

TEST SERIES CSIR-NET/JRF JUNE 2018

BOOKLET SERIES **E**

Full Length Test – 2

Paper Code **01**

Test Type: **TEST SERIES**

CHEMICAL SCIENCES

Duration: 3:00 Hours

Date: 09-06-2018

Maximum Marks: 200

Read the following instructions carefully:

* Single Paper Test is divided into three Parts.

Part - A: This part shall carry 20 questions. The candidate shall be required to answer any 15 questions. Each question shall be of **2 marks**.

Part - B: This part shall contain 40 questions. The candidate shall be required to answer any 35 questions. Each question shall be of **2 Marks**.

Part - C: This part shall contain 60 questions. The candidate shall be required to answer any 25 questions. Each question shall be of **4 marks**.

* Darken the appropriate bubbles with HB pencil/Ball Pen to write your answer.

* There will be negative marking @25% for each wrong answer.

* The candidates shall be allowed to carry the Question Paper Booklet after completion of the exam.

* For rough work, blank sheet is attached at the end of test booklet.



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PART – A

1. Find the height of a box of base area $24 \text{ cm} \times 48 \text{ cm}$, in which the longest stick that can be kept is 56 cm long.
 (a) 8 cm (b) 32 cm (c) 37.5 cm (d) 16 cm
2. An infinite row of boxes is arranged. Each box has half the volume of the previous box. If the largest box has a volume of 20 cc, what is the total volume of all the boxes?
 (a) Infinite (b) 400 cc (c) 40 cc (d) 80 cc

3. If
$$\begin{array}{r} 2a \\ \times b2 \\ \hline c6 \\ 84 \\ \hline 8d6 \end{array}$$

Here a, b, c and d are digits. Then $a + b =$

- (a) 4 (b) 9 (c) 11 (d) 16
4. In each of the following groups of words is a hidden number, based on which you should arrange them in descending order. Pick the correct answer:

E. Papers I Xeroxed

F. Wi-Fi veteran

G. Yourself ourselves

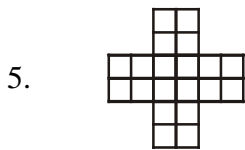
H. Breaks even

(a) H, F, G, H

(b) E, G, F, H

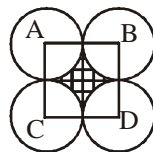
(c) H, F, G, E

(d) H, E, F, G



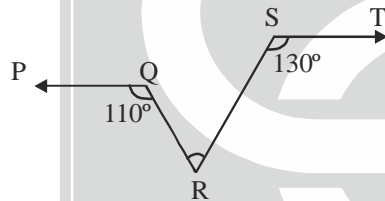
The number of squares in the above figure is

- (a) 30 (b) 29 (c) 25 (d) 20
6. A shopkeeper purchases a product for Rs. 100 and sells it making a profit of 10%. The customer resells it to the same shopkeeper incurring a loss of 10%. In these dealing the shopkeeper makes
 (a) no profit, no loss (b) Rs. 11 (c) Re. 1 (d) Rs. 20
7. A person walks downhill at 10 km/h, uphill at 6 km/h and on the plane at 7.5 km/h. If the person takes 3 hours to go from a place A to another place B, and 1 hour on the way back, the distance between A and B is
 (a) 15 km
 (b) 23.5 km
 (c) 16 km
 (d) Given data is insufficient to calculate the distance
8. Four circles of unit radius each are drawn such that each one touches two others and their centres lie on the vertices of a square. The area of the region enclosed between the circles is



- (a) $\pi - 1$ (b) $\pi - 2$ (c) $3 - \pi$ (d) $4 - \pi$

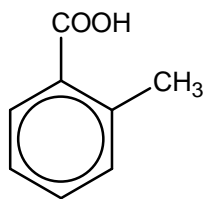
9. An infinite number of identical circular discs each of radius $\frac{1}{2}$ are tightly packed such that the centres of the discs are at integer values of coordinates x and y . The ratio of the area of the uncovered patches to the total area is
- (a) $1 - \frac{\pi}{4}$ (b) $\frac{\pi}{4}$ (c) $1 - \pi$ (d) π
10. Which of the following statements is logically incorrect?
- (a) I always speak the truth (b) I occasionally lie
(c) I occasionally speak the truth (d) I always lie
11. The set of numbers $(5, 6, 7, m, 6, 7, 8, n)$ has an arithmetic mean of 6 and mode (most frequently occurring number) of 7. Then $m \times n =$
- (a) 18 (b) 35 (c) 28 (d) 14
12. A solid contains a spherical cavity. The cavity is filled with a liquid and includes a spherical bubble of gas. The radii of cavity and gas bubble are 2 mm and 1 mm, respectively. What proportion of the cavity is filled with liquid?
- (a) $\frac{1}{8}$ (b) $\frac{3}{8}$ (c) $\frac{5}{8}$ (d) $\frac{7}{8}$
13. If $|4X - 7| = 5$ then the values of $2|X| - |-X|$ is:
- (a) 2, $\frac{1}{3}$ (b) $\frac{1}{2}$, 3 (c) $\frac{3}{2}$, 9 (d) $\frac{2}{3}$, 9
14. What is the average of all multiples of 10 from 2 to 198?
- (a) 90 (b) 100 (c) 110 (d) 120
15. In the following figure, if $PQ \parallel ST$, $\angle PQR = 110^\circ$ and $\angle RST = 130^\circ$, then $\angle QRS = ?$



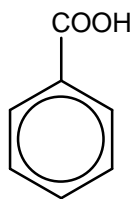
- (a) 40° (b) 50° (c) 70° (d) 60°
16. The total number of digits used in numbering the pages of a book having 366 pages, is:
- (a) 732 (b) 990 (c) 1098 (d) 1305
17. On what dates of April, 2001 did Wednesday fall?
- (a) 1st, 8th, 15th, 22nd, 29th (b) 2nd, 9th, 16th, 23rd, 30th
(c) 3rd, 10th, 17th, 24th (d) 4th, 11th, 18th, 25th
18. A man takes 5 hours 45 min. in walking to a certain place and riding back. He would have gained 2 hours by riding both ways. The time he would take to walk both ways, is:
- (a) 3 hrs 45 min (b) 7 hrs 30 min
(c) 7 hrs 45 min (d) 11 hrs 45 min
19. A box contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the box, if at least one black ball is to be included in the draw?
- (a) 32 (b) 48 (c) 64 (d) 96
20. A man and his wife appear in an interview for two vacancies in the same post. The probability of husband's selection is $\frac{1}{7}$ and the probability of wife's selection is $\frac{1}{5}$. What is the probability that only one of them is selected?
- (a) $\frac{4}{5}$ (b) $\frac{2}{7}$ (c) $\frac{8}{15}$ (d) $\frac{4}{7}$

PART – B

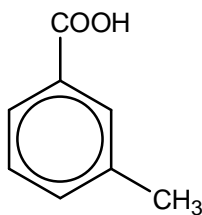
21. Arrange the following compound in order of their increasing acidic strength



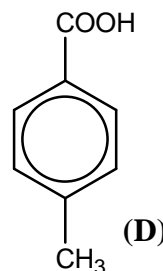
(A)



(B)



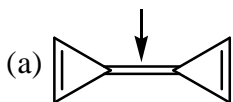
(C)



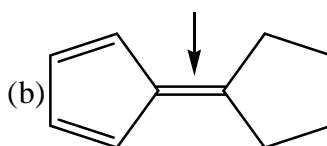
(D)

- (a) $A < B < C < D$ (b) $D < C < A < B$ (c) $D < C < B < A$ (d) $A < B < D < C$

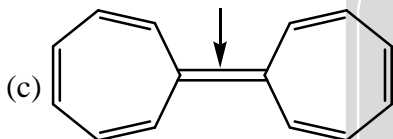
22. Which of the following molecule having lowest rotational barrier across the marked double bond



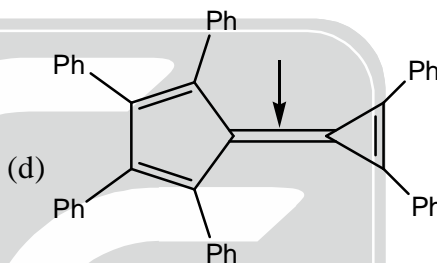
(a)



(b)

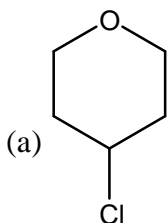


(c)

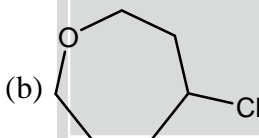


(d)

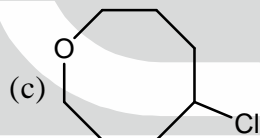
23. Which of the following undergoes fastest solvolysis



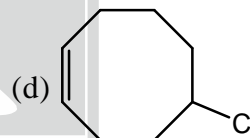
(a)



(b)

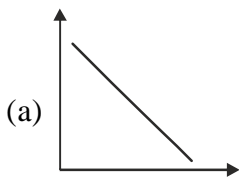


(c)

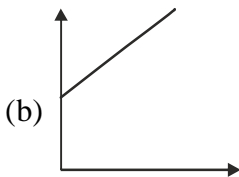


(d)

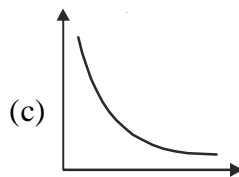
24. The correct plot representing the variation of surface film pressure against surface area is



(a)



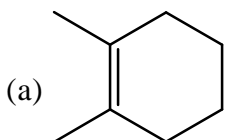
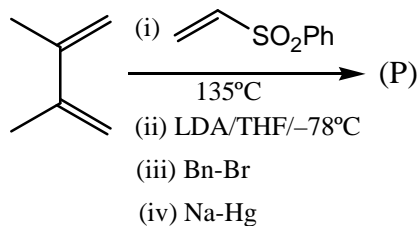
(b)



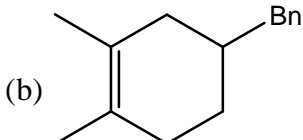
(c)

(d) none of these

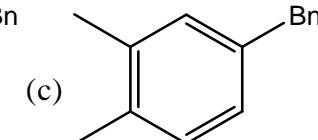
25. The major product (P) is



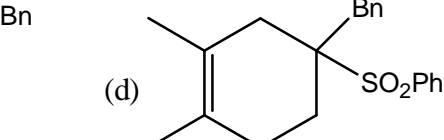
(a)



(b)

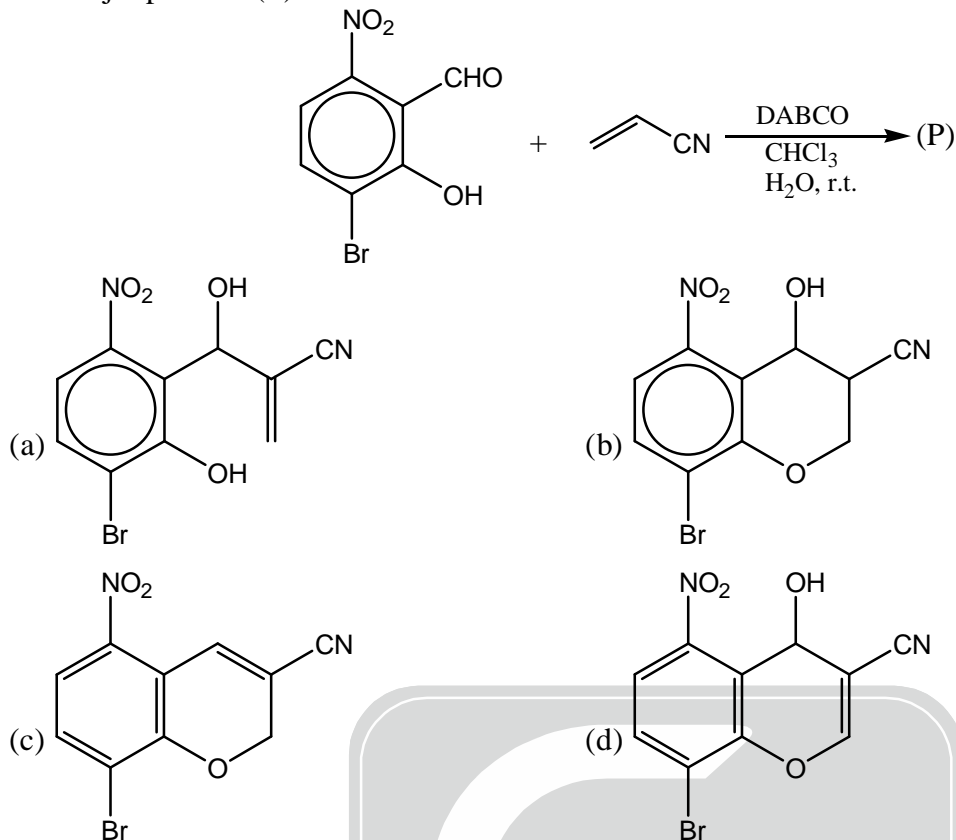


(c)



(d)

26. The major product (P) is



27. The number of M–M bond in the given complex (A) and (B) are respectively



(A)

(B)

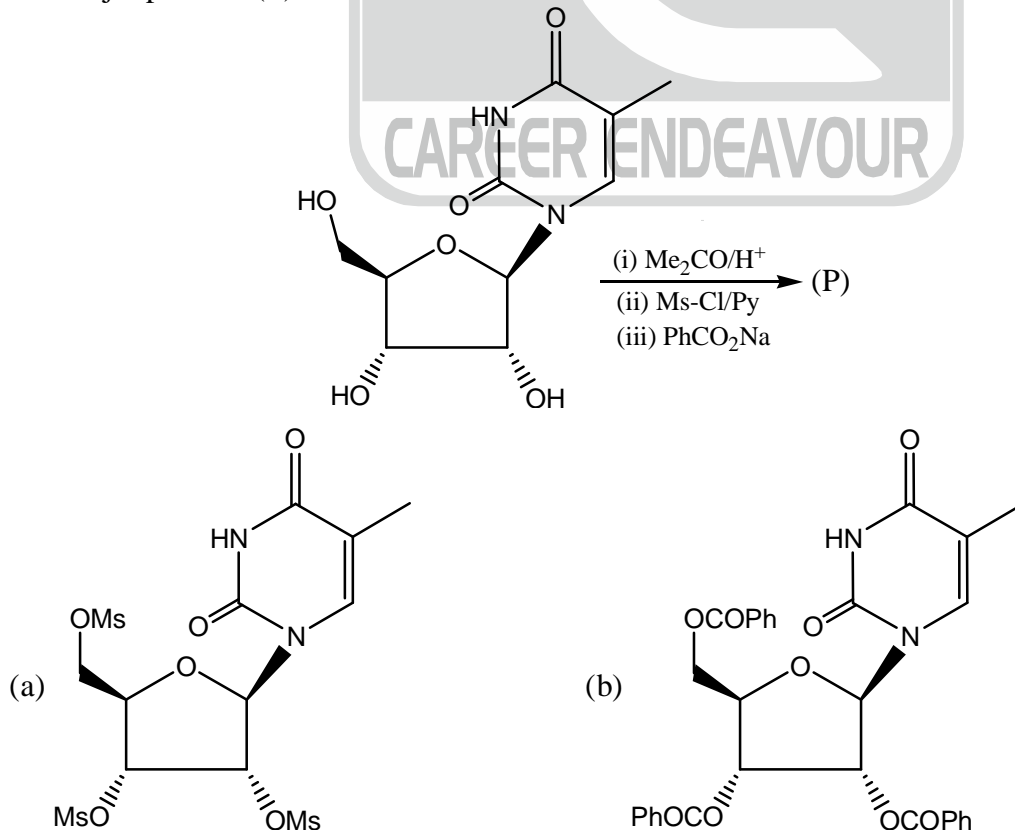
(a) 1 & 0

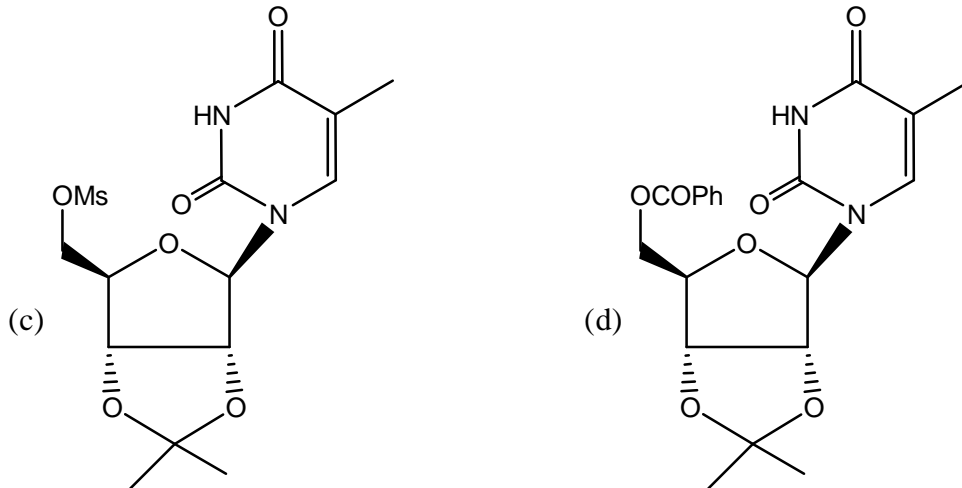
(b) 2 & 0

(c) 1 & 3

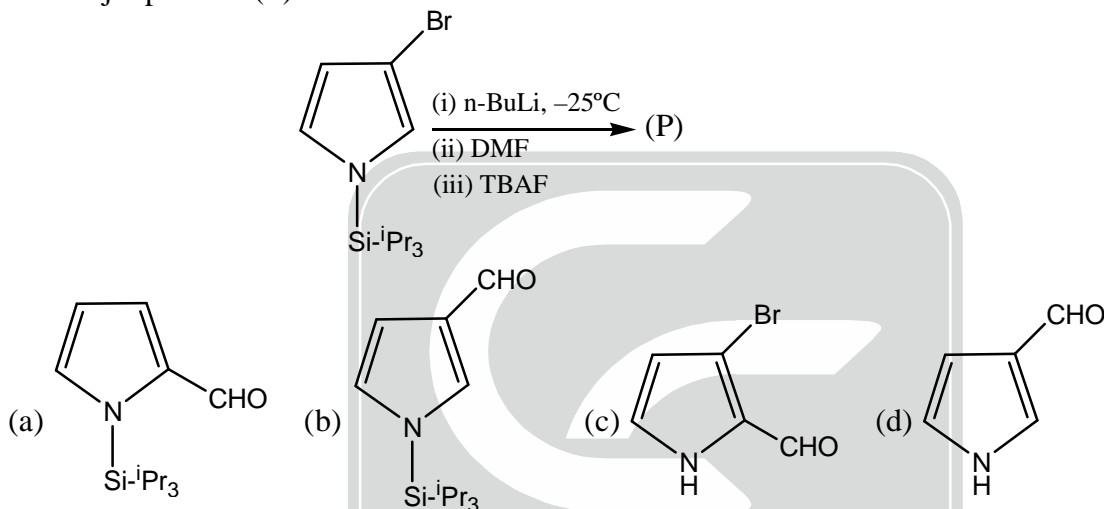
(d) 1 & 2

28. The major product (P) is





29. The major product (P) is



30. Which statement is not true

- (a) PF_3 give one quartet in ^{31}P NMR and one doublet in ^{19}F NMR
 (b) $\text{CH}_2=\text{CF}_2$ gives a triplet in both ^1H and ^{19}F NMR
 (c) $\text{ClBrC}=\text{CH}_2$ give AX type NMR spectrum
 (d) The fluorine resonance in BrF_5 consists of three signals

31. A first order reaction involves energy of activation to be 2 kcal mol^{-1} . The ratio of $\frac{k_{400\text{K}}}{k_{200\text{K}}}$ is approximate

- (a) 0.0025 (b) $e^{0.0025}$ (c) $e^{2.5}$ (d) e^{25}

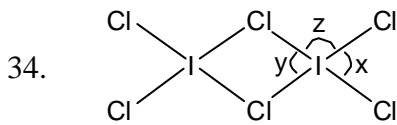
32. In case of NH_3 molecule, the direct product $E \otimes E$ will have the dimension

C_{3v}	E	$2C_3$	$3\sigma_v$		
A_1	1	1	1	z	$x^2 + y^2, z^2$
A_2	1	1	-1	R_z	
E	2	-1	0	$(x, y)(R_x, R_y)$	$(x^2 - y^2, xy)(xz, yz)$

- (a) 4 (b) 6 (c) 8 (d) 12

33. Which of following molecules have maximum number of eight atoms in one plane

- (a) CH_2SF_4 (b) $\text{P}(\text{CH}_3)_2(\text{CF}_3)_3$ (c) I_2Cl_6 (d) All

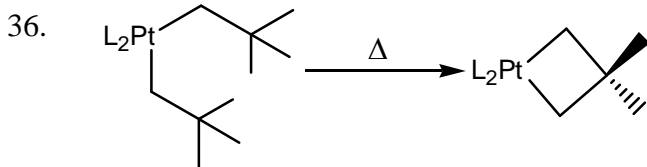


Compare bond angles x , y and z and choose correct bond angles order

- (a) $x > y > z$ (b) $x > z > y$
 (c) $y > x > z$ (d) $z > y > x$

35. The basicity of $\text{H}_5\text{P}_3\text{O}_7$ is

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



The major product formed in this reaction is

- (a) γ elimination followed by β -elimination
 (b) γ elimination followed by reductive elimination
 (c) reductive elimination followed by β -elimination
 (d) γ -elimination followed by migratory insertion

37. Which of the following pair involves ligand metal charge transfer (LMCT)

- (a) $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{MnO}_4]^-$ (b) $[\text{Fe}(\text{CN})_6]^{3-}$ and $[\text{MnO}_4]^-$
 (c) $[\text{MnO}_4]^-$ and $[\text{IrBr}_6]^{2-}$ (d) $[\text{Cr}(\text{CO})_6]$ and $[\text{MnO}_4]^-$

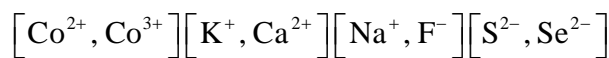
38. The surface tension of dilute solution of a solute is given by

$$\Gamma = \Gamma_0 - ae^{aC_2}$$

where Γ_0 is surface tension of pure solvent and a is same arbitrary constant and C_2 is concentration of solute. Using Gibbs Adsorption equation, the surface excess per unit surface area is given by

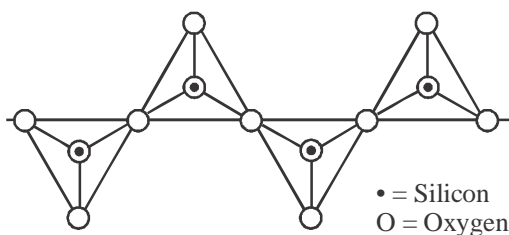
- (a) $\frac{\gamma_c - \gamma}{RT}$ (b) $\frac{aC_2}{RT}$ (c) $\frac{aC_2}{RT}(\gamma_0 - \gamma)$ (d) None of these

39. From each pair given below identify the ion which is smaller in size



- (a) $\text{Co}^{2+}, \text{K}^+, \text{F}^-, \text{S}^{2-}$ (b) $\text{Co}^{3+}, \text{Ca}^{2+}, \text{Na}^+, \text{S}^{2-}$
 (c) $\text{Co}^{2+}, \text{Ca}^{2+}, \text{F}^-, \text{S}^{2-}$ (d) $\text{Co}^{3+}, \text{K}^+, \text{Na}^+, \text{Se}^{2-}$

40. Pyroxenes are a class of silicate minerals, which exhibit a polymeric chain structure, as shown below

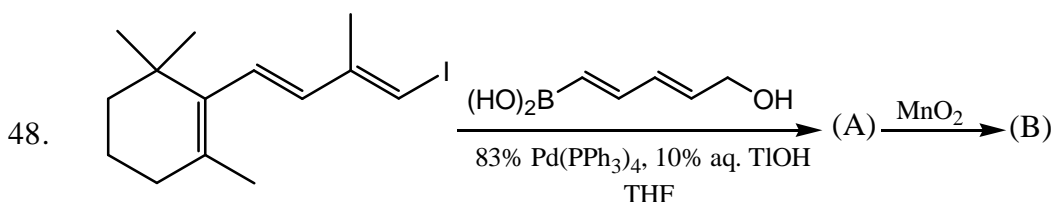


Its simplest repeat unit is

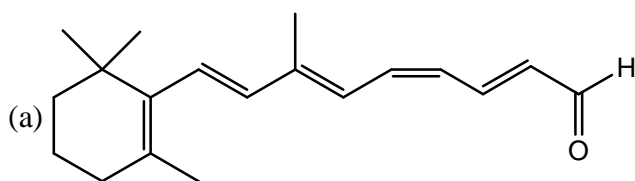
- (a) $[\text{SiO}_4]^{4-}$ (b) $[\text{SiO}_3]^{2-}$ (c) $[\text{Si}_2\text{O}_7]^{6-}$ (d) $[\text{Si}_4\text{O}_{11}]^{6-}$

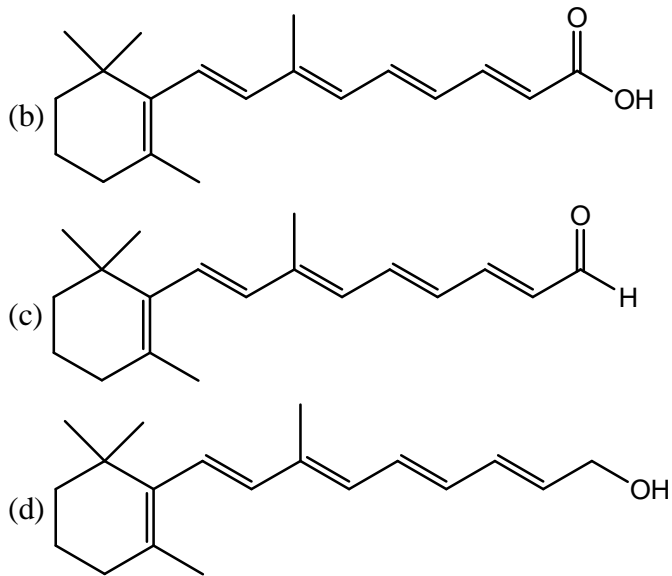
41. Identify the acids in the following two reactions:
 $\text{NOF} + \text{ClF}_3 = \text{NO}^+ + \text{ClF}_4^-$
 $\text{XeO}_3 + \text{OH}^- = \text{HXeO}_4^-$
 (a) ClF_3 and XeO_3 (b) ClF_3 and OH^-
 (c) NOF and OH^- (d) NOF and XeO_3
42. Out of the following which has the least tendency to form $\text{M}=\text{O}$ species?
 (I) $\text{Sc}=\text{O}$ (II) $\text{P}=\text{O}$ (III) $\text{Ln}=\text{O}$ (IV) $\text{Ac}=\text{O}$
 (a) I and II (b) III only (c) IV only (d) I, II and IV
 (Ln = Lanthanides and Ac = actinides)
43. The transition metal ions (viz, Mn, Fe, Co, Cu) are used in redox enzymes in preference of Zn^{2+} , Ga and Ca^{2+} . The reason is that :
 (a) These have spectral bands in the visible region
 (b) These have variables valence or oxidation states
 (c) These produce a specific magnetic field in the cell
 (d) The metal ions are coloured.
44. In a cubic crystal, the value of interplanar spacing for (444) planes is 25 pm. The cell constant is
 (a) 100 pm (b) $100\sqrt{3}$ pm (c) $\frac{100}{\sqrt{3}}$ pm (d) None of these
45. The angular nodes present in the orbital represented by the wave function

$$R(r) = \frac{2\sqrt{2}}{27\sqrt{5}} \left(\frac{Z}{3a_0}\right)^{3/2} \left(\frac{Zr}{a_0}\right)^2 e^{-Zr/3a_0}$$
 is/are
 (a) 1 (b) 2 (c) 3 (d) 4
46. The number of energy levels possible in the range $E < \frac{15h^2}{8ma^2}$ of a cubic box of side a is
 (a) 6 (b) 12 (c) 17 (d) None of these
47. In NMR of spin- $\frac{1}{2}$ particles the energy of level is given by $E = m\hbar\gamma B_0$. The total number of possible arrangements for three spin system are
 (a) 8 (b) 9 (c) 6 (d) 12

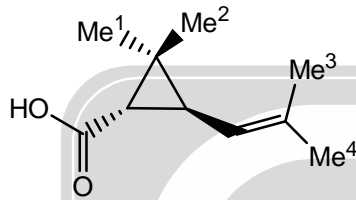


The major product (B) in the above synthetic transformation is





49. Topicity relation between Me^1 & Me^2 and Me^3 & Me^4 are respectively



(a) enantiotopic, diastereotopic
(c) both are enantiotopic

(b) diastereotopic, enantiotopic
(d) both are diastereotopic

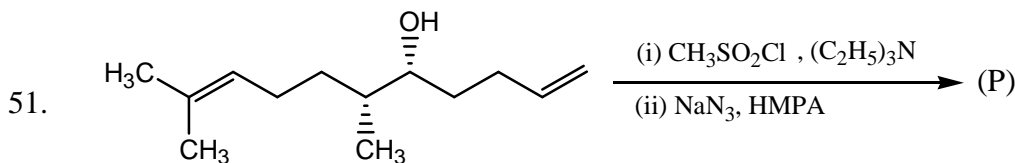
50. Given: $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$ k_1

$\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$ k_2

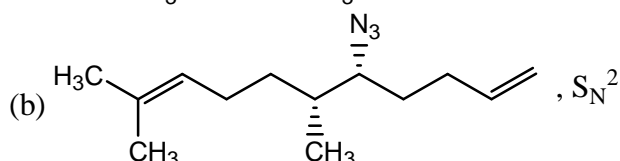
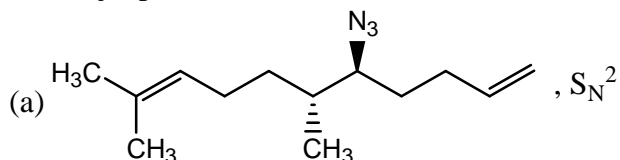
$\text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \rightleftharpoons \text{H}_2\text{O}(\text{g})$ k_3

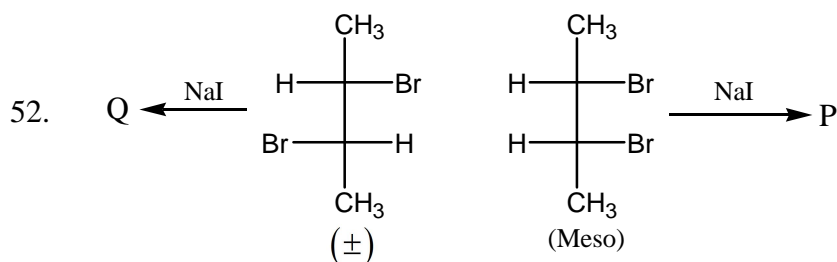
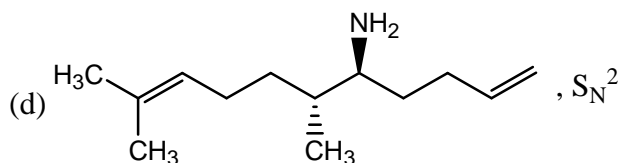
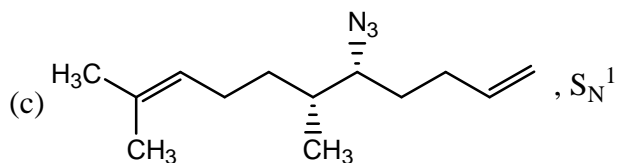
The equilibrium constant for $2\text{NH}_3(\text{g}) + \frac{5}{2}\text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g}) + 3\text{H}_2\text{O}(\text{g})$

(a) $k_1 k_2 k_3$ (b) $\frac{k_1 k_2}{k_3}$ (c) $\frac{k_1 k_3^2}{k_2}$ (d) $\frac{k_2 k_3^3}{k_1}$

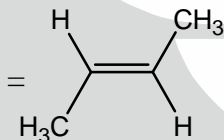
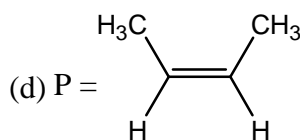
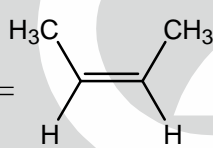
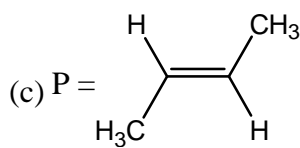
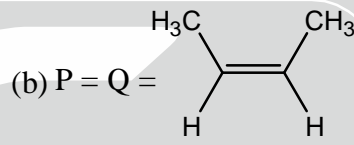
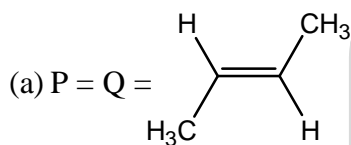


The major product (P) and mechanism involve in this reaction are respectively

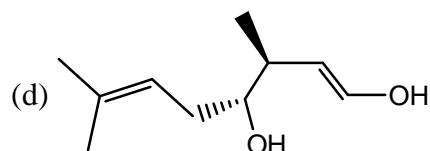
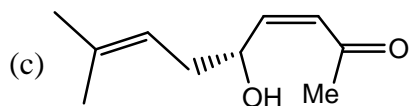
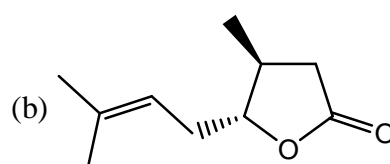
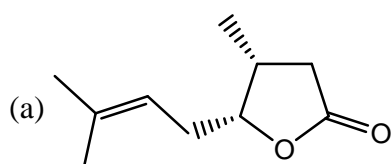
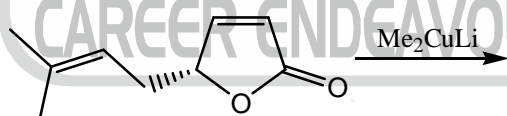




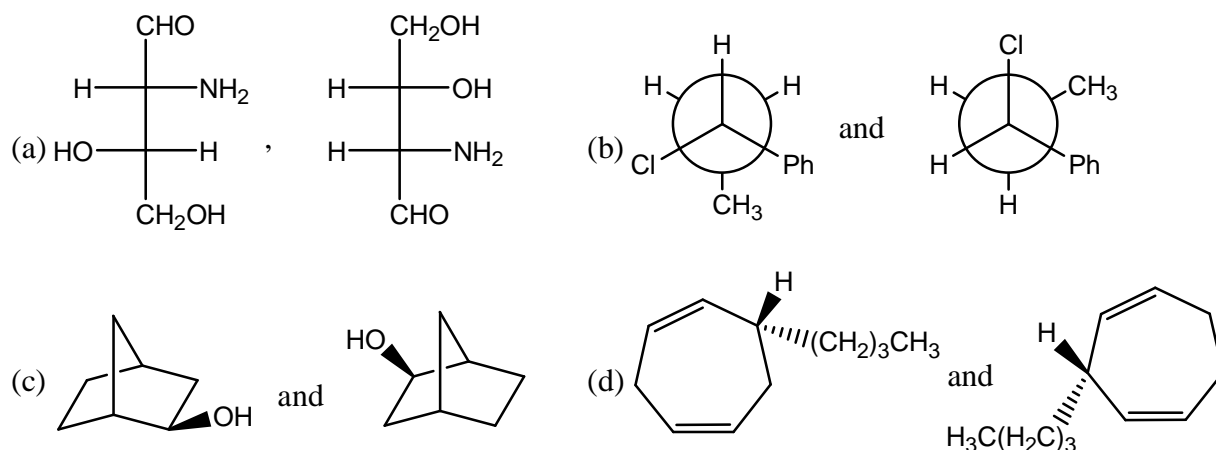
The major product P and Q in the above reaction are



53. Major product in the following reaction is



54. Which of the following pairs of compound are enantiomers



55. $^{14}_6\text{C}$ decays to $^{14}_7\text{N}$ by β^- decays with a half-life of 5730 years if a lg sample of carbon contains 15.0 disintegrations per minute then activity after 10,000 years is

- (a) $15 e^{+1.210}$ dis/min (b) $15 e^{-1.210}$ dis/min (c) $12 e^{-2.110}$ dis/min (d) $12 e^{+2.110}$ dis/min

56. The number of microstate in ^3F term are

- (a) 15 (b) 9 (c) 27 (d) 21

57. For the cell, $\text{Mg} | \text{Mg}^{2+} (0.01\text{M}) || \text{pH} = 1, \text{H}^+ | \text{Pt}(\text{H}_2), E_{\text{cell}}^0 = 2.37\text{V}$

- (a) $E_{\text{cell}} = 2.37 + \frac{0.0591}{2} \text{V}$ (b) $E_{\text{cell}} = 2.37 + 0.0591 \text{V}$
 (c) $E_{\text{cell}} = 2.37\text{V}$ (d) none of these

58. Which of the following is true

- (a) $\left(\frac{\partial T}{\partial A}\right)_V = -S$ (b) $\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_V$ (c) $\left(\frac{\partial G}{\partial P}\right)_T = -S$ (d) $\left(\frac{\partial V}{\partial T}\right)_P = \left(\frac{\partial S}{\partial P}\right)_T$

59. Number of ^{13}C NMR signals in camphor are

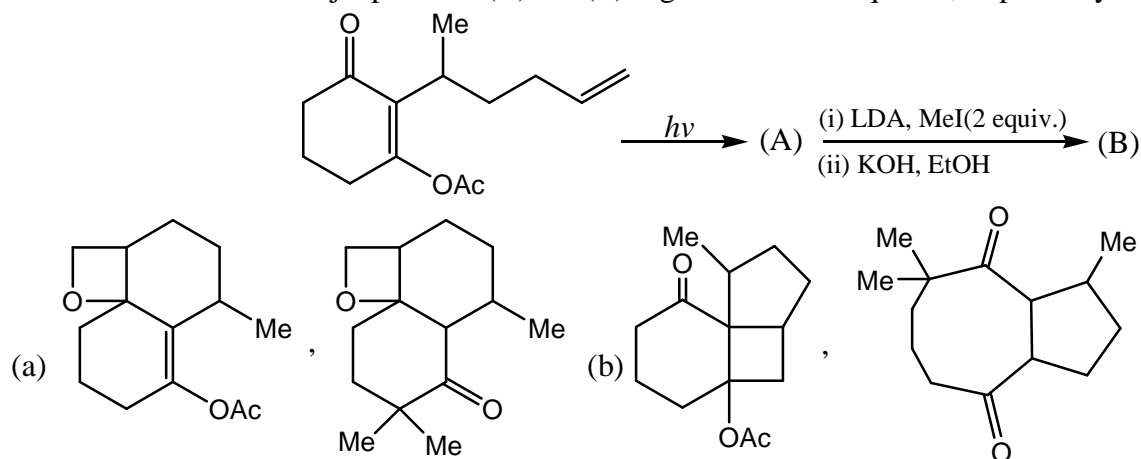
- (a) 9 (b) 10 (c) 11 (d) 8

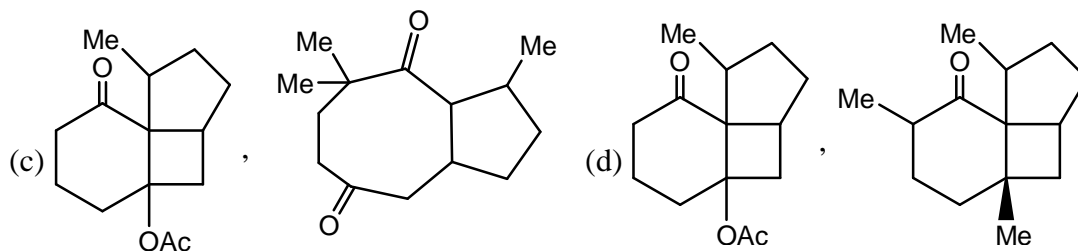
60. Based on equipartition of energy the value of $C_{v,m}$ for acetylene is

- (a) $6R$ (b) $9R$ (c) $5.5R$ (d) none of these

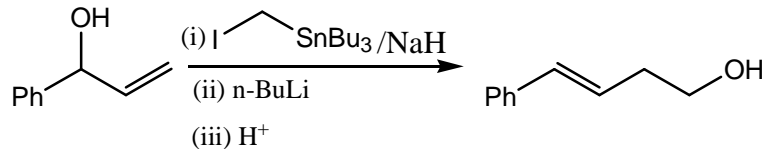
PART - C

61. Predict the structure of major products (A) and (B) in given reaction sequence, respectively



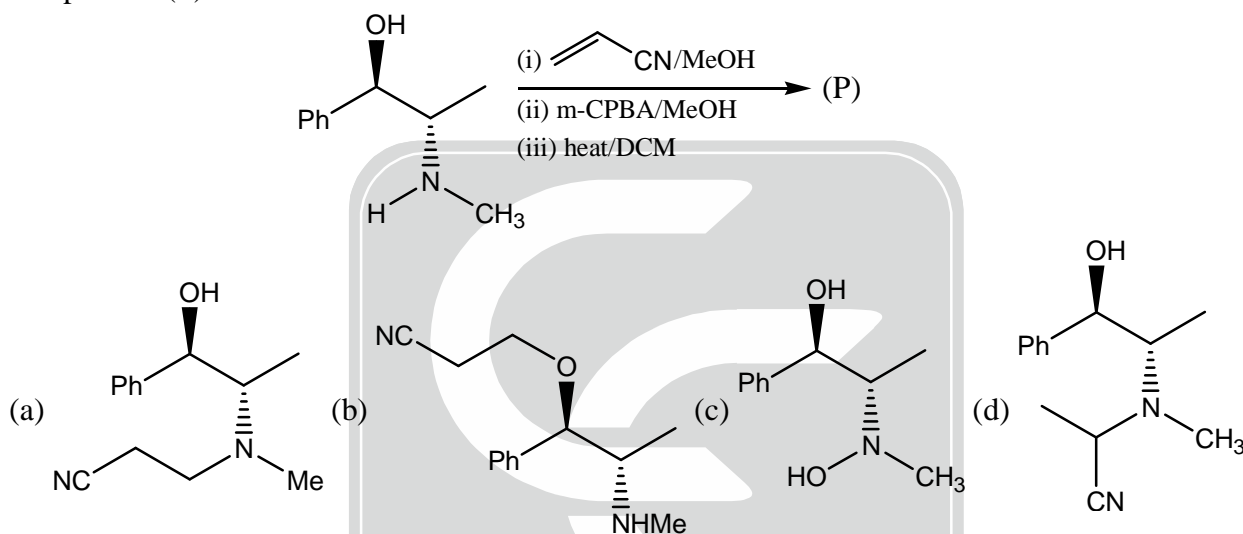


62. Which among the following rearrangement is involved for the following transformation

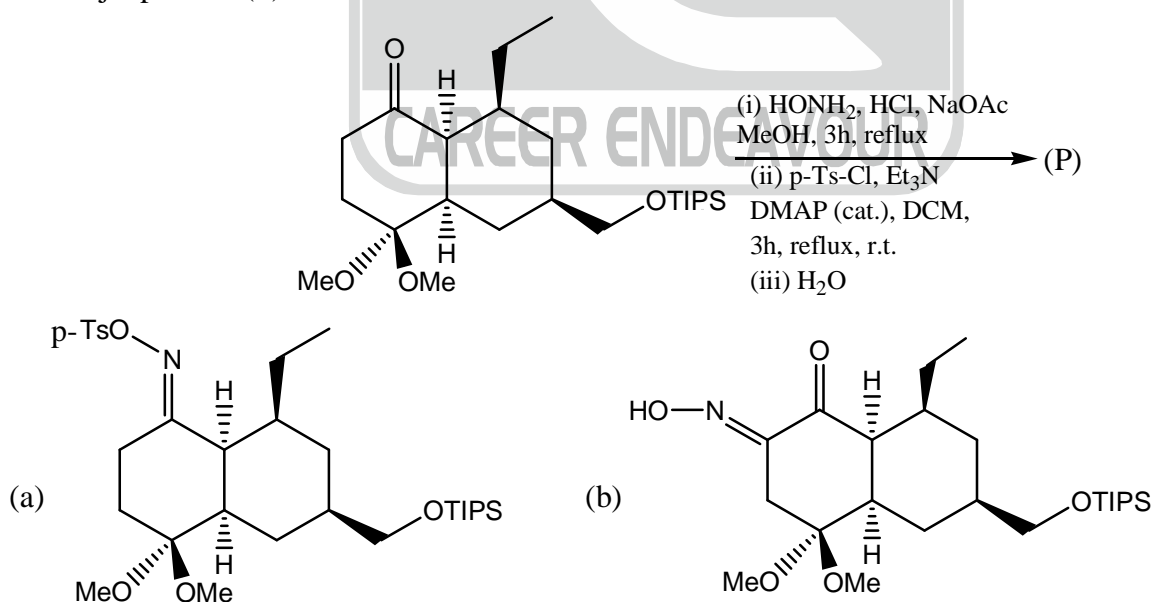


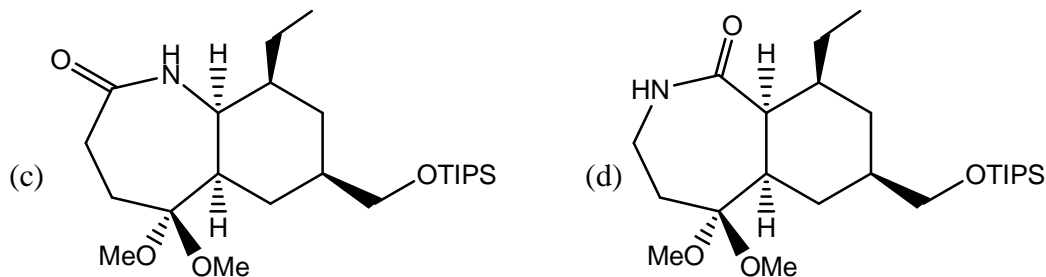
- (a) [3, 3]-sigmatropic rearrangement (b) [1, 3]-sigmatropic rearrangement
(c) [1, 5]-sigmatropic rearrangement (d) [2,3]-sigmatropic rearrangement

63. The product (P) is

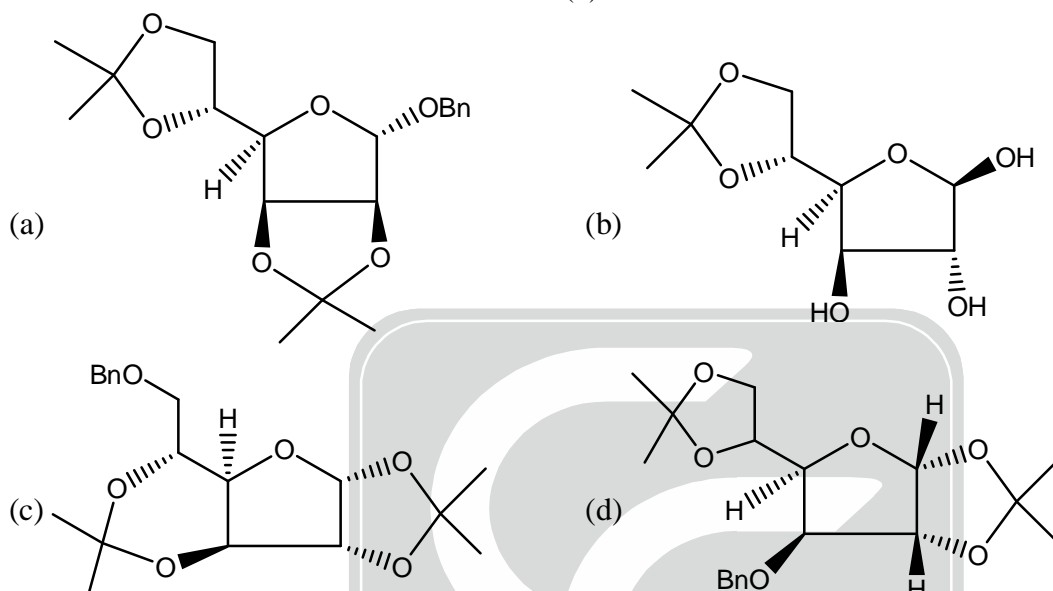
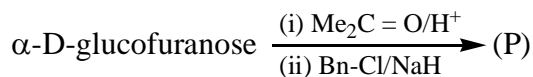


64. The major product (P) is

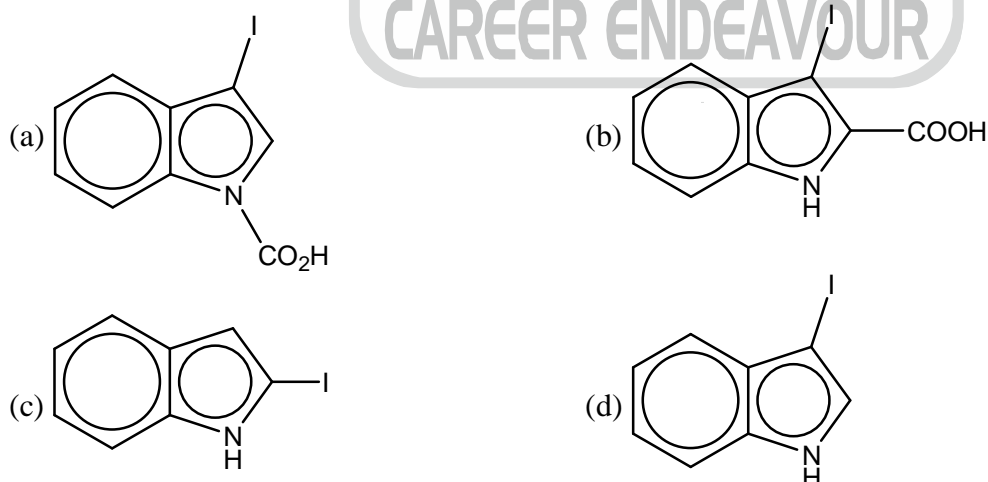
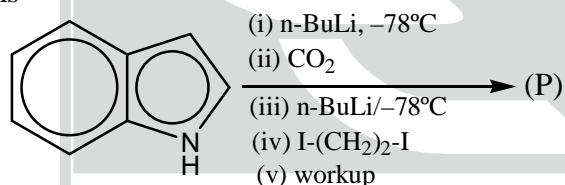




65. The major product (P) is



66. The major product (P) is

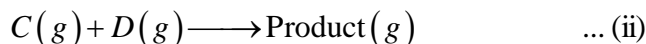
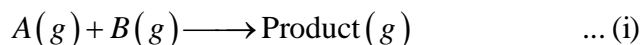


67. For the reaction, $2A^{++} + B^{---} + C^{+++} \longrightarrow \text{Product}$

For the ionic strengths $I_1 = 25$ unit and $I_2 = 16$ unit, the ratio of $\log \left(\frac{k_{I_2}}{k_{I_1}} \right)$ is (in units of Debye Huckel constant)

- (a) 10A (b) -10A (c) 6A (d) -6A

68. Consider the reactions



According to Collision theory the squares of pre-exponential factors of reaction (i) and reaction (ii) is

Species	M (g/mole)	Diameter (nm)
A	2	1
B	4	3
C	6	2
D	8	4

- (a) $\frac{149}{96}$ (b) $\frac{96}{149}$ (c) $\frac{96}{189}$ (d) $\frac{189}{96}$

69. The I.R. active vibrations in ClF_3 molecule are

C_{2v}	E	C_2	$\sigma_v(xz)$	$\sigma'_v(yz)$		
A_1	1	1	1	1	z	x^2, y^2, z^2
A_2	1	1	-1	-1	R_z	xy
B_1	1	-1	1	-1	x, R_y	xz
B_2	1	-1	-1	1	y, R_x	yz

- (a) 6 (b) 4 (c) 3 (d) 2

70. The energy of the first excited quantum state of a particle in the two-dimensional potential

$$V(x, y) = \frac{1}{2} m\omega^2 (x^2 + 4y^2) \text{ is}$$

- (a) $2\hbar\omega$ (b) $3\hbar\omega$ (c) $\frac{3}{2}\hbar\omega$ (d) $\frac{5}{2}\hbar\omega$

71. The wave function of a particle is given by

$$\psi = \frac{1}{\sqrt{2}} \phi_0 + i\phi_1$$

where ϕ_0 and ϕ_1 are the normalised eigen functions with energies E_0 and E_1 corresponding to the ground state and first excited state respectively. The expectation value of the Hamiltonian in the state ψ

- (a) $\frac{E_0 - 2E_1}{3}$ (b) $\frac{E_0 + 2E_1}{3}$ (c) $\frac{E_0}{2} + E_1$ (d) $\frac{E_0}{2} - E_1$

72. Energy order of d-orbital in $[\text{Ni}(\text{CN})_5]^{3-}$ is

- (a) $d_{z^2} > d_{x^2-y^2} \approx d_{xy} > d_{xz} \approx d_{yz}$ (b) $d_{x^2-y^2} > d_{z^2} > d_{xy} > d_{xz} \approx d_{yz}$
 (c) $d_{x^2-y^2} > d_{xy} > d_{z^2} > d_{xz} \approx d_{yz}$ (d) $d_{z^2} > d_{xz} \approx d_{yz} > d_{x^2-y^2} \approx d_{xy}$

73. The ground state term and magnetic moment of Ce ion in $\text{Ce}_2\text{Mg}(\text{NO}_3)_6 \cdot 2\text{H}_2\text{O}$ respectively is

- (a) $^2F_{7/2}$ and 2.54 (b) $^2F_{5/2}$ and 2.54 (c) $^2F_{7/2}$ and 2.28 (d) $^2F_{5/2}$ and 2.28

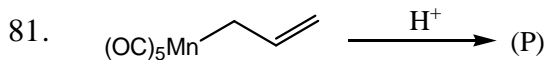
74. Aqueous solution of $\text{Ni}(\text{NO}_3)_2$ (A) on treatment with NH_3 solution convert in B and complex on treatment with *en* convert to complex C. Solution of these complex have yellow, green and blue colour. The appropriate color for A, B, C respectively is

- (a) yellow, green, blue (b) yellow, blue, green (c) green, blue, violet (d) green, violet, blue



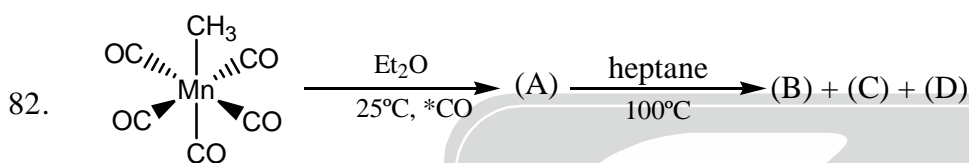
80. Select the correct statement from following?

- (1) $F_2 > BrO_4^- > IO_4^- > ClO_4^- \Rightarrow$ oxidising power
 (2) Cl_2O_6 has two type of chlorine atom
 (3) $BrF_5 > BrF_3 > BrF > IF \Rightarrow$ reactivity order
 (4) liquid I_2Cl_6 show electrical conductivity
 (a) 1, 2 (b) 2, 3 (c) 3, 4 (d) all



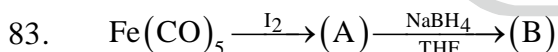
Which of the following statement is true about the product (P)

- (a) the oxidation state of 'Mn' is increased by one unit in the product
 (b) conversion of η^1 - allyl ligand into η^2 - propene
 (c) conversion of η^1 - allyl ligand into η^3 - allyl ligand
 (d) Metal is oxidized.



The possible products (B), C and D in the above reaction

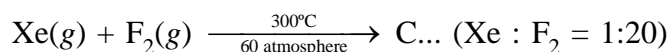
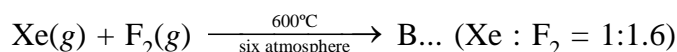
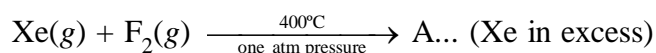
- (a) $CH_3Mn(CO)_4(*CO)$, $CH_3Mn(CO)_5$, $CH_3Mn(CO)_4(*CO)$
 cis 50% 25% trans 25%
- (b) $CH_3Mn(CO)_4(*CO)$, $CH_3Mn(CO)_5$, $CH_3Mn(CO)_4(*CO)$
 cis 25% 25% trans 50%
- (c) $CH_3Mn(CO)_4(*CO)$, $CH_3Mn(CO)_5$, $CH_3Mn(CO)_4(*CO)$
 cis 25% 50% trans 25%
- (d) B = C = D = $CH_3Mn(CO)_4(*CO)$ 100%



The product A and B are respectively

- (a) $Fe(CO)_5I_2$ and $Fe(CO)_5H$ (b) $Fe(CO)_4I_2$ and $Fe(CO)_4H(I)$
 (c) $Fe(CO)_4I_2$ and $Fe(CO)_4H_2$ (d) $Fe_2(CO)_9$ and $[HFe(CO)_4]^-$

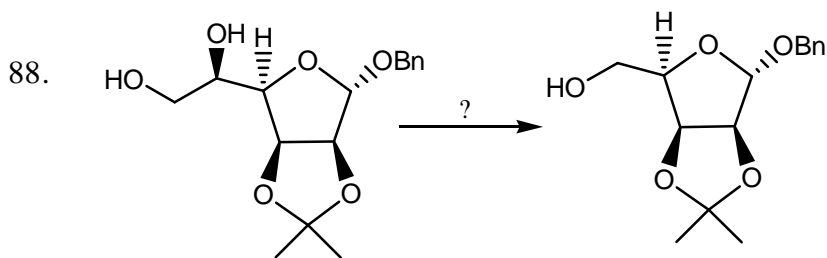
84. Given the following reaction conditions for the formations of the fluorides of Xe



A, B and C in these reactions respectively are

- (a) XeF_4 , XeF_2 , XeF_6 (b) XeF_2 , XeF_4 , XeF_6
 (c) XeF_6 , XeF_4 , XeF_2 (d) XeF_2 , XeF_6 , XeF_4

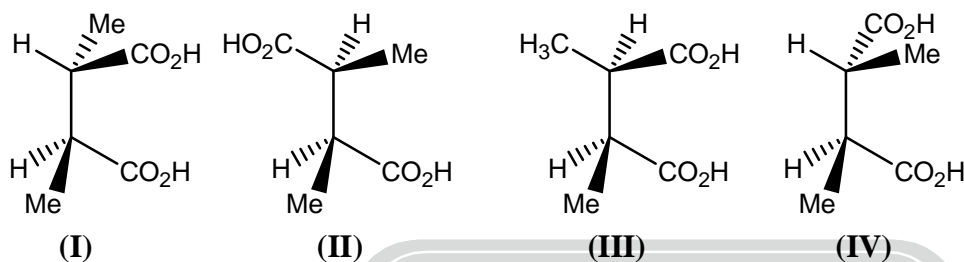




The suitable reagent for the above synthetic transformation is

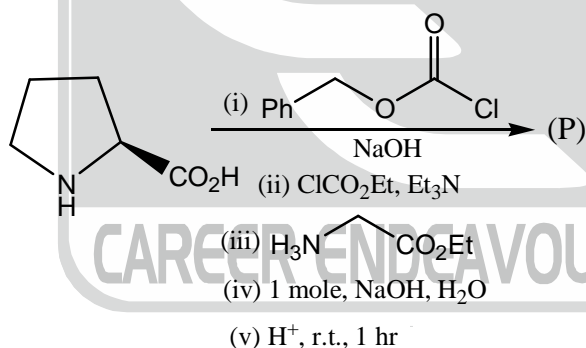
- (a) NaIO_4 , H_2O followed by NaBH_4 , EtOH (b) CsCl_2 , $\text{P}(\text{OMe})_3$
 (c) $\text{Pb}(\text{OAc})_4$ followed by LiAlH_4 , THF (d) PTSA , acetone

89. Correct statement about following compound (I–IV) is

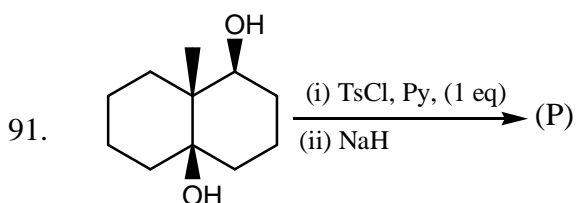


- (a) I and II are configuration, III and IV are conformation
 (b) I and III are conformation, III and IV are configuration
 (c) I and III are configuration, III and IV are configuration
 (d) I and II, III and IV are conformation

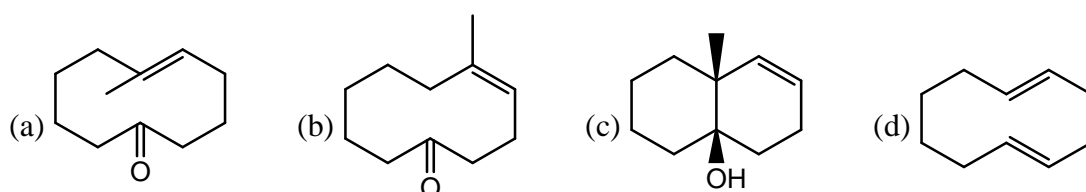
90. The major product (P) is



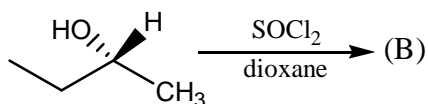
- (a) Pro-Val (b) Val-pro (c) Pro-Gly (d) Gly-Pro



The major product in the above stereocontrolled synthesis is



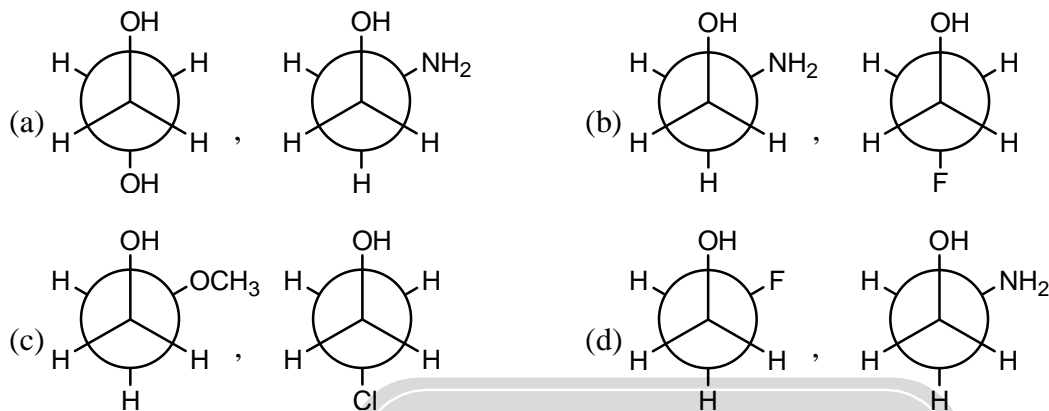
92. An optically active alcohol (A) reacts with SOCl_2 to give product (B) as shown



which one of the following statement is true

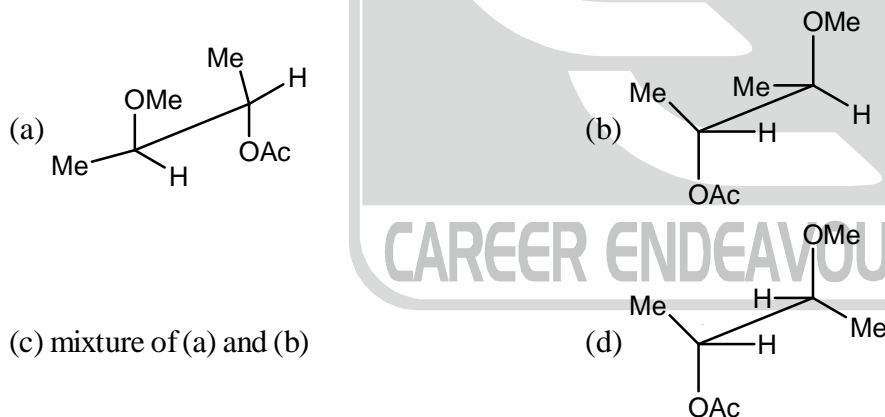
- (a) A and B are both R-isomers
 (b) A and B are both S-isomers
 (c) A is R isomer and (B) is S-isomer
 (d) A is S-isomer and (B) is R-isomer

93. The preferred conformation of 2-substituted ethanol pair



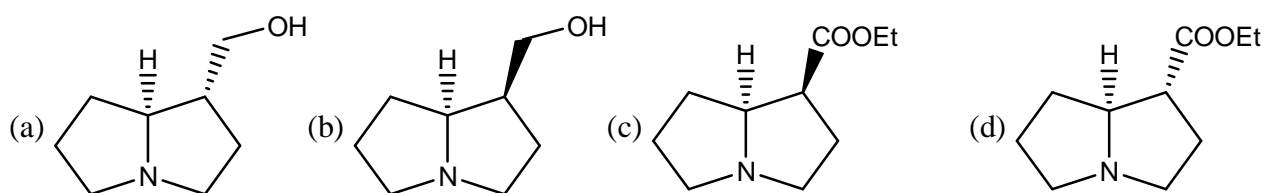
94. $\xrightarrow[\text{AcOH}]{\text{Ag}^+}$ (P)

The major product (P) in the above acetolysis of 3-methoxy-2-bromobutane in presence of silver acetate in acetic acid

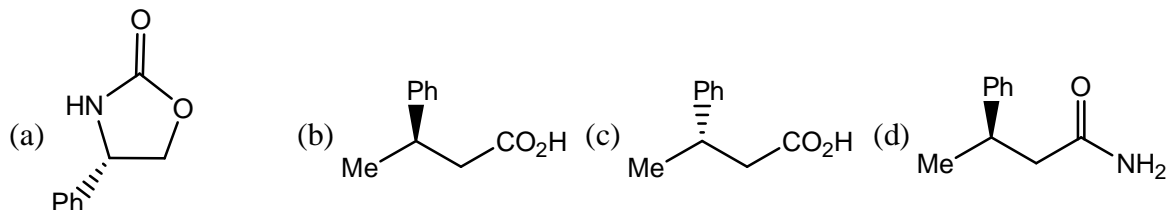
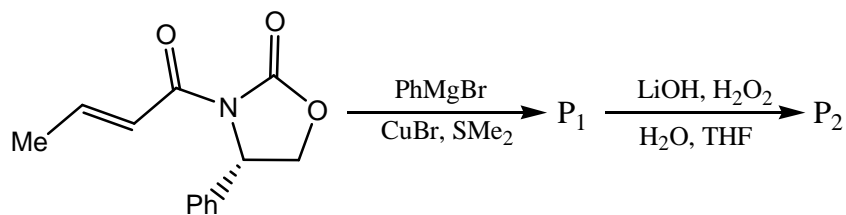


95. $\xrightarrow[\text{(ii) LiAlH}_4]{\text{(i) H}_2, \text{Pd/C}}$ (P)

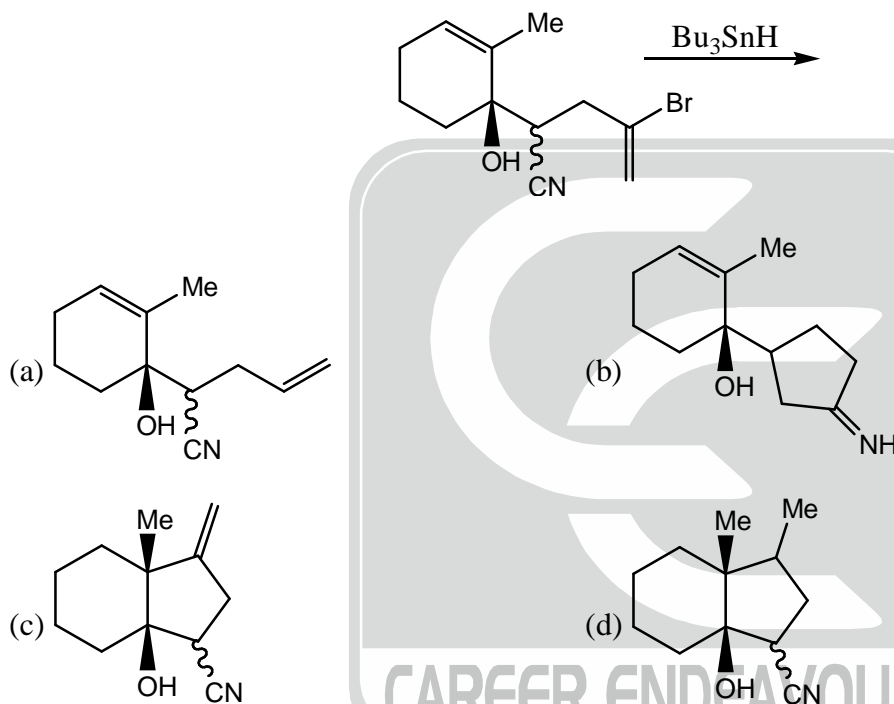
The major product (P) in the above reaction



96. Product 'P₂' in the following reaction sequence is



97. The product in the following reaction is



98. Consider a sample of organic material that contains 1mg of C. Suppose it has a $^{14}\text{C}/^{12}\text{C}$ atom ratio of 1.2×10^{-14} .

How many ^{14}C atoms are present

- (a) 6.02×10^{19} (b) 5.02×10^{19} (c) 6.02×10^5 (d) 5.02×10^5

99. Match the following Column-A with Column-B

Column-A

- (1) UV spectroscopy
 (2) AAS
 (3) Gas chromatography
 (4) Fluorescence and phosphorescence spectrophotometry

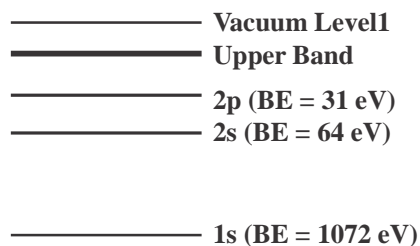
- (a) 1-S, 2-Q, 3-P, 4-R
 (c) 1-Q, 2-R, 3-S, 4-P

Column-B

- (P) Xenon flash lamp
 (Q) Thermal conductivity detector
 (R) Hollow cathode lamp
 (S) Deuterium discharge lamp

- (b) 1-S, 2-R, 3-Q, 4-P
 (d) 1-Q, 2-P, 3-S, 4-R

100. pH of a solution prepared by mixing 25 mL of a 0.5M solution of HCl, 10 ml of a 0.5M solution of NaOH and 15 mL of water is
 (a) 0.82 (b) 1.0 (c) 2.0 (d) 3.0
101. The diagram opposite shows an energy level diagram for sodium with approximate binding energies for the core levels.



If are using Mg $K\alpha$ ($h\nu = 1253.6 \text{ eV}$) radiation, at what kinetic energy will the Na 1s, 2s and 2p photoelectron peaks be observed ?

- (a) 182, 1190 and 1223 eV (b) 1223, 1190 and 182 eV
 (c) 1072, 64 and 31 eV (d) None
102. If Poly Dispersity Index (PDI) of a polymer sample is 1.5, then extent of polymerisation will be
 (a) 1.5 (b) 4.5 (c) 3.0 (d) none
103. An aqueous mixed solution of NaCl and HCl is exactly neutralized by an aqueous NaOH solution. The number of components in the final mixture is
 (a) 1 (b) 2 (c) 3 (d) 4
104. If $\psi = c_1\phi_A + 0.4\phi_B$ is a normalized molecular orbital of a diatomic molecule AB, constructed from ϕ_A and ϕ_B . Which are normalized the overlap between ϕ_A and ϕ_B is 1. The value of c_1 is
 (a) 0.6 (b) 0.36 (c) 0.8 (d) 0.3
105. Equivalent conductance of saturated BaSO_4 is $400 \text{ ohm}^{-1} \text{ cm}^2 \text{ equiv}^{-1}$ and specific conductance is $8 \times 10^{-5} \text{ ohm}^{-1} \text{ cm}^{-1}$. Hence, K_{sp} of BaSO_4 is
 (a) $4 \times 10^{-8} \text{ M}^2$ (b) $1 \times 10^{-8} \text{ M}^2$ (c) $2 \times 10^{-4} \text{ M}^2$ (d) $1 \times 10^{-4} \text{ M}^2$
106. Match List-A with List-B

- | List-A | List-B |
|--|----------------------------|
| (A) $[\text{HCr}(\text{CO})_5]^-$ | (I) -6.9 ppm |
| (B) $[(\text{CO})_{10} \text{Cr}_2\text{H}]^-$ | (II) +23.2 ppm |
| (C) $[\text{HCo}_6(\text{CO})_{15}]^-$ | (III) -19.5 ppm |
| (D) $[\text{AlH}_4]^-$ | (IV) -0.00 ppm |
| (a) A-II, B-III, C-IV, D-IV | (b) A-I, B-III, C-II, D-IV |
| (c) A-IV, B-III, C-I, D-II | (d) A-III, B-II, C-I, D-IV |

107. An organic compound exhibits following spectral data:

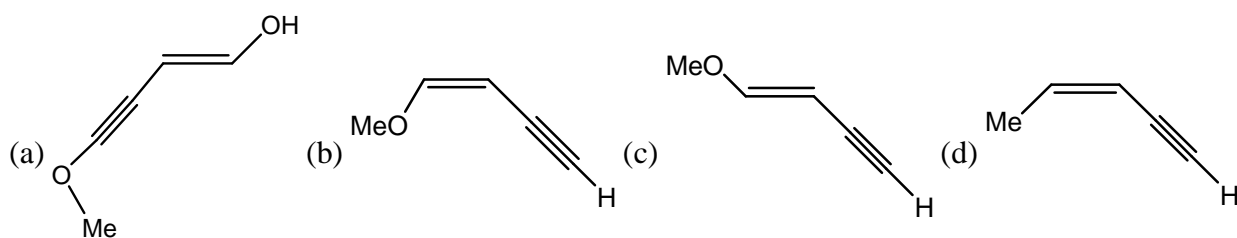
^{13}C NMR: 60.6, 78.6, 80.9, 158.3, 184.2

^1H NMR (δ , ppm): 3.07 (1H, m, J = 1 and 2.5 Hz); 3.45 (3H, S)

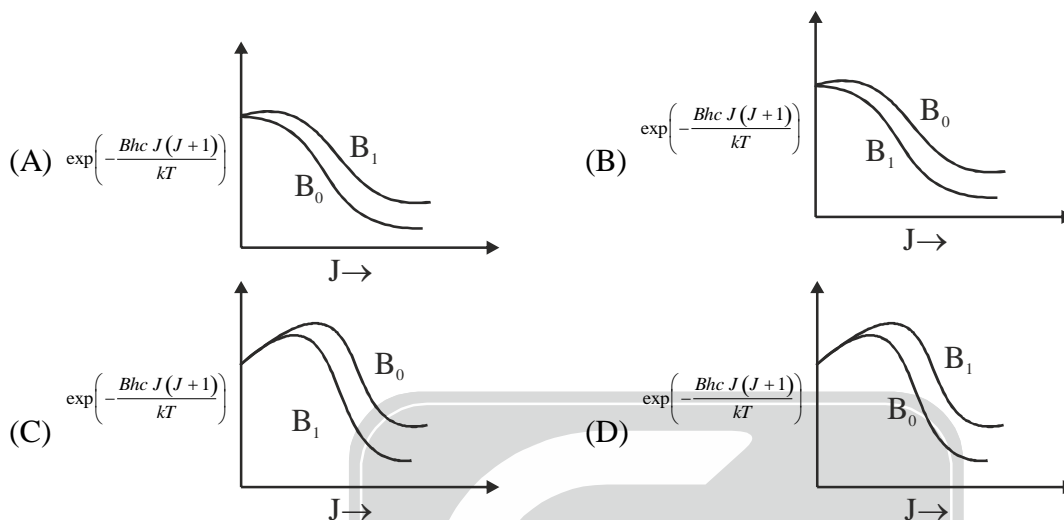
6.53 (1H, m, J = 1 and 6.5 Hz); 4.52 (1H, m, 2.5 and 6.5 Hz)



The correct structure of compound's



108. Consider the following graphs:



Which of the following graph correctly represent the variation of J (rotational constant) with

$$\exp\left(-\frac{BhcJ(J+1)}{kT}\right)$$

where, B_1 = rotational constant in first excited state

B_0 = rotational constant in first ground state

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

109. The ESR spectrum of methoxymethyl radical will appear as

- (a) A triplet of quartet (b) A triplet of quintet
(c) A quartet of quartet (d) A doublet of quartet

110. If the perturbation $H' = ax$, where a is constant is added to the infinite square well potential

$$V(x) = \begin{cases} 0 & 0 \leq x \leq \pi \\ \infty & \text{otherwise} \end{cases}$$

The first order correction to the ground state is

- (a) $\frac{a\pi}{2}$ (b) $\frac{a\pi}{\sqrt{2}}$ (c) $\frac{a\pi}{4}$ (d) None of these

111. Observe the following electronic transition of a diatomic molecule.

- (A) ${}^1\Sigma_g^+ \rightarrow {}^3\Sigma_g^+$ (B) ${}^1\Sigma_u^+ \rightarrow {}^1\Sigma_g^+$ (C) ${}^1\Delta_u \rightarrow {}^1\Sigma_g^+$ (D) ${}^1\Pi_g \rightarrow {}^1\Sigma_u^+$

The allowed transitions are

- (a) (A) and (C) only (b) (B) and (D) only (c) (A), (B) and (C) only (d) (A), (C) and (D) only

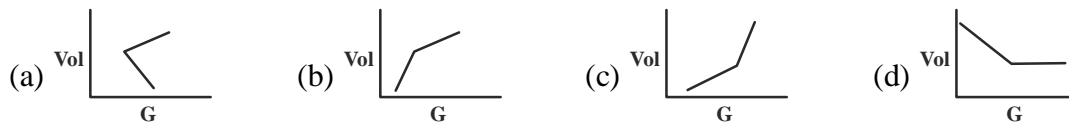
112. The number of microstates that are possible, when three particles are distributed in six states such that the resulting wave functions are antisymmetric with respect to exchange of the particles, is

- (a) 20 (b) 32 (c) 40 (d) 28

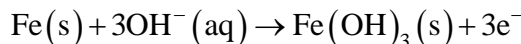
113. For a radical, the magnetic field is 3810G, the frequency of microwave radiation is 9600 MHz. Calculate the g-value.

- (a) 1.80 (b) 1.50 (c) 2.00 (d) 2.20

114. Benzoic acid is titrated against NaOH conductometrically, graphical representation will be



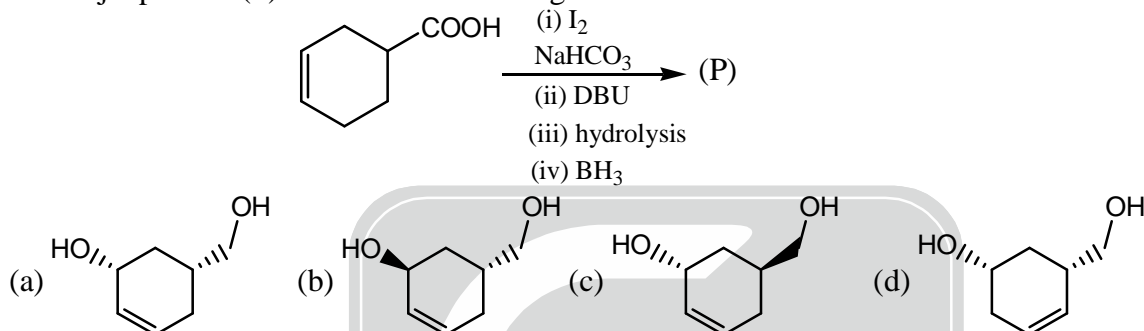
115. K_{sp} of $\text{Fe}(\text{OH})_3(\text{s})$ is 10^{-38} . If $\text{Fe}|\text{Fe}^{3+} = 0.036\text{V}$ then calculate the potential of following reaction



taking $0.0591 \approx 0.06$

- (a) 0.724 V (b) -0.724 V (c) 0.796 (d) -0.796

116. The major product (P) formed in the following reaction is



117. The average velocity of gas molecule is 400 m/second. The rms velocity of the gas is

- (a) 368 m/s (b) 400 m/s (c) 434 m/s (d) 414 m/s

118. The heat of combustion of benzene in bomb calorimeter was found to be $3263.9 \text{ kJ mol}^{-1}$ at 25°C . The heat of combustion of benzene at constant pressure is

- (a) $-3267.6 \text{ kJ mol}^{-1}$ (b) $3267.6 \text{ kJ mol}^{-1}$ (c) $3260.2 \text{ kJ mol}^{-1}$ (d) $-3260.2 \text{ kJ mol}^{-1}$

119. Consider following statements:

- (A) NO and N_2O would show its activity in most rigid form of spectroscopy in terms of gross selection rule.
 (B) Among H_2 , NO, N_2O and CH_4 , NO and N_2O are most rigid molecules to show their activity in molecular spectroscopy in terms of gross selection rule.
 (C) Among H_2 , NO, N_2O and CH_4 , NO and N_2O are most labile molecules to show their activity in molecular spectroscopy in terms of gross selection rule.
 (D) Among N_2 , CO_2 , OCS, H_2O , $\text{CH}_2 = \text{CH}_2$ and C_2H_6 , CO_2 , OCS, H_2O , $\text{CH}_2 = \text{CH}_2$ and C_6H_6 are I.R. active while N_2 is rotational RAMAN active. However N_2 will provide alternate lines in rotational RAMAN spectrum

Which of the above statements are correct

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

120. There are many phenomenon where changes in one variable are related to changes in other variables. The way the variables are related is measured by finding their correlation coefficient (r), so if data for 'x' and 'y' are dependent on each other, then correlation coefficient (r) is given by –

[$X = x - \bar{x}$, $Y = y - \bar{y}$, $\sigma_x = \text{std. deviation of 'x'}$, $\sigma_y = \text{std. deviation of y}$, n = no. of values of x and y]

- (a) $r = \frac{\sum XY}{n\sigma_x\sigma_y}$ (b) $r = \frac{n\sigma_x\sigma_y}{\sum XY}$ (c) $r = n\sigma_x\sigma_y$ (d) $r = \frac{\sum X \sum Y}{n\sigma_x\sigma_y}$

All the very Best for NET "17th June 2018" Exam

Space for rough work





CHEMICAL SCIENCES

Date : 09-06-2018

TEST SERIES-E

ANSWER KEY

PART-A

1. (d)	2. (c)	3. (c)	4. (d)	5. (b)	6. (b)	7. (a)
8. (d)	9. (a)	10. (d)	11. (d)	12. (d)	13. (b)	14. (b)
15. (d)	16. (b)	17. (d)	18. (d)	19. (c)	20. (b)	

PART-B

21. (c)	22. (d)	23. (c)	24. (c)	25. (b)	26. (c)	27. (d)
28. (d)	29. (d)	30. (d)	31. (c)	32. (a)	33. (b)	34. (b)
35. (a)	36. (b)	37. (c)	38. (c)	39. (b)	40. (b)	41. (a)
42. (b)	43. (b)	44. (b)	45. (b)	46. (a)	47. (a)	48. (c)
49. (d)	50. (d)	51. (a)	52. (c)	53. (b)	54. (b)	55. (b)
56. (d)	57. (c)	58. (b)	59. (b)	60. (d)		

PART-C

61. (c)	62. (d)	63. (c)	64. (c)	65. (d)	66. (c)	67. (a)
68. (c)	69. (a)	70. (d)	71. (b)	72. (b)	73. (b)	74. (c)
75. (a)	76. (d)	77. (d)	78. (c)	79. (d)	80. (d)	81. (b)
82. (a)	83. (c)	84. (b)	85. (d)	86. (c)	87. (b)	88. (a)
89. (d)	90. (c)	91. (a)	92. (a)	93. (d)	94. (c)	95. (b)
96. (b)	97. (c)	98. (c)	99. (b)	100. (a)	101. (a)	102. (d)
103. (b)	104. (c)	105. (b)	106. (b)	107. (b)	108. (a)	109. (a)
110. (a)	111. (b)	112. (c)	113. (a)	114. (b)	115. (c)	116. (a)
117. (c)	118. (a)	119. (c)	120. (a)			

