

TEST SERIES CSIR-NET/JRF DEC. 2018

BOOKLET SERIES **E**

Full Length Test – 2

Paper Code **01**

Test Type: **TEST SERIES**

CHEMICAL SCIENCES

Duration: 3:00 Hours

Date: 07-12-2018

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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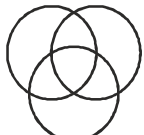
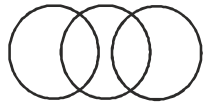

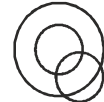
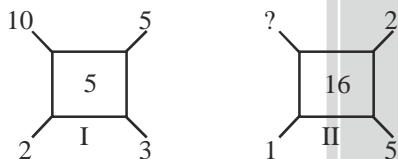
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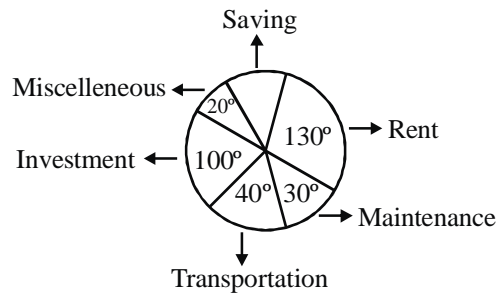


PART – A

1. At what, minute between h ' O clock and $(h + 1)$ ' O clock the hour and minute hands of a clock coincide?
 (a) $\frac{60h}{11}$ (b) $\frac{60h}{55}$ (c) $\frac{55h}{60}$ (d) $\frac{60(h+1)}{60}$
2. If the day of the 7th January in 1992 was tuesday and it was Rams birthday, then what will be the day of Ram's birthday in 1997.
 (a) Tuesday (b) Monday (c) Wednesday (d) Sunday
3. What should be the ideal diagram for women mothers and lawyears,
 (a)  (b)  (c)  (d) 
4. Below is given statement and based on that statement you have to find out which of the conclusions follows?
 Statement : Unless India, a country achieves total literacy, it can't reach its mission of development.
 Conclusion: (i) It is possible to reach total literacy in India
 (ii) No development is possible without a proper mission
 (a) Only I follows (b) Only II follows (c) None follows (d) both follows
5. A board of directorate meeting comprising 7 members sits in a row facing north. Amit is to the immediate left of Barun but on the immediate right of Dougulus. Qarmor is on the right side of Amit but on the left of Sushant. Tarun is on the left side of Vikram who is sitting to the left of Dougulus. Who is sitting in the middle?
 (a) Vikram (b) Amit (c) Qamar (d) Dougulus
6. 
 (a) 15 (b) 26 (c) 30 (d) 10
7. Mother's age is four times the age of her daughter after 10 years the age of mother will be twice the age of her daughter. Find the present age of daughter.
 (a) 5 (b) 7 (c) 14 (d) 8
8. A boy is constructing a house on a contract basis of 10 hours. He constructs 10 feet in an hour and rests for 30 minute after an hour's work is done. How much feet he constructs in 10 hours.
 (a) 60 (b) 70 (c) 75 (d) 65
9. An amount of 172,00 to be divided among 5 grandsons, 4 granddaughters and 2 nieces of a man. If each granddaughter receives 4 times the amount of each niece and each grandson receives five time the amount of each niece. How much each granddaughter receive
 (a) 1600 Rs. (b) 1200 Rs. (c) 1500 Rs. (d) 2000 Rs.
10. In the class 8th in DAV school the average score of girls and boys is 73 is 71 respectively. The average score for the whole class 71.8. The percentage of boys is
 (a) 50% (b) 40% (c) 60% (d) 70%
11. To gain a profit of 10% on selling the mixture of syrup and water at the cost price of syrup, the quantity of water to be mixed with 50 kg of syrup is How much Kg. (Provided water is available free of cost.)
 (a) 10 kg (b) 5 kg (c) 5.5 kg (d) 8 kg

12. The shadow of a monument becomes 120 m longer when the altitude of the Sun changes from 45° to 30° . What is the height of the monument ?
- (a) $30(\sqrt{3} + 1)$ (b) $60(\sqrt{3} + 1)$ (c) $120(\sqrt{3} - 1)$ (d) $30(\sqrt{3} - 1)$

13. Given below is a pie chart based on that pie chart which provides the information of expenditure of a family in various fields, based on these information find out income of the family?



The saving of the family is ₹ 1200.

- (a) ₹ 9,600 (b) ₹ 10,800 (c) ₹ 6,000 (d) 8,400
14. If in the trapezium ABCD, E and F are the points such that it divides non parallel sides in 5 : 3 ratio, then length of EF in cm is [Given : AB = 20 cm and CD = 8 cm]



- (a) 15.5 cm (b) 12 cm (c) 16.5 cm (d) 14 cm
15. What is the area of the largest possible circle, which can be drawn in a square of 24 cm side.
- (a) 200π (b) 120π (c) 144π (d) 196π
16. Municipality of delhi digs a well of a diameter 10 m and the depth being 12 m and the soil is then spread around the well spread evenly in a circular manner having 6 m extra radius around the well. What is the height of the soil.
- (a) $3\frac{1}{8}$ m (b) $4\frac{1}{8}$ m (c) 4 m (d) $2\frac{1}{3}$ m
17. Two balls are drawn in random from a container having 3 red balls and 8 white balls. Find the probability that both the balls are red ?
- (a) $\frac{5}{11}$ (b) $\frac{3}{35}$ (c) $\frac{3}{55}$ (d) $\frac{2}{55}$
18. If $2^a = 4^b = 8^c$, then $a + 2b + 3c = ?$
- (a) 5c (b) 9c (c) 8c (d) 6c
19. Excluding the stoppages, the speed of a train is 48 km/hr and including the stoppages the speed is 40 km/hr for how much minute the train stops in a hours journey in each stations if there are 5 stations in each hours journey?
- (a) 3 minutes (b) 2 minutes (c) 5 minutes (d) 1 minute
20. Ram is twice as much efficient as Shyam, if Shyam completes a work in 20 days, then in how many days they will complete the whole work working alternately starting with Ram.
- (a) $13\frac{1}{3}$ days (b) $6\frac{2}{3}$ days (c) 5 days (d) $8\frac{1}{3}$ days

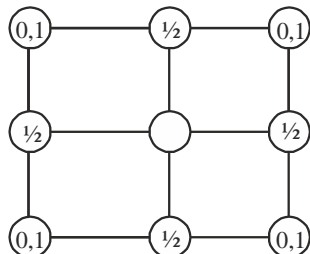
PART – B

21. Though a constant shift of energy levels of a system changes the partition function, the properties that do not change are
 (a) change in average energy (b) probability of the finding the particle in a state
 (c) entropy and heat capacity (d) all of the above
22. For a closed system, the change in pressure with entropy at constant temperature is equal to
 (a) $\left(\frac{\partial V}{\partial T}\right)_P$ (b) $-\left(\frac{\partial V}{\partial T}\right)_P$ (c) $\left(\frac{\partial T}{\partial V}\right)_P$ (d) $-\left(\frac{\partial T}{\partial V}\right)_P$
23. The change in entropy of the system, if two moles of oxygen gas expands from 10L to 20L at constant temperature, is
 (a) $5.76 \text{ atmLmol}^{-1}\text{K}^{-1}$ (b) $11.5 \text{ atmLmol}^{-1}\text{K}^{-1}$
 (c) $5.76 \text{ J mol}^{-1}\text{K}^{-1}$ (d) $11.5 \text{ JK}^{-1}\text{mol}^{-1}$
24. The standard reduction potential of $A^+|A$ and $B^{2+}|B$ are 0.3V and 0.7V. The equilibrium constant for the cell reaction is
 (a) $10^{13.5}$ (b) $10^{9.2}$ (c) $10^{6.7}$ (d) $10^{8.5}$
25. If ψ is a wavefunction in two dimensions, the dimension of $\frac{\hbar}{i} \frac{\partial \psi}{\partial x}$ is
 (a) $\text{kgm}^{-1}\text{s}^{-2}$ (b) $\text{kgm}^2\text{s}^{-2}$ (c) kg s^{-2} (d) kg s^{-1}
26. The angular quantum number associated with the wave function

$$Y_{\ell,m} = \sqrt{\frac{45}{32}} \sin \theta \cos \theta (7 \cos^2 \theta - 3) \frac{1}{\sqrt{2\pi}} e^{-i\phi}$$
 is
 (a) +1 (b) -1 (c) 4 (d) 0
27. Select the correct statement(s) regarding B_2 , C_2 , N_2 and O_2
 (1) $N_2 > C_2 > O_2 > B_2$ (Bond energy) (2) $B_2 > C_2 > O_2 > N_2$ (Bond length)
 (3) $B_2 > O_2 > C_2 > N_2$ (Bond length) (4) $N_2 > O_2 > C_2 > B_2$ (Bond energy)
 The correct answer is
 (a) 1, 2 (b) 1, 3 (c) 2, 4 (d) 3, 4
28. For the reaction,

$$A \xrightleftharpoons[k_2]{k_1} 3B ; B \xrightarrow{k_3} C$$
 The net rate of formation of B is given by
 (a) $k_1[A]$ (b) $3k_1[A]$
 (c) $k_1[A] - k_2[B]^3 - k_3[B]$ (d) $3k_1[A] - 3k_2[B]^3 - k_3[B]$
29. The intercept of $\ln k$ vs $\frac{1}{T}$ graph regarding Arrhenius equation is
 (a) $\ln A$ (b) $\log A$ (c) $-\frac{E_a}{R}$ (d) $-\frac{E_a}{2.303R}$
30. If the value of Mark-Houwink-exponent is 1.0, then which of the following relation is correct
 (a) $\bar{M}_m = \bar{M}_n$ (b) $\bar{M}_m = \bar{M}_v$ (c) $\bar{M}_m = \bar{M}_z$ (d) None of these

31. For a triatomic gas involving non-dissociative Langmuir adsorption, the extent of adsorption at low pressure is proportional to
 (a) P (b) $P^{1/3}$ (c) P^3 (d) None of these
32. The molecule which does not belong to C_{2v} symmetry is
 (a) SF_4 (b) ClF_3 (c) both (d) None of these
33. In the following representation of a fcc lattice



The digits in centre are

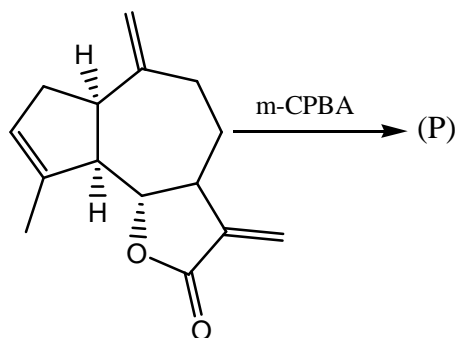
- (a) $\frac{1}{2}, \frac{1}{2}$ (b) $0, \frac{1}{2}$ (c) $0, 1$ (d) $1, \frac{1}{2}$
34. The structure factor of a BCC lattice for (112) planes is
 (a) 0 (b) 1 (c) 2 (d) 4
35. The bond enthalpy of noble gas compound varies in the order
 (a) $Kr-F > Xe-O > Xe-F$ (b) $KrF < Xe-O < Xe-F$
 (c) $Kr-F < Xe-F < Xe-O$ (d) $Xe-O < Kr-F < XeF$
36. Arrange the relative rates of S_N2 reactions of the given compounds with the iodide ion
- $$\begin{array}{c}
 \text{CH}_3 \\
 | \\
 \text{H}_3\text{C}-\text{CH}-\text{Cl}
 \end{array}$$

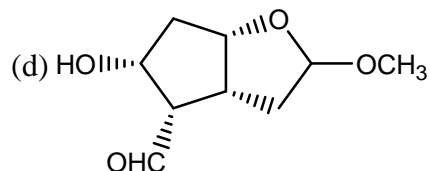
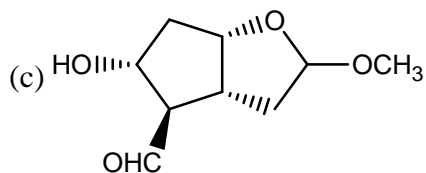
(I)

(II)

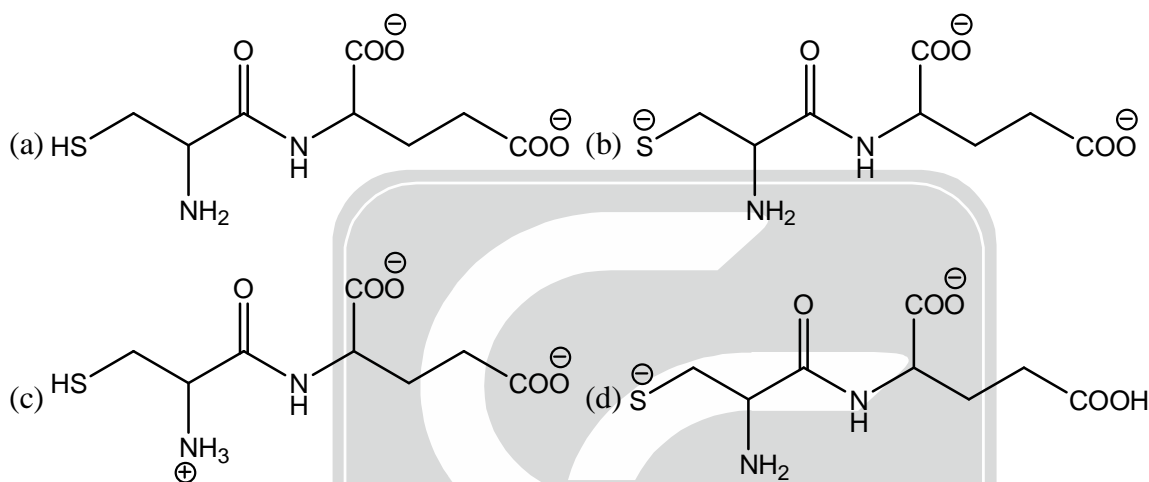
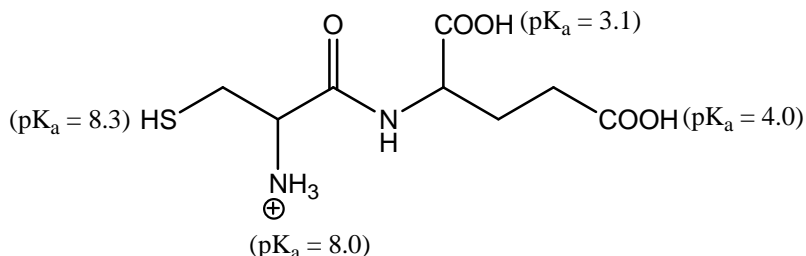
(III)

(IV)
- (a) $IV > II > III > I$ (b) $IV > III > II > I$ (c) $I > II > III > IV$ (d) $II > III > I > IV$
37. Which of the following statement is not true
 (a) $I^- > Br^- > Cl^- > F^-$ (nucleophilicity) (b) $C_6H_5Si^- > C_6H_5S^- > C_6H_5O^-$ (Basicity)
 (c) $C_6H_5Se^- > C_6H_5S^- > C_6H_5O^-$ (nucleophilicity)
 (d) $CH_3O^- > C_6H_5O^- > CH_3CO_2^- > NO_3^-$ (Basicity as well as nucleophilicity)
38. The major product (P) is

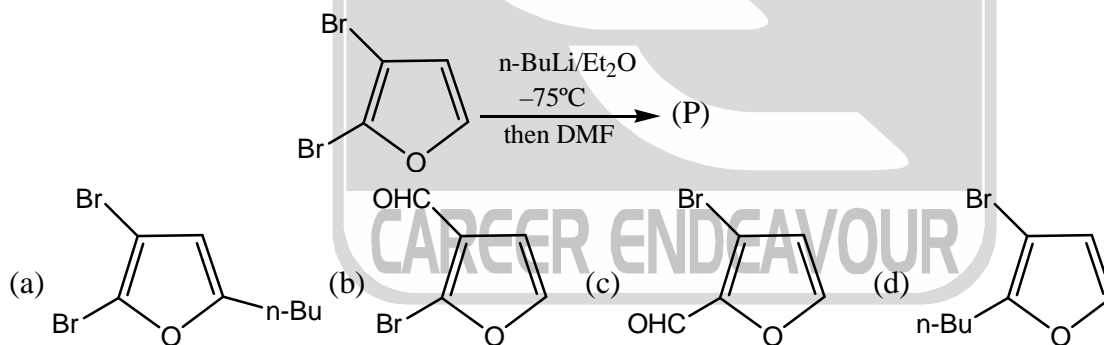




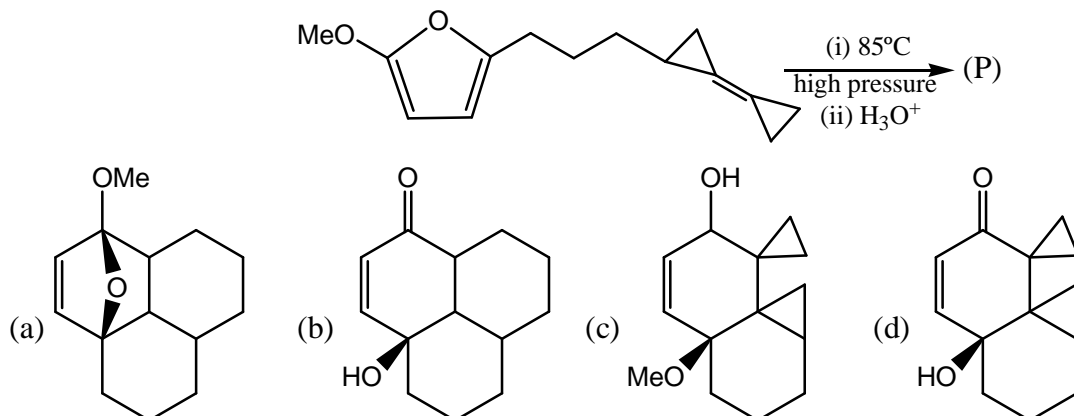
43. The pK_a value of the salt of Cys-Glu peptide is given below. The predominant form that would exist at $pH = 10$ is

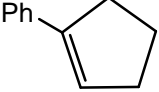
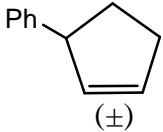
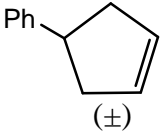
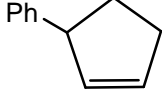


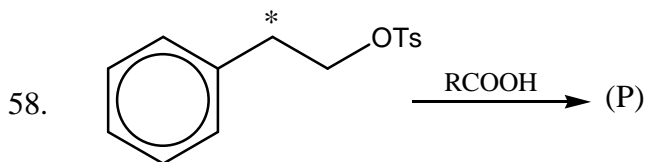
44. The major product (P) is



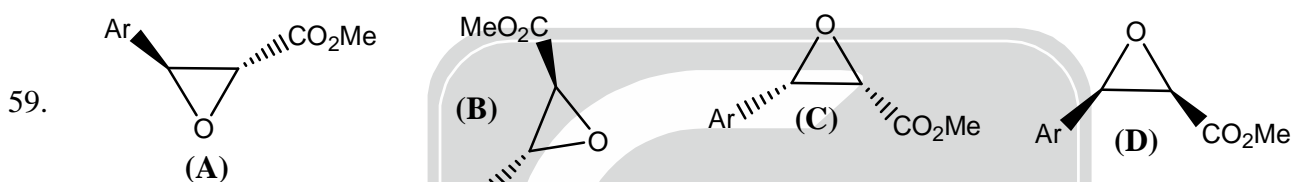
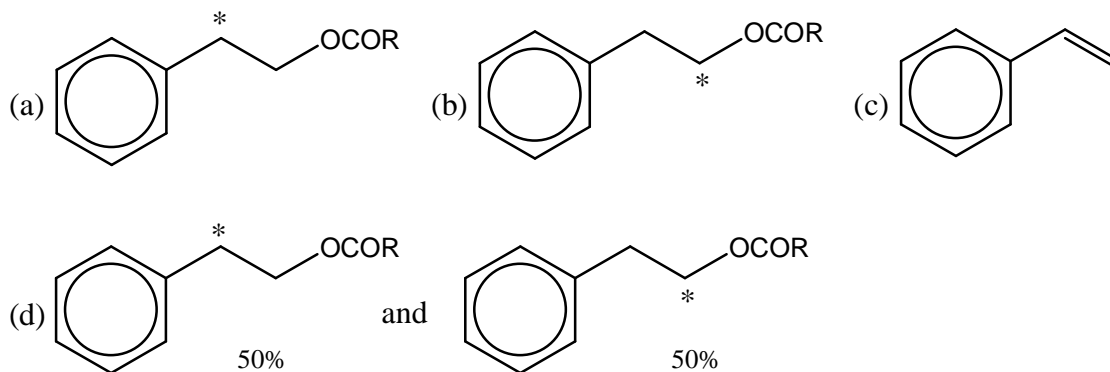
45. The major product in the given transformation is



46. $\text{PhBr} + \text{Cyclopentadiene} \xrightarrow[\text{DMA}]{\text{Pd(OAc)}_2, \text{PPh}_3, \text{NaOAc}}$ (P)
The major product (P) in the above reaction is
- (a)  (b)  (\pm) (c)  (\pm) (d)  (optically active)
47. Number of species having stereochemically active lone pair among XeF_6 , IF_6^- , SeF_6^{2-} , SeBr_6^{2-} , SbCl_6^{3-} , XeF_8^{2-} is
(a) 3 (b) 4 (c) 2 (d) 5
48. Which of the following complex is strongest reducing agent?
(a) $[\text{Cr}(\text{CN})_6]^{3-}$ (b) $[\text{Fe}(\text{CN})_6]^{3-}$ (c) $[\text{Co}(\text{CN})_6]^{4-}$ (d) $[\text{Mn}(\text{CN})_6]^{3-}$
49. The structure of $\text{Tc}(\eta^3 - \text{B}_3\text{H}_{10})(\text{CO})_3$ is
(a) Arachno (b) Nido (c) Closo (d) Hypho
50. Which of the following pair of lanthanoids show similarities to II group elements
(a) Eu to Ho (b) Sm and Gd (c) Eu and Yb (d) Yb and Sm.
51. The source and window material use in microwave spectroscopy and infrared spectroscopy is
(a) Cathode temperature, mica window
(b) Klystron, mica window, Nernst filament, KBr window material
(c) Laser, Quartz, Nernst filament, mineral salt
(d) Cathode temperature, laser, Klystron, mica window
52. 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
53. 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
54. The ESR spectrum of methoxymethyl radical will appear as
(a) A triplet of quartets (b) A triplet of quintets
(c) A quartet of quartets (d) A doublet of quartets
55. In $\text{trans} - [\text{PtXH}(\text{PEt}_3)_2]$, the correct order of ligand (X) with respect to $\bar{\nu}_{\text{Pt-H}}$ value is
(a) $\text{Cl}^- > \text{Br}^- > \text{I}^- > \text{CN}^-$ (b) $\text{I}^- > \text{Br}^- > \text{Cl}^- > \text{CN}^-$
(c) $\text{CN}^- > \text{I}^- > \text{Br}^- > \text{Cl}^-$ (d) $\text{I}^- > \text{CN}^- > \text{Br}^- > \text{Cl}^-$
56. The correct statement about alcohol dehydrogenase is
(a) The metal involved in this compound is Mo
(b) It is a dimer of two subunits and each subunit contains one Zn atom
(c) It is a dimer of two subunits and each subunits contains two Zn atoms
(d) It is a monomer and it contains two Zn atoms
57. From the following, select the False Isolobal analogies
(a) $\text{CH}_2 \xleftrightarrow{\text{O}} \text{SiH}_2 \xleftrightarrow{\text{O}} \text{Fe}(\text{CO})_4 \xleftrightarrow{\text{O}} \text{Ru}(\text{CO})_4$
(b) $\text{CH}_2^\ominus \xleftrightarrow{\text{O}} \text{BH}_3^- \xleftrightarrow{\text{O}} [\text{Fe}(\text{CO})_5]^+ \xleftrightarrow{\text{O}} \text{Mn}(\text{CO})_5$
(c) $\text{CH}_3^+ \xleftrightarrow{\text{O}} \text{BH}_3 \xleftrightarrow{\text{O}} [\text{Cr}(\text{CO})_5]^- \xleftrightarrow{\text{O}} \text{Mn}(\text{CO})\text{Cl}$
(d) $\text{Ni}(\text{CO})_3 \xleftrightarrow{\text{O}} \text{CH}_2 \xleftrightarrow{\text{O}} \text{CH}_3^+ \xleftrightarrow{\text{O}} \text{CH}^-$



The product (P) in the above synthetic transformation is



- (I) (A) and (C) are enantiomers
 (II) (B) and (D) are diastereomers
 (III) (C) and (D) are enantiomers
 (IV) (A) and (B) are homomers
 (V) (A) and (B) are enantiomers

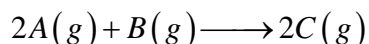
Incorrect statements regarding above compounds

- (a) I, III, IV (b) II, V (c) I, IV (d) II, I

60. Which of the following is not true for graphite
 (a) the carbon atoms are sp^2 hybridized
 (b) It has a layer structure with a distance between the layers of 0.142 nm.
 (c) It conducts electricity in the direction of the plane
 (d) Binding between layers is by weak van der Waals force.

PART - C

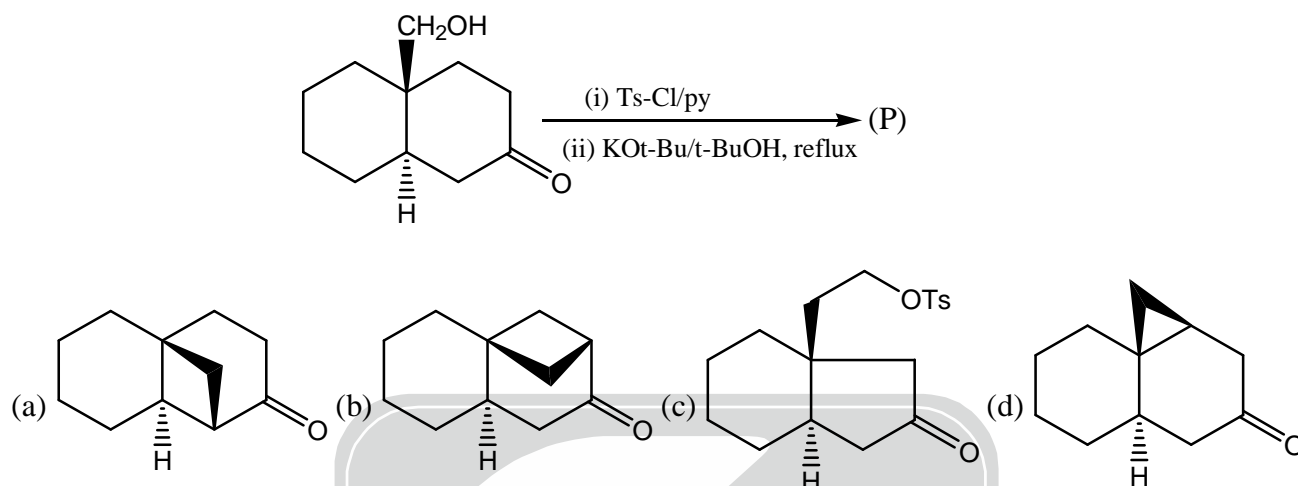
61. The change in internal energy for the following reaction at 500K is (ΔU at 300K is -30kJ).



Given: $C_{p,m}$ of
 A is $20.3 \text{ JK}^{-1}\text{mol}^{-1}$
 B is $38.3 \text{ JK}^{-1}\text{mol}^{-1}$
 C is $22.3 \text{ JK}^{-1}\text{mol}^{-1}$

- (a) 35.2 kJ (b) 36.7 kJ (c) -35.2 kJ (d) -36.7 kJ
62. Among the following statements, the correct one is
 (I) Maltose gives positive Tollen's test and it has $\alpha-1, 4'$ glycosidic linkage
 (II) Lactose is a disaccharide consisting of D-galactose and D-glucose by $\beta-1, 4'$ glycosidic linkage
 (III) Sucrose is a disaccharide and gives negative Tollen's test
 (IV) Amylose is a polysaccharide and gives positive Tollen's test
 (a) I, II and IV (b) I, III and IV (c) I, II and III (d) all of the above

63. The change in Gibbs free energy on mixing 2 moles of O_2 with 5 moles of He at 500K is
 (a) -34.7 J (b) -17.38 kJ (c) -17.38 J (d) -34.7 kJ
64. Dielectric constant of salt AB and A_2B is 100 and 121. If the concentration of AB is 0.01M and that of A_2B is 0.02M, then the relation the debye screening length at the same temperature is
 (a) $k_{AB}^{-1} = k_{A_2B}^{-1}$ (b) $k_{AB}^{-1} > k_{A_2B}^{-1}$ (c) $k_{AB}^{-1} < k_{A_2B}^{-1}$ (d) Cannot be determined.
65. The major product (P) is



66. If $[L^2, L_z] = 0$, then the value of the commutator $[\hat{L}_+, \hat{L}_-, \hat{L}_z]$ is
 (a) 0 (b) $+i\hbar^2$ (c) $-\hbar^2$ (d) $+\hbar^2$
67. Regarding second excited state of a 1-D S.H.O., if

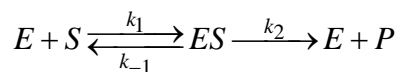
$$\alpha = \frac{8\pi^2 m E}{h^2} \text{ and } \beta = \frac{\sqrt{mk}}{\hbar}$$
 The ratio $\left(\frac{\alpha}{\beta}\right)$ is equal to
 (a) 1 (b) 3 (c) 5 (d) 7
68. In cyclobutadiene molecule (according to Huckel theory) the transition from LOMO to HUMO will require an energy of
 (a) 75 kJmole^{-1} (b) 150 kJmole^{-1} (c) 225 kJmole^{-1} (d) 300 kJmole^{-1}
69. The first order correction to the ground state energy of an anharmonic oscillator whose potential energy is

$$U(x) = \frac{1}{2} kx^2 + \frac{1}{6} \gamma x^3 + \frac{1}{24} bx^4$$
 is
 (a) $\frac{b\hbar^2}{mk}$ (b) $\frac{b\hbar}{32mk}$ (c) $\frac{b\hbar^2}{32mk}$ (d) 0
70. The Arrhenius parameters for the thermal decomposition

$$2A_{(g)} \longrightarrow 3B_{(g)}$$
 are
 $E_a = 100 \text{ kJmol}^{-1}$ are $RT = 1.0 \text{ kJmole}^{-1}$. The enthalpy of formation of activated complex will be
 (a) 102 kJmole^{-1} (b) 100 kJmole^{-1} (c) 99 kJmole^{-1} (d) 98 kJmole^{-1}

71. If the fluorescence quantum yield of a photochemical reaction is 10^{-1} and rate constant for fluorescence is 10^8 s^{-1} , then the sum of all non-radiative rate constants is
 (a) $9 \times 10^8 \text{ s}^{-1}$ (b) $9 \times 10^{-8} \text{ s}^{-1}$ (c) $8 \times 10^8 \text{ s}^{-1}$ (d) $8 \times 10^{-8} \text{ s}^{-1}$

72. In the enzyme-catalysed reaction,



If the value of maximum velocity is $3.42 \times 10^2 \text{ mol dm}^{-3} \text{ s}^{-1}$ and turn-over-number is $3.42 \times 10^4 \text{ s}^{-1}$, the initial concentration of enzyme would have been

- (a) 10^4 mol dm^{-3} (b) $10^{-4} \text{ mol dm}^{-3}$ (c) 10^2 mol dm^{-3} (d) $10^{-2} \text{ mol dm}^{-3}$
73. When 10^{-6} g of a compound (molecular weight = $60.23 \text{ g mole}^{-1}$) was dropped on a water surface (in \AA^2), a monolayer area of 400 cm^2 was formed. The cross-sectional area of one molecule of the compound is
 (a) 400 (b) 40 (c) 4 (d) None
74. A polymer has the following molar-mass-distribution

Number of molecules	molar mass
100	1000
1000	10000

The number average molar mass is approximately

- (a) 100 (b) 1000 (c) 10000 (d) None of these
75. The reducible representation of cis- H_2O_2 molecule with basis of 3N-coordinate is
 (a) 2, 0, 2, 0 (b) 3, 0, 3, 0 (c) 4, 0, 4, 0 (d) None of these
76. If $\sin^2 \theta$ values for a particular crystal lattice are found to be 3K, 4K and 8K where $K = 0.01$. The wavelength of X-ray used to obtain this pattern is 2\AA . The unit cell and unit cell length are respectively
 (a) SCC, 10\AA (b) BCC, 0.1\AA (c) FCC, 0.1\AA (d) FCC, 10\AA
77. A molecule in a gas undergoes about 1×10^9 collisions in each second suppose that one collision in 10 is effective in deactivating the molecule rotationally. The width (in Hz) of rotational transition in the molecule will be
 (a) 1.59 MHz (b) 15.9 MHz (c) 159 MHz (d) None of these

78. Consider the statement:

- (I) The ground state term for $t_{2g}^6 e_g^2$ in octahedral field is ${}^3A_{2g}$
 (II) Unlike d-d transitions the f-f transitions do not change much with nature of ligand.
 (III) The molar absorptivity at λ_{max} minimum for $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ than $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$
 (IV) $\text{KFe}[\text{Fe}(\text{CN})_6]$ show intervalence charge transfer transitions

The correct statement(s) is

- (a) I and II (b) III and IV (c) I, III and IV (d) All of these
79. Consider the statement(s)
 (I) If an enzyme fixes N_2 in plants by evolving H_2 , the number of electrons associated with that is 8.
 (II) The number of inorganic sulfides in cubane like ferredoxin is four
 (III) The oxidation state of iron in met-hemoglobin is three
 (IV) Mg^{2+} is preferred in photo-synthesis by chlorophyll because it has spin orbit coupling.
 The correct statement(s) is
 (a) I, II and III (b) II and III (c) I and IV (d) all of these



80. The spin part which is not consistent with the space part $\frac{1}{\sqrt{2}}[\phi_1(1)\phi_2(2) - \phi_1(2)\phi_2(1)]$ is

(a) $\alpha(1)\alpha(2)$

(b) $\beta(1)\beta(2)$

(c) $\frac{1}{\sqrt{2}}[\alpha(1)\beta(2) + \alpha(2)\beta(1)]$

(d) $\frac{1}{\sqrt{2}}[\alpha(1)\beta(2) - \alpha(2)\beta(1)]$

81. Consider the statement:

(I) Chelate effect is due to equal contribution of entropy and enthalpy change

(II) The enthalpies of hydration of Ca^{2+} , Mn^{2+} and Zn^{2+} follow the order $\text{Mn}^{2+} > \text{Zn}^{2+} > \text{Ca}^{2+}$

(III) On the basis of crystal field theory Ni^{2+} can have two unpaired electron in square planar geometry

(IV) The most stabilised orbital in crystal field splitting of trigonal, bipyramidal geometry is $d_{x^2-y^2}$

The incorrect statement is/are

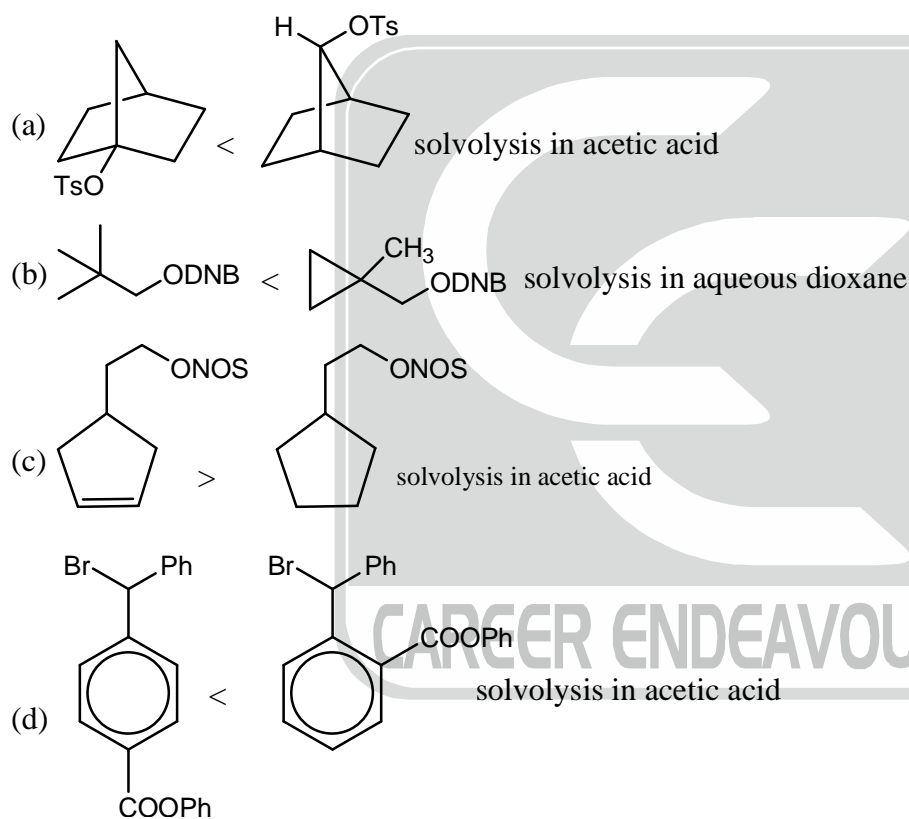
(a) I and II

(b) II, III and IV

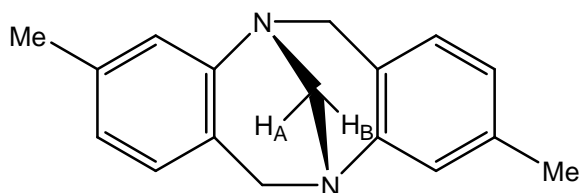
(c) II and IV

(d) All of these

82. The incorrect statement among the following series reaction



83. In the given compound, the hydrogens H_A and H_B are



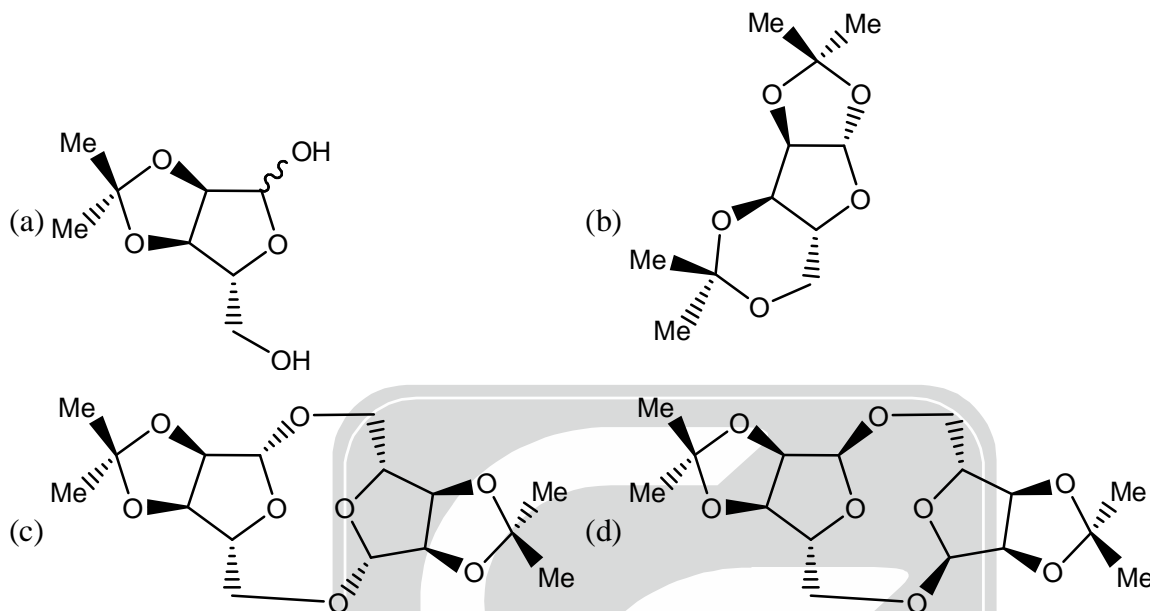
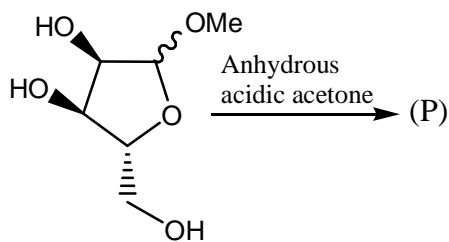
(a) Enantiotopic

(b) Homotopic

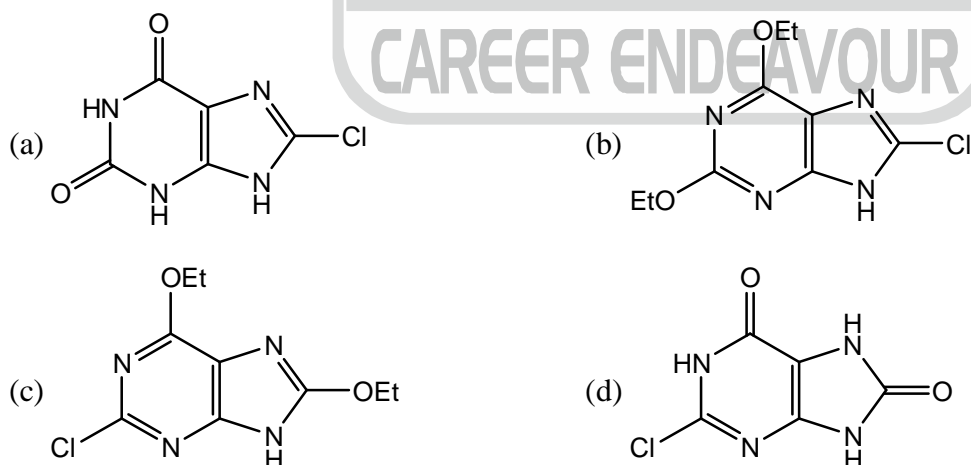
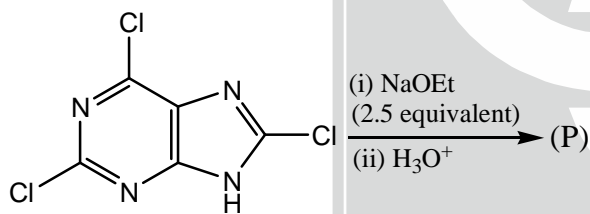
(c) Diastereotopic

(d) Epimeric

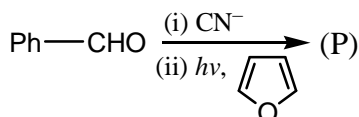
84. Give the major product (P) is

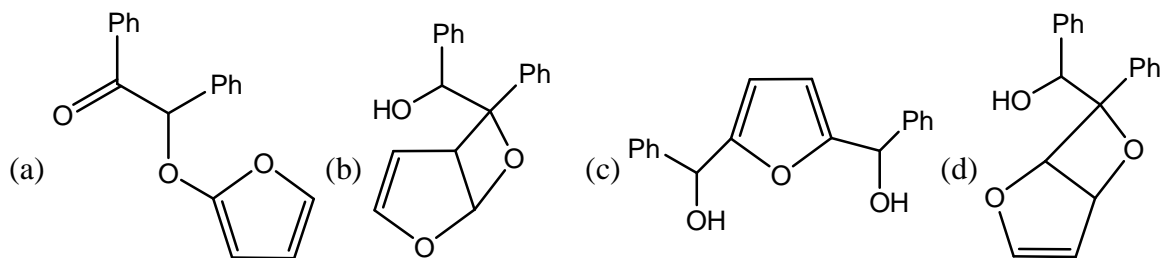


85. The major product (P) is

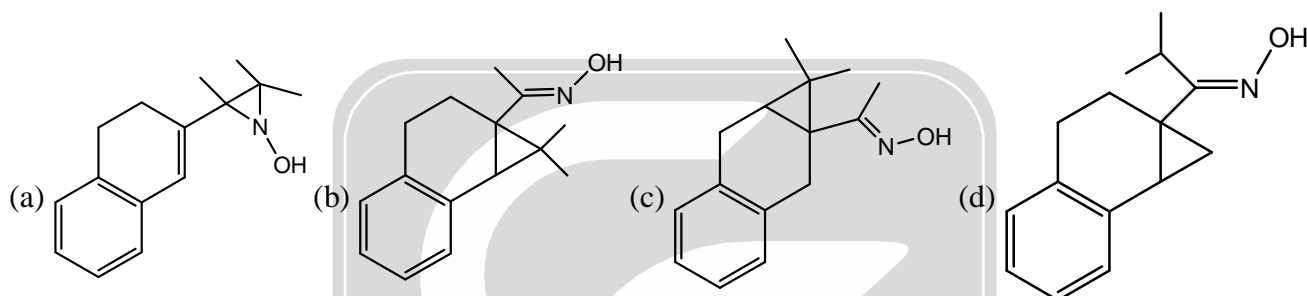
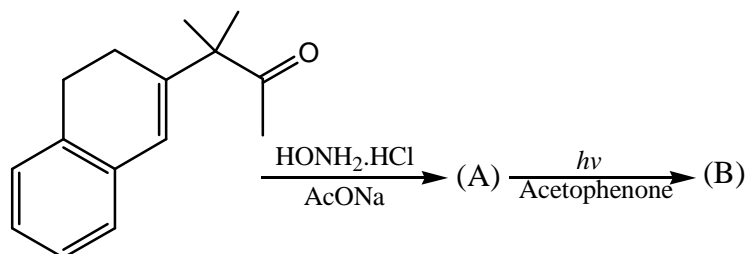


86. The major product in the given reaction sequence is





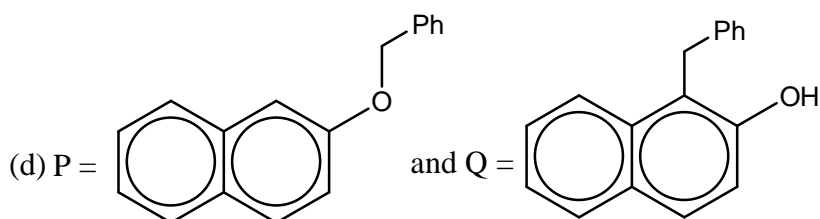
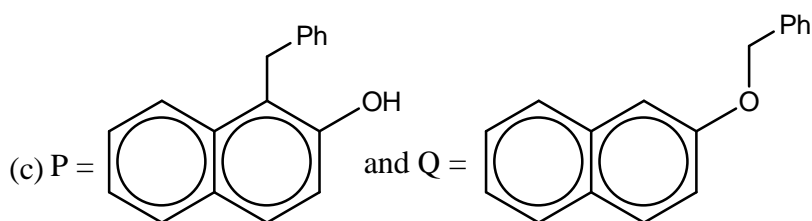
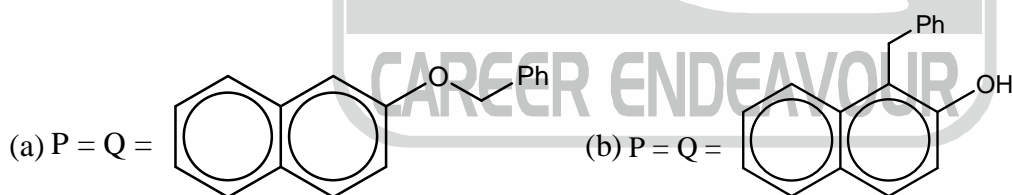
87. The major product (B) is

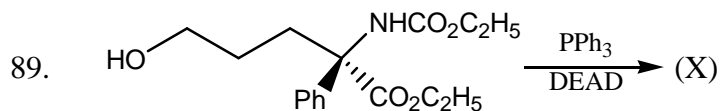


88.

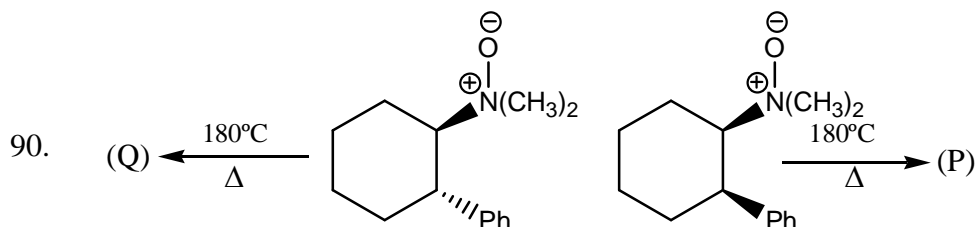
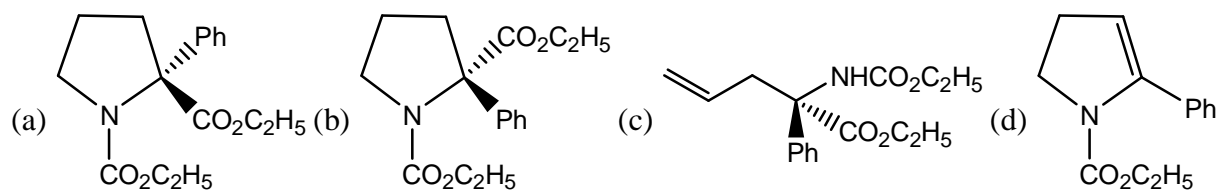


The major product (P) and (Q) in the above reaction is

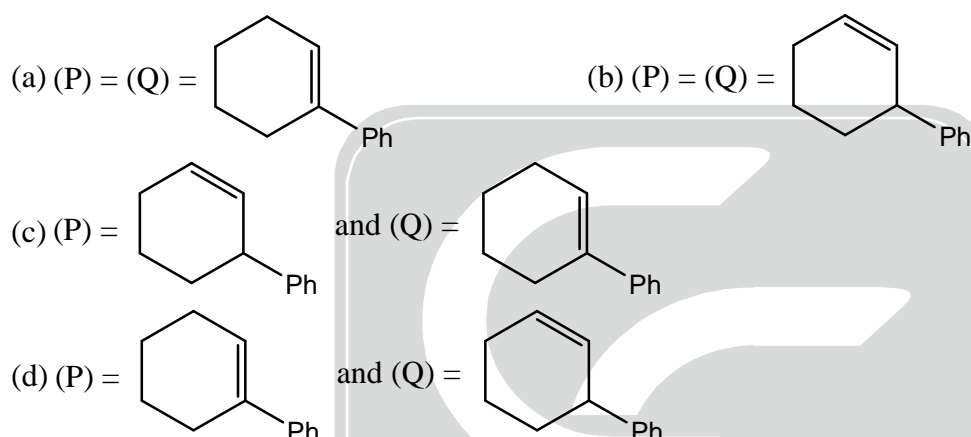




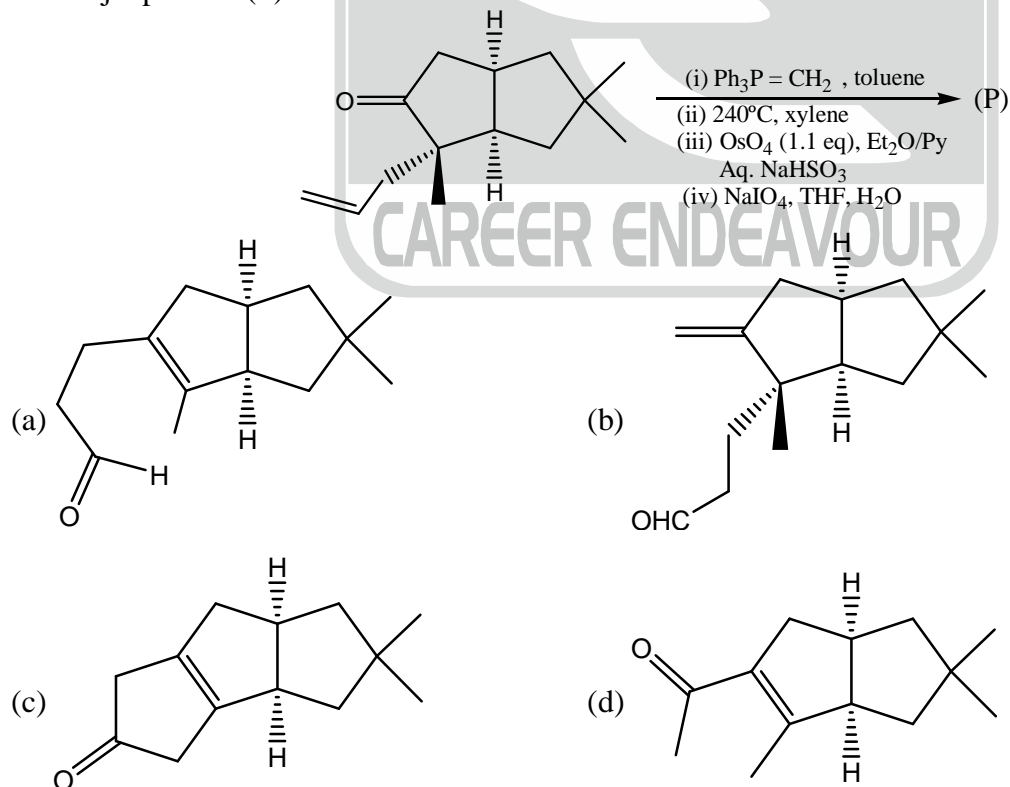
The major product (X) in the above reaction is



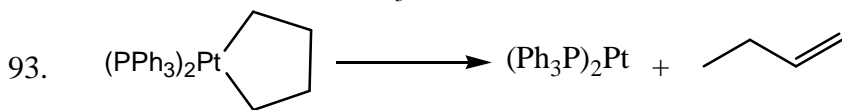
The major product (P) and (Q) in the above pyrolytic reaction, are respectively



91. The major product (P) is

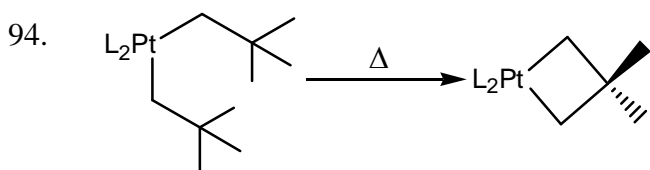


92. The cyanamide ion NCN^{2-} is
 (a) isoelectronic with CO_2 , and has a bent structure
 (b) Isoelectronic with CO_2 , and has a linear structure
 (c) Isoelectronic with N_2O , and has a V-shaped structure
 (d) Isoelectronic with N_3^- , and has a pyramidal structure



The mechanism involves in the formation of the product

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

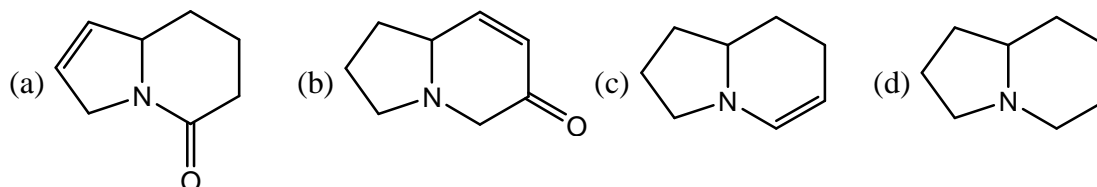
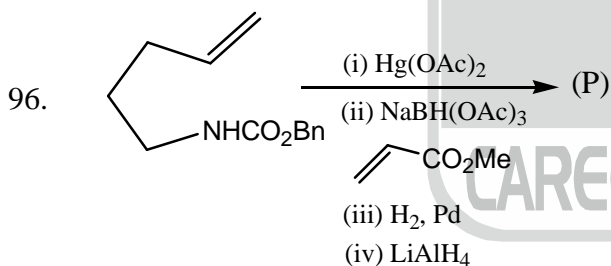


The major product formed in this reaction is

- (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
95. 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) $\frac{5}{2}\hbar\omega$



97. Arrange the following complexes in the increasing order of their lability

- (a) $[\text{Co}(\text{NH}_3)_6]^{2+} < [\text{Mn}(\text{H}_2\text{O})_6]^{2+} < [\text{Cr}(\text{CN})_6]^{3-}$
 (b) $[\text{Cr}(\text{CN})_6]^{3-} < [\text{Mn}(\text{H}_2\text{O})_6]^{2+} < [\text{Co}(\text{NH}_3)_6]^{2+}$
 (c) $[\text{Cr}(\text{CN})_6]^{3-} < [\text{Co}(\text{NH}_3)_6]^{2+} < [\text{Mn}(\text{H}_2\text{O})_6]^{2+}$
 (d) $[\text{Co}(\text{NH}_3)_6]^{2+} < [\text{Cr}(\text{CN})_6]^{3-} < [\text{Mn}(\text{H}_2\text{O})_6]^{2+}$

98. The structure of $\text{UO}_2(\text{NO}_3)_2 \cdot 2\text{H}_2\text{O}$ is

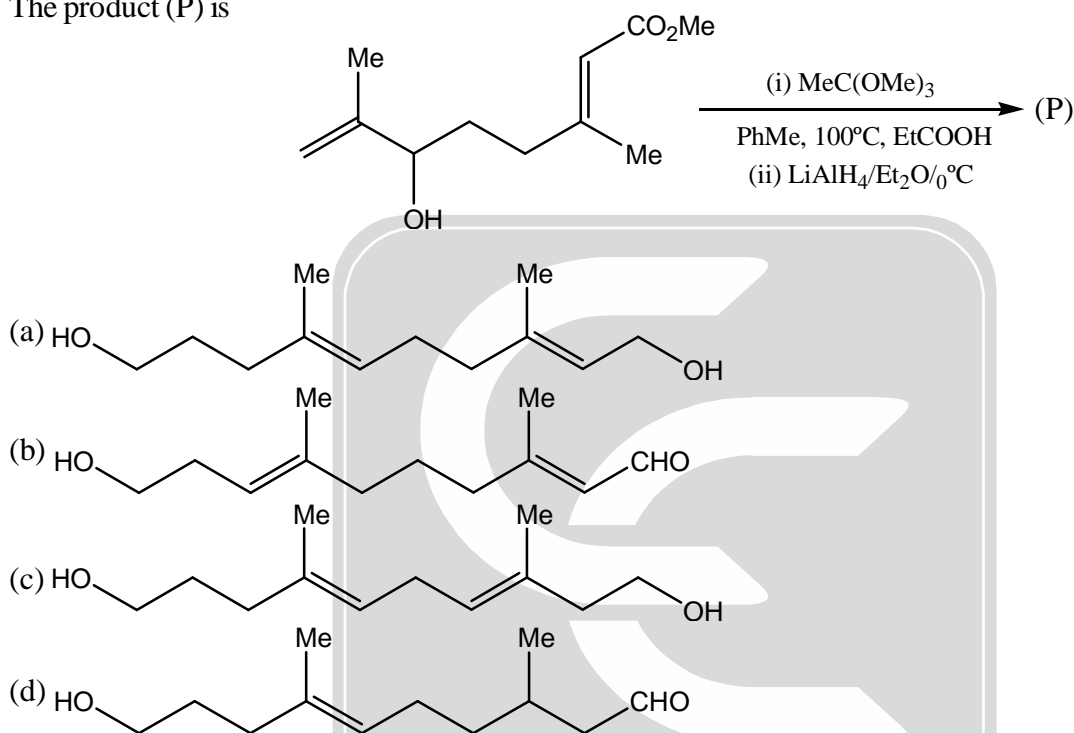
- (a) Hexagonal bipyramidal (b) Square antiprismatic
(c) Cubic (d) Bicapped octahedral

99. $(\text{OC})_5\text{Mn}-\text{CH}_2\text{CH}=\text{CH}_2 \xrightarrow{\text{H}^+} (\text{P})$

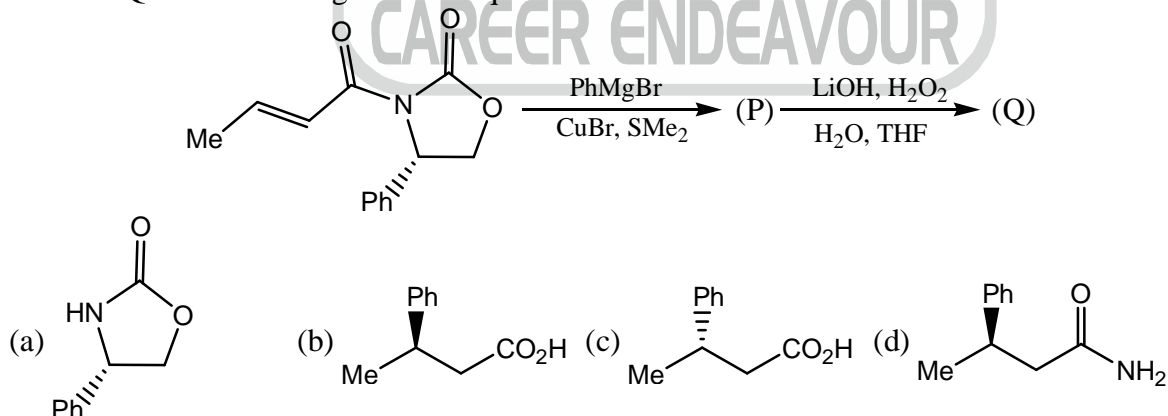
Which of the following statement is true about the product (P)

- (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.

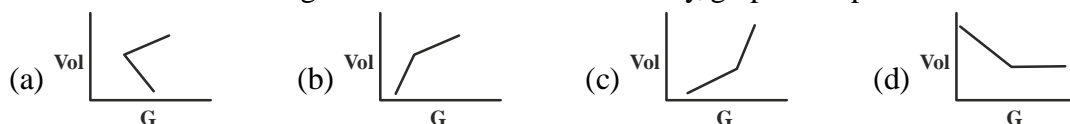
100. The product (P) is



101. Product 'Q' in the following reaction sequence is



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



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



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

104. 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 –

[$X = x - \bar{x}$, $Y = y - \bar{y}$, σ_x = std. deviation of 'x' σ_y = 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) $r = \frac{\sum X\sum Y}{n\sigma_x\sigma_y}$

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

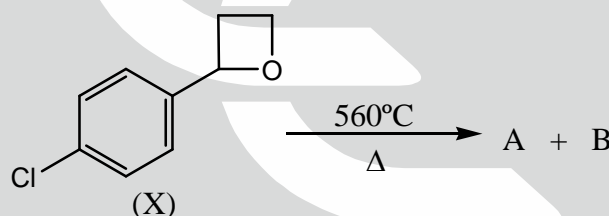
Column-A

- (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

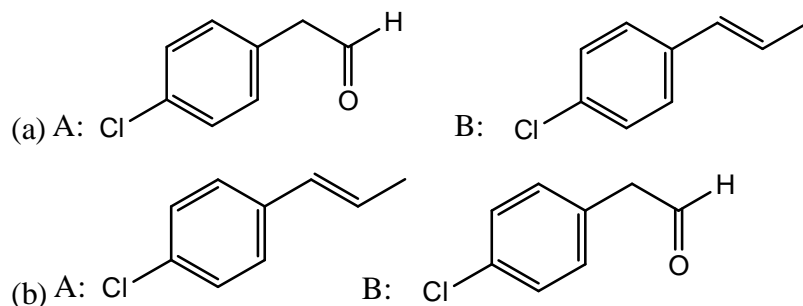
- (P) Xenon flash lamp
 (Q) Thermal conductivity detector
 (R) Hallow cathode lamp
 (S) Deuterium discharge lamp
 (b) 1-S, 2-R, 3-Q, 4-P
 (d) 1-Q, 2-P, 3-S, 4-R

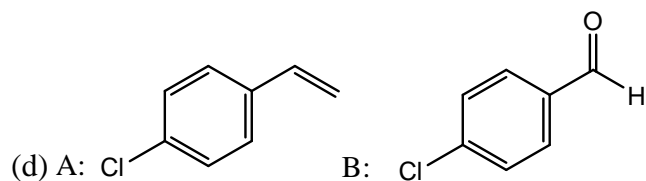
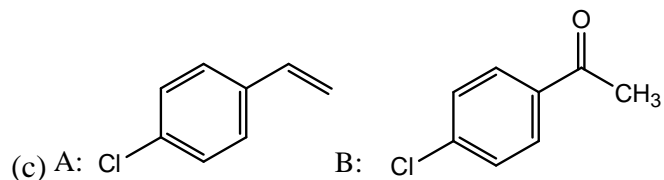
106. Heating the compound 'X' at 560°C gives two products with spectroscopic data shown below. Identify these two products.



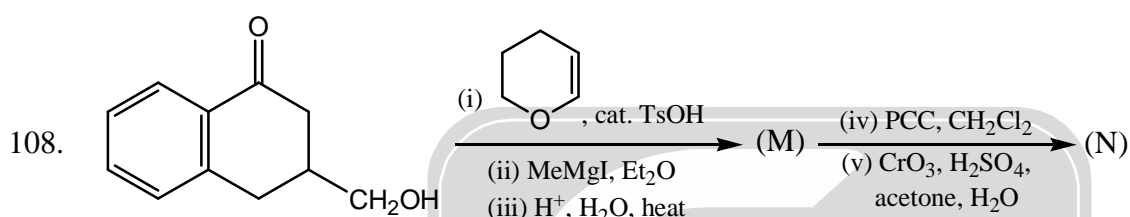
'A' has IR 1640 cm^{-1} ; m/z 138(100%), 140(33%) $\delta\text{H}(\text{ppm})$ 7.1(4H, s), 6.5(1H, dd, J17, 11Hz) 5.5(1H, dd, J17, 2Hz), 5.1(1H, dd, J11, 2Hz)

'B' has IR 1700 cm^{-1} ; m/z 111(45%), 113(15%), 139(60%), 140(100%), 141(20%) and 142(33%) $\delta\text{H}(\text{ppm})$ 9.9(1H, s), 7.75(2H, d, J9Hz) and 7.43(2H, d, J9Hz)

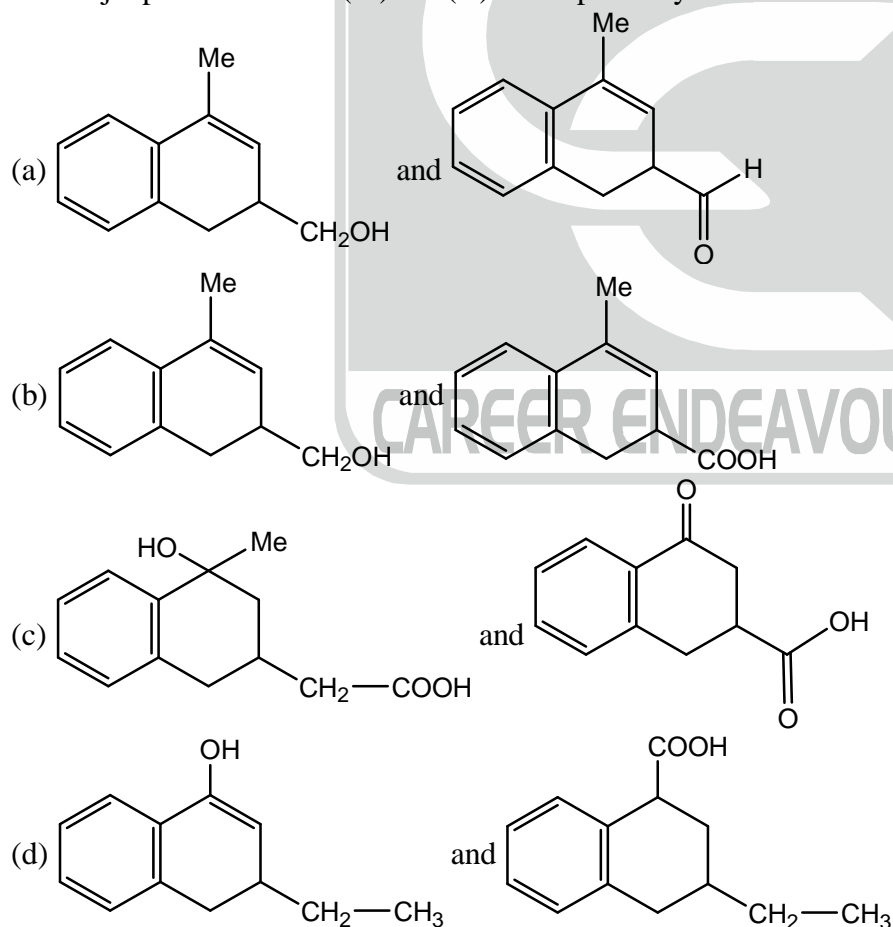




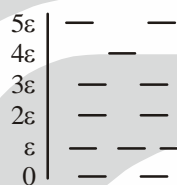
107. The pure-rotational RAMAN Spectrum of $^{14}\text{N}_2$ shows a spacing of 7.99 cm^{-1} between adjacent rotational lines. The spacing between the unshifted line at ν_0 and each of the pure rotational linear molecule lines close to ν_0 is
- (a) 24 cm^{-1} (b) 40 cm^{-1} (c) 7.99 cm^{-1} (d) 48 cm^{-1}



The major product formed (M) and (N) are respectively

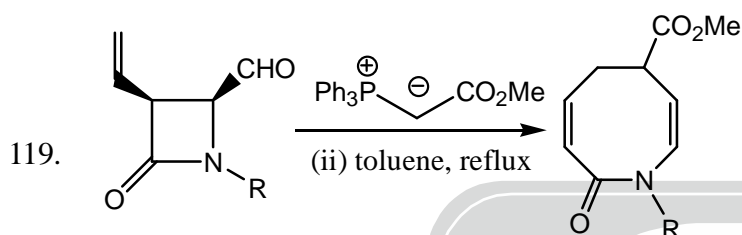


109. The age of ancient wooden items, if it is known that the specific activity of ^{14}C nuclide in them amount to $3/5$ of that in lately felled trees. (The half-life of ^{14}C nuclei is 5570 years)
 (a) 4104.9 years (b) 4204.8 years (c) 4304.9 years (d) 4004.9 years
110. The correct description for ESR spectrum of $[\text{Cu}(\text{en})_2]^{2+}$ with D_{2h} symmetry will be... (en = ethylene diamine)
 Consider Nuclear spin for Cu = $3/2$, $A_N = 25\text{G}$ and $A_H = 0.0\text{G}$
 (a) Nine hyperfine lines
 (b) Four bunches of fine lines. Each bunch having nine fine lines
 (c) Four bunches of hyperfine lines. Each bunch having nine hyperfine lines
 (d) Four bunches of fine lines. Each bunch having nine hyperfine lines
111. The correct order of isomer shift in Mössbauer spectrum of following iron (III) complexes will be.
 (a) $[\text{Fe}(\text{CN})_5\text{NO}] > [\text{Fe}(\text{CN})_5\text{CO}] > [\text{Fe}(\text{CN})_5\text{PPh}_3] > [\text{Fe}(\text{CN})_5\text{NH}_3]$
 (b) $[\text{Fe}(\text{CN})_5\text{NO}] < [\text{Fe}(\text{CN})_5\text{CO}] < [\text{Fe}(\text{CN})_5\text{PPh}_3] < [\text{Fe}(\text{CN})_5\text{NH}_3]$
 (c) $[\text{Fe}(\text{CN})_5\text{NH}_3] > [\text{Fe}(\text{CN})_5\text{CO}] > [\text{Fe}(\text{CN})_5\text{PPh}_3] > [\text{Fe}(\text{CN})_5\text{NO}]$
 (d) $[\text{Fe}(\text{CN})_5\text{NH}_3] < [\text{Fe}(\text{CN})_5\text{CO}] < [\text{Fe}(\text{CN})_5\text{PPh}_3] < [\text{Fe}(\text{CN})_5\text{NO}]$
112. For given levels of a system using Boltzmann distribution the molecule partition function for $T \rightarrow \infty$ and $T \rightarrow 0$ is



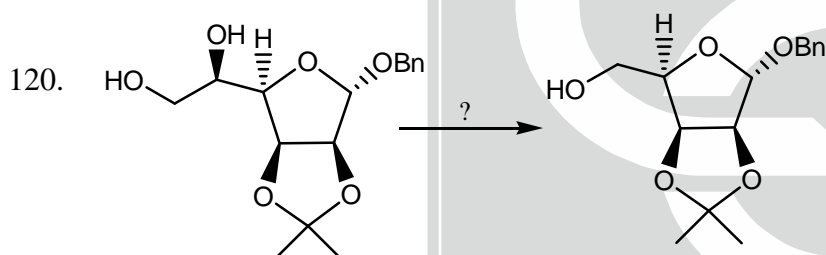
- (a) 6, 0 (b) 6, 2 (c) 11, 0 (d) 12, 2
113. 0.1 mole of CH_3NH_2 ($K_b = 5 \times 10^{-4}$) is mixed with 0.08 mole of HCl and diluted to one litre. What will be the H^+ concentration in dilution.
 (a) $8 \times 10^{-2}\text{M}$ (b) $8 \times 10^{-11}\text{M}$ (c) $1.6 \times 10^{-11}\text{M}$ (d) $8 \times 10^{-5}\text{M}$
114. Select Correct statements from following?
 (1) Lanthanoids do not obey 18 electron rule
 (2) they have sharper absorption peak than actinoids
 (3) Ln^{2+} have broader peak than Ln^{3+} ions
 (4) Ln^{3+} ions prefer to bind π -acceptor ligands
 (a) 1, 2, 3, 4 (b) 1, 2, 3 (c) 1, 2 (d) 2, 3
115. Select the correct statement from the following
 (A) large size ligand prefer Td rather than octahedron when CFSE is low
 (B) Co(II) prefer to form Td complex to Ni(II)
 (C) $[\text{Cu}(\text{tn})_2]^{2+}$ is more stable than $[\text{Cu}(\text{en})_2]^{2+}$
 (D) $d_{z^2} > d_{x^2-y^2} > d_{xz} = d_{yz} > d_{xy}$ (energy of d-orbital for d^1 system)
 (a) A, B (b) B, C, D (c) A, C, D (d) A, B, D
116. Select the correct statement regarding cyclic phosphazene is/are
 (I) they are hard to reduce electrochemically
 (II) they do not show hypso and bathochromic shift
 (III) their stability has no effect on non-planarity
 (IV) they are less aromatic than benzene
 (a) I and IV (b) I, II and IV (c) II and IV (d) I, II, III and IV

117. The correct statement regarding distribution of Boron atomic orbital in $[\text{BnHn}]^{2-}$ is/are
 (I) n in the $n(\text{B}-\text{H}_i)$ bonding orbital
 (II) $(n+1)$ in framework bonding molecular orbitals
 (III) $(2n-1)$ in non-bonding and anti-bonding framework molecular orbitals
 (IV) none of the above
 (a) I and II (b) II and III (c) I, II and III (d) IV
118. Select the correct statement from following
 (I) f-f transition peaks are broader than f-d transition
 (II) f-f transition are stronger than f-d transition
 (III) f-f transition are weaker than f-d transition
 (IV) Ln^{3+} shows stronger emission spectrum than d-block metals.
 (a) I, II, IV (b) II, IV (c) III, IV (d) I, II



The correct mechanism involve in the above reaction is

- (a) wittig reaction followed by cope rearrangement (b) wittig reaction
 (c) cope rearrangement followed by wittig reaction (d) wittig reaction followed by claisen rearrangement



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) p-TSA, acetone

 All the Best for NET "16th Dec. 2018" Exam

Space for rough work



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North Delhi : 33-35, Mall Road, G.T.B. Nagar (Opp. Metro Gate No. 3), Delhi-09, Ph: 011-27653355, 27654455



CHEMICAL SCIENCES

Date : 07-12-2018

TEST SERIES-E (FULL LENGTH TEST-2)

ANSWER KEY

PART-A

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

PART-B

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

PART-C

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

