CHEMISTRY

BOOKS - G.R. BATHLA & SONS CHEMISTRY (HINGLISH)

INTRODUCTION TO ORGANIC CHEMISTRY

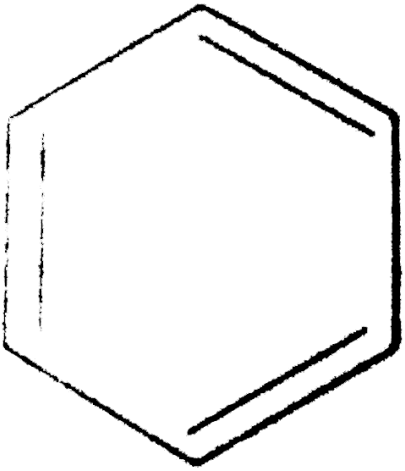
Example

1. Indicate the number of σ and π bonds in the following molecules:

(i) $CH_3 - CH = CH_2$ (ii) $CH_3 - CH_2 - CH_2 - CH_3$

(iii) $CH_3 - C \equiv C - CH_3$ (iv)

(iv)



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2. Indicate the type of hybridization of each carbon atom in the following molecules:

(i) $CH_3 - C \equiv CH - CH_3$ (ii) $H_2C = C = CH_2$

(iii) $CH_3 - CH = CH - CH_3$ (iv) $CH_3 - CH_2 - CH_3$

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Illustration Of Objective Questions

1. Which of the following has maximum bond energy?

A. CI_2

B. F_2

C. Br_2

D. I_2

Answer: A

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2. Which one of the following does not have sp^2 hybridised carbon ?

A. CH_3COCH_3

B. CH_3COOH

C. $CH_3 - C \equiv N$

D. CH_3CONH_2

Answer: C

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3. Which bond is not polar?

A. $O - F$

B. $C - CI$

C. $C - F$

D. $C - N$

Answer: A

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4. Number of $H -$ bonds formed by a water molecule is:

A. 2

B. 8

C. 1

D. 4

Answer: D

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5. The electronegativity follows the order:

A. $F > CI > Br > O$

B. $F > O > CI > Br$

C. $O > F > CI > Br$

D. $CI > F > O > Br$

Answer: B

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6. In which of the following compounds, delocalized bonding is not possible?

A. 1,3-Butadiene

B. 1,4-Pentadiene

C. 1,3,5-Hexatriene

D. Benzene

Answer: B

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7. Carbonyl group has following resonating structures

(I) $(\mathrm{I}) > \overset{+}{\mathrm{C}} - \overset{-}{\mathrm{O}}\ (\mathrm{II}) > \overset{-}{\mathrm{C}} - \overset{+}{\mathrm{O}}\ (\mathrm{III}) > \mathrm{C} = \mathrm{O}$

The correct order of stablity of these structures is

A. $(i) > (ii) > (iii)$

B. $(iii) > (i) > (ii)$

C. $(i) > (iii) > (ii)$

D. $(iii) > (ii) > (i)$

Answer: C

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8. The ratio of σ-and π-bonds in mesitylene is:

A. 3

B. 5

C. 6

D. 7

Answer: D

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9. Suggest a method to purify benzene containing non-volatile impurities:

A. Steam distillation

B. distillation under reduced pressure

C. simple distillation

D. sublimation

Answer: C

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10. A substance has boiling point 563K, but it starts decomposing near this temperature. Which type of distillation process is suitable for its purification?

A. Distillation

B. Fractional distillation

C. Steam distillation

D. Distillation under reduced pressure

Answer: D

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11. Petroleum refining involvs:

A. vaccum distillation

B. Fractional distillation

C. Steam distillation

D. passing over activated charcoal

Answer: B

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12. In steam distillation of toluene, the pressure of toluene vapour is:

A. equal to the pressure of barometer

B. less than the pressure of barometer

C. equal to vapour pressure of toluene in simple distillation

D. more than the vapour pressure of toluene in simple distillation

Answer: B

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Problems For Practice

1. In each case, select the property which is typical of organic rather than inorganic compounds:

A. (i) Water soluble (ii) Water insoluble

B. (i) Low melting point (ii) High melting point

C. (i) Flammable (ii) Non-flammable

D. (i) Ionic bonding (ii) Covalent bonding

E. (i) Chemical reactions are slow (ii) Chemical reactions are fast

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2. Classify the following into polar and non-polar molecules:

(i) CO_2, (ii) $CHCI_3$, (iii) CCI_4, (iv) CH_3OCH_3,

(v) C_2H_5OH, (vi) C_2H_6, (vii) CH_2CI_2, (viii) NH_3, (ix) H_2O, (x) CH_3CI.

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3. Indicate the type of hybridization of each carbon atom in the following molecules:

(i) $\overset{1}{C}H_3 - \overset{2}{C}H = \overset{3}{C}H - \overset{4}{C}H_3$ (ii) $H - \overset{1}{C} \equiv \overset{2}{C} - \overset{3}{C} \equiv \overset{4}{C} - H$

(iii) $\overset{1}{C}H_3 - \overset{2}{C} \equiv \overset{3}{C} - \overset{4}{C}H_3$ (iv) $\overset{1}{C}H_3$

(v) $\overset{1}{C}H_3 - \overset{2}{C} \equiv N$ (vi) $H - \overset{1||}{\overset{O}{C}} - NH_2$

(vii) $\overset{1}{C}H_3 - \overset{2||}{\overset{O}{C}} - \overset{3}{C}H_3$ (ix) $H_2C = C = O$

(x) $C(CN)_4$ (xi) $CH_3\overset{+}{C}H_2$

(xii) $CH_3\overset{-}{C}H_2$ (xiii) $CH_2\overset{â € ¢}{C}H_2$

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4. Indicate the number of σ-and π-bonds in the following molecules:

(i) $CH_3 - C \equiv C - H$ (ii) $CH_3 - CH = CH_2$

(iii) $H_2C = C = CH_2$ (iv) $CH_3 - CH_2 - CH_3$

(v) $H_2C = C - CH - CH_3$ (vi) $HC = C - CH = CHCH_3$

(vii) $H_2C = CH - C \equiv N$ (viii) CH_3OH

(ix) $CH_3 - C \equiv N$ (x) CH_3NO_2

(xi) CH_2CI_2 (xii) C_6H_{12} (Hexene)

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5. (a) How do bond length and bond strength vary in the following cases?

$C - C, C = C, C \equiv C$

(b) Arrange the $sp -$, sp^{2-} and sp^3-hybridization in increasing order of:

(i) bond length (ii) bond angle (iii) bond energy

(iv) size of orbitals (v)s-character

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6. Which resonance form in each of the following sets is the major contributor to the real structure?

(i)

$$\underset{(A)}{CH_2-\overset{\overset{CH_3}{|}}{C}-CH=CH_2} \leftrightarrow \underset{(B)}{\overset{+}{C}H_2-\overset{\overset{CH_3}{|}}{C}=CH-\overset{-}{C}H_2} \leftrightarrow \underset{(C)}{\overset{-}{C}H_2-\overset{\overset{CH_3}{|}}{C}=}$$

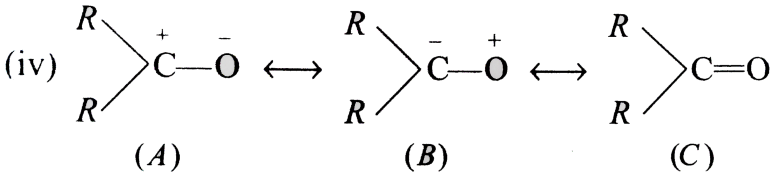
(ii)

$$\underset{(A)}{CH_3-\overset{\overset{O}{||}}{C}-CH=CH_2} \leftrightarrow \underset{(B)}{CH_3-\overset{\overset{O^-}{|}}{\overset{+}{C}}-CH=CH_2} \leftrightarrow \underset{(C)}{CH_3-\overset{\overset{O^-}{|}}{C}=C}$$

(iii)

$$\underset{(A)}{CH_2=CH-CH=CH_2} \leftrightarrow \underset{(B)}{\overset{+}{C}H_2-CH=CH-\overset{-}{C}H_2} \leftrightarrow \overset{-}{C}H_2-CH$$

(iv)



(A) (B) (C)

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7. Answer of the following:

(i) The type of hybridization, which carbon atoms undergo in the

formation of ethane molecule is.

(ii) The type of hybridization, which carbon atoms undergo in the formation of ethene molecule $(H_2C = CH_2)$ is.

(iii) The type of hybridization, which carbon atoms undergo in the formation of ethyne molecule $(HC \equiv CH)$ is.

(iv) Carbon-carbon bond distance in benzene is intermediate between the C-C bond distances in ethene and ethane.

(v) Alcohols have higher boiling points than the corresponding isomeric ethers.

(vi) CH_3OH has higher boiling point than CH_3SH.

(vii) The o-and p-chlorophenols have different boiling points.

(viii) The three carbon-oxygen bonds are equal in carbonate ion.

(ix) Carbon-oxygen bond lengths in formic acid are $1.23\tilde{A}\ldots$ and $1.36\tilde{A}\ldots$ and both the carbon-oxygen bonds in sodium formaate have same value, i.e., $1.27\tilde{A}\ldots$.

(x) A mixture of plant pigments is separated by which method?

(xi) The purity of an organic solid is tested by which physical property?

(xii) C-C bond lengths in ethane, ethylene and acetylene are.

(xiii) What are the bond angles in $sp^3 - sp^2$-and sp-hybrid orbitals?

(xiv) Chloral hydrate, $CCI_3CH(OH)_2$ is stable although it has two hydroxyl groups attached to the same carbon atom.

(xv) C=C bond length is shorter than the C-C bond length.

(xvi) Why o-hydroxy benzaldehyde is a liquid at room temperature while p-hydroxy benzaldehyde is a high melting solid?

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8. Arrange the following in increasing order of a dipole moment.

(a) HF, HCI, HBr, HI

(b) $CH_3CI, CH_3Br, CH_3I, CH_3F$

(c) $CHF_3, CHI_3, CHBr_3, CHCI_3$

(d) $CH_4, CH_3CI, CH_2CI_2, CHCI_3$

(e) NH_3, SbH_3, AsH_3, PH_3

(f) $SO_3, SiO_2, P_2O_5, CI_2O_7$

(g) o-chlorotoluene, m-chlorotoluene, p-chlorotoluene

(h) o-nitrophenol, m-nitrophenol, p-nitrophenol

(i) o-dichlorobenzen, m-dichlorobenzene, p-dichlorobenzene

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9. Explain the following:

(i) Why is ethylene a planar molecule and acetylene a linear molecule?

(ii) Why does bond length decrease in the order?

$C - C > C = C > C \equiv C$

(iii) The boiling point of methanol is $66^\circ C$ and that of methyl mercaptan is $6^\circ C$ whereas the boiling points of diethyl ether an diethyl sulphide are $35^\circ C$ and $92^\circ C$ respectively.

(iv) ethanol boils at higher temperature than ethylamine inspite of the fact that both have nearly same molecular masses.

(v) What effect should the following resonance of vinyl chloride have on its dipole moment?

$CH_2 = CH - CI \leftrightarrow \overset{-}{C}H_2 - CH = \overset{+}{C}I$

(vi) The central carbon-carbon bond in 1,3-butadiene is shorter than that of n-butane.

(vii) What property of carbon accounts for the occurrence of large number of its compounds?

(viii) The C-CI bond is polar while CCI_4 is non-polar.

(ix) Explain the factor on which polarity of bond depends.

(x) The CI atom has same electronegativity as nitrogen but it does not form effective hydrogen bonding.

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10. Explain how the following mixtures may be separated:

(i) A mixture of two miscible liquids.

(ii) A mixture of benzoic acid and sodium chloride (solid mixture)

(iii) A mixture of plant pigments.

(iv) Ether and water.

(v) Benzic acid-water mixture.

(vi) A mixture of benzoic acid and camphor,

(vii) A mixture of iodine (I_2) and KCI.

(viii) A mixture of toulene and phenol.

(ix) A mixture of toulene and aniline.

(x) A mixture of ethanol and ethanol.

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11. (i) Ducuss orbital structure of methane.

(ii) Discuss orbital structure of ethylene.

(iii) Discuss orbital structure of acetylene.

(iv) Discuss the hybridization of carbon atom in allene (C_3H_4) and show the π-orbital overlaps.

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12. Match the following:

(a)

(A) Vital force theory	(i) Bond angle 120°
(B) sp^3- hybridization	(ii) Kolbe
(C) Hydrogen bonding	(iii) $W\ddot{o}$hler
(D) Resonance	(iv) One sigma two pi bonds
(E) sp^2- hybridization	(v) Sublimation
(F) Urea	(vi) Vaccum distillation
(G) Acetic acid	(vii) CH_4
(H) Naphthalene	$(viii)$ Berzelius
(I) Triple bond	(ix) C_6H_6
(J) Glycerol	(x) C_2H_5OH

(b)

(A) Sublimation	(i) Benzene+Toluene
(B) Chromatography	(ii) Tswett
(C) Steam distillation	(iii) Camphor
(D) Fractional distillation	(iv) Aniline

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Objective Questions Level A

1. The property of catenation is strongest in carbon because:

A. it ionisation potential is low

B. its electronegativity is low

C. the C-C bond energy is high

D. its atomic radius is small

Answer: C

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2. The main source of organic compounds is:

A. vegetable kingdom

B. synthetic reactions

C. animal kingdom

D. petroleum

Answer: B

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3. The first organic compound prepared from inorganic compounds was:

A. acetic acid

B. methane

C. urea

D. ethyl alcohol

Answer: C

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4. The first organic compound syntesised in the laboratory from its elements:

A. urea

B. methane

C. ethylene

D. acetic acid

Answer: D

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5. Which of the following represents the given mole of hybridization $sp^2 - sp^2 - sp - sp$ from left to right?

A. $H_3C - CH = CH - CH_3$

B. $HC \equiv C - C \equiv CH$

C. $H_2C = CH - C \equiv CH$

D. $H_2C = CH - CH = CH_2$

Answer: C

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6. The C-H bond distance is the longest in:

A. C_2H_2

B. C_2H_4

C. C_2H_6

D. $C_2H_2Br_2$

Answer: C

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7. The enolic form of acetone contains

A. 9 sigma bonds, 1 pi bond and 2 lone pairs of electrons

B. 8 sigma bonds, 2 pi bonds are 2 lone pairs of electrons

C. 10 sigma bonds, 1 pair pi bond and 1 lone pair of electron

D. 9 sigma bonds, 2 pi bonds and 1 lone pair of electron

Answer: A

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8. The number of σ and π-bonds in but-1-en-3-yne are

A. 5 sigma and 5 pi

B. 7 sigma and 3pi

C. 8 sigma and 2 pi

D. 6 sigma and 4pi

Answer: B

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9. How many sigma and pi bonds are there in tetracyano ethylene molecule?

A. 9σ and 9π

B. 9σ and 7π

C. 5σ and 9π

D. 5σ and 7π

Answer: A

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10. Number of σ and π bonds in benzophenone is:

A. 24,6

B. 24,7

C. 25,6

D. 25,7

Answer: D

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11. The compound buta-1,2 diene has:

A. only sp-hybridized carbon atom

B. only sp^2-hybridized carbon atom

C. both sp-and sp^2-hybridized carbon atoms

D. $sp - sp^2$ and sp^3-hybridization carbon atoms

Answer: D

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12. In the compound $HC \equiv C - \overset{CH_3}{\underset{|}{C}} = CH_2$, the hybridization of C_2 and C_3 carbons are respectively:

A. sp^3 and sp^2

B. sp^2 and sp^3

C. sp^3 and sp

D. sp^2 and sp

Answer: D

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13. The $CI - C - CI$ angle in $1, 1, 2, 2,$ tetrachloroethone and tetrachloromethane respectively will be about:

A. 90° and 109.5°

B. 109.5° and 90°

C. 109.5° and 120°

D. 120° and 109.5°

Answer: D

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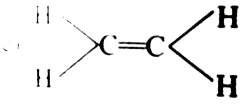
14. Which of the following molecules does not have net dipole moment?

A. $CH_3 - Br$

B. CH_2CI_2

C. 

D. $HCOOH$

Answer: C

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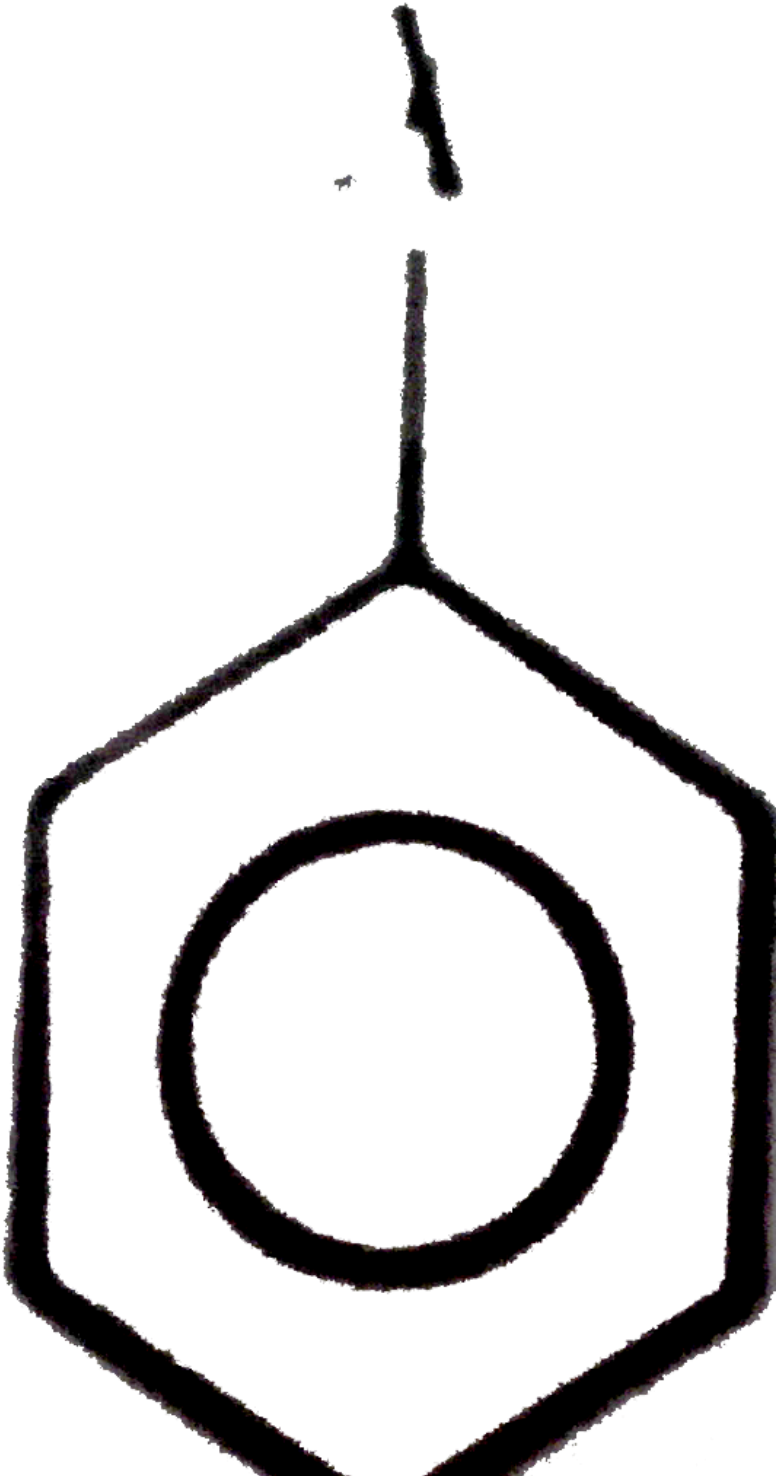
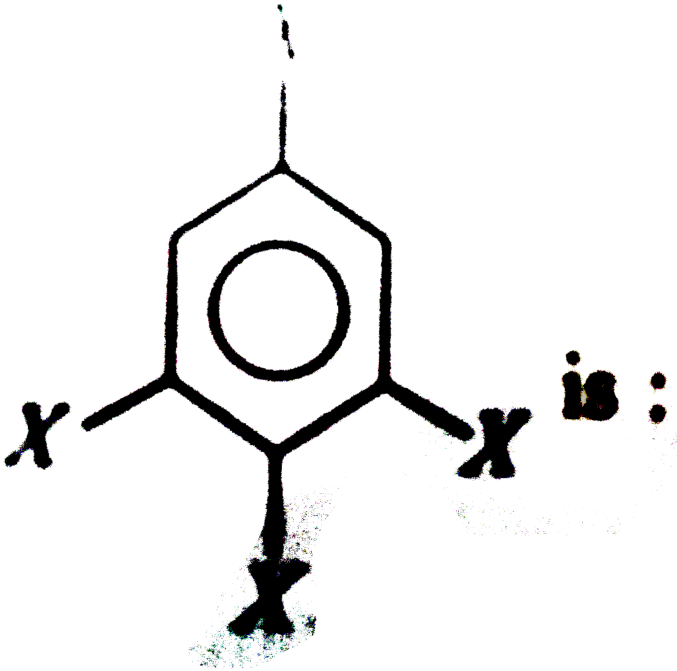
15. Dipole moment of



is 1.5D. The dipole moment of



is :

A. 1D

B. $1.5D$

C. $2.25D$

D. 3D

Answer: B

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16. Among the following, the molecule with the highest dipole moment is :

A. CH_3CI

B. CH_2CI_2

C. $CHCI_3$

D. CCI_4

Answer: A

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17. Arrange the following molecules in the correct order of decreasing C-C bond length:

A. $C_2H_4 > C_2H_2 > C_2H_6 > C_6H_6$

B. $C_2H_6 > C_6H_6 > C_2H_4 > C_2H_2$

C. $C_2H_6 > C_2H_4 > C_6H_6 > C_2H_2$

D. $C_2H_2 > C_6H_6 > C_2H_4 > C_2H_6$

Answer: B

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18. The bond energy (in kcal mol^{-1}) of a $C-c$ single bond is approximately

A. 1000

B. 100

C. 10

D. 1

Answer: B

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19. Which of the following pairs have identical bond order?

A. CN^- and CN^+

B. CN^- and O_2^-

C. CN^- and NO^+

D. NO^+ and O_2^-

Answer: C

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20. The correct order of bond energy is:

A. $I_2 > Br_2 > CI_2 > F_2$

B. $CI_2 > Br_2 > F_2 > I_2$

C. $CI_2 > F_2 > Br_2 > I_2$

D. $I_2 > Br_2 > F_2 > CI_2$

Answer: B

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21. All carbon atoms are sp^2-hybridised in:

A. $HC \equiv C - C \equiv CH$

B. $H_2C = C = CH_2$

C. 2-butene

D. 1,3-butadine

Answer: D

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22. Resonance occurs due to the :

A. delocalisation of sigma-electrons

B. delocalisation of pi-electrons

C. migration of H-atoms

D. migration of protons

Answer: B

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23. Resonance structures of a molecule do not have:

A. identical arrangement of atoms

B. nearly the same energy content

C. the same number of paired electrons

D. identical bonding

Answer: D

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24. Maximum number of σ bonds that may be present in an isomer of C_4H_8 are:

A. 10

B. 11

C. 12

D. 13

Answer: C

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25. How many sigma and pi-bonds are there in the molecule of dicyanoethene $(CN - CH = CH - CN)$?

A. 3 sigma and 3 pi

B. 5 sigma and 2 pi

C. 7 sigma and 5pi

D. 2 sigma and 3pi

Answer: C

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26. Which of the following compounds shows evidence of the strongest hydrogen bonding?

A. Propane-1,2,3-triol

B. Propane-1,2-diol

C. Propan-1-ol

D. Propan-2-ol

Answer: A

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27. The hydrogen bond is strongest in which one of the following?

A. $F - H - - - - F$

B. $O - H - - - - O$

C. $S - H - - - - F$

D. $F - H - - - O$

Answer: A

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28. Increasing order of carbon-carbon bond length for the following is:

$\underset{(A)}{C_2H_4}$ $\underset{(B)}{C_2H_2}$ $\underset{(C)}{C_6H_6}$ $\underset{(D)}{C_2H_6}$

A. $B < C < A < D$

B. $C < B < A < D$

C. $D < C < A < B$

D. $B < A < C < D$

Answer: D

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29. The correct order of boiling points of hydrogen halide is:

A. $HF > HCI > HBr > HI$

B. $HI > HBr > HCI > HF$

C. $HCI > HF > HI > HBr$

D. $HF > HI > HBr > HCI$

Answer: D

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30. Among the following, the correct order of acidity is:

A. $HClO_2 < HClO_2 < HClO_3 < HClO_4$

B. $HClO_4 < HClO_2 < HClO < HClO_3$

C. $HClO_3 < HClO_4 < HClO_2 < HClO$

D. $HClO < HClO_2 < HClO_3 < HClO_4$

Answer: D

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31. The state of hybridization of C_2, C_3, C_5 and C_6 of the hydrocarbon,

$$\underset{7}{CH_3} - \underset{6}{\overset{\overset{CH_3}{|}}{\underset{|}{C}}} - \underset{5}{CH} = \underset{4}{CH} - \underset{3}{\overset{\overset{CH_3}{|}}{C}} H - \underset{2}{C} \equiv \underset{1}{CH}$$ is:

A. sp, sp^3, sp^2 and sp^3

B. sp, sp^2, sp^2 and sp^3

C. sp, sp^2, sp^3 and sp^2

D. sp^3, sp^2, sp^2 and sp

Answer: A

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32. Types of hybridisation of carbon atoms noted as 1 and 2 are:

$$H_2C = \overset{2}{C}H - \overset{1}{C} \equiv N$$

A. sp^2, sp

B. sp, sp^2

C. sp, sp^3

D. sp, sp^3

Answer: B

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33. Which of the following organic compounds has the same hybridization as its combustion product (CO_2) ?

A. Ethyne

B. Ethene

C. Ethane

D. Ethanol

Answer: A

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34. In allene (C_3H_4), the type (s) of the carbon atom (s) is (are) :

A. only sp^2

B. sp^2 and sp^3

C. sp and sp^3

D. sp and sp^2

Answer: D

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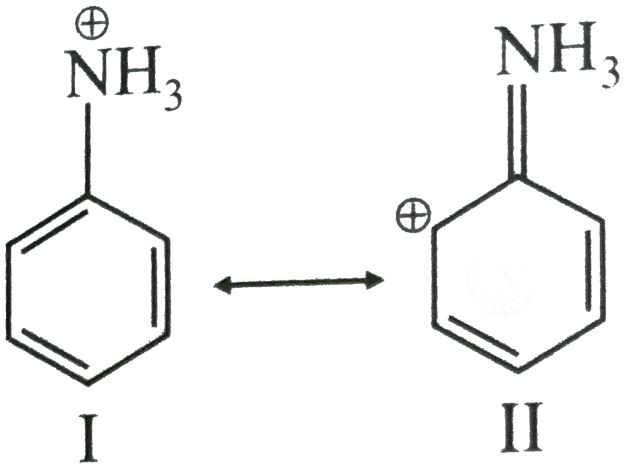
35.



I II

Examine the following two structures for the anilinium ion and choose the correct statement from the ones given below:

A. II is not an acceptable cononical structure because carbonium ions are less stable than ammonium ions

B. II is not an acceptable canonical structure because it is non-aromatic

C. II is not an acceptable canonical structure because nitrogen has 10 valence electrons

D. II is acceptable canonical structure

Answer: C

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36. Which of the following molecules has the maximum dipole moment ?

A. NF_3

B. NH_3

C. CH_4

D. CO_2

Answer: B

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37. In the straight-chain hydrocarbon C_8H_{10}, the C atoms beginning from one end have the hybridizations sp^3, sp^2, sp^2, sp^3, sp^2, sp^2, sp, and sp, respectively. The hydrocarbon is

A. $CH_3 - C \equiv C - CH_2 - CH = CH - CH = CH_2$

B. $CH_3 - CH = CH - CH_2 - CH = CH - C \equiv CH$

C. $CH_3 - CH = CH - CH_2 - C \equiv C - CH = CH_2$

D. $CH_3 - C \equiv C - CH_2 - C \equiv C - CH \equiv CH_2$

Answer: B

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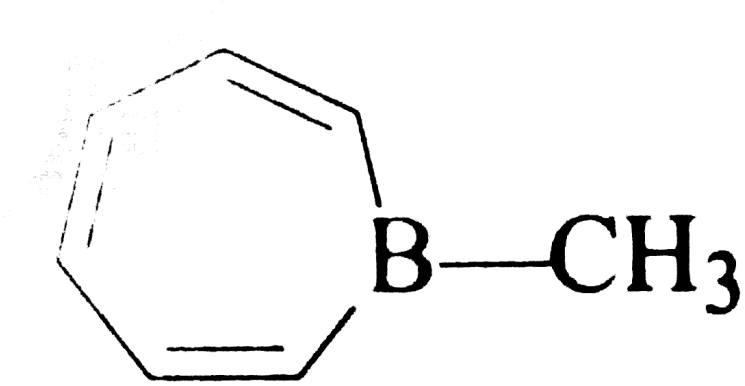
38. The compound shown is planar and all the C-C bond lengths are the same. What is the bonding of sp^2-hybridized boron?



A. The p-orbital contains an unshared pair of electrons

B. A hybrid orbital contains an unshared pair of electrons

C. The p-orbital is vacant

D. A hybrid orbital is vacant

Answer: C

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39. In hexa-1,3-diene-5-yne, the number of $C-C\sigma$, $C-C\pi$ and $C-H\sigma$ bonds respectively are:

A. 5,5 and 5

B. 5,3 and 6

C. 5,4 and 6

D. 6,3 and 5

Answer: C

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40. The variation of the boiling points of the hydrogen halides is in the order $HF > HI > HBr > HCl.$

What explains the higher boiling point of hydrogen fluoride?

A. The electronegativity of fluorine is much higher than for other elements in the group

B. The bond energy of HF molecules is greater than in other hydrogen halides

C. There is a strong hydrogen bonding between HF molecules

D. The effect of nuclear shielding is much reduced in fluorine which polarises the HF molecule

Answer: C

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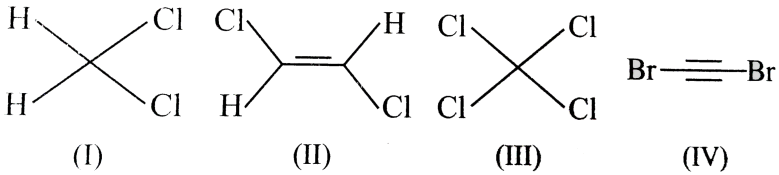
41. The compound that will have a permanent dipole moment among the following is:



A. I

B. II

C. III

D. IV

Answer: A

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42. Resonance energy of benzene is about so muh kcal/mol:

A. 35

B. 58

C. 100

D. 109

Answer: A

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43. Which of the following resonating structures of $1-$ methoxy-1,3-butadiene is least stable?

A. $\overset{-}{.}CH_2 - CH = CH - CH = \overset{+}{O} - CH_3$

B. $\overset{-}{.}CH_2 - \overset{+}{C}H - CH = CH - O - CH_3$

C. $H_2C = CH - \overset{-}{C}H_2 - CH = \overset{+}{O} - CH_3$

D. $H_2C = CH - \overset{-}{C}H - \overset{+}{C}H - O - CH_3$

Answer: B

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44. In which of the compounds below is there more than one kind of hybridization (sp, sp^2, sp^3) for carbon?

(i) $CH_3CH_2CH_2CH_3$ (ii) $CH_3 - CH = CH - CH_3$

(iii) $H_2C - CH - CH - CH_2$ (iv) $H - C \equiv C - H$

A. (i) and (iv)

B. (ii) and (iii)

C. (ii)

D. (iii) and (iv)

Answer: C

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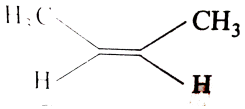
45. Which of the following hydrocarbons has the lowest dipole moment?

A. $CH_3 - C \equiv C - CH_3$

B. (b) 

C. $CH_3CH_2C \equiv CH$

D. $H_2C = CH - C \equiv CH$

Answer: A

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46. Maximum amount of hydrogen bonding occurs in case of:

A. HOH

B. HF

C. C_2H_5OH

D. NH_3

Answer: B

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47. Intramolecular hydrogen bonding is exhibited by:

A. o-nitrophenol

B. catechol

C. salicyclic acid

D. all of these

Answer: D

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48. The maximum possible number of hydrogen bonds a water molecule can form is

A. 4

B. 3

C. 2

D. 1

Answer: A

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49. Which of the following explanations accounts for o-nitro-phenol to be more volatile than p-nitrophenol?

A. Intermolecular hydrogen bonding

B. Resonance

C. Intramolecular hydrogen bonding

D. Inductive effect

Answer: C

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50. Only sp and sp^2 hybrid orbitals are involved in the formation of :

A. $CH_3 - CH = CH_2$

B. $CH_3 - CH_3$

C. $CH_3 - C \equiv CH$

D. $H_2C = C = CH_2$

Answer: D

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51. The number of sigma (σ) and pi (π) bonds present in 1,3,5,7-octatetraene respectively are:

A. 14 and 3

B. 17 and 4

C. 16 and 5

D. 15 and 4

Answer: B

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52. The correct order of increasing bond length of C - H ,C - O, C - C and C = C is

A. $C-H<C=C<C-O<C-C$

B. $C-C<C=C<C-O<C-H$

C. $C-O<C-H<C-C<C=C$

D. $C - H < C - O < C - C < C = C$

Answer: A

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53. The C-H bond and C-C bond in ethane are formed by which of the following types of overlap?

A. $sp^3 - s$ and $sp^3 - sp^3$

B. $sp^2 - s$ and $sp^2 - sp^2$

C. sp-s and sp-sp

D. p-s and p-p

Answer: A

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54. Arrange the following compounds in order of increasing dipole moment:

(i) toluene (ii) m-dichloro benzene

(iii) o-dichloro benzene (iv) p-dichloro benzene

A. $(i) < (iv) < (ii) < (iii)$

B. $(iv) < (i) < (ii) < (iii)$

C. $(iv) < (i) < (iii) < (ii)$

D. $(iv) < (ii) < (i) < (iii)$

Answer: B

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55. Sublimation is a process in which a solid:

A. changes into another allotropic form

B. changes into liquid form

C. changes into vapour form

D. none of the above

Answer: C

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56. Naphthalene is a volatile solid. It is best purified by:

A. crystallisation

B. distillation

C. steam distillation

D. sublimation

Answer: D

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57. Methanol and acetone can be separated by:

A. fractional distillation

B. distillation

C. steam distillation

D. vaccum distillation

Answer: A

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58. Separation of two substances by fractional crystallisation depends upon their differences in:

A. densities

B. volatility

C. solubility

D. crystalline shape

Answer: C

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59. Aniline is separated from aniline-water mixture by:

A. fractional crystallisation

B. sublimation

C. solvent extraction

D. steam distillation

Answer: D

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60. Glycerol is purified by:

A. steam distillation

B. vaccum distillation

C. sublimation

D. simple distillation

Answer: B

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61. Two immiscible liquids are separated by:

A. separating funnel

B. fractional distillation

C. chromatography

D. sublimation

Answer: A

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62. The best and latest technique for isolation, purification and separation of organic compound is

A. chromatography

B. steam distillation

C. crystallisation

D. vaccum distillation

Answer: A

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63. Steam distillation is applied to those organic compounds which are steam volatile and:

A. soluble in water

B. insoluble in water

C. sparingly soluble in water

D. insoluble in all solvents

Answer: B

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64. There are several criteria for purity of organic compounds. Out of these which one is considered best?

A. Melting point

B. Microscopic examination

C. Mixed melting point

D. Colour

Answer: C

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65. Two volatile and miscible liquids can be separated by fractional distillation into pure components under the conditions when:

A. they have low boiling points

B. the difference in their boiling points is large

C. the boiling points of the liquids are close to each other

D. they do not form azeotropic mixture

Answer: D

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66. If the boiling point difference between the two liquids is not musch then they can be separated by:

A. simple distillation

B. fractional distillation

C. steam distillation

D. differential extraction

Answer: B

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67. In paper chromatography:

A. the moving phase is a liquid and stationary phase is a solid

B. the moving phase is a solid and stationary phase is a liquid

C. both the phases are liquids

D. both the phases are solids

Answer: C

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68. Oils are purified by:

A. fractional distillation

B. steam distillation

C. vaccum distillation

D. simple distillation

Answer: B

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69. Chromatography analysis is done based on the property of:

A. diffusion

B. condensation

C. absorption

D. adsorption

Answer: D

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70. A mixture of naphthalene and benzoic acid can be separated by:

A. chromatography

B. sublimation

C. fractional crystallation

D. distillation

Answer: A

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71. In column chromatography, the moving phase is:

A. the substances which are to be separated

B. eluent

C. absorption

D. mixture of eluent and substances to be separated

Answer: D

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72. Azeotropic mixtures are

A. boil at different temperature

B. are mixtures of solids

C. are constant boiling mixtures

D. none of the above

Answer: C

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73. Which is useful for the separating benzoic acid from methyl benzoate?

A. Aq. $NaHCO_3$

B. Dil. HCI

C. Aq. $NaHSO_3$

D. Dil. H_2SO_4

Answer: A

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74. A mixture of camphor and benzoic acid can be separated by

A. sublimation

B. fractional distillation

C. chemical method

D. extraction with solvents

Answer: C

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75. Anthracene is purified by

A. filtration

B. distillation

C. crystallisation

D. sublimation

Answer: D

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76. Which of the following is useful for making pure water from a solution of salt in water?

A. Filtration

B. Simple distillation

C. Steam distillation

D. Chromatography

Answer: B

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77. Water and alcohol can be separated from a mixture by:

A. fractional distillation

B. sublimation

C. decantation

D. evaporation

Answer: A

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78. A mixture of water and $NaCI$ can be separated by:

A. sublimation

B. evaporation

C. decantation

D. filtration

Answer: B

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79. In laboratory, solvent can be separated from solute by the process:

A. decantation

B. sedimentation

C. distillation

D. filtration

Answer: C

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80. In simple distillation of liquids, it involves simultaneously:

A. vaporisation and condensation

B. heating and sublimation

C. vaporisation and sublimation

D. boiling and filtration

Answer: A

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81. Distillation under reduced pressure is used to purify liquids which:

A. are highly volatile

B. have high boiling points

C. are explosives

D. decomposes below their boiling points

Answer: D

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82. Which one of the following reagents is useful for separating aniline from nitrobenzene?

A. Aq. $NaHCO_3$

B. Aq. $NaHSO_3$

C. Aq. HCI

D. Dilute H_2SO_4

Answer: C

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83. A mixture of phenol and benzoic acid will completely dissolve in an aqueous solution of:

A. HCI

B. $NaCI$

C. $NaHCO_3$

D. $NaOH$

Answer: D

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84. Silica gel is used for keeping away the moisture because it:

A. adsorbs water molecule

B. absorbs water molecule

C. reacts with water

D. none of the above

Answer: A

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85. Anhydrous $CaCI_2$ is used as drying agent, because it:

A. adsorbs water molecule

B. absorbs water molecule

C. both absorbs and absorbs water molecule

D. none of the above

Answer: B

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86. The function of fractionating column is:

A. to separate the two components

B. to provide greater cooling surface to the vapours

C. to kept the vapour pressure constant

D. to avoid mixing of the vapours of two components

Answer: B

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87. One having high vapour pressure at temperature below its melting point is:

A. benzoic acid

B. salicylic acid

C. citric acid

D. all of these

Answer: A

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88. Osazone formation is used to separate and identify:

A. alcohols

B. carboxylic acids

C. carbohydrates

D. strach

Answer: C

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89. Fractional distillation is used to separate liquids which differ in their boiling points by:

A. $0 - 10^{\circ} C$

B. $10 - 20^{\circ} C$

C. $20 - 40^{\circ} C$

D. $40 - 80^{\circ} C$

Answer: A

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90. Which of the substance is purified by sublimation?

A. Naphthalene

B. Benzoic acid

C. Camphor

D. All of these

Answer: D

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91. A mixture of oil and water is separated by:

A. filtration

B. using separating funnel

C. sublimation

D. fractional distillation

Answer: B

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92. Styrene can be purified by:

A. simple distillation

B. fractional distillation

C. vaccum distillation

D. steam distillation

Answer: D

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93. (A) is a higher phenol and (B) is an aromatic carboxylic acid. Separation of a mixture of (A) and (B) can be carried out easily by using a solution of:

A. $NaOH$

B. lime

C. $NaHCO_3$

D. Na_2CO_3

Answer: C

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94. Which is correct statement about azeotropic mixture?

A. It boils at constant temperature

B. It does not obey Raoult's law

C. It cannot be separated by fractional distillation

D. All of the above

Answer: D

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95. Separation of organic compounds by column chromatography is due to:

A. selective absorption

B. selective adsorption

C. both absorption and absorption

D. solubilities

Answer: B

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96. The technique of gas liquid chromatography is suitable for compounds which are:

A. soluble in water

B. highly volatile

C. vaporise without decomposition

D. liquids

Answer: C

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97. two substances when separated out on the basis of their extent of adsorption, by one material, the phenomenon is called:

A. chromatography

B. paper chromatography

C. steam distillation

D. sublimation

Answer: A

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98. Wen a hybridization state of carbon atom changes from sp^3 to sp^2 and finally to sp, the angle between the hybridized orbitals:

A. is not affected

B. increases progressively

C. decreases gradually

D. decreases considerably

Answer: B

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99. The bond enthalpy is highest for:

A. F_2

B. CI_2

C. Br_2

D. I_2

Answer:

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100. Hybridization of C_2 and C_3 of $H_3C - CH = C = CH - CH_3$ are:

A. sp, sp

B. sp, sp^3

C. sp^2, sp^2

D. sp^2, sp

Answer: D

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101. $p-$ nitrophenol and $o-$ nitrophenol are separated by

A. crystallisation

B. fractional distillation

C. distillation

D. steam distillation

Answer: D

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102. Intermolecular hydrogen bonding is strongest in

A. methylamine

B. phenol

C. formaldehyde

D. methanol

Answer: D

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103. Identify the correct order of boiling points of the following compounds: $CH_3CH_2\underset{1}{C}H_2CH_2OH, CH_3CH_2\underset{2}{C}H_2CHO$

$CH_3CH_2\underset{3}{C}H_2COOH$

A. $I > II > III$

B. $I > III > II$

C. $III > I > II$

D. $III > II > I$

Answer: C

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104. Camphor is often used in molecular mass determination because

A. It is readily available

B. it has very high cryoscopic constant

C. it is a volatile

D. it is a solvent for organic substances

Answer: C

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105. How will you separate a solution (miscible) of benzene $+CHCl_3$?

A. Distillation

B. Sublimation

C. Filtration

D. Crystallisation

Answer: A

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106. Allyl cyanide contains σ and π-bonds:

A. $5\sigma, 7\pi$

B. $9\sigma, 3\pi$

C. $3sigm, 4\pi$

D. $9\sigma, 9\pi$

Answer: B

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107. Which of the following gives correct arrangement of compounds involved based on their bond strength?

A. $HF > HCI > HBr > HI$

B. $HI > HBr > HCI > HF$

C. $HF > HBr > HCI > HI$

D. $HCI > HF > HBr > HI$

Answer: A

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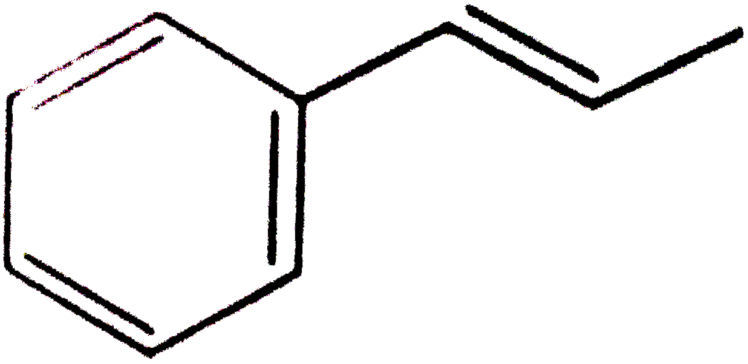
108. How many bonds are there in



A. $14\sigma, 8\pi$

B. $18\sigma, 8\pi$

C. $19\sigma, 4\pi$

D. $14\sigma, 2\pi$

Answer: C

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109. The correct order regarding the electronegativity of hybrid orbitals of carbon is ?

A. $sp < sp^2 > sp^3$

B. $sp < sp^2 < sp^3$

C. $sp > sp^2 < sp^3$

D. $sp > sp^2 > sp^3$

Answer: D

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110. Among the following mixiture dipole-dipole as the mojor interaction is present is

A. benzene and ethanol

B. acetonitrile and acetone

C. KCI and water

D. benzene and carbon tetrachloride

Answer: B

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111. Consider the following compounds:

(A) chloroethene (B) benzene (C) buta-1,3-diene (D) 1,3,5-hexatriene

All the carbon atoms are sp^2-hybridized in:

A. A,C,D only

B. A,B only

C. B,C,D only

D. A,B,C,D

Answer:

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112. The decreasing order of blood dissociation energies of C-C, C-H and H-H bonds is:

A. $H-H>-C-H>-C-C-$

B. $-C-C->-C-H>H-H$

C. $-C-H>-C-C->H-H$

D. $-C-C->H-H>-C-H$

Answer: A

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113. In 2-butene, which one of the following statements is true?

A. $C_1 - C_2$ bond is a $sp^3 - sp^3\sigma$ bond

B. $C_2 - C_3$ bond is a $sp^3 - sp^2\sigma$ bond

C. $C_1 - C_2$ bond is a $sp^3 - sp^2\sigma$bond

D. $C_1 - C_2$ bond is a $sp^2 - sp^2\sigma$ bond

Answer: C

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114. Compare List I and List II and choose the correct matching codes from the choices given:

$ListI$	$ListII$
(A)Glycerol	(i)Sublimation
(B)o-nitrophenol	(ii)Beilstein's test
(C)Anthracene	(iii)Victor-Meyer's method
(D)Halogens	(iv)Steam distillation
(E)Molecular weight	(v)Vacuum distillation
	(iv)Eudiometry

A. $(A-v),(B-iv),(C-i),(D-ii),(E-iii)$

B. $(A-iv),(B-v),(C-i),(D-vi),(E-ii)$

C. $(A-vi),(B-iv),(C-i),(D-iii),(E-ii)$

D. $(A-v),(B-iv),(C-vi),(D-ii),(E-iii)$

Answer: A

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115. In the following compound, the number of 'sp' hybridised carbon is:

$$H_2C=C=CH-\underset{\underset{CN}{|}}{CH}-C\equiv CH$$

A. 5

B. 3

C. 2

D. 4

Answer: D

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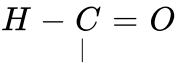
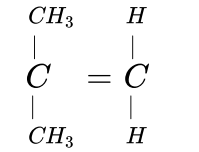
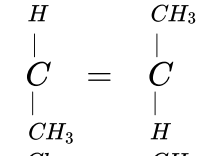
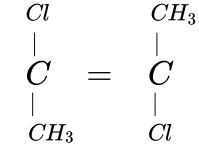
116. Which of the following has the highest dipole moment?

A. 

B. 

C. 

D. 

Answer: A

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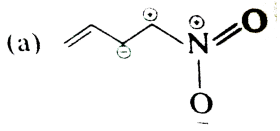
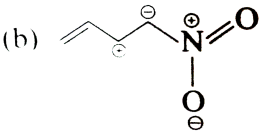
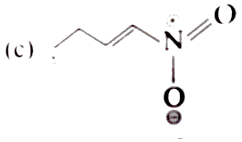
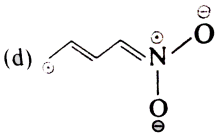
117. Among the following, the least stable resonance structure is :

A. 

B. 

C. 

D. 

Answer: A

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118. Which one of the following arrangements does not give the correct picture of the trends indicated against it ?

A. $F_2 > Cl_2 > Br_2 > I_2$: Bond dissociation energy

B. $F_2 > CI_2 > Br_2 > I_2$: Electronegativity

C. $F_2 > CI_2 > Br_2 > I_2$: Oxidising power

D. $F_2 > CI_2 > Br_2 > I_2$: Electron gain enthalpy

Answer: C

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119. The enolic form of ethyl acetoacetate as shown below has

A. 9 sigma bonds and 2 pi bonds

B. 9 sigma bonds and 1 pi bond

C. 16 sigma bonds and 1 pi bond

D. 18 sigma bonds and 2 pi bonds

Answer: D

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120. The enolic form of butanone contains

A. 12σ bonds, 1π bond and 2 lone pairs of electron

B. 11σ bonds, 1π bond and 2 lone pairs of electrons

C. 12σ bonds, 1π bonds and 1 lone pair of electrons

D. 10σ bonds, 2π bonds and 2 lone pairs of electrons

Answer: A

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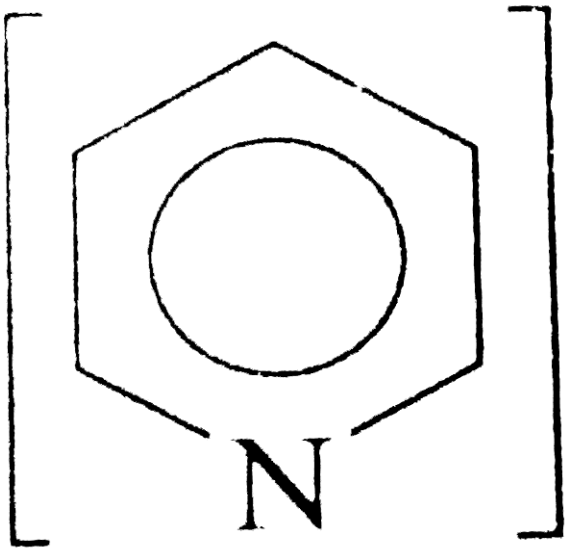
121. Hybridization of nitrogen atom in pyridine



is:

is:

A. sp^3 and sp^2

B. sp^2

C. sp

D. sp^3d

Answer: B

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122. The number of π-bonds in the following compound $O_2N - C \equiv C - NO_2$ is:

A. 2

B. 3

C. 4

D. 1

Answer: C

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123. The compound in which underlined carbon uses only its sp^3-hybrid orbitals for bond formation is:

A. $CH_3\underline{C}OOH$

B. $CH_3\underline{C}ONH_2$

C. $CH_3\underset{-}{C}H_2OH$

D. $CH_3\underset{C}{H} = CH_2$

Answer: C

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124. Match the following:

(A)Simple distillation	$(i)$to separate the liquids which are steam vola insoluble in water and contains non-volatile im
(B)Fractional distillation	$(ii)$to separate liquids which decomposes at a t below their normal boiling points
(C)Vaccum distillation	$(iii)$to separate two or more liquids which hav points close to each other
(D)Steam distillation	$(iv)$to separate liquid from non-volatile impur

A. $\begin{matrix} A & B & C & D \\ (i) & (ii) & (iii) & (iv). \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ (iv) & (iii) & (ii) & (i). \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ (iii) & (i) & (iv) & (ii). \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ (ii) & (iv) & (i) & (iii). \end{matrix}$

Answer: B

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125. Match the following:

(A)Sublimation	(i)Ether+toluene
(B)Distillation	(ii)o-Nitrophenol+p-nitrophenol
(C)Vaccum distillation	(iii)Benzoic acid+benzaldehyde
(D)Steam distillation	(iv)Glycerol from spent lye

A. $\begin{matrix} A & B & C & D \\ (iv) & (iii) & (ii) & (i). \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ (i) & (ii) & (iii) & (iv). \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ (iii) & (i) & (iv) & (ii). \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ (ii) & (iv) & (i) & (iii). \end{matrix}$

Answer: C

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126. Allyl cyanide has

A. 9 sigma bond, 4pi bonds and no lone pair

B. 9 sigma bonds, 3pi bonds and one lone pair

C. 8 sigma bonds, 5 pi bonds and one lone pair

D. 8 sigma bonds, 3pi bonds and two lone pairs

Answer: B

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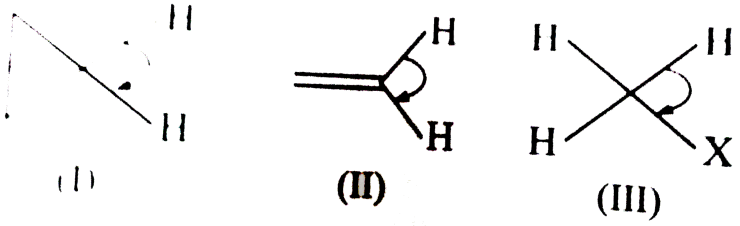
127. The correct order of decreasing H-C-H angle in the following molecule is:



A. $I > II > III$

B. $II > I > III$

C. $III > II > I$

D. $I > III > II$

Answer: B

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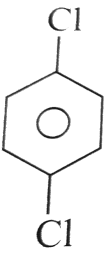
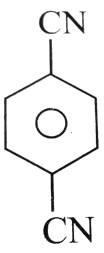
128. For which of the following molecule significant $\mu \neq 0$?

A. 

B. 

C. 

D. 

A. III and IV

B. only I

C. I and II

D. only III

Answer: A

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129. Consider the molecules CH_4, NH_3 and H_2O which of the given statement is false ?

A. The H-O-H bonds angle in H_2O is smaller than the H-N-H bond angle in NH_3

B. The H-C-H bond angle in CH_4 is larger than the H-N-H bond angle in NH_3

C. The H-C-H bond angle in CH_4, the H-N-H bond angle in NH_3 and the H-O-H bond angle in H_2O are all greater than 90°

D. The H-O-H bond angle in H_2O is larger than the H-C-H bond angle in CH_4

Answer: D

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130. The distillation technique most sited for separating glycerol from spent lye in the soap industry is

A. simple distillation

B. fractional distillation

C. steam distillation

D. Distillation under reduced pressure

Answer: D

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Objective Questions Level B

1.  This hydrocarbon has hybridization on C-atoms:

A. sp, sp^2, sp^3

B. sp, sp^2

C. sp^2, sp^3

D. sp, sp^3

Answer: B

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2. 1°, 2°, 3° and 4° carbon atoms are present in:

A. 2,2,3-trimethyl pentane

B. 2,3,4-trimethyl pentane

C. both (a) and (b)

D. none of the above

Answer: A

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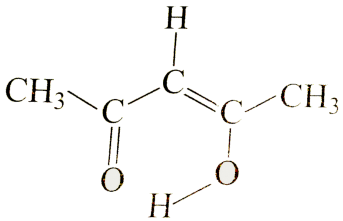
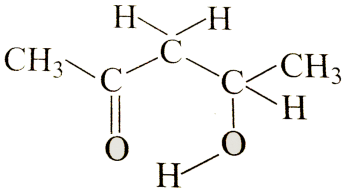
3. Two molecules indicated below are capable to intramolecular H-bonding. Which is likely to form more stable hydrogen bonds?



(I)



(II)

A. I

B. II

C. Both are equally capable

D. Cannot be predicted

Answer: A

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4. Which one of the underlined carbons is sp^3-hybridized?

A. $CH_3\underset{-}{C}H = CH_2$

B. $CH_3\underset{-}{C}H_2NH_2$

C. $CH_3\underset{C}{O}NH_2$

D. $CH_2CH_2\underset{C}{N}$

Answer: B

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5. The hybridization of iodine in iodosobenzen is:

A. sp

B. sp^2

C. sp^3

D. sp^3d

Answer: C

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6. Carboxylic acids do not give the characteristic reactions of $> C = O$ group because of :

A. polar nature

B. resonance

C. symmetrical structure

D. attached alkyl group

Answer: B

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7. Which among the following has highest boiling point?

A. $CH_3CH_2CH_2CH_2CI$

B. $(CH_3)_\circ CHCH_2CI$

C. $(CH_3)_3C - CI$

D. None of the above

Answer: A

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8. Which among the following has highest melting point?

A. $(CH_3CO)_2O$

B. CH_3CN

C. CH_3CONH_2

D. CH_3COCI

Answer: C

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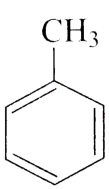
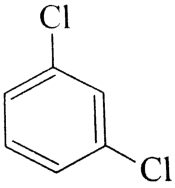
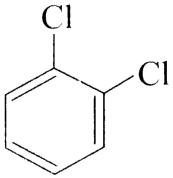
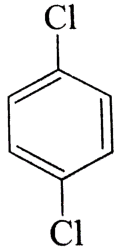
9. Order of arrangement of the following compounds with increasing dipole moment is:

(I) 

(II) 

(III) 

(IV) 

A. $I < IV < II < III$

B. $IV < I < II < III$

C. $IV < I < III < II$

D. $IV < II < I < III$

Answer: B

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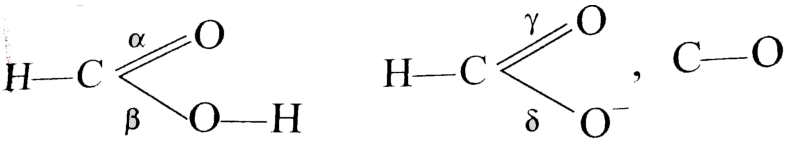
10. 

designated by α, β, γ and δ are in order:

A. $\alpha = \gamma < \beta = \delta$

B. $\alpha < \beta < \gamma = \delta$

C. $\alpha < \gamma = \delta < \beta$

D. all are equal

Answer: C

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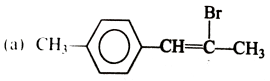
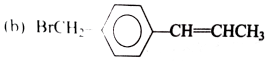
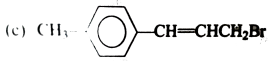
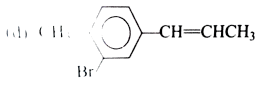
11. Which one of the following compounds is an allylic halide?

A. 

B. 

C. 

D. 

Answer: C

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12. The compound in which all carbon atoms use only sp^3-hybrid orbitals for bond formation is:

A. CH_3CHO

B. CH_3COCH_3

C. $(CH_3)_3COH$

D. $HCOOH$

Answer: C

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13. Which of the following is unacceptable resonating structure of buta-12,3-triene?

A. $\overset{-}{\text{â€¢C}}H_2 - C \equiv C - \overset{\oplus}{C}H_2$

B. $CH_2 = C = C = CH_2$

C. $\overset{\oplus}{C}H_2 - C \equiv C - \overset{-}{\underset{\text{â€¢}}{\underset{\text{â€¢}}{C}}}H_2$

D. $\overset{-}{\text{â€¢C}}H_2 - C \equiv C - \underset{\text{â€¢}}{C}H_2$

Answer: D

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14. The resonating structures of cyanate ion are $O = C = \overset{1-}{N} \leftrightarrow \overset{1-}{O} - C \equiv N \leftrightarrow \overset{1+}{\equiv} C - \overset{2-}{N}$. The correct set of oxidation states of O, C and N respectively with the most stable structure out of the above is :

A. (i) $-3, +4, -2$

B. (ii) $-2, +4, -3$

C. (iii) $-1, +4, -3$

D. (i) $0, +4, -5$

Answer: B

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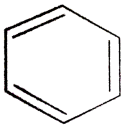
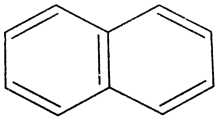
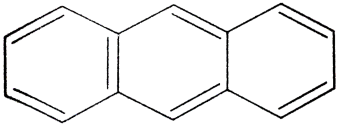
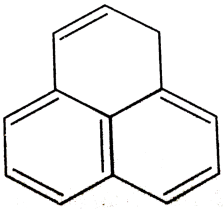
15. Arrange the following molecules in increasing order of σ to π bond ratio:

(1) 

(2) 

(3) 

(4) 

A. $2 < 3 < 4 < 1$

B. $2 < 4 < 3 < 1$

C. $3 < 2 < 1 < 4$

D. $2 < 3 < 1 < 4$

Answer: C

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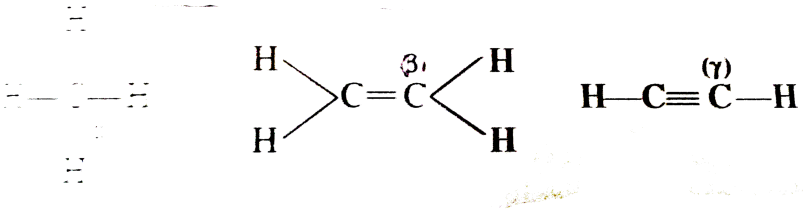
16. Arrange the following C-H bonds (α, β, γ) in decreasing order of bond energy:



A. $\alpha > \beta > \gamma$

B. $\gamma > \beta > \alpha$

C. $\beta > \alpha > \gamma$

D. $\gamma > \alpha > \beta$

Answer: B

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17. In the reaction,

$CH_3 - \underset{*}{\overset{O}{\overset{||}{C}}} - NH_2 \xrightarrow[\Delta]{P_2O_5} \underset{*}{C} \equiv N$. The hybridization state of marked carbon atom changes from:

A. sp^2 to sp

B. sp^3 to sp

C. sp^3 to sp^2

D. sp^2 to sp^3

Answer: A

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18. Arrange the following resonating structures of formic acid in order of decreasing stability:

$$\underset{(I)}{H-\overset{\overset{O}{||}}{C}-OH} \leftrightarrow \underset{(II)}{H-\overset{\overset{O^-}{||}}{C}-\overset{+}{O}H} \leftrightarrow \underset{(III)}{H\overset{\overset{O^-}{|}}{\underset{+}{C}}-OH} \leftrightarrow \underset{(IV)}{H-\overset{\overset{O^-}{|}}{\underset{-}{C}}-O}$$

A. $II > I > III > IV$

B. $I > III > II > IV$

C. $III > II > IV > I$

D. $IV > III > I > II$

Answer: B

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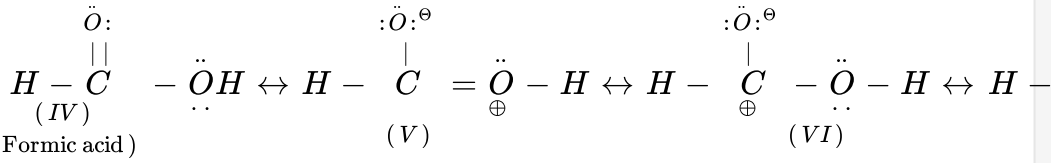
19. Arrange the following resonating structures in the order of decreasing stability :

(a) $\underset{\substack{(I)\\(\text{Vinyl chloride})}}{CH_2=CH-\ddot{\underset{\cdot\cdot}{Cl}}:} \leftrightarrow \underset{(II)}{:\overset{\ominus}{C}H_2-CH=\overset{\oplus}{\underset{\cdot\cdot}{Cl}}:} \leftrightarrow \underset{(III)}{\overset{\oplus}{C}H_2-CH=\ddot{\underset{\cdot\cdot}{Cl}}^{\ominus}}$

b.



(c) Write the resonating structure of phenol in order of decreasing stability.

A. $I > II > III$

B. $III > II > I$

C. $II > I > III$

D. $I > I \equiv III$

Answer: A

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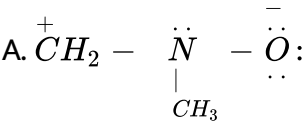
20. Among the following four structures, one is not a permissible resonance form. Identify the wrong structure.

A. 

B. $CH_2 - \overset{+}{\underset{|}{\underset{CH_3}{N}}} - \overset{-}{\underset{\cdot\cdot}{\overset{\cdot\cdot}{O}}}:$

C. $CH_2 - \underset{|}{\underset{CH_3}{N}} = \underset{\cdot\cdot}{O}:$

D. $:\overset{-}{C}H_2 - \overset{+}{\underset{|}{\underset{CH_3}{N}}} = \underset{\cdot\cdot}{O}:$

Answer: C

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21. Identify the weakest C-H bond among the following:

$$H - \underset{\alpha}{\underset{|}{\overset{H}{\underset{H}{C}}}} - H, R - \underset{\beta}{CH_2} - H, R - \underset{|}{\overset{R}{C}}\underset{\gamma}{H} - H, R - \underset{\delta}{\underset{|}{\overset{R}{\underset{R}{C}}}} - H$$

A. α

B. β

C. γ

D. δ

Answer: D

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22. Which of the following is the correct sequence of the bond length?

A. $S-H>C-H>N-H>O-H$

B. $C-H>S-H>O-H>N-H$

C. $O-H>N-H>C-H>S-H$

D. $S-H>O-H>N-H>C-H$

Answer: A

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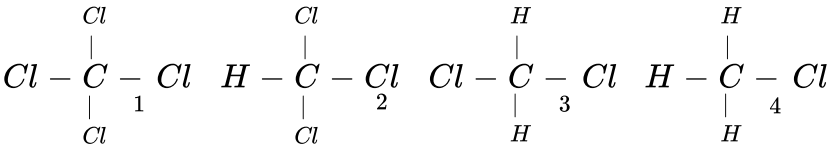
23. Arrange the following bonds in decreasing order of bond length:



A. $1>2>3>4$

B. $4 > 3 > 2 > 1$

C. $2 > 3 > 1 > 4$

D. $4 > 1 > 2 > 3$

Answer: B

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24. Which of the following compounds has weakest C-X bonds?

A. CH_3F

B. CH_3Cl

C. CH_3Br

D. CH_3I

Answer: D

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25. How many electrons are present in the p-orbitals of methyl cation?

A. 2

B. 3

C. 4

D. None of these

Answer: D

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26. In which of the following , delocalisation of $\pi -$ electrons is/are possible?

A. $CH_2 = CH_2$

B. $CH_3 - CH_2 - CH = CH_2$

C. $CH_2 = CH - CH = CH_2$

D. $CH_2 = CH - CH_2 - CH = CH_2$

Answer: C

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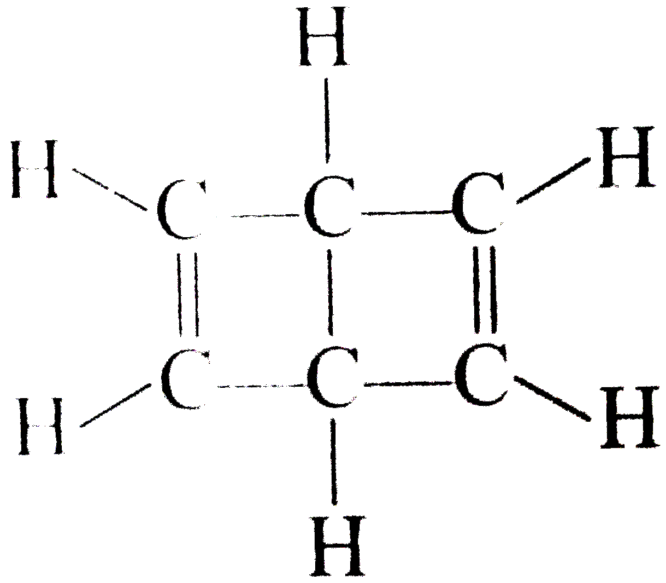

27.

In the given Dewar structure of benzene, which of the following statement (s) is/are correct?

A. All the carbons are in sp^2-hybrid state

B. All the carbons are in sp^3-hybrid state

C. Four carbons are in sp^2 and two in sp^3-hybrid state

D. Four carbons are in sp^3-and two in sp^2-hybrid state

Answer: C

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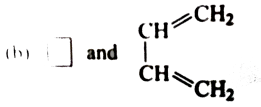
28. The pair of structure that are resonance hybrid is:

A. $H\ddot{O} - \overset{+}{C}HCH_3$ and $H\overset{+}{O} = CHCH_3$

B. 

C. $CH_3 = \overset{:O:}{\underset{||}{C}} - H$ and $CH_2 = \underset{|}{\overset{\ddot{O} - H}{C}}$

D. $CH_3\overset{+}{C}H_2$ and $\overset{+}{C}H_2CH_3$

Answer: A

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29. The correct decreasing order of stability of I,II and III carbocations is:

(I) $CH_3 - \overset{+}{C}H - CH_3$ (II) $CH_3 - \overset{+}{C}H - COCH_3$

(III) $CH_3 - \overset{+}{C}H - OCH_3$

A. $I > II > III$

B. $II > III > I$

C. $III > I > II$

D. $II > I > III$

Answer: C

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30. The hybrid states of carbon atoms in $(\overset{B}{C}N)_4\overset{A}{C}_2$ are A and B and number of π bonds in compounds is C. Then:

A. $A = sp$, $B = sp^2$ and $C = 9$

B. $A = sp^2$, $B = sp$ and $C = 9$

C. $A = sp^3, B = sp$ and $C = 9$

D. $A = sp^2, Bsp^2$ and $C = 9$

Answer: B

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31. $\underset{X_1}{-}\overset{+}{\underset{|}{C}}-\underset{\dot{X}_2}{\dot{C}}-\underset{X_3}{\ddot{C}}-\overset{-}{\underset{|}{C}}-\underset{X_4}{}$, Select the correct state of hybridization at X_1, X_2, X_3 and X_4.

A. $\begin{matrix} X_1 & X_2 & X_3 & X_4 \\ sp^2 & sp & sp^2 & sp^3 \end{matrix}$

B. $\begin{matrix} X_1 & X_2 & X_3 & X_4 \\ sp^3 & sp^2 & sp & sp \end{matrix}$

C. $\begin{matrix} X_1 & X_2 & X_3 & X_4 \\ sp^2 & sp^2 & sp & sp^3 \end{matrix}$

D. $\begin{matrix} X_1 & X_2 & X_3 & X_4 \\ sp^3 & sp^2 & sp^2 & sp \end{matrix}$

Answer: A

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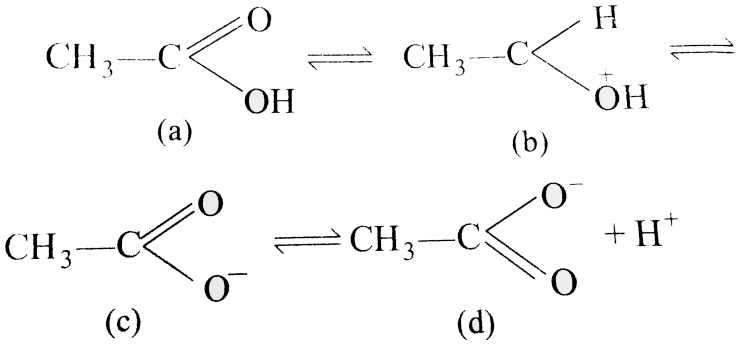
32. Which of the following structures have resonance stability?



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33. Which of the following compounds has (have) sp-hybridized carbon atom?

A. $CH_2 = C = O$

B. $CH_2 = CH - CN$

C. $CH_3 - CH = CH_2$

D. $H_2C = O$

Answer: A::B

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34. Resonating structures of a molecule have:

A. identical bonding

B. different bonding

C. identical arrangement of atoms and nearly same energies

D. tha same number of paired and unpaired electrons

Answer: B::C::D

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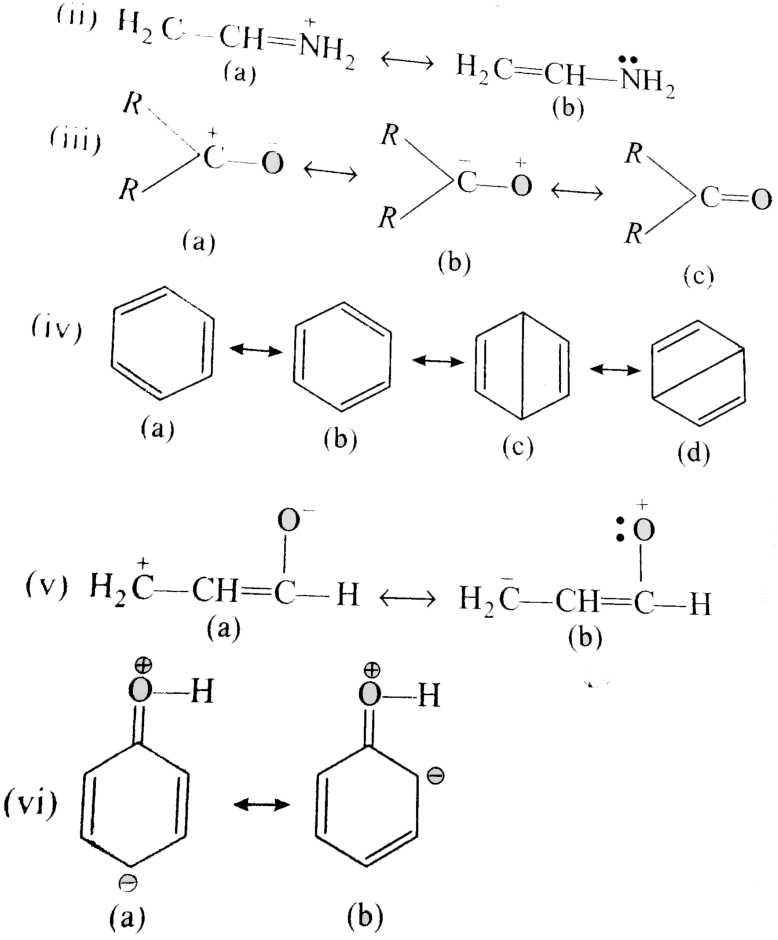
35. Which resonance form in each of the following sets is the major contributor to the real structure?

(i)

$$\underset{(a)}{H_2C=CH-\ddot{\underset{\cdot\cdot}{C}}I:} \leftrightarrow \underset{(b)}{H_2\overset{-}{\ddot{C}}-CH=\overset{-}{\underset{\cdot\cdot}{C}}\overset{+}{I}:} \leftrightarrow \underset{(c)}{H_2\overset{+}{C}-CH=\ddot{\underset{\cdot\cdot}{C}}I:^{-}}$$

(ii) $\underset{(a)}{H_2\bar{C}-CH=\overset{+}{N}H_2} \leftrightarrow \underset{(b)}{H_2=CH-\ddot{N}H_2}$



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36. Chromatography technique is used in the separation of:

A. volatile liquids

B. amino acids

C. plant pigments

D. sugars

Answer: A::B::C

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37. Mixed melting point is determined to check:

A. the purity of organic compound

B. whether the two compounds are same

C. whether the two compounds can different

D. whether the two compounds can be separated by fractional crystallisation method

Answer: A::B::D

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38. Which of the following compounds can be purified by vaccum distillation?

A. Glycerine

B. Glycerol

C. Propane-1,2,3-triol

D. Ethanol

Answer: A::C

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39. Which of the following compounds can be purified by steam distillation?

A. Salicyladehyde

B. Bromobenzene

C. p-Hydroxy benzaldehyde

D. Nitrobenzene

Answer: A::B::D

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40. Mixture of benzene and aniline can be separated by:

A. distillation

B. steam distillation

C. dil.HCI

D. dil. NaOH

Answer: A::C

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41. Absolute alcohol can be prepared from rectified spirit by

A. azeotrpoic distillation with benzene

B. fractional distillation

C. keeping over fresh CaO for few hours and then distilling

D. distillation under reduced pressure

Answer: A::C

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42. Select the wrong statements about chromatography.

A. Moving phase is liquid and stationary phase is solid

B. Moving phase is liquid and stationary phase is liquid

C. Moving phase is solid and stationary phase is solid

D. Moving phase is solid and stationary phase is liquid

Answer: A::C::D

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43. A substance which decomposes at or below its boiling point cannot be purified by:

A. steam distillation

B. simple distillation

C. fractional distillation

D. distillation under reduced pressure

Answer: A::B::C

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44. Refining of petroleum does not involve:

A. simple distillation

B. steam distillation

C. fractional distillation

D. distillation under reduced pressure

Answer: A::C::D

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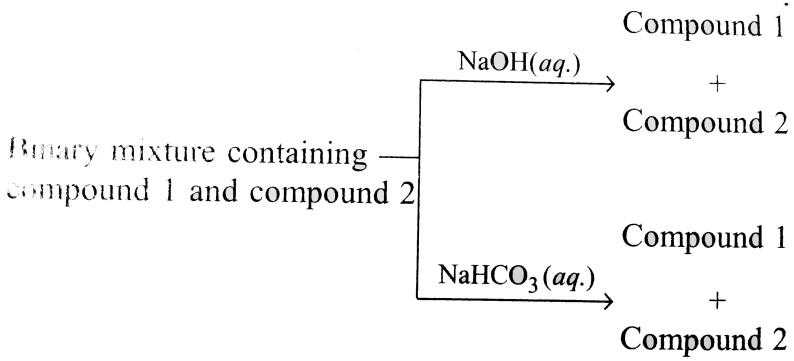
45. Identify the binary mixture(s) that can be separated into individual compounds, by differential extraction, as shown in the given scheme:



A. C_6H_5OH and C_6H_5COOH

B. C_6H_5COOH and $C_6H_5CH_2OH$

C. $C_6H_5CH_2OH$ and C_6H_5OH

D. $C_6H_5CH_2OH$ and C_6H_5COOH

Answer: B::D

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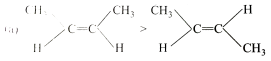
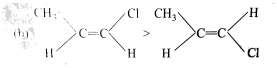
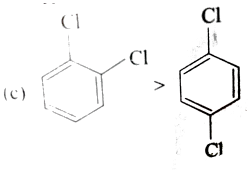
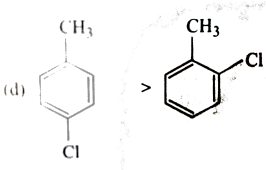
46. Which are correct regarding boiling point?

A. 

B. 

C. 

D. 

Answer: A::B::C::D

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Assertion Reason Type

1. (A) Oils are purified by steam distillation.

(R) The compounds which decompose at their boiling points can be purified by steam distillation.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: C

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2. (A) Mixture of glucose and m-dinitrobenzene can be separated by shaking it with ether.

(R) Glucose is soluble in water.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: B

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3. Assertion : Thiophene present in commercial benzene as an impurity can be removed by shaking the mixture with cold concentrated H_2SO_4.

Reason : Thiophene is a heterocyclic aromatic compound.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: B

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4. (A) A mixture of comphor and benzoic acid cannot be separated by sublimation.

(R) Camphor on heating sublimes but benzoic acid does not.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: C

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5. (A) A mixture of o-nitrophenol and p-nitrophenol can be separated by steam distillation.

(R) o-nitrophenol is steam volatile but p-nitrophenol is not though both are water soluble.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: A

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6. (A) Acetone (b.pt 329K) and methyl alcohol (b.pt 338K) are separated by fractional distillation.

(R) Fractional distillation helps in separating two liquids from their mixture when their boiling points differ by $10^{\circ} C$.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: A

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7. (A) Aniline has odd molecular mass, i.e., 93.

(R) All nitrogenous compounds containing odd no of nitrogen has odd molecular mass.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: A

Watch Video Solution

8. (A) Molecular nitrogen is less reactive than molecular oxygen.

(R) The bond length of N_2 is shorter than that of oxygen.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: A

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9. p-Hydroxybenzoic acid has a lower boiling point than o-hydroxybenzoic acid.

o-Hydorxybenzoic acid has intramolecular hydrogen bonding.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: D

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10. (A) Chlorine has higher electron affinity than fluorine.

(R) Chlorine is a poor oxidising agent than fluorine.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: C

View Text Solution

11. (A) The dipole moment of CH_3F is lower than that of CH_3CI.

(R) The C-F bond is more polar than C-CI bond.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: B

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12. Assertion : trans $-$ Pent $-2-$ ene is polar but trans $-$ but $-2-$ ene is non $-$ polar.

Reason : The polarity of cis-$-isomersism$ or $ethantrans$-$isomer, whichareeithernon$-` polar or less polar.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: B

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13. (A) Pyrrole is more basic than pyridine.

(R) In pyrrole, nitrogen is sp^2-hybridized.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: D

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14. (A) Essential oils are volatile and are insoluble in water. ltbr. (R) Essential oils are purified by steam distillation.

A. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is the correct explanation for statement-1 (A).

B. Statement-1 (A) and statement-2 (R) are true and statement-2 (R) is not the correct explanation for statement-1 (A)

C. Statement-1 (A) is true, statement-2 (R) is false

D. Statement-1 (A) is false, statement-2 (R) is true

Answer: A

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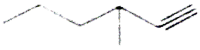
Matrix Match Type

1. Match the following:

Column I	Column II
(a) 	(p) one tertiary C-atom
(b) 	(q) *sp*-hybridization
(c) 	(r) *sp* and sp^3-hybridization
(d) 	(s) 2π bonds

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2. Match the following:

ColumnI	*ColumnII*
(a)Sublimation	(p)Gilycerine cane sugar
(b)Simple distillation	(q)Aniline nitrobenzene
(c)Fractional distillation	(r)Benzene and aniline
(d)Distillation under reduced pressure	(s)Naphthalene camphor
(e)Steam distillation	(t)Methanol and propanone

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Passage 1

1. A polar covalent bond is formed between the two elements of different electronegativies. The polarity of a bond depends on the electronegativity difference, the boiling atoms and also on the shape of the molecule.

A-B Let x_A and x_B are the electronegativites of bonding atoms A and B then, percentage ionic character of the bond can be calculated, as

% ionic character $= 21|x_A - x_B| + 3.5|x_A - x_B|^2$ Dipole moment of the bond (μ) depends on the bond length and the polarity of the bond.

$\mu = q \times d$

Here, q = charge of the dipoles

d = bond length

It is observed that the dipole moment increases with increase in the inductive effect. Answer the following questions as indicated: Select code (a) if the statement is true and code (b) if the statement is false.

The dipole moment of $CH_3 - X$ bond lies in the following sequence:

$CH_3 - I < CH_3 - Br < CH_3 - CI$

True (a) False (b)

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2. A polar covalent bond is formed between the two elements of different electronegativies. The polarity of a bond depends on the electronegativity difference, the boiling atoms and also on the shape of the molecule.

A-B Let x_A and x_B are the electronegativites of bonding atoms A and B then, percentage ionic character of the bond can be calculated, as

$\%$ ionic character $= 21|x_A - x_B| + 3.5|x_A - x_B|^2$ Dipole moment of the bond (μ) depends on the bond length and the polarity of the bond.

$\mu = q \times d$

Here, q = charge of the dipoles

d = bond length

It is observed that the dipole moment increases with increase in the inductive effect. Answer the following questions as indicated: Select code (a) if the statement is true and code (b) if the statement is false.

Dipole moment of methanol is less than ethanol:

True (a) False (b)

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3. A polar covalent bond is formed between the two elements of different electronegativies. The polarity of a bond depends on the electronegativity difference, the boiling atoms and also on the shape of the molecule.

A-B Let x_A and x_B are the electronegativites of bonding atoms A and B then, percentage ionic character of the bond can be calculated, as

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$\mu = q \times d$

Here, q = charge of the dipoles

d = bond length

It is observed that the dipole moment increases with increase in the inductive effect. Answer the following questions as indicated: Select code (a) if the statement is true and code (b) if the statement is false.

Dipole moment of C-Cl bond is greater than C-F bond:

True (a) False(b)

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4. A polar covalent bond is formed between the two elements of different electronegativies. The polarity of a bond depends on the electronegativity difference, the boiling atoms and also on the shape of the molecule.

A-B Let x_A and x_B are the electronegativites of bonding atoms A and B then, percentage ionic character of the bond can be calculated, as

$\%$ ionic character $= 21|x_A - x_B| + 3.5|x_A - x_B|^2$ Dipole moment of the bond (μ) depends on the bond length and the polarity of the bond.

$\mu = q \times d$

Here, q = charge of the dipoles

d = bond length

It is observed that the dipole moment increases with increase in the inductive effect. Answer the following questions as indicated: Select code (a) if the statement is true and code (b) if the statement is false.

Dipole moment of methyl alcohol  is less than that of water:

True (a) False (b)

View Text Solution

5. A polar covalent bond is formed between the two elements of different electronegativies. The polarity of a bond depends on the electronegativity difference, the boiling atoms and also on the shape of the molecule.

A-B Let x_A and x_B are the electronegativites of bonding atoms A and B then, percentage ionic character of the bond can be calculated, as

$\%$ ionic character $= 21|x_A - x_B| + 3.5|x_A - x_B|^2$ Dipole moment of the bond (μ) depends on the bond length and the polarity of the bond.

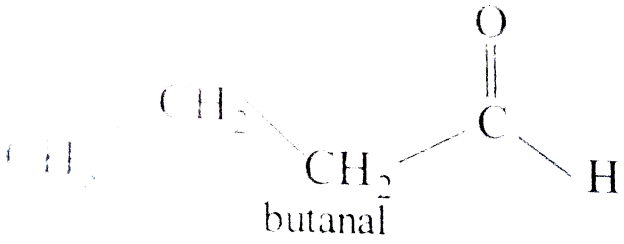
$\mu = q \times d$

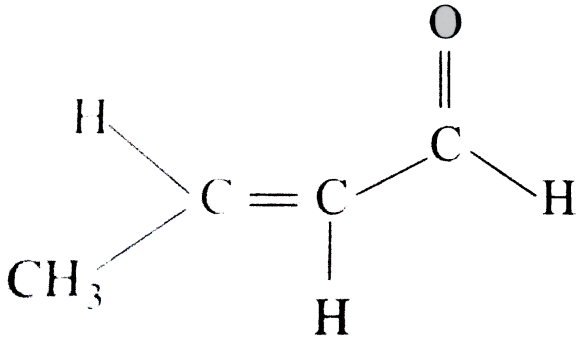
Here, q = charge of the dipoles

d = bond length

It is observed that the dipole moment increases with increase in the inductive effect. Answer the following questions as indicated: Select code (a) if the statement is true and code (b) if the statement is false.

Dipole moment of trans-2 butenal is greater than butanal:





False (b)

True (a) False(b)

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6. A polar covalent bond is formed between the two elements of different electronegativies. The polarity of a bond depends on the electronegativity difference, the boiling atoms and also on the shape of the molecule.

A-B Let x_A and x_B are the electronegativites of bonding atoms A and B

then, percentage ionic character of the bond can be calculated, as

% ionic character $= 21|x_A - x_B| + 3.5|x_A - x_B|^2$ Dipole moment of the bond (μ) depends on the bond length and the polarity of the bond.

$\mu = q \times d$

Here, q = charge of the dipoles

d = bond length

It is observed that the dipole moment increases with increase in the inductive effect. Answer the following questions as indicated: Select code (a) if the statement is true and code (b) if the statement is false.

Dipole moment of para-nitrophenol is greater than phenol:

True (a) False(b)

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7. A polar covalent bond is formed between the two elements of different electronegativies. The polarity of a bond depends on the electronegativity difference, the boiling atoms and also on the shape of the molecule.

A-B Let x_A and x_B are the electronegativites of bonding atoms A and B

then, percentage ionic character of the bond can be calculated, as

% ionic character $= 21|x_A - x_B| + 3.5|x_A - x_B|^2$ Dipole moment of the bond (μ) depends on the bond length and the polarity of the bond.

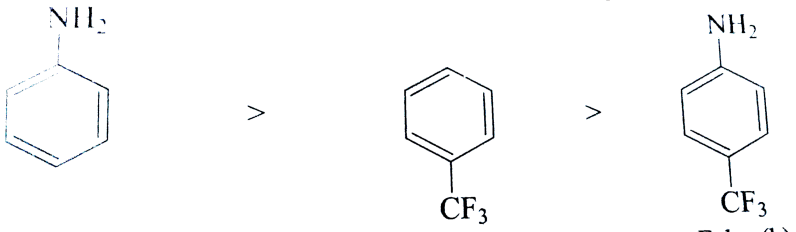
$\mu = q \times d$

Here, q = charge of the dipoles

d = bond length

It is observed that the dipole moment increases with increase in the inductive effect. Answer the following questions as indicated: Select code (a) if the statement is true and code (b) if the statement is false.

Dipole moment of aniline, trifluoromethylbenze and p-trifluoromethyl aniline lies in the following sequence:



True (a)

False (b)

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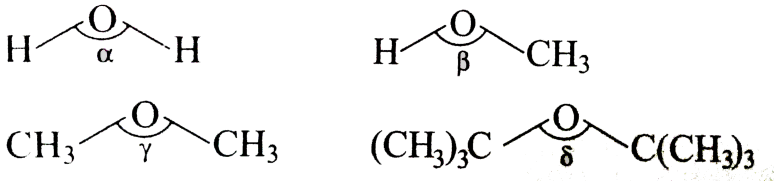
Passage 2

1. Geometry of organic compound is often described in terms of the valence shell electron pair repulsion theory. The VSEPR model rests on the premise that an electron pair, either bonded pair or an unshared pair, associated with a particular atom will be as far away from the atom's other electron pairs as possible. The tricoordinate carbon atoms of an alkene or carbonyl group also form bonds with angles near 120°. In these compounds, unsaturated double bonds have two electron pairs-those of the sigma and pi bonds. Repulsion by these two pairs are some what greater than those between single bonds, so that deviation from exact 120° trigonal geometry is observed. Another factor which has important influence on shapes is non bonded repulsion between the atoms within the molecule. Such repulsion is also referred to as steric effects.



Select the correct sequence of bond angles indicated in the above molecules.

A. $\alpha < \beta < \gamma < \delta$

B. $\alpha = \beta = \gamma = \delta$

C. $\alpha > \beta > \gamma > \delta$

D. $\alpha < \beta < \delta < \gamma$

Answer: A

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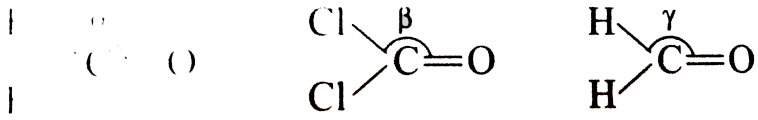
2. Geometry of organic compound is often described in terms of the valence shell electron pair repulsion theory. The VSEPR model rests on the premise that an electron pair, either bonded pair or an unshared pair, associated with a particular atom will be as far away from the atom's other electron pairs as possible. The tricoordinate carbon atoms of an alkene or carbonyl group also form bonds with angles near 120°. In these compounds, unsaturated double bonds have two electron pairs-those of the sigma and pi bonds. Repulsion by these two pairs are some what greater than those between single bonds, so that deviation from exact 120° trigonal geometry is observed. Another factor which has important

influence on shapes is non bonded repulsion between the atoms within the molecule. Such repulsion is also referred to as steric effects.



Select the correct sequence of indicated bond angles.

A. $\alpha < \beta < \gamma$

B. $\alpha > \beta > \gamma$

C. $\alpha = \beta = \gamma$

D. $\alpha < \beta < \gamma$

Answer: B

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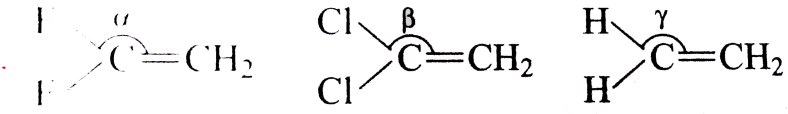
3. Geometry of organic compound is often described in terms of the valence shell electron pair repulsion theory. The VSEPR model rests on the premise that an electron pair, either bonded pair or an unshared pair, associated with a particular atom will be as far away from the atom's

other electron pairs as possible. The tricoordinate carbon atoms of an alkene or carbonyl group also form bonds with angles near 120°. In these compounds, unsaturated double bonds have two electron pairs-those of the sigma and pi bonds. Repulsion by these two pairs are some what greater than those between single bonds, so that deviation from exact 120° trigonal geometry is observed. Another factor which has important influence on shapes is non bonded repulsion between the atoms within the molecule. Such repulsion is also referred to as steric effects.



Select the correct sequence of indicated bond angles.

A. $\alpha > \beta > \gamma$

B. $\alpha = \beta = \gamma$

C. $\alpha < \beta < \gamma$

D. $\alpha > \gamma < \gamma$

Answer: A

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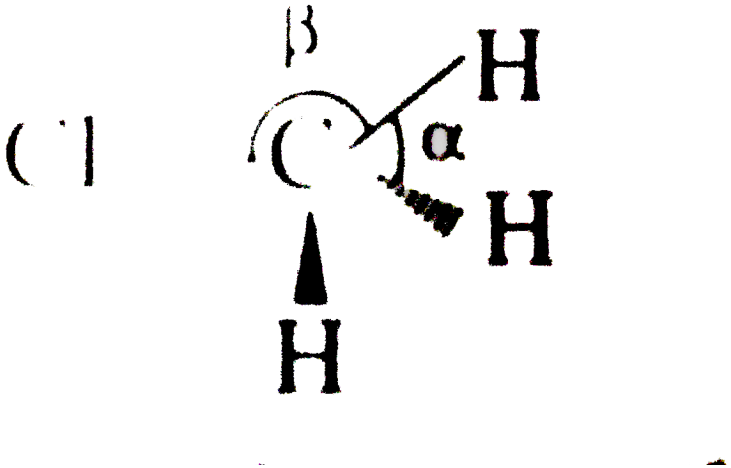
4. Geometry of organic compound is often described in terms of the valence shell electron pair repulsion theory. The VSEPR model rests on the premise that an electron pair, either bonded pair or an unshared pair, associated with a particular atom will be as far away from the atom's other electron pairs as possible. The tricoordinate carbon atoms of an alkene or carbonyl group also form bonds with angles near 120°. In these compounds, unsaturated double bonds have two electron pairs-those of the sigma and pi bonds. Repulsion by these two pairs are some what greater than those between single bonds, so that deviation from exact 120° trigonal geometry is observed. Another factor which has important influence on shapes is non bonded repulsion between the atoms within the molecule. Such repulsion is also referred to as steric effects.



Which among the following is correct about the indicated bond angles?

A. $\alpha = \beta$

B. $\alpha > \beta$

C. $\alpha < \beta$

D. Can not be predicted

Answer: B

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5. Geometry of organic compound is often described in terms of the valence shell electron pair repulsion theory. The VSEPR model rests on the premise that an electron pair, either bonded pair or an unshared pair, associated with a particular atom will be as far away from the atom's other electron pairs as possible. The tricoordinate carbon atoms of an alkene or carbonyl group also form bonds with angles near 120°. In these compounds, unsaturated double bonds have two electron pairs-those of the sigma and pi bonds. Repulsion by these two pairs are some what greater than those between single bonds, so that deviation from exact 120° trigonal geometry is observed. Another factor which has important influence on shapes is non bonded repulsion between the atoms within the molecule. Such repulsion is also referred to as steric effects.

Which compound has bond angles nearest to 120°?

A. $O = C = S$

B. CHI_3

C. $H_2C = O$

D. $H - C \equiv C - H$

Answer: C

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Passage 3

1. Double bond equivalents help in search for structure of a compound. It involves following steps:

Calculate the expected number of hydrogen atoms in the saturated structure.

(a) For C_n there would be: $(2n + 2)$ hydrogens if compound contains C,H,O only.

(b) For C_n, N_m there would be $(2n + 2 + m)$ hydrogens.

Subtract the actual number of hydrogen and divide by 2. This gives the double bond equivalents.

Ring is considered to possess single DBE.

Double bond equivalent of $C_7H_{16}O$ would be

A. 2

B. 3

C. 4

D. 1

Answer: A

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2. Double bond equivalents help in search for structure of a compound. It involves following steps:

Calculate the expected number of hydrogen atoms in the saturated structure.

(a) For C_n there would be: $(2n+2)$ hydrogens if compound contains C,H,O only.

(b) For C_n, N_m there would be $(2n+2+m)$ hydrogens.

Subtract the actual number of hydrogen and divide by 2. This gives the double bond equivalents.

Ring is considered to possess single DBE.

Double bond equivalent of benzene will be:

A. 2

B. 3

C. 4

D. 1

Answer: C

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3. Double bond equivalents help in search for structure of a compound. It involves following steps:

Calculate the expected number of hydrogen atoms in the saturated structure.

(a) For C_n there would be: $(2n+2)$ hydrogens if compound contains C,H,O only.

(b) For C_n, N_m there would be $(2n+2+m)$ hydrogens.

Subtract the actual number of hydrogen and divide by 2. This gives the double bond equivalents.

Ring is considered to possess single DBE.

Which of the following is not correct?

A.

Compound	DBE
$C_7H_{10}O$	2

B.

Compound	DBE
C_7H_8O	4

C.

Compound	DBE
$C_7H_{17}N$	3

D.

Compound	DBE
$C_7H_{13}NO$	2

Answer: C

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4. Double bond equivalents help in search for structure of a compound. It involves following steps:

Calculate the expected number of hydrogen atoms in the saturated structure.

(a) For C_n there would be: $(2n + 2)$ hydrogens if compound contains

C,H,O only.

(b) For C_n, N_m there would be $(2n + 2 + m)$ hydrogens.

Subtract the actual number of hydrogen and divide by 2. This gives the double bond equivalents.

Ring is considered to possess single DBE.

Double bond equivalent of $C_7H_{16}O$ would be

A. 0

B. 1

C. 2

D. 3

Answer: A

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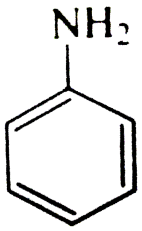
Passage 4

1. The hydrogen bond is an electrostatic attractive force between covalently bonded hydrogen atom of one molecule and an electronegative atom like (F,O,N) of other molecule. Hydrogen bond is nearly an electrostatic attractive force and not a normal chemical bond. It is very weak (2-10 kcal/mol) as compared to a colvent bond (strength 50-100 kcal/mol). In intramolecular hydrogen bonding, the two or more than two molecules of the same or different substances are linked to form polymeric aggregate. Intermolecular hydrogen bonding increases the boiling point of the compound and also its solubility in water. Intramolecular hydrogen bonding occurs within two atoms of the same molecule. Intramolecular hydrogen bonding is also called chelation, since it involves ring formation. intramolecular hydrogen bonding decreases the boiling point of the compound and also its solubility in water.

Which among the following has lowest boiling point?

A. (a) 

B. $CH_3CH_2CH_2NH_2$

C. $CH_3CH_2 - \overset{\overset{CH_3}{|}}{N}H$

D. $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{N}}$

Answer: D

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2. The hydrogen bond is an electrostatic attractive force between covalently bonded hydrogen atom of one molecule and an electronegative atom like (F,O,N) of other molecule. Hydrogen bond is nearly an electrostatic attractive force and not a normal chemical bond. It is very weak (2-10 kcal/mol) as compared to a colvent bond (strength 50-100 kcal/mol). In intramolecular hydrogen bonding, the two or more than two molecules of the same or different substances are linked to form polymeric aggregate. Intermolecular hydrogen bonding increases the boiling point of the compound and also its solubility in water.

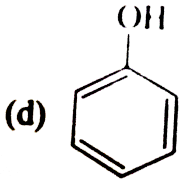
Intramolecular hydrogen bonding occurs within two atoms of the same molecule. Intramolecular hydrogen bonding is also called chelation, since it involves ring formation. intramolecular hydrogen bonding decreases the boiling point of the compound and also its solubility in water.

Which of the following molecules is dimerised when dissolved in non-polar or organic solvent?

A. $R - COOH$

B. $\begin{matrix} COOH \\ | \\ COOH \end{matrix}$

C. $R - OH$

D. 

Answer: A

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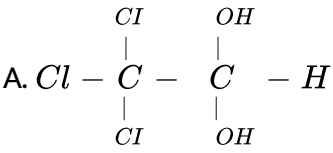
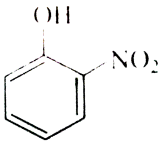
3. The hydrogen bond is an electrostatic attractive force between covalently bonded hydrogen atom of one molecule and an electronegative atom like (F,O,N) of other molecule. Hydrogen bond is nearly an electrostatic attractive force and not a normal chemical bond. It is very weak (2-10 kcal/mol) as compared to a colvent bond (strength 50-100 kcal/mol). In intramolecular hydrogen bonding, the two or more than two molecules of the same or different substances are linked to form polymeric aggregate. Intermolecular hydrogen bonding increases the boiling point of the compound and also its solubility in water. Intramolecular hydrogen bonding occurs within two atoms of the same molecule. Intramolecular hydrogen bonding is also called chelation, since it involves ring formation. intramolecular hydrogen bonding decreases the boiling point of the compound and also its solubility in water.

Which of the following compounds is (are) stabilised by intramolecular hydrogen bonding?

A. 

(b) 

B.

C. $CH_3 - \overset{\overset{OH}{|}}{C} = CH - \overset{\overset{O}{||}}{C} - OC_2H_5$

D. $\begin{matrix} CH_2OH \\ | \\ CH_2OH \end{matrix}$

Answer: A::B::C

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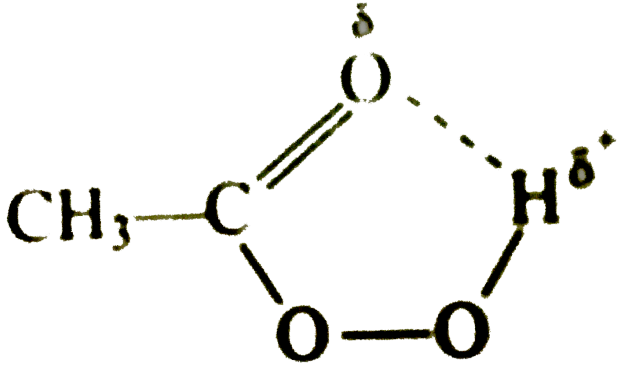
4. The hydrogen bond is an electrostatic attractive force between covalently bonded hydrogen atom of one molecule and an electronegative atom like (F,O,N) of other molecule. Hydrogen bond is nearly an electrostatic attractive force and not a normal chemical bond. It is very weak (2-10 kcal/mol) as compared to a colvent bond (strength 50-100 kcal/mol). In intramolecular hydrogen bonding, the two or more than two molecules of the same or different substances are linked to form polymeric aggregate. Intermolecular hydrogen bonding increases the

boiling point of the compound and also its solubility in water. Intramolecular hydrogen bonding occurs within two atoms of the same molecule. Intramolecular hydrogen bonding is also called chelation, since it involves ring formation. intramolecular hydrogen bonding decreases the boiling point of the compound and also its solubility in water.

Select the compound which involves intramolecular hydrogen bonding.



A. $HCOOH$

B. CH_3COOH

C. C_6H_5COOH

D. CH_3COOH

Answer: D

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5. The hydrogen bond is an electrostatic attractive force between covalently bonded hydrogen atom of one molecule and an electronegative atom like (F,O,N) of other molecule. Hydrogen bond is nearly an electrostatic attractive force and not a normal chemical bond. It is very weak (2-10 kcal/mol) as compared to a colvent bond (strength 50-100 kcal/mol). In intramolecular hydrogen bonding, the two or more than two molecules of the same or different substances are linked to form polymeric aggregate. Intermolecular hydrogen bonding increases the boiling point of the compound and also its solubility in water. Intramolecular hydrogen bonding occurs within two atoms of the same molecule. Intramolecular hydrogen bonding is also called chelation, since it involves ring formation. intramolecular hydrogen bonding decreases the boiling point of the compound and also its solubility in water.

$$\underset{\substack{2,4-\text{pentadione}\\(A)}}{CH_3-\overset{O}{\overset{||}{C}}-CH_2-\overset{O}{\overset{||}{C}}-CH_3} \Leftrightarrow \underset{\substack{4-\text{hydroxypent-3-en-2-one}\\(B)}}{CH_3-\overset{OH}{\overset{|}{C}}=CH-\overset{O}{\overset{||}{C}}-CH_3}$$

Select the correct statement about above tautomers.

A. Form (A) is more stable due to formation of intramolecular hydrogen bond

B. Form (B) is more stable due to formation of intermolecular hydrogen bond

C. Form (B) is more stable due to the formation of intramolecular hydrogen bond

D. Form (A) is more stable due to the formation of intermolecular hydrogen bond

Answer: C

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Single Integer Answer Type

1. How many bonds (σ and π) are there in the following molecules?

(i) $H_2C = C = CH_2$ (ii) $CH_3 - C \equiv CH$

(iii) $H_2C = CH - C \equiv N$ (iv) CH_3NO_2

(v) CH_3OH (iv) C_2H_2

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2. How many number of H-bonds are formed by a water molecule?

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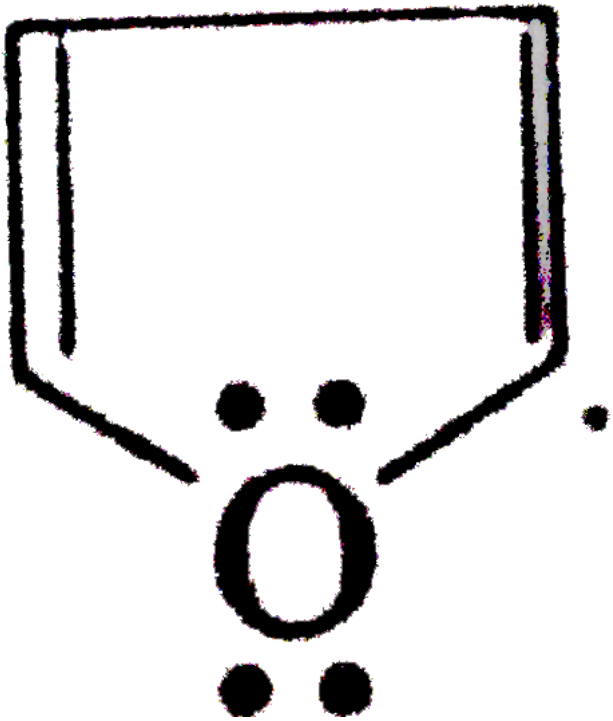
3. How many resonating structures are possible for the compound furan



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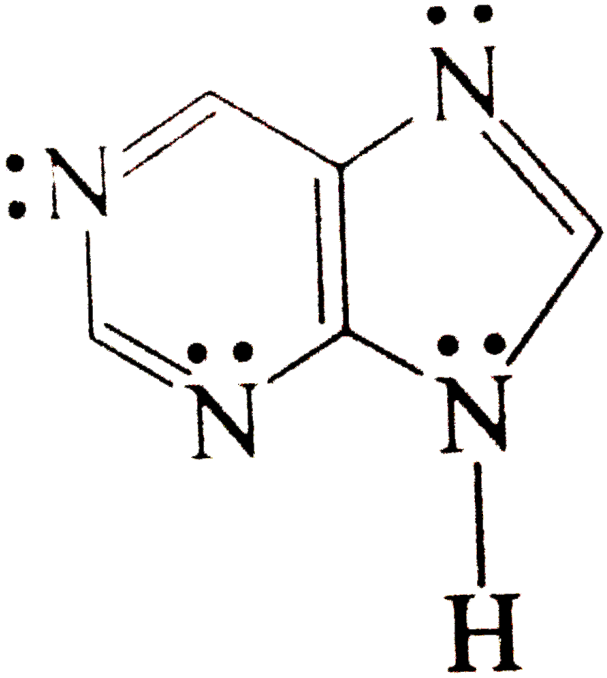
4. The purine heterocycle occurs mainly in the structure of DNA. Identify number of 'N, atoms having localised lone pair of electron.



(Purine)

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