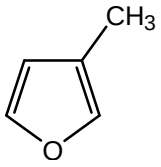
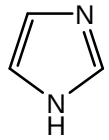
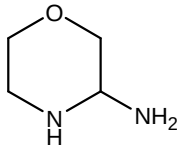
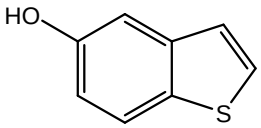
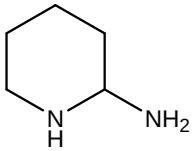
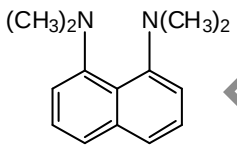
55. Match the structures in **List - I** with their correct names in **List - II.**

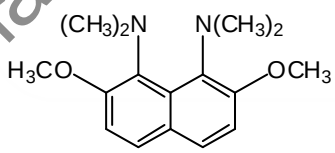
List - I	**List - II**
(P) 	(i) 3-methyl furan
(Q) 	(ii) Imidazole
(R) 	(iii) 5-hydroxybenzothiazole
(S) 	(iv) 2-amino piperidine.
(T) 	(v) 2-amino morpholine

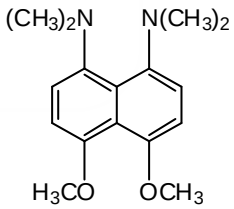
(a) P-i, Q-ii, R-v, S-iii, T-iv (b) P-ii, Q-iii, R-iv, S-v, T-i
(c) P-iii, Q-iv, R-v, S-i, T-ii (d) P-iv, Q-v, R-i, S-ii, T-iii

56. The result of the reduction of either (R) or (S) 2-methylcyclohexanone, in separate reactions, using $LiAlH_4$ is that the reduction of
(a) The R enantiomer is stereoselective (b) The R enantiomer is stereospecific.
(c) The S enantiomer is stereospecific (d) Both the R and S enantiomers is stereoselective.

57. The increasing order of basicity among the following is

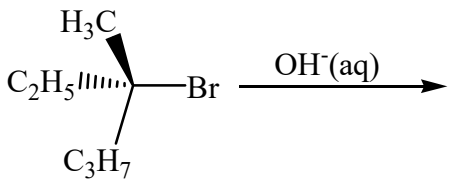

(X)


(Y)


(Z)

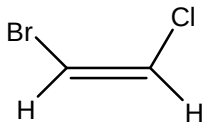
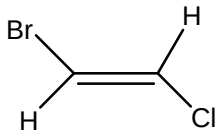
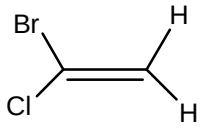
(a) Y < X < Z (b) Y < Z < X (c) X < Z < Y (d) X < Y < Z

58. In the reaction,



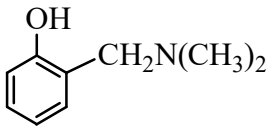
if the concentration of both the reactants is doubled, then the rate of the reaction will
(a) remain unchanged (b) quadruple
(c) reduce to one fourth (d) double

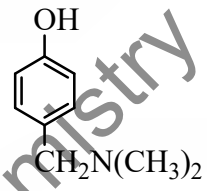
59. Match the structures in **List - I** with the coupling constant $\left[{}^{1}H\,J\,(Hz)\right]$ given in **List - II**

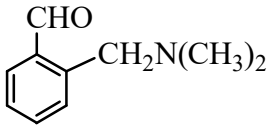
List - I	**List - II**
(1) 	(i) ~ 1 Hz
(2) 	(ii) ~ 10 Hz
(3) 	(iii) ~ 15 Hz

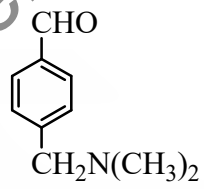
(a) 1-(i), 2- (ii), 3-(iii) (b) 1-(ii), 2-(iii), 3-(i)
(c) 1-(iii), 2-(ii), 3-(i) (d) 1-(iii), 2-(i), 3-(ii)

60. Phenol on reaction with formaldehyde and dimethyl amine mainly gives

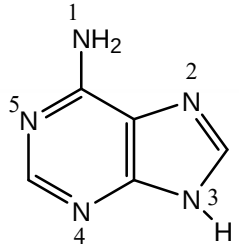
(a) 

(b) 

(c) 

(d) 

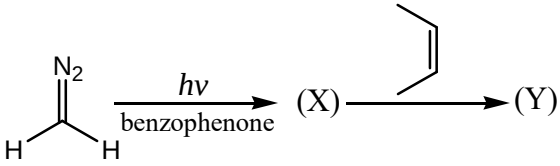
61. The mono protonation of adenine (X) in acidic solution



(X)

mainly occurs at
(a) position 1 (b) position 2 (c) position 3 (d) either position 4 or 5.

62. In the following reaction,



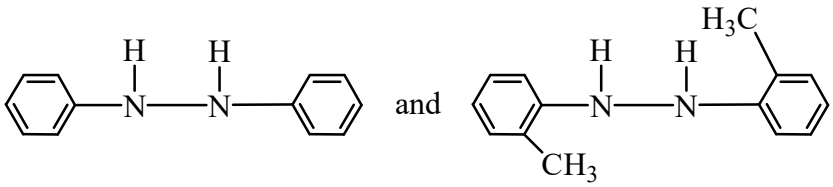
(X) and (Y) respectively are
(a) ^{1}:CH_2 and cis 1, 2-dimethylcyclopropane

(b) ^{3}:CH_2 and cis 1, 2-dimethylcyclopropane

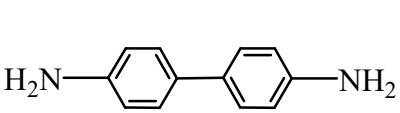
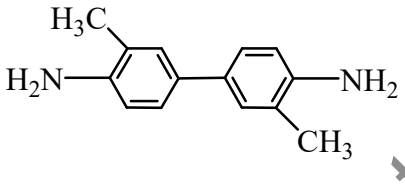
(c) ^{1}:CH_2 and a mixture of cis/trans 1, 2-dimethylcyclopropane

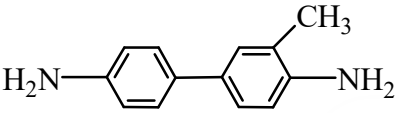
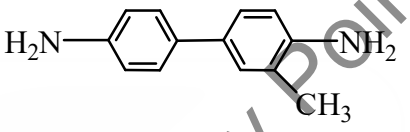
(d) ^{3}:CH_2 and a mixture of cis/trans 1, 2-dimethylcyclopropane

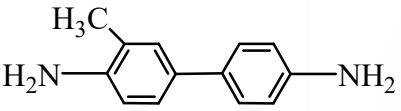
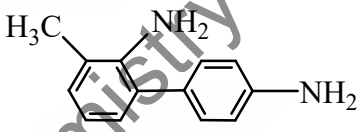
63. The major products obtained upon treating a mixture of

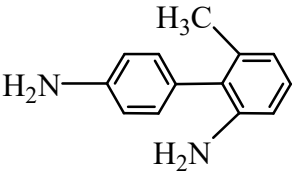
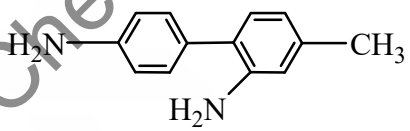


with a strongly acidic solution of H_2SO_4 is

(a)  and 

(b)  and 

(c)  and 

(d)  and 

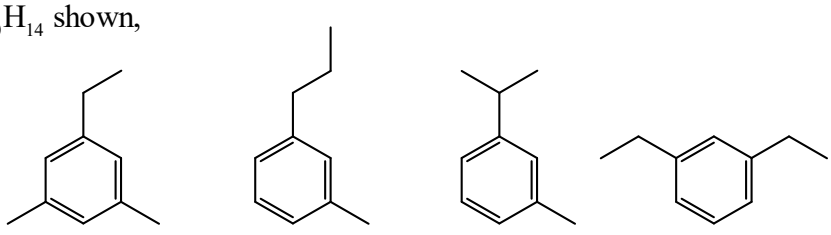
64. Match the observed pricipal absorptions in the visible spectrum shown in **List - I** with the bond shows this absorption in **List - II.**

List - I	**List - II**
(1) $\sigma \rightarrow \sigma^*$	(i) C–C
(2) $n \rightarrow \sigma^*$	(ii) C–O
(3) n, π^*	(iii) C=O
(3) π, π^*	(iv) C = C

(a) 1-(i), 2-(ii), 3-(iii), 4-(iv) (b) 1-(i), 2-(iii), 3-(ii), 4-(iv)

(c) 1-(ii), 2-(i), 3-(iv), 4-(iii) (d) 1-(iv), 2-(ii), 3-(iii), 4-(i)

65. Among the isomers $C_{10}H_{14}$ shown,

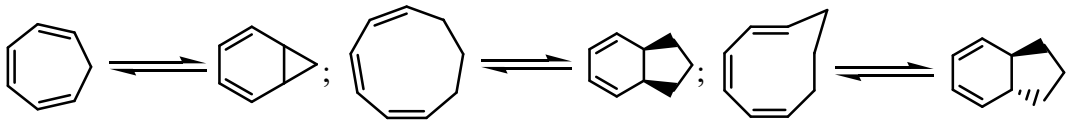


P **Q** **R** **S**

the isomer that can be identified uniquely by mass spectrometry alone is:

(a)P (b) Q (c) R (d) S

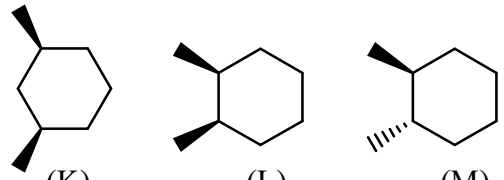
66. The direction of rotation of the following thermal electrocyclic ring closures.



respectively is:

(a) Disrotory, disrotatory, disrotatory
(b) Conrotatory, conrotatory, conrotatory
(c) Disrotatory, disrotatory, conrotatory
(d) Disrotatory, conrotatory, disrotatory.

67. The molecules (s) that exist as meso structure (s).

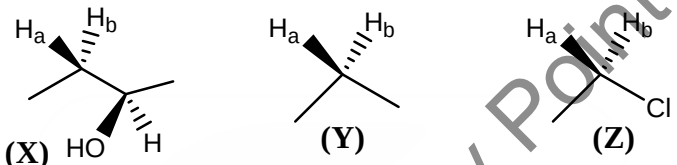


(K) (L) (M)

is/are:

(a) Only M (b) Both K and L (c) Only L (d) Only K

68. Stereochemical descriptors for the atoms labeled H_a and H_b in the structures.



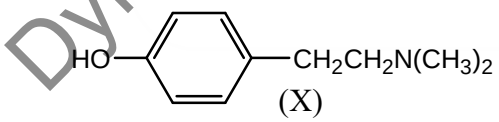
respectively are:

(a) X-homotopic, Y-enantiotopic and Z-diastereotopic
(b) X-enantiotopic, Y-homotopic and Z-diastereotopic
(c) X-diastereotopic, Y-homotopic and Z-enantiotopic
(d) X-homotopic, Y-diastereotopic and Z-enantiotopic.

69. Treatment of the pentapeptide Gly-Arg-Phe-Ala-Ala, in separate experiments, with the enzymes Trypsin, Chyemotrypsin and Carboxypeptidase A respectively, gives :

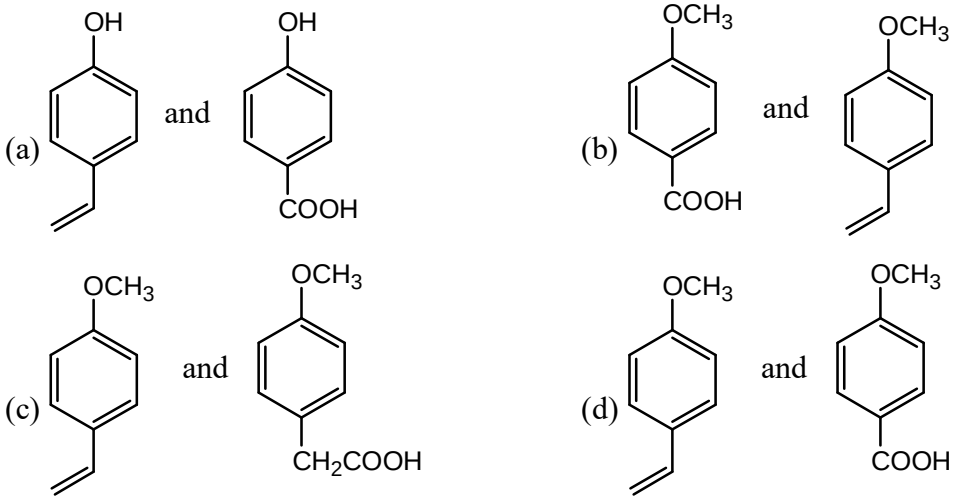
(a) Gly-Arg + Phe-Ala-Ala; Gly-Arg-Phe+Ala-Ala; Gly-Arg-Phe-Ala+Ala
(b) Gly-Arg-Phe+Ala-Ala; Gly-Arg-Phe+Ala-Ala; Gly-Arg-Phe-Ala+Ala
(c) Gly-Arg+Phe-Ala-Ala; Gly-Arg-Phe-Ala+Ala; Gly-Arg-Phe+Ala-Ala
(d) Gly-Arg + Phe-Ala-Ala; Gly-Arg-Phe+Ala-Ala; Gly+ Arg-Phe- Ala + Ala

70. Hordenine (x), an alkaloid, undergoes Hoffmann degradation to give compound (Y).



(X)

(Y) on treatment with alkaline permanganate (Z). Y and Z respectively are



Common data for Q.71, Q.72, Q.73:

Trans 1, 2–difluoroethylene molecule has a 2-fold rotational axis, a symmetry plane perpendicular to the rotatinal axis and an inversion centre.

71. The number of distinct symmetry operations that can be performed on the molecule is:
(a) 2 (b) 4 (c) 6 (d) 8

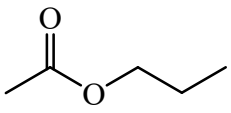
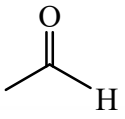
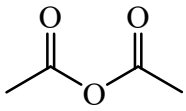
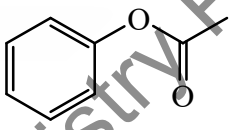
72. The number of irreducible representations of the point group of the molecule is:
(a) 1 (b) 2 (c) 3 (d) 4

73. If two H atoms of the above molecule are also replaced by F atoms, the point group of the resultant molecule will be
(a) C_i (b) C_{2h} (c) C_{2v} (d) D_{2h}

Common Data for Q.74 and Q.75 :

Reactivity of aryl amines towards electrophilic aromatic substitution is much higher than that of aliphatic amines. Hence differential reactivity of the amino group is desirable in many reactions.

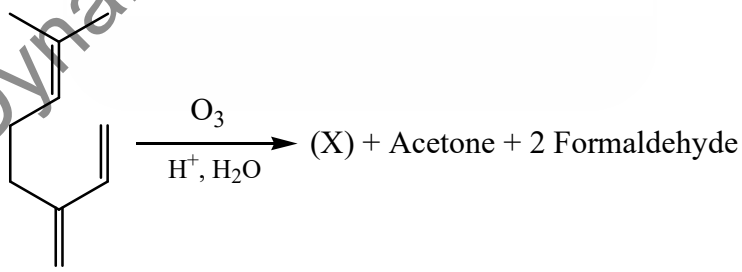
74. The compound which on reacting with aniline will NOT form an acetanilide is

(a) 
(b) 
(c) 
(d) 

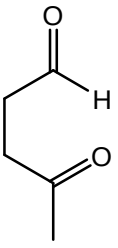
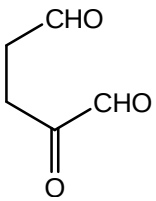
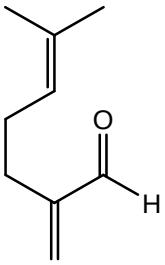
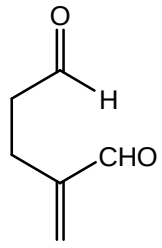
75. Aniline can be distinguished from methylamine by its reaction with
(a) p-toluene sulphonyl chloride/KOH
(b) (i) $NaNO_2$/HCl, 0-5°C (ii) alkaline β -napthol
(c) Sn/HCl
(d) acetyl chloride

Linked Answer Q.76 and Q.77:

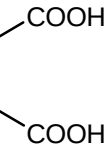
76. In the reaction,

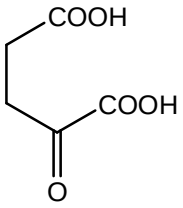


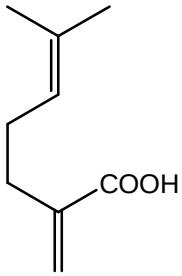
Compound X is

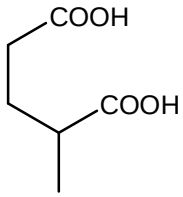
(a) 
(b) 
(c) 
(d) 

77. Oxidation of X with chromic acid chiefly gives

(a) 

(b) 

(c) 

(d) 

Linked Answer Type Q. 78 and Q.79:

78. In the reaction, AMP $\xrightarrow[175^{o}C]{\text{aq. } NH_3}$ (X) + H_3PO_4

Compound X is

(a) Adenine (b) Xanthine

(c) 2, 6 - diaminopurine (d) Adenosine

79. Compound X on treatment with conc. HCl gives

(a) Uric acid (b) Adenine (c) Hypoxanthine (d) Guanine

Linked Answer Type Q.80 and Q.81.

80. The reaction of ammonium chloride with BCl_3 at 140°C at followed by treatment with $NaBH_4$ gives the product X. The formula of X is

(a) $B_3N_3H_3$ (b) $B_3N_3H_6$ (c) $B_3N_3H_{12}$ (d) $[BH-NH]_n$

81. Which of the following statement(s) is/are true for X?

(I) X is not isoelectronic with benzene

(II) X undergoes addition reaction with HCl.

(III) Electrophilic substitution reaction on X is much faster than that of benzene

(IV) X undergoes polymerization at 90°C

(a) I and II (b) Only II (c) II and III (d) I and IV

Linked Answer Type Q.82 and Q.83.

82. Consider a particle of mass m moving in a one-dimensional box under the potential V = 0 for $0 \le x \le a$ and $V = \infty$ outside the box. When the particle is in its lowest energy state the average momentum ($< p_x >$ of the particle is

(a) $< p_x > = 0$ (b) $< p_x > = \frac{h}{a}$ (c) $< p_x > = \frac{h}{2a}$ (d) $< p_x > = \frac{h}{2\pi a}$

83. The uncertainty in the momentum (Δp_s) of the particle in its lowest energy state is:

(a) $\Delta p_x = 0$ (b) $\Delta p_x = \frac{h}{a}$ (c) $\Delta p_x = \frac{h}{2a}$ (d) $\Delta p_x = \frac{h}{2\pi a}$

Linked Answer Type Q. 84 and Q.85.

84. In the mixture obtained by mixing 25.0 mL 1.2×10^{-3} M $MnCl_2$ and 35.0 mL of 6.0×10^{-4} M KCl solution, the concentrations (M) of Mn^{2+}, K^+ and Cl^- ions respectively are

(a) $6.0\times10^{-4}, 3.0\times10^{-4}, 1.5\times10^{-3}$ (b) $6.0\times10^{-4}, 3.0\times10^{-4}, 9.0\times10^{-4}$

(c) $5.0\times10^{-4}, 3.5\times10^{-4}, 1.35\times10^{-3}$ (d) $5.0\times10^{-4}, 3.5\times10^{-4}, 8.5\times10^{-4}$

85. The activity (M) of Mn^{2+} ions in the above solution is

(a) 1.0×10^{-4} (b) 2.0×10^{-4} (c) 3.0×10^{-4} (d) 4.0×10^{-4}