following species:

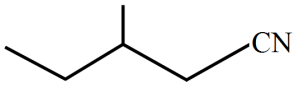
i. $HNO_3 + H_2SO_4$
ii. CH_3COCl
iii. alc. KCN

91. Give the IUPAC names of the following compounds:

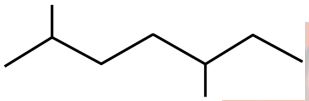
i.



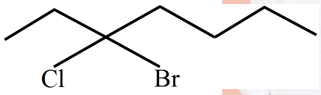
ii.



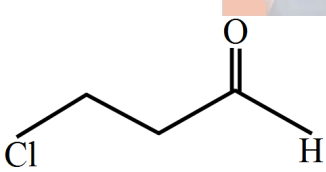
iii.



iv.



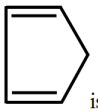
v.



vi. Cl_2CHCH_2OH

92. i. Draw cis and trans-structures for Hex-2-ene. Which isomer will have higher boiling point and why?

ii.

Explain why  is not aromatic

93. The following techniques are used to quantitatively estimate extra elements in organic compound. Identify the name of the method and the element estimated by this method.

i. A known mass of an organic compound is heated with fuming HNO_3 in presence of $AgNO_3$.
ii. Organic compound is heated with dry copper oxide in atmosphere of CO_2.
iii. Organic compound is heated with conc. H_2SO_4.

94. What is the hybridisation of each carbon in $H_2C = C = CH_2$.

*** Case study based questions** **[8]**

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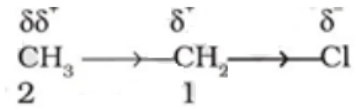
95. Read the passage given below and answer the following questions from 1 to 5.

A reagent that brings an electron pair to the reactive site is called a nucleophile (Nu:) i.e., nucleus seeking and the reaction is then called nucleophilic. A reagent that takes away an electron pair from reactive site is called electrophile (E+) i.e., electron seeking and the reaction is called electrophilic.

Electron Displacement Effects in Covalent Bonds The electron displacement in an organic molecule may take place either in the ground state under the influence of an atom or a substituent group or in the presence of an appropriate attacking reagent. The electron displacements due to the influence of an atom or a substituent group present in the molecule cause permanent polarlisation of the bond. Inductive effect and resonance effects are examples of this type of electron displacements. Temporary electron displacement effects are seen in a molecule when a reagent approaches to attack it. This type of electron displacement is called electrometric effect or polarisability effect.

Inductive Effect When a covalent bond is formed between atoms of different electronegativity, the electron density is more towards the more electronegative atom of the bond. Such a shift of electron density results in a polar covalent bond. Bond polarity leads to various electronic effects in organic compounds. Let us consider cholorethane (CH_3 CH_2Cl) in which the C–Cl bond is a polar covalent bond. It is polarised in such a way that the carbon-1 gains some positive charge $(\delta+)$ and the chlorine some negative charge $(\delta-)$ The fractional electronic charges on the two atoms in a polar covalent bond are denoted by symbol (delta) and the shift of electron density is shown by an arrow that points from $(\delta+)$ to $(\delta-)$ end of the polar bond.



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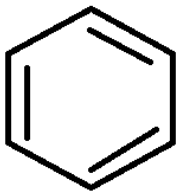
In turn carbon-1, which has developed partial positive charge $(\delta+)$draws some electron density towards it from the adjacent C-C bond. Consequently, some positive charge $(\delta\delta+)$develops on carbon-2 also, where $(\delta\delta+)$ symbolises relatively smaller positive charge as compared to that on carbon – 1. In other words, the polar C – Cl bond induces polarity in the adjacent bonds. Such polarisation of σ- bond caused by the polarisation of adjacent $\sigma-$bond is referred to as the inductive effect.

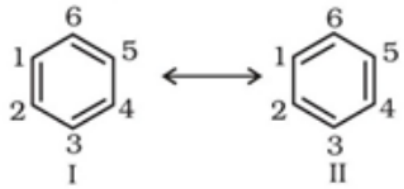
Resonance Structure There are many organic molecules whose behaviour cannot be explained by a single Lewis structure. An example is that of benzene. Its cyclic structure containing alternating C–C single and C=C double bonds shown is inadequate for explaining its characteristic properties.



Benzene

As per the above representation, benzene should exhibit two different bond lengths, due to C–C single and C=C double bonds. However, as determined experimentally benzene has a uniform C–C bond distances of 139 pm, a value intermediate between the C–C single(154 pm) and C=C double (134 pm) bonds. Thus, the structure of benzene

cannot be represented adequately by the above structure. Further, benzene can be represented equally well by the energetically identical structures I and II.



Therefore, according to the resonance theory the actual structure of benzene cannot be adequately represented by any of these structures, rather it is a hybrid of the two structures (I and II) called resonance structures. The resonance structures (canonical structures or contributing structures) are hypothetical and individually do not represent any real molecule. They contribute to the actual structure in proportion to their stability.

Resonance Effect The resonance effect is defined as 'the polarity produced in the molecule by the interaction of two π-bonds or between a π-bond and lone pair of electrons present on an adjacent atom'. The effect is transmitted through the chain. There are two types of resonance or mesomeric effect designated as R or M effect. (i) Positive Resonance Effect (+R effect) In this effect, the transfer of electrons is away from an atom or substituent group attached to the conjugated system. This electron displacement makes certain positions in the molecule of high electron densities. This effect in aniline is shown as : (ii) Negative Resonance Effect (- R effect) This effect is observed when the transfer of Electrons is towards the atom or substituent Group attached to the conjugated system. For Example in nitrobenzene this electron Displacement can be depicted as : The atoms or substituent groups, which represent +R or –R electron displacement effects are as follows: +R effect: – halogen, –OH, –OR, –OCOR, –NH2, –NHR, –NR2, –NHCOR, – R effect: – COOH, –CHO, > C = O, – CN, – NO_2 The presence of alternate single and double bonds in an open chain or cyclic system is termed as a conjugated system. These systems often show abnormal behaviour. The examples are 1,3- butadiene, aniline and nitrobenzene etc. In such systems, the π-electrons are delocalised and the system develops polarity.

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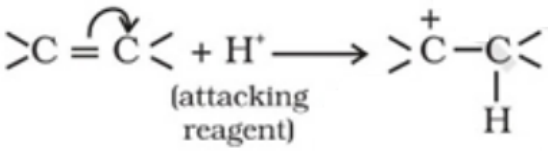
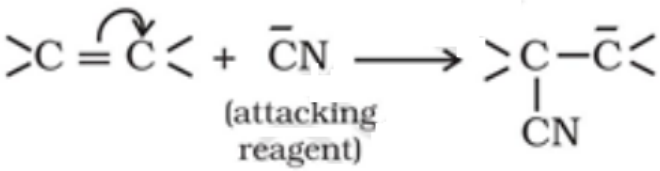
Electromeric Effect (E effect) It is a temporary effect. The organic compounds having a multiple bond (a double or triple bond) show this effect in the presence of an attacking reagent only. It is defined as the complete transfer of a shared pair of π-electrons to one of the atoms joined by a multiple bond on the demand of an attacking reagent. The effect is annulled as soon as the attacking reagent is removed from the domain of the reaction. It is represented by E and the shifting of the electrons is shown by a curved arrow ( ). There are two distinct types of electromeric effect.

a) Positive Electrometric Effect (+E effect)- In this effect the π−electrons of the multiple bond are transferred to that atom to which the reagent gets attached. For example



b) Negative Electromeric Effect (–E effect) -In this effect the $\pi-$ electrons of the multiple bond are transferred to that atom to which the attacking reagent does not get attached. For example: When inductive and electromeric effects operate in opposite directions, the electomeric effect predominates.



i. A reagent that brings an electron pair to the reactive site is called a ...
   a. nucleophile
   b. electrophile
   c. amphoteric
   d. amphophillic

ii. A reagent that takes away an electron pair from reactive site is called ..
   a. nucleophile
   b. electrophile
   c. amphoteric
   d. amphophillic

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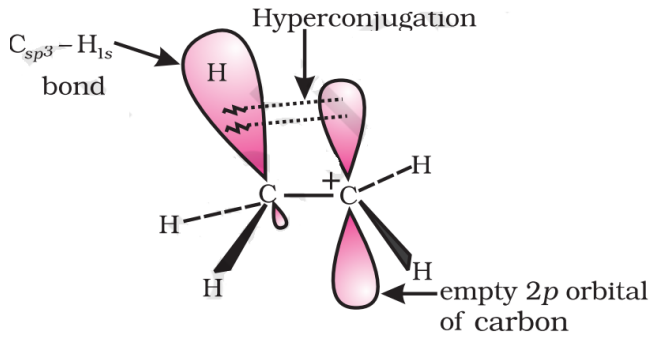
3. The ... effect is defined as the polarity produced in the molecule by the interaction of two π-bonds or between a π-bond and lone pair of electrons present on an adjacent atom.
   a. hindrance
   b. inductive
   c. resonance
   d. hyperconjunction

iv. –OH group, represent ... electron displacement effect.
   a. M+
   b. M-
   c. R-
   d. R+

v. – COOH group, represent ... electron displacement effect.
   a. M+
   b. M-
   c. R-
   d. R+

96. Read the passage given below and answer the following questions from 1 to 5.



Hyperconjugation is a general stabilising interaction. It involves delocalisation of σ electrons of C—H bond of an alkyl group directly attached to an atom of unsaturated system or to an atom with an unshared p orbital. The σ electrons of C—H bond of the alkyl group enter into partial conjugation with the attached unsaturated system or with the unshared p orbital. Hyperconjugation is a permanent effect. To understand hyperconjugation effect, let us take an example of CH 32 + (ethyl cation) in which the positively charged carbon atom has an empty p orbital. One of the C-H bonds of the methyl group can align in the plane of this empty p orbital and the electrons constituting the C-H bond in plane with this p orbital can then be delocalised into the empty p orbital as depicted in Figure.

This type of overlap stabilises the carbocation because electron density from the adjacent σ bond helps in dispersing the positive charge.

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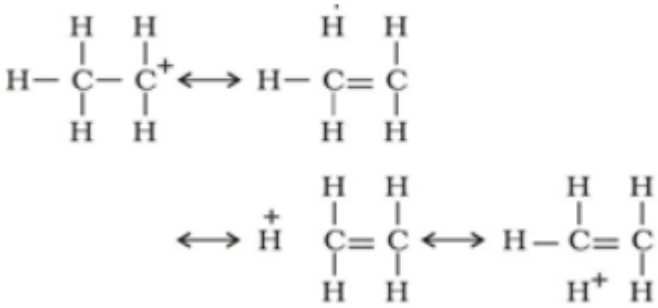


In general, greater the number of alkyl groups attached to a positively charged carbon atom, the greater is the hyperconjugation interaction and stabilisation of the cation. Thus, we have the following relative stability of carbocations:

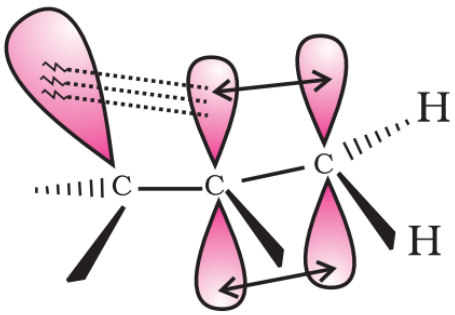
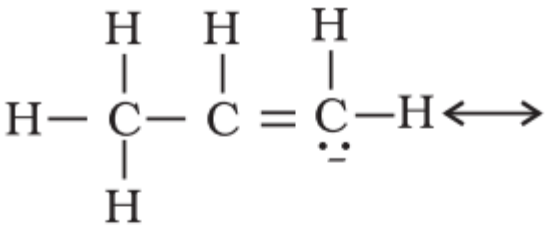


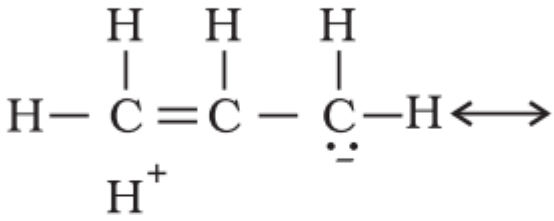
Fig. 12.4(b) *Orbital diagram showing hyperconjugation in propene*

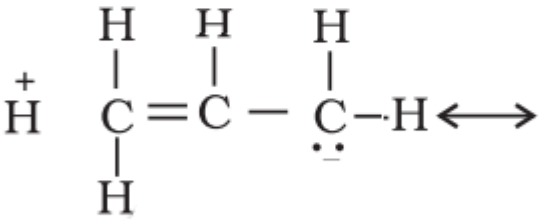
Hyperconjugation is also possible in alkenes and alkylarenes. Delocalisation of electrons by hyperconjugation in the case of alkene can be depicted as in Figure.

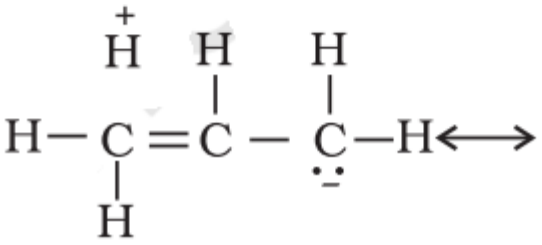
There are various ways of looking at the hyperconjugative effect. One of the way is to regard C—H bond as possessing partial ionic character due to resonance.

The hyperconjugation may also be regarded as no bond resonance.









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The hyperconjugation may also be regarded as no bond resonance.

Methods of purification of organic compounds Once an organic compound is extracted from a natural source or synthesised in the laboratory, it is essential to purify it. Various methods used for the purification of organic compounds are based on the nature of the compound and the impurity present in it. The common techniques used for purification are as follows :

i) Sublimation

ii) Crystallisation

iii) Distillation

iv) Differential extraction and

v) Chromatography

Finally, the purity of a compound is ascertained by determining its melting or boiling point. Most of the pure compounds have sharp melting points and boiling points. New methods of checking the purity of an organic compound are based on different types of chromatographic and spectroscopic techniques.

Sublimation On heating, some solid substances change from solid to vapour state without passing through liquid state. The purification technique based on the above

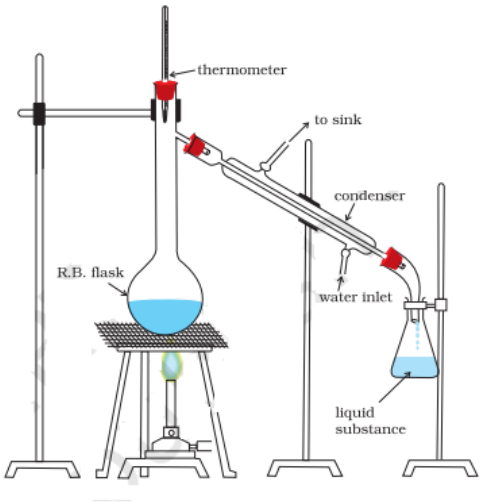
principle is known as sublimation and is used to separate sublimable compounds from non- sublimable impurities.

Crystallisation This is one of the most commonly used techniques for the purification of solid organic compounds. It is based on the difference in the solubilities of the compound and the impurities in a suitable solvent. The impure compound is dissolved in a solvent in which it is sparingly soluble at room temperature but appreciably soluble at higher temperature. The solution is concentrated to get a nearly saturated solution. On cooling the solution, pure compound crystallises out and is removed by filtration. The filtrate (mother liquor) contains impurities and small quantity of the compound. If the compound is highly soluble in one solvent and very little soluble in another solvent, crystallisation can be satisfactorily carried out in a mixture of these solvents. Impurities, which impart colour to the solution are removed by adsorbing over activated charcoal. Repeated crystallisation becomes necessary for the purification of compounds containing impurities of comparable solubilities.

Distillation This important method is used to separate

i) volatile liquids from nonvolatile impurities and

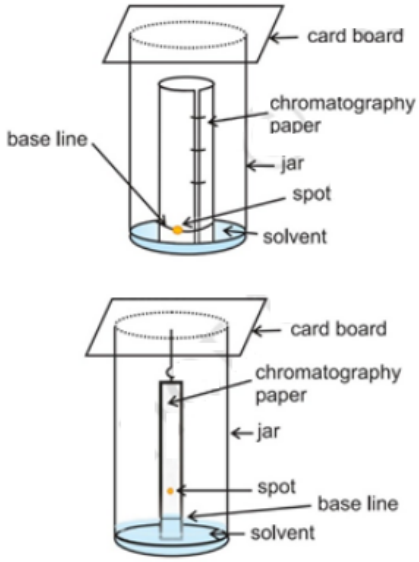
ii) the liquids having sufficient difference in their boiling points.



Liquids having different boiling points vaporise at different temperatures. The vapours are cooled and the liquids so formed are collected separately. Chloroform (b.p 334 K) and aniline (b.p. 457 K) are easily separated by the technique of distillation (Fig 12.5). The liquid mixture is taken in a round bottom flask and heated carefully. On boiling, the vapours of lower boiling component are formed first. The vapours are condensed by using a condenser and the liquid is collected in a receiver. The vapours of higher boiling component form later and the liquid can be collected separately.

Partition Chromatography: Partition chromatography is based on continuous differential partitioning of components of a mixture between stationary and mobile phases. Paper chromatography is a type of partition chromatography. In paper chromatography, a special quality paper known as chromatography paper is used. Chromatography paper contains water trapped in it, which acts as the stationary phase. A strip of chromatography paper spotted at the base with the solution of the mixture is suspended in a suitable solvent or a mixture of solvents (Fig. 12.13). This solvent acts as the mobile phase. The solvent rises up the paper by capillary action and flows over the spot. The paper selectively retains different components according to their differing partition in the two phases. The paper strip so developed is known as a chromatogram. The spots of the separated coloured compounds are visible at different heights from the

position of initial spot on the chromatogram. The spots of the separated colourless compounds may be observed either under ultraviolet light or by the use of an appropriate spray reagent as discussed under thin layer chromatography.



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11th & 12th
MATHS, PHYSICS, CHEMISTRY, (By KD Sir)
BIOLOGY, HISTORY,,ECO, POLITY, GEOGRAPHY
IIT- JEE, NEET, NDA, CUET
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i. Hyperconjunction involves delocalisation of ... electrons of C—H bond of an alkyl group directly attached to an atom of unsaturated system or to an atom with an unshared p orbital.
   a. σ
   b. π
   c. δ
   d. η

ii. Which of the is an example of technique used for purification.
   a. Distillation
   b. Differential extraction
   c. Chromatography
   d. All the above

iii. On heating, some solid substances change from solid to vapour state without passing through liquid state is known as ...
   a. Melting
   b. Boiling
   c. Sublimation
   d. Condensation

iv. The hyperconjugation may also be regarded as ....
   a. bonding resonance
   b. no bond resonance
   c. no bond induction
   d. bonding induction

v. Chromatography paper contains water trapped in it, which acts as the ... phase.
   a. mobile
   b. stationery
   c. Secondary
   d. quaternary

*** Given Section consists of questions of 5 marks each.** **[35]**

97. Give condensed and bond line structural formulas and identify the functional group(s) present, if any, for:

i. 2, 2, 4-Trimethylpentane.
ii. 2-Hydroxy-1, 2, 3-propanetricarboxylic acid.
iii. Hexanedial.

98. Give a brief description of the principles of the following techniques taking an example in each case.

Chromatography.

99. What are hybridisation states of each carbon atom in the following compounds?

$CH_2=C=O$, $CH_3CH=CH_2$, $(CH_3)_2CO$, $CH_2=CHCN$, C_6H_6.

100. A liquid with high boiling point decomposes on simple distillation but it can be steam distilled for its purification. Explain how is it possible?

101. Draw a diagram of bubble plate type fractionating column. When do we require such type of a column for separating two liquids. Explain the principle involved in the separation of components of a mixture of liquids by using fractionating column. What industrial applications does this process have?

102.
i. Two solids which have different solubilities in a solvent and which do not react when dissolved in it.
ii. Liquid that decompose at its boiling point.
iii. Steam volatile liquid and immiscible with water.
iv. Two liquids which have boiling points close to each other.
v. Two liquids with large difference in their boiling points.

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1st to 8th All Subjects
One Day
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103. The ratio of mass percent of C and H of an organic compound $C_xH_yO_z$ is 6 : 1. If one molecule of the above compound ($C_xH_yO_z$) contains half much oxygen of required to burn one molecule of compound C_xH_y completely to CO_2 and H_2O. What is empirical formula of $C_xH_yO_z$?

----- काक चेष्टा बको ध्यानं, श्वान निद्रा तथैव च । अल्पहारी गृह त्यागी, विद्यार्थी पंच लक्षणं ॥ -----