

# TEST SERIES CSIR-NET/JRF Dec. 2017

BOOKLET SERIES **D**

Full Length Test – 1

Paper Code **01**

Test Type: **TEST SERIES**

## CHEMICAL SCIENCES

Duration: 3:00 Hours

Date: 05-12-2017

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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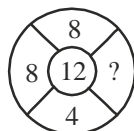
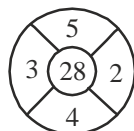


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## PART-A

1. Which of the following numbers will completely divide  $(3^{25} + 3^{26} + 3^{27} + 3^{28})$   
 (a) 11 (b) 16 (c) 25 (d) 30
2. Four different electronic devices make a beep after every 30 minutes, 1 hour,  $1\frac{1}{2}$  hour and 1 hour 45 minutes respectively. All the devices beeped together at 12 noon. They will again beep together at  
 (a) 12 midnight (b) 3 A.M. (c) 6 A.M. (d) 9 A.M.
3. A two digit number becomes five-sixth of itself when its digits are reversed. The two digits differ by one. The number is  
 (a) 45 (b) 54 (c) 56 (d) 65
4. Milk contains 5% water. What quantity of pure milk should be added to 10 litres of milk to reduce this to 2%?  
 (a) 5 litres (b) 7 litres (c) 15 litres (d) 18 litres
5. A man sells two flats at the rate of Rs. 1995 lakh each. On one he gains 5% and on the other he loses 5%. His gain or loss percent in the whole transaction is  
 (a) 0.25% loss (b) 0.25% gain (c) 2.5% loss (d) 25% loss
6. An article was sold for Rs.  $y$  after giving a discount of  $x\%$ . Then its list price is  
 (a)  $\frac{100y}{100-x}$  (b)  $\frac{100y}{1-x}$  (c)  $\frac{100y}{1-(x/100)}$  (d) none of these
7. The speeds of three cars are in the ratio 5 : 4 : 6. The ratio between the time taken by them to travel the same distance is  
 (a) 5 : 4 : 6 (b) 6 : 4 : 5 (c) 10 : 12 : 15 (d) 12 : 15 : 10
8. If  $x$  men, working  $x$  hours per day, can do  $x$  units of work in  $x$  days, then  $y$  men, working  $y$  hours per day would be able to complete how many units of work in  $y$  days?  
 (a)  $\frac{x^2}{y^3}$  (b)  $\frac{x^3}{y^2}$  (c)  $\frac{y^2}{x^3}$  (d)  $\frac{y^3}{x^2}$
9. A train  $x$  starts from Meerut at 4 P.M. and reaches Ghaziabad at 5 P.M. While another train  $y$  starts from Ghaziabad at 4 P.M. and reaches Meerut at 5 : 30 P.M. The two trains will cross each other at  
 (a) 4 : 36 P.M. (b) 4.42 P.M. (c) 4 : 48 P.M. (d) 4 : 50 P.M.
10. If the side of an equilateral triangle is decreased by 20% then its area is decreased by  
 (a) 36% (b) 40% (c) 60% (d) 64%
11. The radius of a wire is decreased to one-third and its volume remains the same. The new length is how many times the original length?  
 (a) 1 times (b) 3 times (c) 6 times (d) 9 times
12. If the number from 1 to 45 which are exactly divisible by 3 were arranged in ascending order minimum number being on the top, which would come at the ninth place from the top?  
 (a) 18 (b) 24 (c) 21 (d) 27
13. Find the missing number



(a) 2

(b) 3

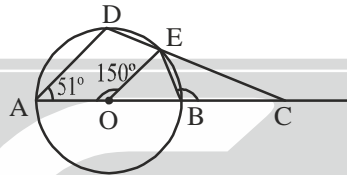
(c) 4

(d) 5

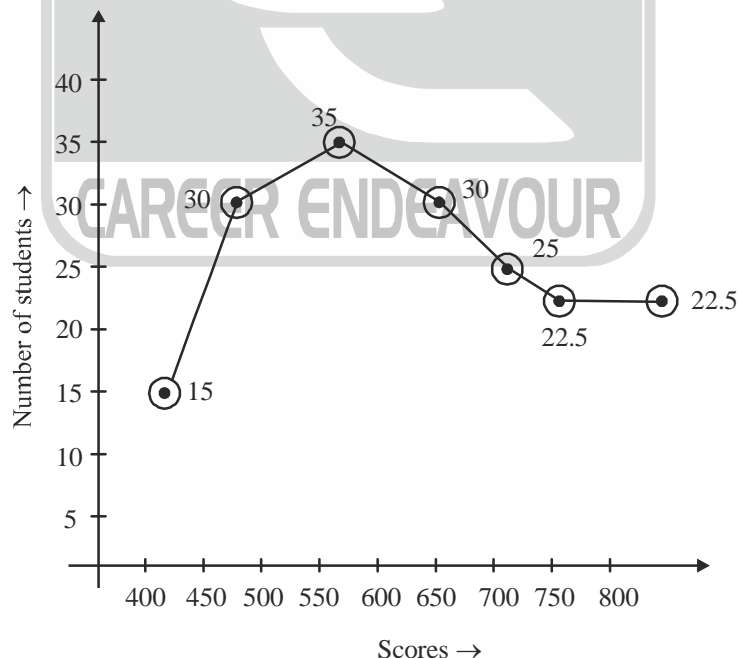


14. **Statement :** (I) Some players are singers  
(II) All singers are tall  
**Conclusion:** (I) Some players are tall  
(II) All players are tall  
(a) Only conclusion (I) follows (b) Only conclusion (II) follows  
(c) Both (I) and (II) follows (d) Neither (I) nor (II) conclusion
15. An object is projected from south-east direction to north-west direction with a certain force. Air exerts an equal force from south-west direction to north-east direction. What will be the new direction of the object?  
(a) towards south-east (b) towards north-east  
(c) towards east (d) towards south-west
16. A man and his wife appear in an interview for two vacancies in the same post. The probability of husband's selection is  $(1/7)$  and wife's selection is  $(1/5)$ . What is the probability that only one of them is selected?  
(a)  $\frac{4}{5}$  (b)  $\frac{2}{7}$  (c)  $\frac{8}{15}$  (d)  $\frac{4}{7}$

17. In the following figure, AB be diameter of a circle whose centre is O. If  $\angle AOE = 150^\circ$ ,  $\angle DAO = 51^\circ$  then the measure of  $\angle CBE$  is

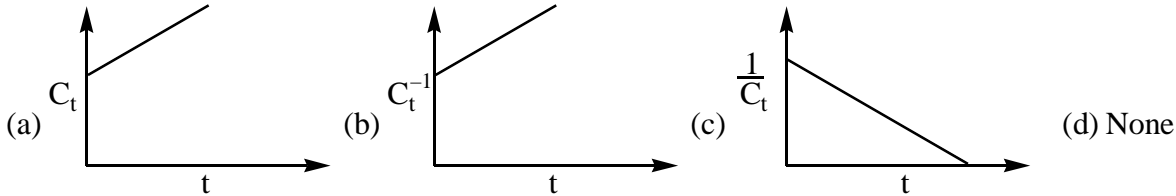


- (a)  $115^\circ$  (b)  $110^\circ$  (c)  $105^\circ$  (d)  $120^\circ$
18. The perpendiculars drawn from the vertices to the opposite sides of a triangle, meet at the point  
(a) incentre (b) circumcentre (c) centroid (d) orthocentre
19. The diagram is frequency polygon for the scores of students in a test. What is the total number of students appeared in the test?

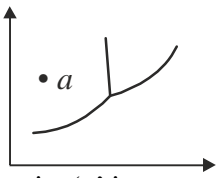


- (a) 180 (b) 200 (c) 250 (d) 150
20. Three taps A, B and C can fill a tank in 12, 15 and 20 hours respectively. If A is open all the time and B and C are open for one hour each alternately, the tank will be full in  
(a) 6 hrs (b)  $6\frac{2}{3}$  hrs (c) 7 hrs (d)  $7\frac{1}{2}$  hrs

## PART-B

21. In 1-D simple harmonic oscillator  $\psi_n(x)$  will be non-zero. For  $x = 0$  for  
 (a) Ground state (b) First excited state  
 (c) Both (d) None
22. The Hermitian operator(s) is/are  
 (a)  $e^{d/dx}$  (b)  $i\left(\frac{d}{dx}\right)$  (c) Both (d) None
23. The second order reaction is represented by  

 (a)  $C_t$  vs  $t$  (b)  $C_t^{-1}$  vs  $t$  (c)  $\frac{1}{C_t}$  vs  $t$  (d) None
24. The fluorescence quantum efficiency is given by  
 (a)  $\frac{1}{\phi_f} = 1 - \frac{k_{\text{non-radiative}}}{k_f}$  (b)  $\frac{1}{\phi_f} = 1 + \frac{k_{\text{non-radiative}}}{k_f}$   
 (c)  $\frac{1}{\phi_f} = 1 + \frac{1}{k_f}$  (d)  $\frac{1}{\phi_f} = 1 + \frac{k_{sv}}{k_f}$
25. The angle between the planes (100) and (110) is  
 (a)  $30^\circ$  (b) more than  $30^\circ$  but less than  $45^\circ$   
 (c)  $45^\circ$  (d) more than  $45^\circ$
26. Which of the following is not an addition polymer  
 (a) ORLOM (b) DECROX (c) PVC (d) POLYSTYRENE
27. In Freundlich adsorption isotherm, the value of  $\frac{1}{n}$  is  
 (a) 1 in case of physisorption (b) 1 in case of chemisorption  
 (c) Between '0' and '1' in all cases (d) Between '2' and '4' in all cases
28. The symmetry operation  $S_6^2$  brings same molecule in an orientation that can also be obtained by performing  
 (a) Inversion centre (b) A two-fold axis of symmetry  
 (c) A three fold axis of symmetry (d) A six-fold axis of symmetry
29. The chemical potential among the following is  
 (a)  $\left(\frac{\partial U}{\partial n_i}\right)_{T,P,n_j}$  (b)  $\left(\frac{\partial U}{\partial n_i}\right)_{S,V,n_j}$  (c)  $\left(\frac{\partial H}{\partial n_i}\right)_{T,P,n_j}$  (d)  $\left(\frac{\partial U}{\partial n_i}\right)_{T,P,n_i}$
30. A carnot engine waste 4kJ of energy from 10 kJ which is it absorbs from hot reservoir. If the temperature of cold reservoir is  $99^\circ\text{C}$ , the temperature of hot reservoir is  
 (a) 500K (b) 610 K (c) 820 K (d) 930 K
31. The incorrect statement is  
 (a) On doubling the coefficient of reaction,  $\Delta G$  gets double but  $E_{\text{cell}}$  remain same  
 (b) On dubling the coefficient of reaction,  $\Delta G$  and  $E_{\text{cell}}$  gets double  
 (c) The temperature dependence of  $E_{\text{cell}}$  is given by Nernst equation  
 (d) Lower the pH, higher the concentration of  $\text{H}^+$ .

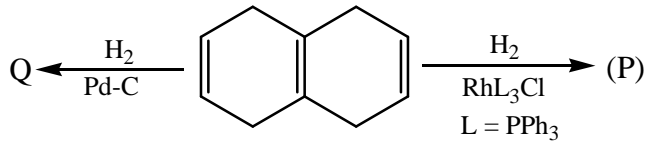
32. For the given phase diagram



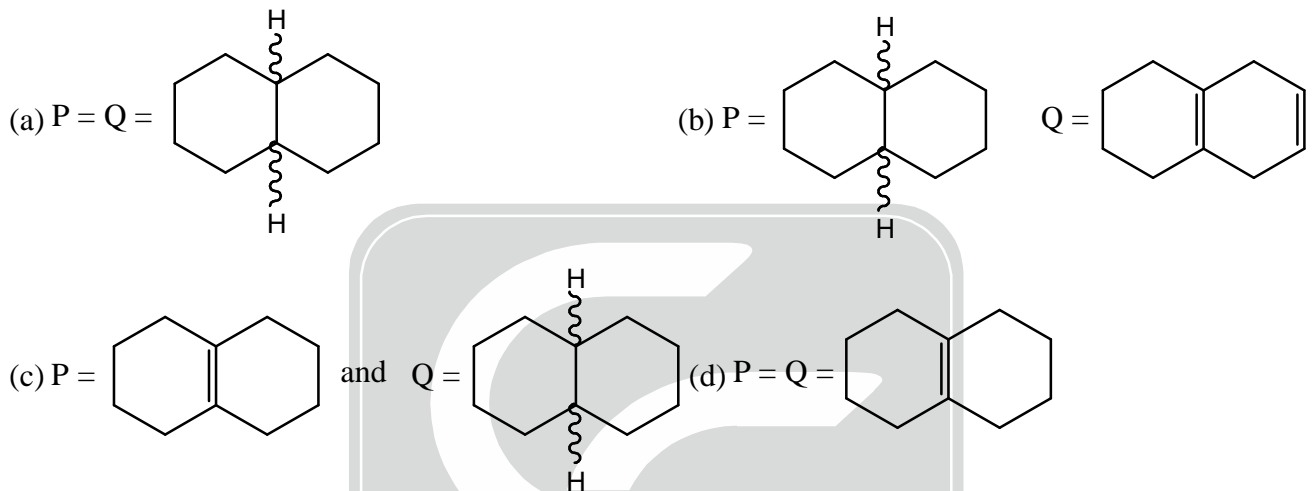
The number of phase at point 'a' is

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

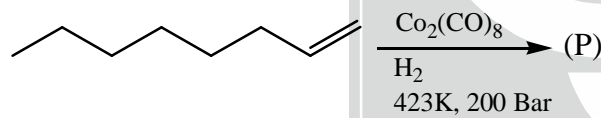
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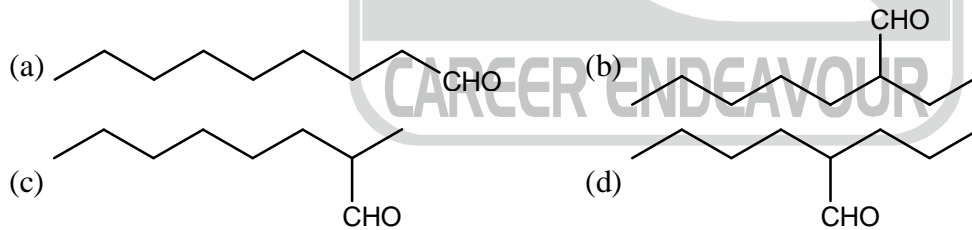
The major hydrogenation products (P) and (Q) in the above reaction are



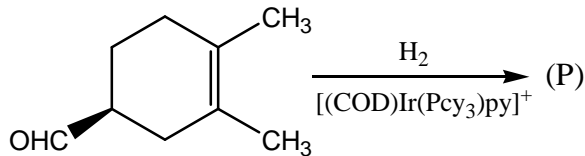
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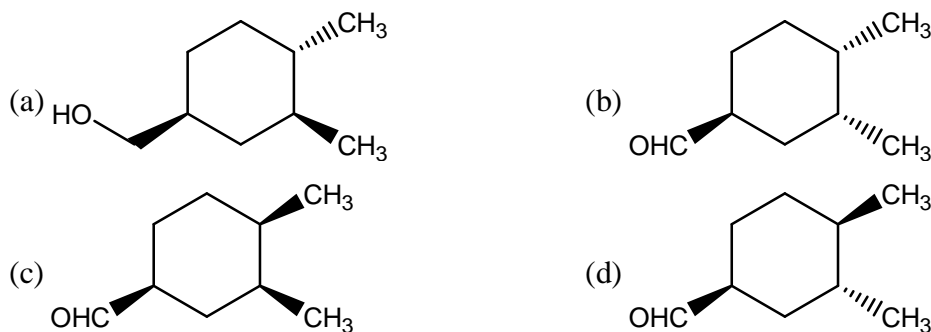
The major product (P) in the above reaction is



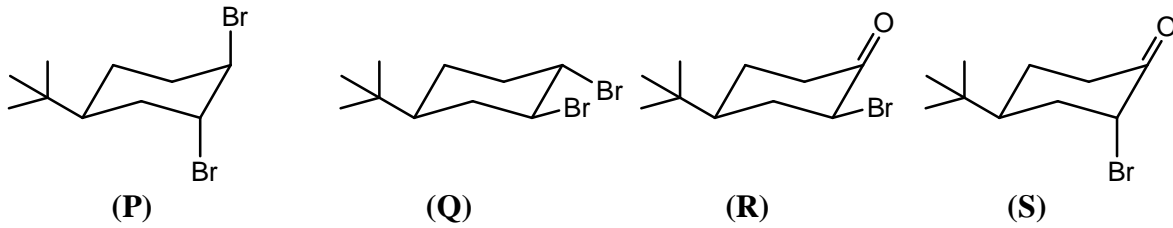
35.



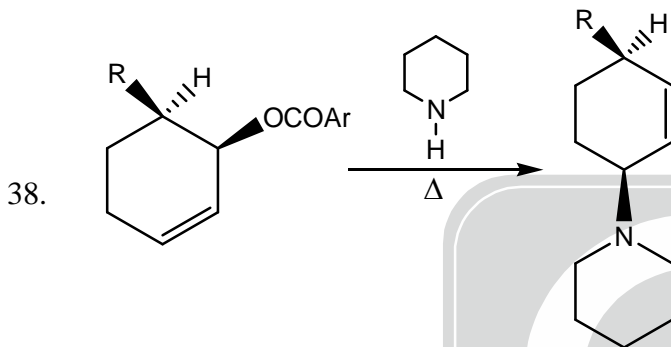
The major product (P) in the above reaction is



36. Find out the isostructural pair among the following homoleptic carbonyl complex  
 (a)  $\text{Co}_2(\text{CO})_8$  solid and  $\text{Co}_2(\text{CO})_8$  in hexane (b)  $\text{Co}_4(\text{CO})_{12}$  and  $\text{Ir}_4(\text{CO})_{12}$   
 (c)  $\text{Co}_4(\text{CO})_{12}$  and  $\text{Co}_6(\text{CO})_{16}$  (d)  $\text{Co}_4(\text{CO})_{12}$  and  $\text{Rh}_4(\text{CO})_{12}$
37. Which of the following statement is correct in terms of dipole moment regarding compound P, Q, R and S

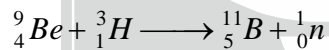


- (a)  $P > Q$  and  $R < S$  (b)  $P > Q$  and  $R > S$  (c)  $P < Q$  and  $S > R$  (d)  $P = Q$  and  $S = R$



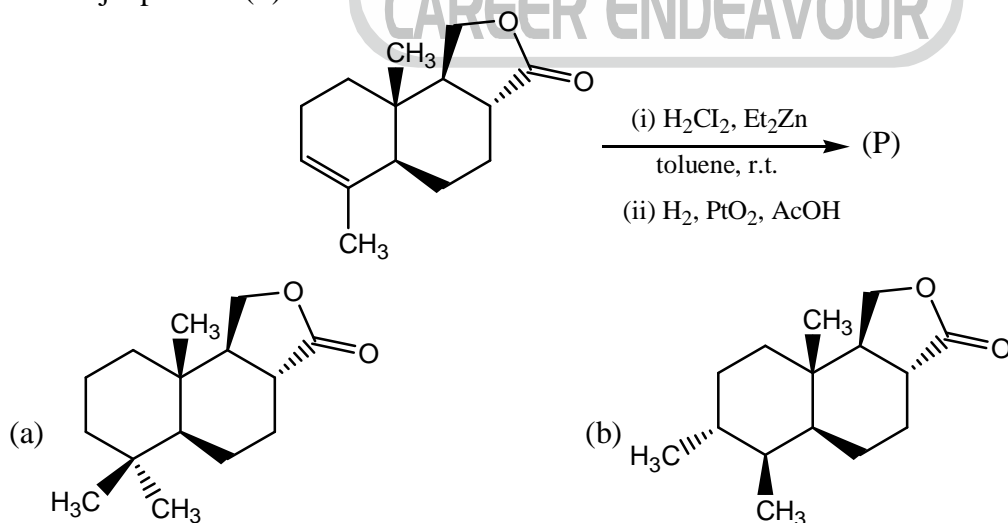
The product is an example of reaction

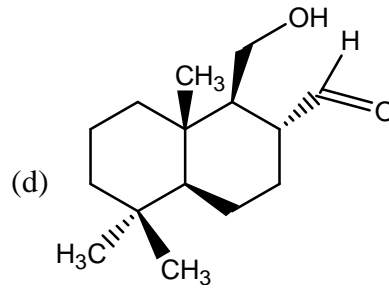
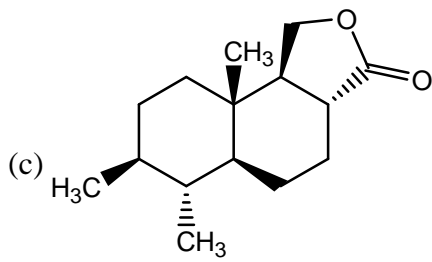
- (a)  $\text{S}_{\text{N}}2$  (b)  $\text{S}_{\text{N}}2'$  (c)  $\text{S}_{\text{N}}1$  (d)  $\text{S}_{\text{N}}\text{i}$
39. Which ones of the following statements are true for given reaction,



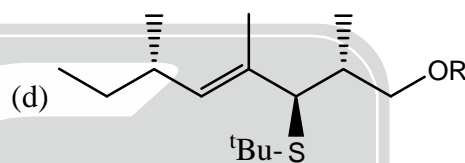
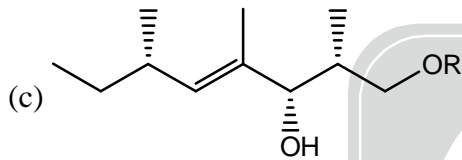
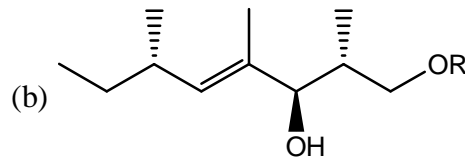
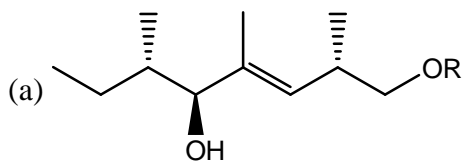
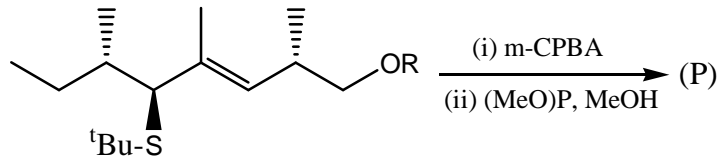
- (1) It is fusion reaction (2) It is fission reaction  
 (3) It is natural radioactivity decay (4) Total neutron number is conserved  
 (a) 1, 2 (b) 2, 3 (c) 1, 4 (d) 2, 4

40. The major product (P) is

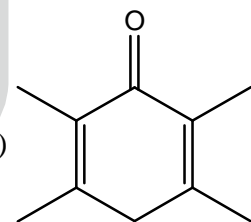
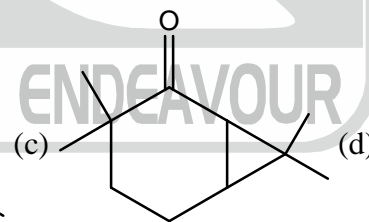
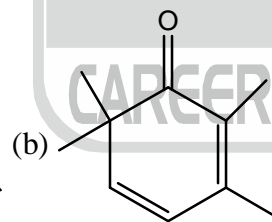
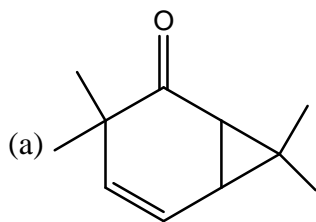
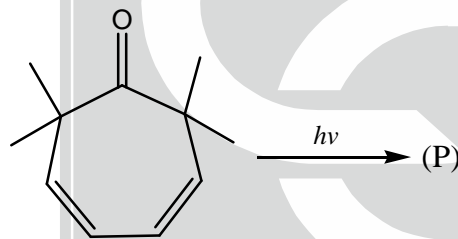




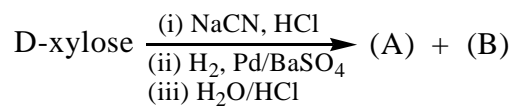
41. The major product (P) is



42. The major product (P) is



43. The products (A) and (B) in the following reaction is



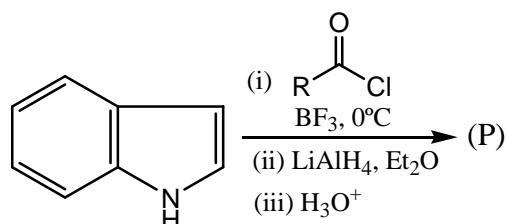
(a) A = D-allose, B = D-altrose

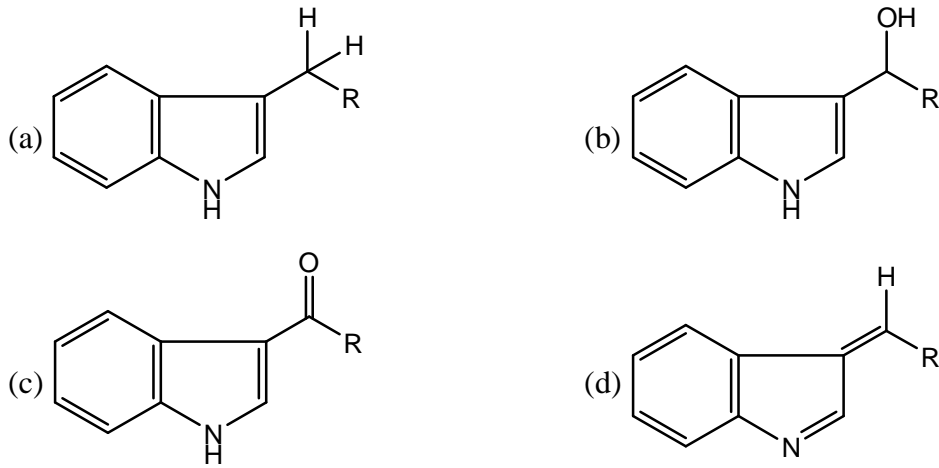
(b) A = D-glucose, B = D-mannose

(c) A = D-gulose, B = D-idose

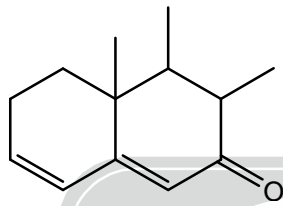
(d) D-galactose and D-talose

44. The major product (P) is



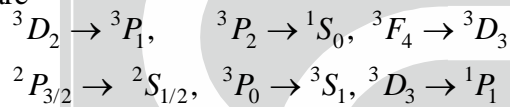


45. The value of  $\lambda_{\max}$  in the following molecule is



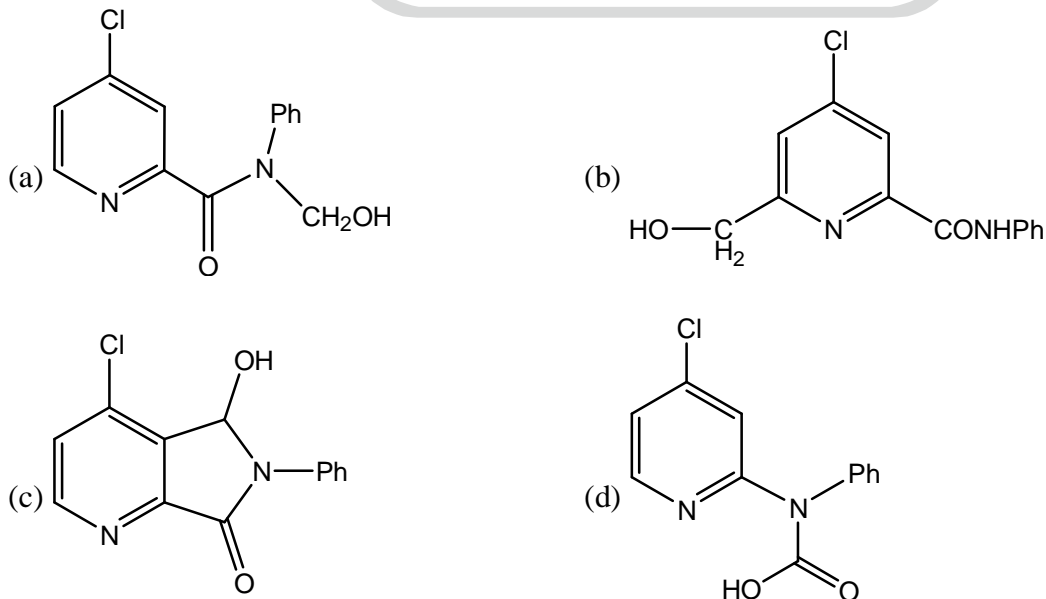
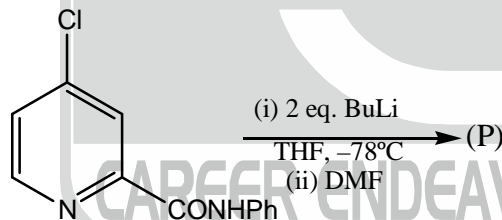
- (a) 260                      (b) 280                      (c) 373                      (d) 273

46. The total number of allowed transitions between terms in the following normal electronic emission spectrum of many electron atom is/are



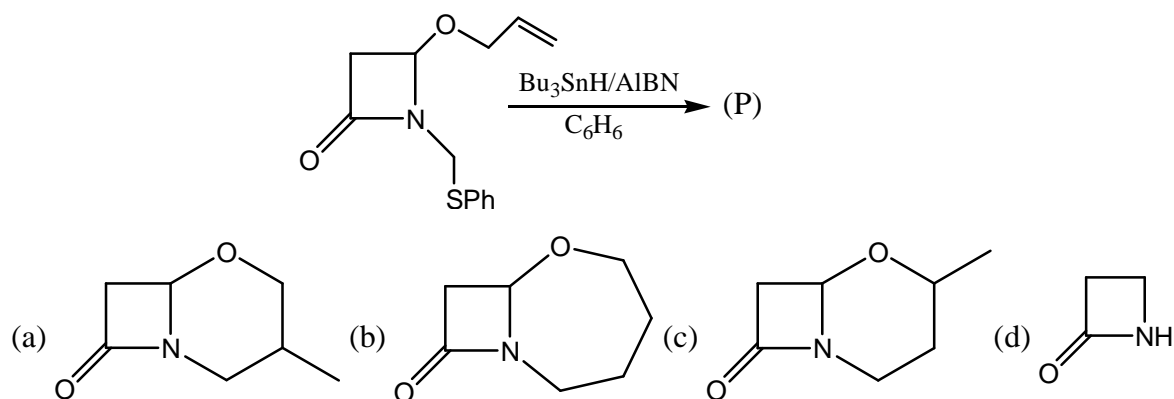
- (a) 4                      (b) 2                      (c) 3                      (d) 6

47. The major product (P) is

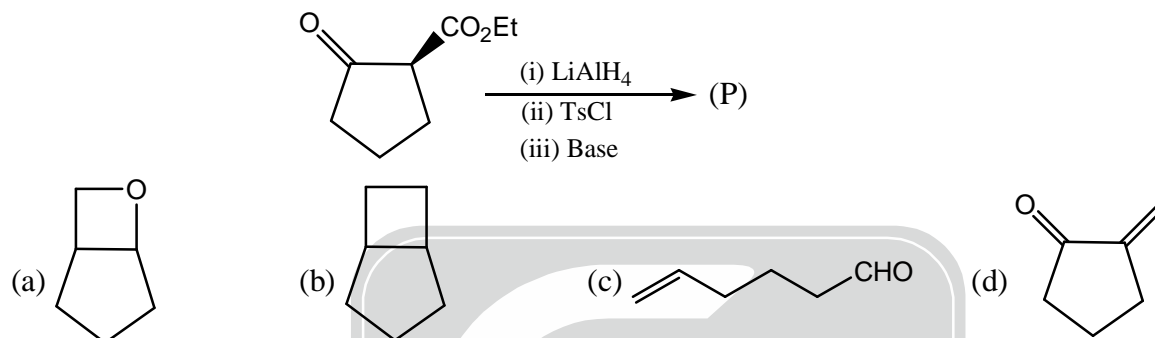




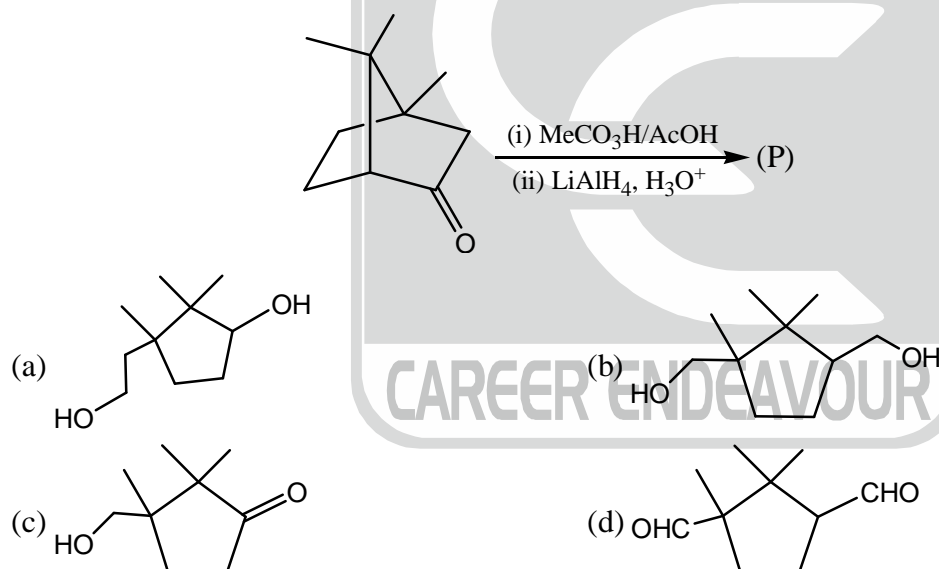
48. The major product (P) is



49. The major product (P) is



50. The major product (P) is



51. If the leading anharmonic correction to the energy of the  $n^{\text{th}}$  vibrational level of a diatomic molecule is

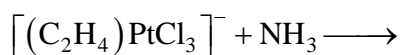
$$-x_e \left( n + \frac{1}{2} \right)^2 \hbar \omega \text{ with } x_e = 0.003. \text{ The total number of energy levels possible is approximately}$$

- (a) 166                      (b) 200                      (c) 366                      (d) 416

52. Classify the following carboranes by structural type

- (1)  $\text{C}_2\text{B}_9\text{H}_{12}^-$                       (2)  $\text{C}_2\text{B}_7\text{H}_{13}$                       (3)  $\text{C}_4\text{B}_2\text{H}_6$
- (a) 1-nido, 2-arachano, 3-nido                      (b) 1-nido, 2-closo, 3-nido
- (c) 1-closo, 2-arachano, 3-nido                      (d) 1-closo, 2-nido, 3-nido

53. Predict the product (equimolar mixture)



- (a) cis  $[Pt(C_2H_4)NH_3Cl_2]$                       (b) trans  $-[Pt(NH_3)_2Cl_2]$   
 (c) trans  $-[Pt(C_2H_4)(NH_3)Cl_2]$               (d) cis  $-[Pt(NH_3)_2Cl_2]$

54. Which statement is correct description of hemerythrin

- (a) A heme protein with one Fe centre at the active site  
 (b) A metalloprotein containing two Fe centre at the active site  
 (c) The non-heme protein with one Fe centre at active site  
 (d) A heme protein without Fe centre at the active site

55. The enzyme which contain cubane like ferredoxin is

- (a) carbonic anhydrase                              (b) urease  
 (c) zymase    (d) nitrogenase

56. Which of the following carbide on hydrolysis produce  $CH_4$  as product?

- (A)  $CaC_2$                       (b)  $Mg_2C_3$                       (C)  $Be_2C$                       (D)  $Al_4C_3$   
 (a) A and B                      (b) only D                      (c) C and D                      (d) only C

57. The alkaline hydrolysis of  $P_4$  with NaOH produces

- (a)  $Na_2H_2PO_2$                                       (b)  $Na_2H_2PO_3$   
 (c)  $P(OH)_3$     (d)  $NaH_2PO_2$  and  $PH_3$

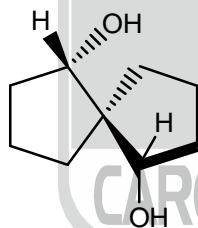
58. Which of the following pair of halide show metallic conductivity

- (a)  $LaI_3$  and  $CeI_3$                                   (b)  $ThI_2$  and  $LuI_3$   
 (c)  $GdI_3$  and  $LaI_2$                                   (d)  $ThI_2$  and  $LaI_2$

59.  $NCl_3$  hydrolyzes readily in water, forming

- (a)  $NH_2OH$  and  $HCl$                               (b)  $NH_4^+ OH^-$  and  $HOCl$   
 (c)  $NH_4^+ OH^-$  and  $HClO_4$                       (d)  $NH_3$  and  $HCl$

60. Assign the R/S configuration at chiral centre, the correct option is



- (a) 1S, 5S, 6S                      (b) 1S, 5R, 6S                      (c) 1R, 5R, 6R                      (d) 1R, 5S, 6R

### PART-C

61. Consider a particle of mass 'm' moving under a potential of the form

$$V(x) = \begin{cases} \frac{1}{2}kx^2 & \text{for } x > 0 \\ \infty & \text{otherwise} \end{cases}$$

The third excited state corresponds to n equals

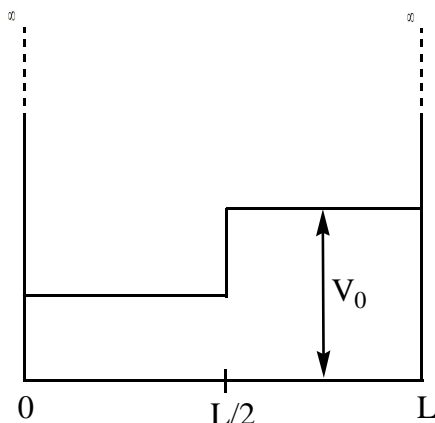
- (a) 3                      (b) 5                      (c) 7                      (d) none

62. An electron is confined in a cubic box of side  $a$ . The degeneracy of the state having momentum  $\frac{3\pi\hbar}{a}$  is

- (a) 1                      (b) 3                      (c) 6                      (d) none

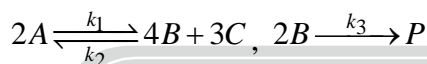


63. Consider a particle of mass 'm' confined in a infinite potential well in between '0' and 'L'. A constant perturbation is applied as shown below



The first order correction to the ground state is

- (a)  $\frac{3V_0}{4}$  (b)  $\frac{V_0}{4}$  (c) 0 (d) none
64. For the following sequence of reactions



the  $\frac{d[B]}{dt}$  is given by

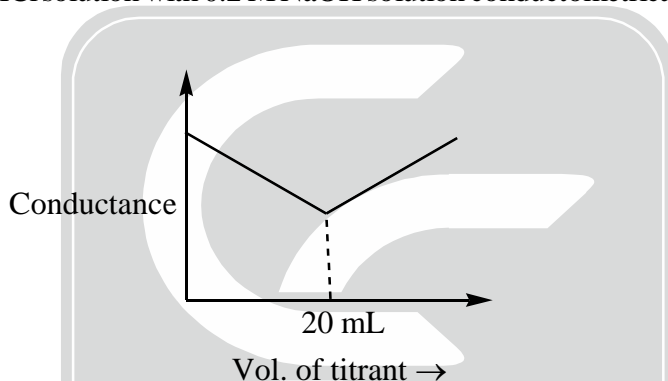
- (a)  $\frac{1}{4}k_1[A]^2 - \frac{1}{4}k_2[B]^4[C]^3 - \frac{1}{2}k_3[B]^2$  (b)  $\frac{1}{2}k_1[A]^2 - \frac{1}{2}k_2[B]^4[C]^3 - k_3[B]^2$   
 (c)  $2k_1[A]^2 - 2k_2[B]^4[C]^3 - k_3[B]^2$  (d)  $4k_1[A]^2 - 4k_2[B]^4[C]^3 - 2k_3[B]^2$
65. The data obtained from two sets of experiment A and B have the following characteristics
- | Experiment         | A        | B        |
|--------------------|----------|----------|
| Mean               | 25 units | 50 units |
| Standard Deviation | 4 units  | 4 units  |
- It may be concluded that
- (a) A is more precise than B (b) A is less precise than B  
 (c) A and B are the same precision (d) Relative precision of A and B can not be assessed
66. The rate dependence for a particular reaction at a particular temperature is given by

$$\ln k = 5 - \frac{13000}{T}$$

The activation energy at 130 K is ( $R = 2 \text{ cal K}^{-1} \text{ mole}^{-1}$ )

- (a) 100 kcal  $\text{K}^{-1} \text{ mole}^{-1}$  (b) 100 kcal  $\text{mole}^{-1}$   
 (c) 26 kcal  $\text{mole}^{-1}$  (d) 26 kcal  $\text{K}^{-1} \text{ mole}^{-1}$
67. The co-ordination number of anion in case of sphalerite and wurtzite structure are respectively  
 (a) 4 and 4 (b) 4 and 8 (c) 8 and 4 (d) none
68. The plane(s) which show allowed reflection in both bcc and fcc lattices is/are  
 (I) (100) (II) (111) (III) (110)  
 (a) II (b) III (c) I (d) None
69. The probability of link is given by
- (a)  $\frac{k_{av} + 1}{k_{av}}$  (b)  $\frac{k_{av}}{k_{av} + 1}$  (c)  $\frac{k_{av} - 1}{k_{av}}$  (d)  $\frac{k_{av}}{k_{av} - 1}$

70. The incorrect statement regarding physisorption is  
 (a) It occurs because of Vanderwalls forces  
 (b) More easily liquifiable gases are adsorbed readily  
 (c) Under high pressure it results into multimolecular layer on adsorbent surface  
 (d) Enthalpy of adsorption is low and positive
71. The characters of reducible representation of  $SF_4$  molecule w.r.to basis of 3N-coordinate are  
 (a) 3, -1, 1, 1      (b) 3, -1, 3, 3      (c) 15, -1, 1, 1      (d) 15, -1, 3, 3
72. If  $\alpha$  is thermal expansion coefficient and  $\beta$  represents compressibility factor then  $\frac{\alpha}{\beta}$  for ideal gas is  
 (a)  $\frac{1}{TP}$       (b)  $\frac{1}{P}$       (c)  $\left(\frac{\partial P}{\partial T}\right)_V$       (d) 1
73.  $\left(\frac{\partial U}{\partial P}\right)_V$  for an ideal gas is  
 (a)  $C_V \frac{\beta}{\alpha}$       (b)  $C_P \frac{\beta}{\alpha}$       (c)  $C_V \frac{\alpha}{\beta}$       (d)  $C_P \frac{\alpha}{\beta}$
74. On titrating, 10 mL of HCl solution with 0.2 M NaOH solution conductometrically following plot is observed. The molarity of HCl is



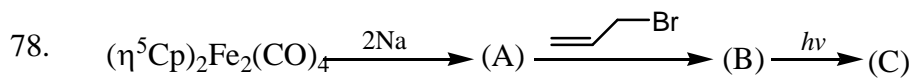
- (a) 0.1 M      (b) 0.2 M      (c) 0.3 M      (d) 0.4 M
75. The maximum current measured while determining  $M^{2+}$  using dropping mercury electrode is  $1.2 \mu A$ . Current observed before applying voltage is  $0.2 \mu A$ . When  $-0.4V$  is applied, the current is  $0.8 \mu A$ . The  $E_{1/2}$  will be  
 (a) -0.395      (b) -0.405      (c) -0.390      (d) -0.410
76. Which of the following statements is incorrect in regard to boron nitride?  
 (a) Both boron nitride and graphite are slippery solids  
 (b) Both boron nitride and graphite have layered structures with sheets made up of hexagonal rings  
 (c) The hexagonal ring in boron nitride is made up of alternate B and N atoms joined together  
 (d) Both boron nitride and graphite are electrical conductors
77. The mean number of molecules per unit volume with a speed  $v$  in the range between  $v$  and  $v + dv$  is given by a function  $F(v)dv$  as

$$F(v)dv = C \cdot v^2 e^{-\alpha v^2/T} dv$$

then mean speed is

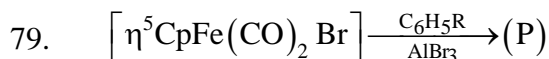
- (a)  $\sqrt{\frac{8T}{\alpha\pi}}$       (b)  $\sqrt{\frac{4T}{\alpha\pi}}$       (c)  $\sqrt{\frac{2T}{\alpha\pi}}$       (d)  $\sqrt{\frac{T}{\alpha\pi}}$





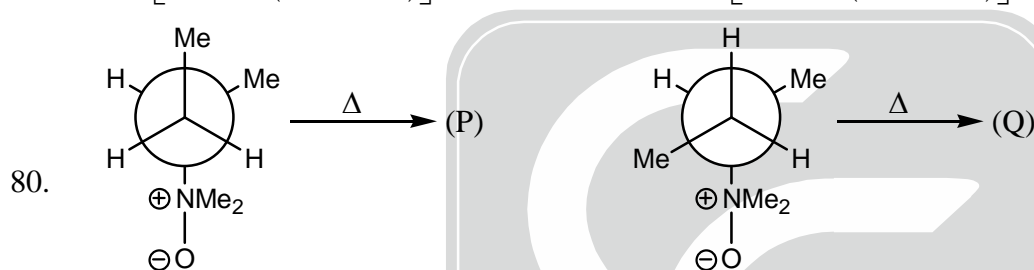
The product A, B and C, respectively are

- (a) A:  $[\eta^5\text{CpFe}(\text{CO})_2]^+$  B:  $[\eta^5\text{CpFe}(\eta^1\text{C}_3\text{H}_5)]$  C:  $[\eta^5\text{CpFe}(\eta^3\text{C}_3\text{H}_5)]$   
 (b) A:  $[\eta^5\text{CpFe}(\text{CO})_2]^-$  B:  $[\eta^5\text{CpFe}(\eta^1\text{C}_3\text{H}_5)(\text{CO})_2]$  C:  $[\eta^5\text{CpFe}(\eta^3\text{C}_3\text{H}_5)(\text{CO})]$   
 (c) A:  $[\eta^5\text{CpFe}(\text{CO})_2]^-$  B:  $[\eta^5\text{CpFe}(\eta^1\text{C}_3\text{H}_5)(\text{CO})_2]$  C:  $[\eta^5\text{CpFe}(\eta^1\text{C}_3\text{H}_5)(\text{CO})_2]$   
 (d) A:  $[\text{HFe}(\text{CO})_4]^-$  B:  $[\text{HFe}(\eta^1\text{C}_3\text{H}_5)(\text{CO})_4]$  C:  $[\text{HFe}(\text{CO})_2(\eta^3\text{C}_3\text{H}_5)]$



The major product in the above reaction is

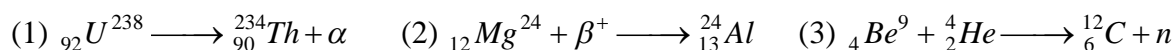
- (a)  $[\eta^5\text{CpFe}(\text{CO})_2\text{R}]$  (b)  $[\eta^5\text{CpFe}(\eta^5\text{C}_5\text{H}_5)]^+$   
 (c)  $[\eta^5\text{CpFe}(\eta^6\text{C}_6\text{H}_5\text{R})]\text{AlBr}_4$  (d)  $[\eta^5\text{CpFe}(\eta^6\text{C}_6\text{H}_5\text{R})]$



The major product (P) and (Q) are respectively

- (a) P = Q =
- (b) P = Q =
- (c) P = and Q =
- (d) P = and Q =

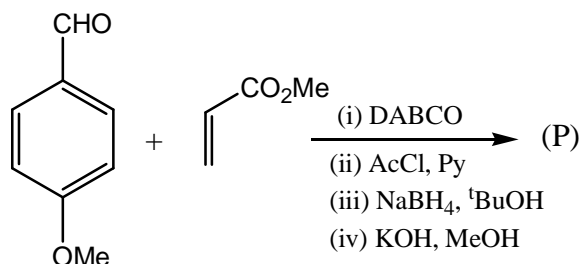
81. In the following reaction

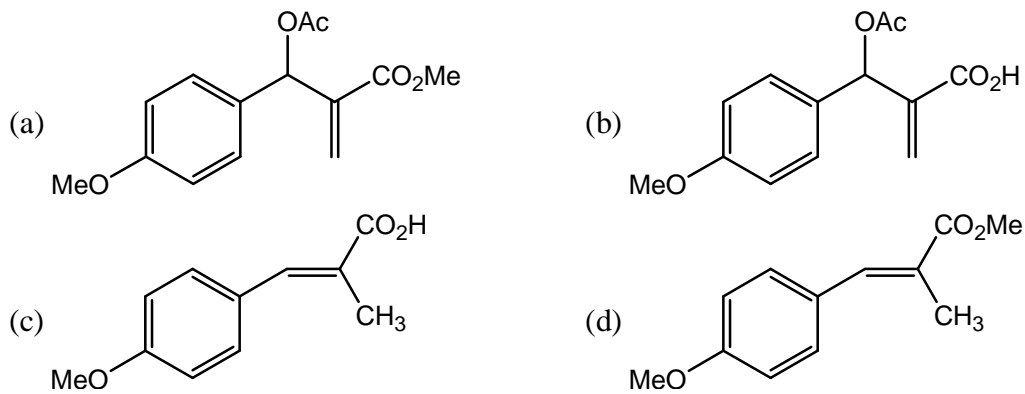


The artificial radioactive decay is/are

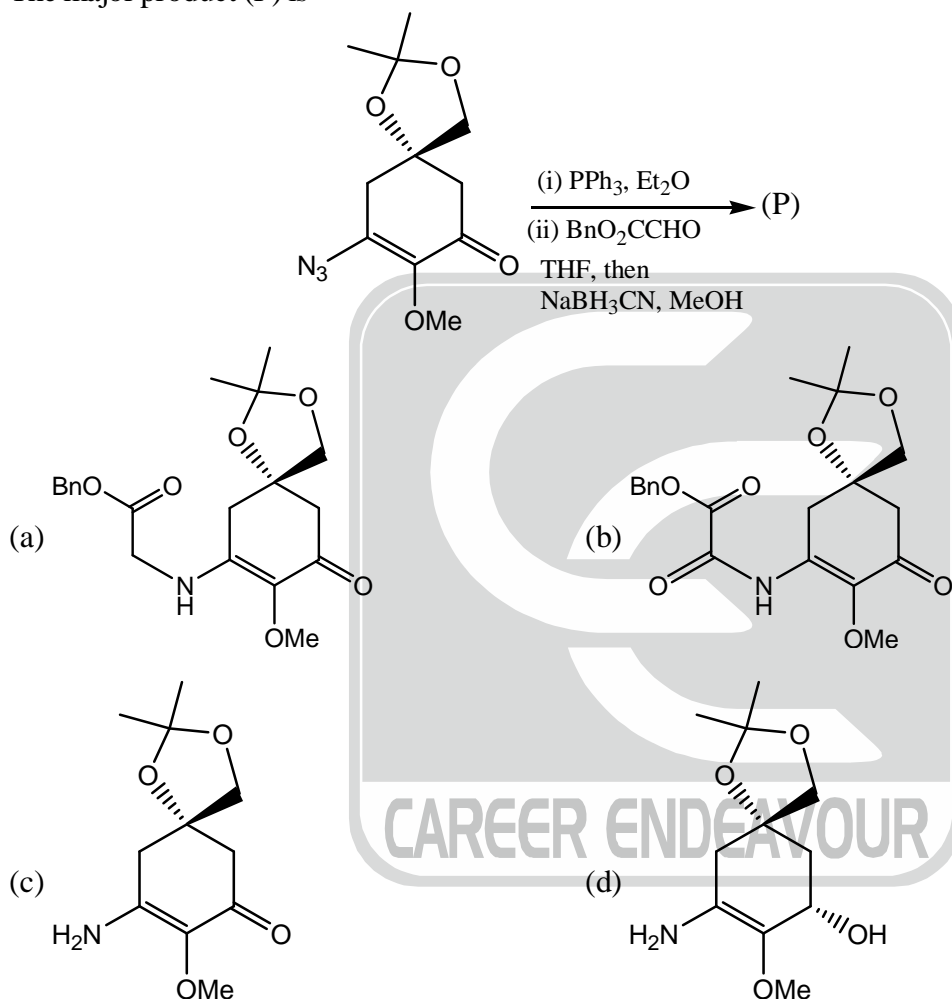
- (a) 2, 3 (b) 1, 2 (c) 1, 3 (d) none of these

82. The major product (P) is

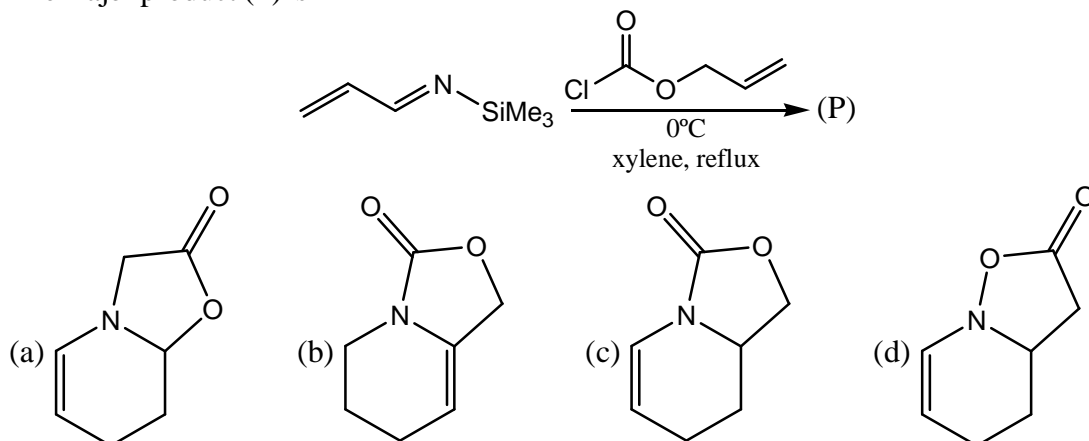




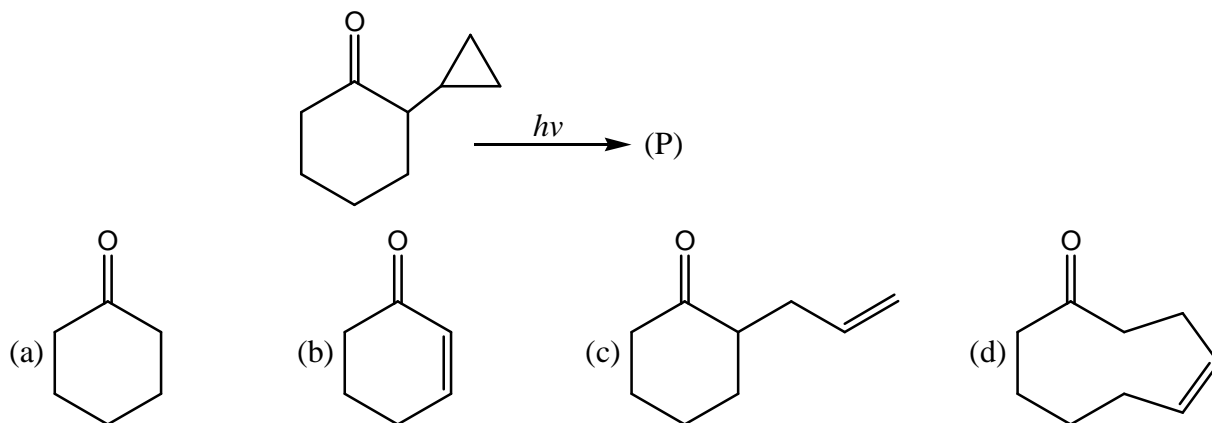
83. The major product (P) is



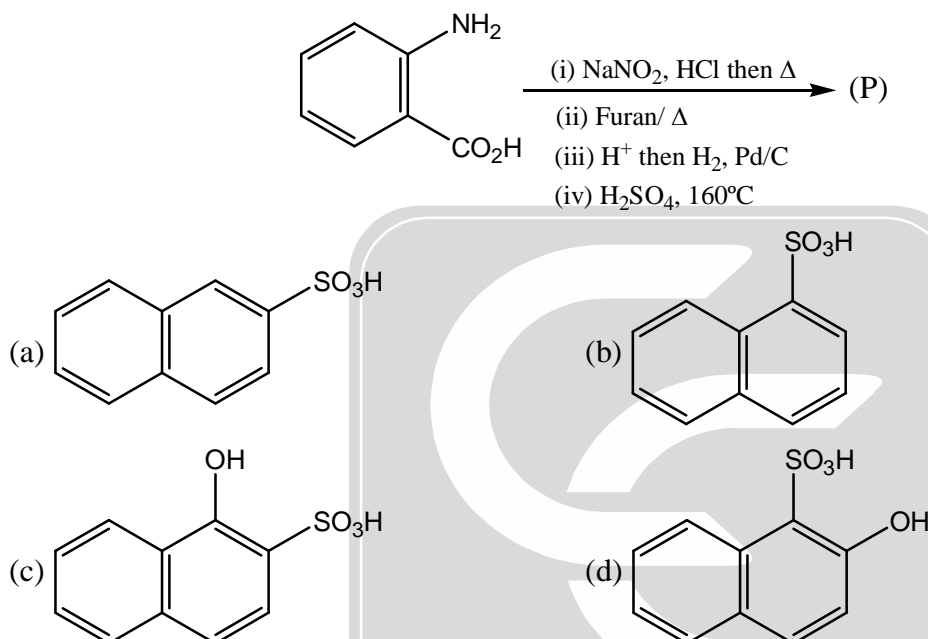
84. The major product (P) is



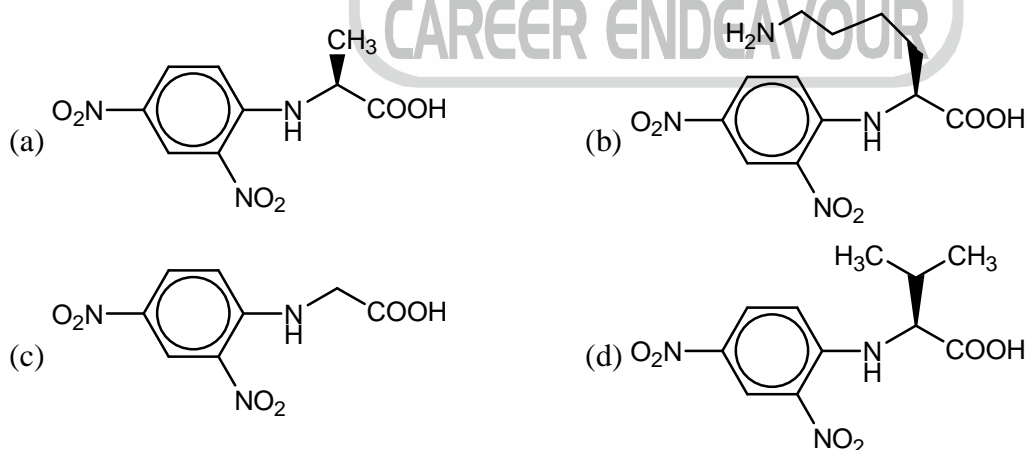
85. The major product (P) is



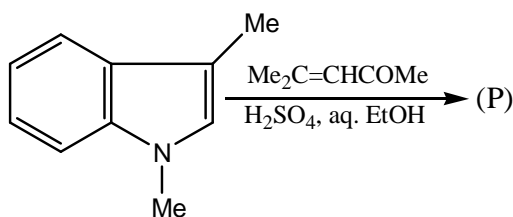
86. The major product (P) is

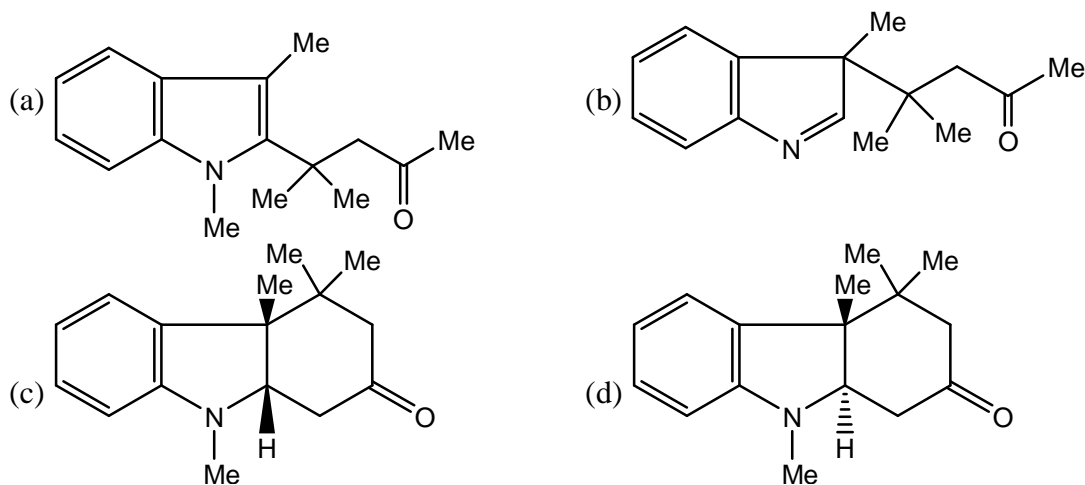


87. A pentapeptide Ala-Val-Gly-Lys-Asp upon two cycles Edmann degradation gives a tripeptide (X). Treatment of tripeptide with sangers reagent and followed by hydrolysis gives (y). The product (y) is

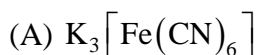


88. The major product (P) is

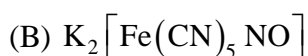




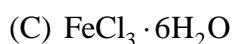
89. The correct match for isomer shift in the following complex in Mossbauer spectrum is/are  
**Complex** **Isomer shift**



(P) 0.119



(Q) 0.085



(R) -0.012



(S) -0.027

(a)  $A \rightarrow P, B \rightarrow R, C \rightarrow S, D \rightarrow Q$

(b)  $A \rightarrow R, B \rightarrow S, C \rightarrow Q, D \rightarrow P$

(c)  $A \rightarrow Q, B \rightarrow P, C \rightarrow R, D \rightarrow S$

(d)  $A \rightarrow S, B \rightarrow Q, C \rightarrow P, D \rightarrow R$

90. Total number of ESR line in the ESR spectrum of  $[AlH_3]$  radical,  $[Mo(^{13}CN)_8]^{-3}$ , (radical,  $NO_2(SO_3^-)_2$ ), cyclooctatetraene radical ( $A = 3.21$  G), ( $Al, I = 5/2$ )

(a) 24, 9, 3, 8

(b) 20, 8, 4, 9

(c) 24, 3, 9, 8

(d) 24, 9, 3, 9

91. In a potentiometric titration the end point is not obtained by observing

(1) change in colour

(2) jump in potential

(3) increase in current

(4) increase in turbidity

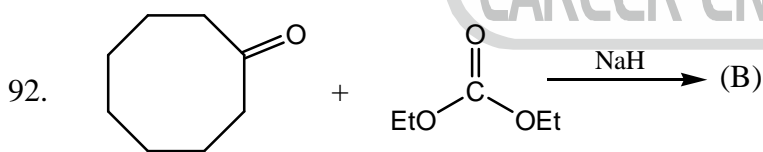
The correct option is

(a) 1, 2

(b) 2, 3

(c) 4, 2

(d) 1, 3, 4



(A)

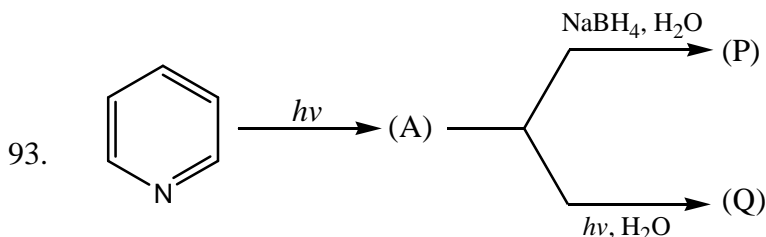
In the following transformation the  $^1H$  NMR signal difference between compound A and B is/are

(a) 0

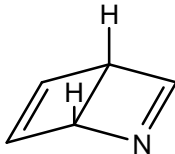
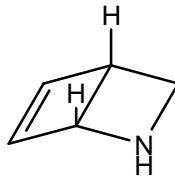
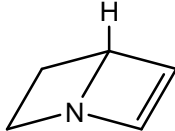
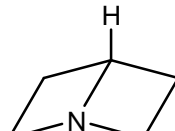
(b) 2

(c) 5

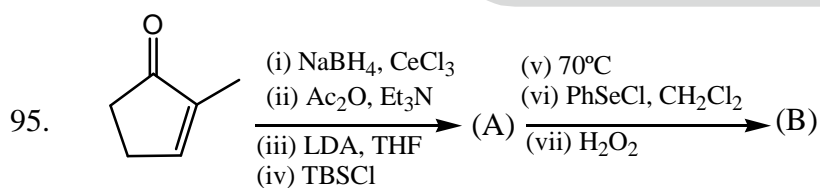
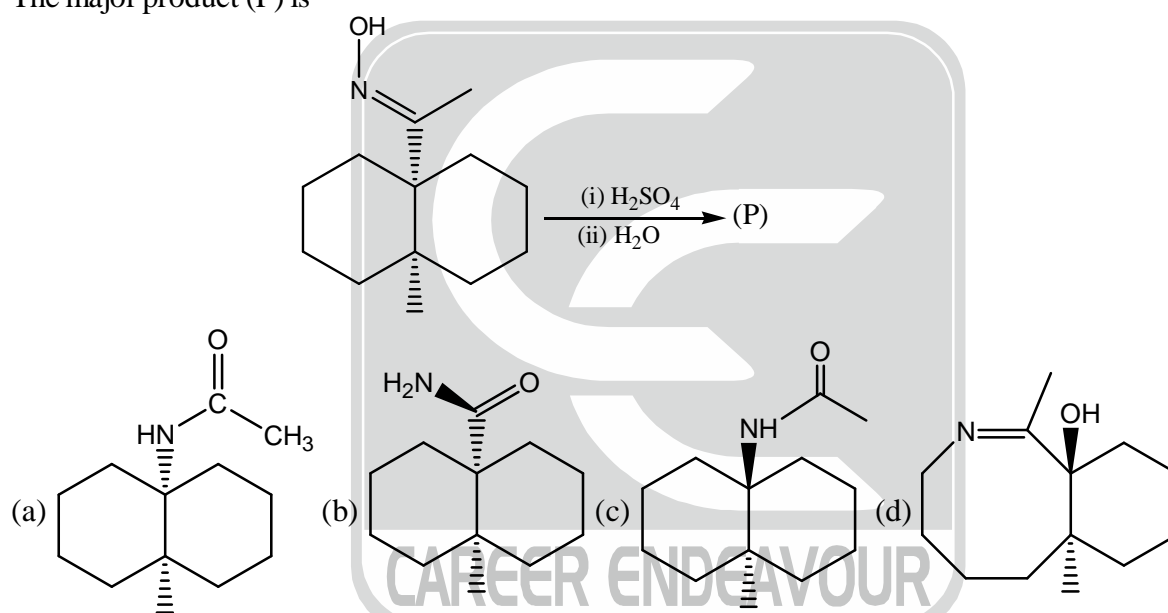
(d) 3

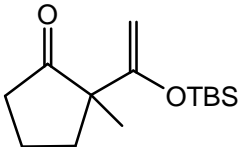
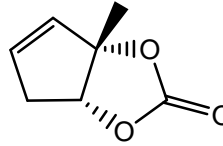
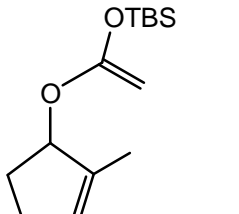
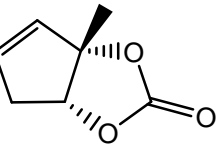


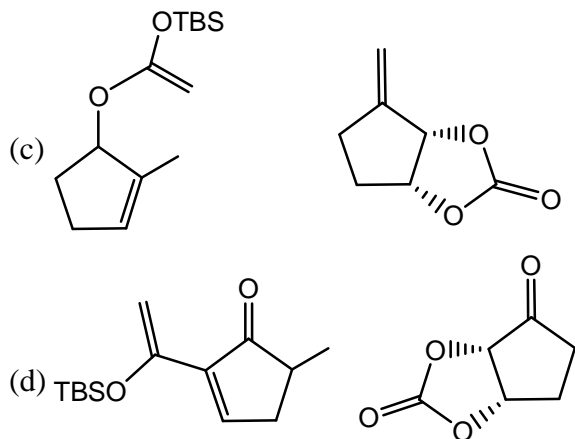


- (a)   $\text{H}_2\text{NHC}=\text{CHCH}=\text{CHCHO}$
- (b)   $\text{H}_2\text{NHC}=\text{CHCH}=\text{CHCHO}$
- (c)   $\text{H}_2\text{NH}_2\text{C}-\text{CH}_2\text{CH}_2-\text{CH}_2-\text{CHO}$
- (d)   $\text{H}_2\text{N}-\overset{\text{H}_2}{\text{C}}-\overset{\text{H}_2}{\text{C}}-\underset{\text{H}}{\text{C}}=\text{CHCHO}$

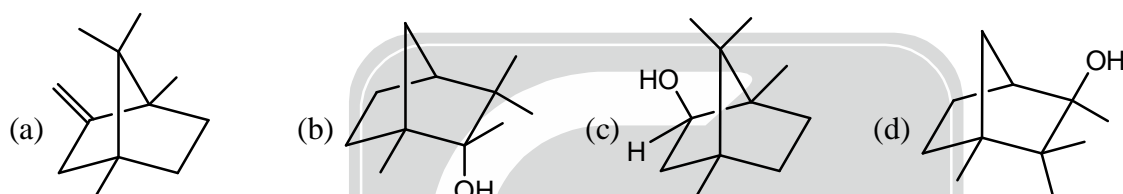
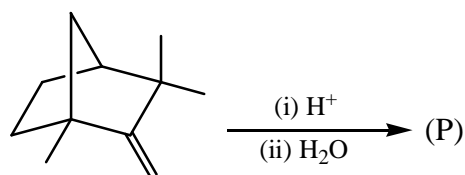
94. The major product (P) is



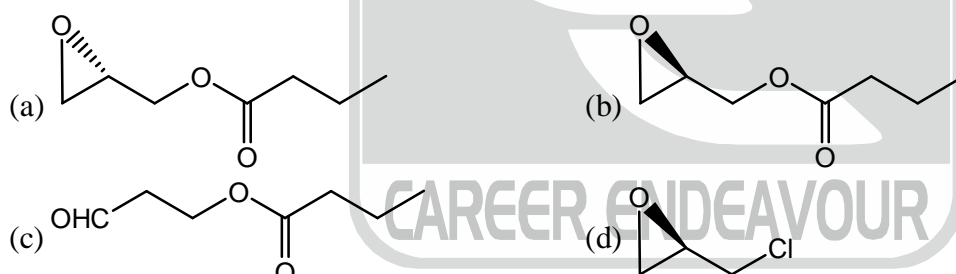
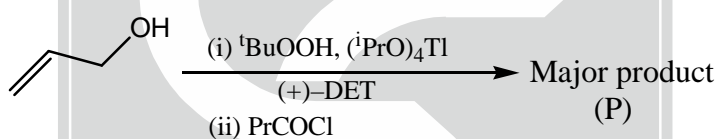
- (a)  
- (b)  



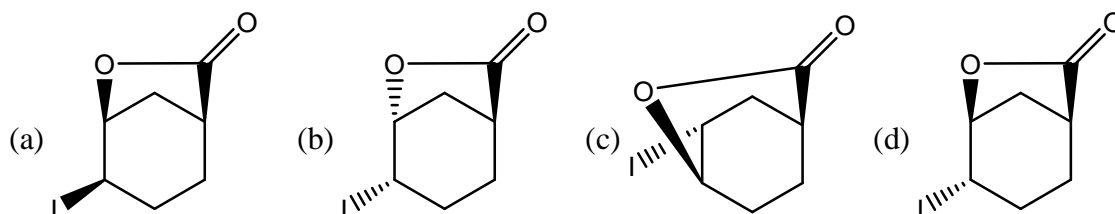
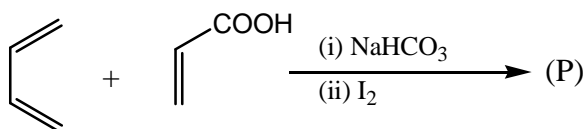
96. The major product (P) is



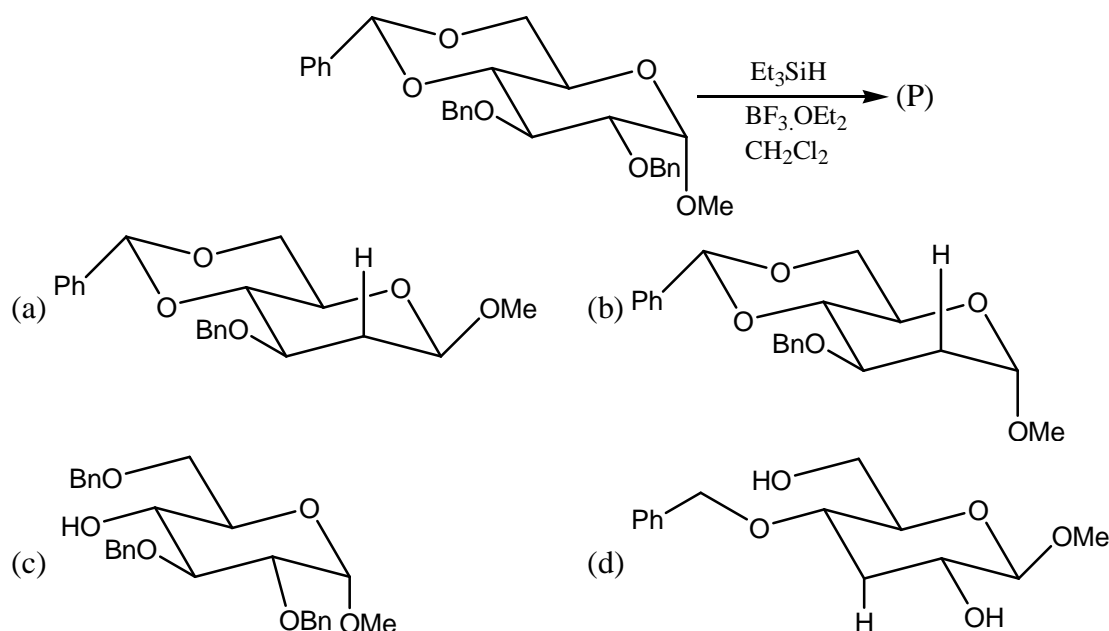
97. The major product (P) is



98. The major product (P) is



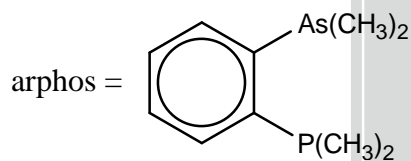
99. The major product (P) is



100. In the  $[ML_4]$  spherical rotor the M-L bond length is 200 pm. The moment of inertia of  $ML_4$  would be close to [Mass of M =  $9.5 \times 10^{-27}$  kg, L =  $6.5 \times 10^{-27}$  kg]

- (a)  $69 \times 10^{-20}$  kg mtr<sup>2</sup> (b)  $69 \times 10^{-47}$  kg mtr<sup>2</sup> (c)  $60 \times 10^{-51}$  kg mtr<sup>2</sup> (d)  $59 \times 10^{-50}$  kg mtr<sup>2</sup>

101. The number of possible isomers for complexes  $Re(\text{arphos})_2 Br_2$



- (a) 3 (b) 4 (c) 6 (d) 8

102. On the basis of VSEPR, the structures of



- (a) Td and trigonal bipyramidal (b) square planar and trigonal bipyramidal  
(c) Td and square pyramidal (d) square planar and square pyramidal

103. Consider the correct statement for diatomic cation  $Br_2^+$  and  $I_2^+$

- (1) The bond order of these cation is smaller than corresponding neutral diatomic molecule  
(2) The bond length of these cation is smaller than corresponding neutral diatomic molecule

(3) They are coloured due to electronic transition from  $\pi_g^*$  (HOMO) to  $\sigma_u^*$  (LUMO)

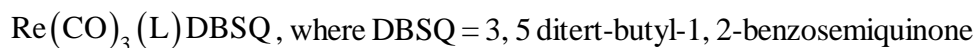
(4)  $I_2^+$  is bright red while  $Br_2^+$  is blue

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

104. Solution of the complexes (A)  $[Co(NH_3)_6]^{2+}$ , (B)  $[Co(H_2O)_6]^{2+}$  & (C)  $[CoCl_4]^{2-}$  are coloured. One is pink, another yellow and third is blue, select the colour match from following

- (a) A-Blue, B-yellow, C-pink (b) A-yellow, B-pink, C-blue  
(c) A-pink, B-blue, C-yellow (d) A-yellow, B-blue, C-pink

105. The electronic absorption spectra of a series of complexes of formula



Show a single maximum in visible region. The absorption maximum for three of these complexes in benzene solution are shown below (molar absorptivity are in range of 5,000 to 6,000  $\text{L mol}^{-1}\text{cm}^{-1}$ ).

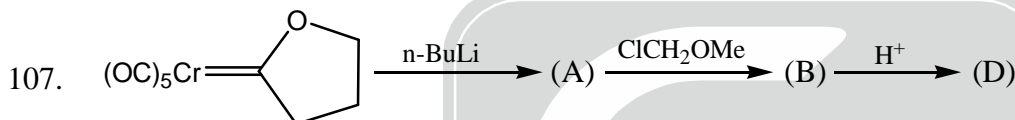
L	$\nu_{\text{max}}, \text{cm}^{-1}$
$\text{P}(\text{OPh}_3)_3$	18250
$\text{PPh}_3$	17300
$\text{NEt}_3$	16,670

Are these bands more likely due to

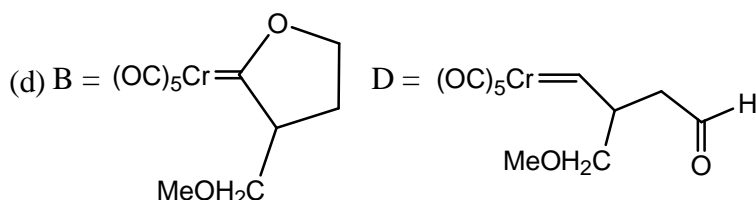
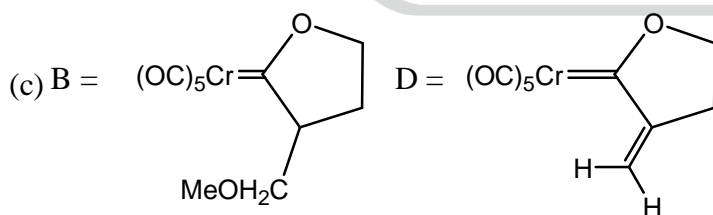
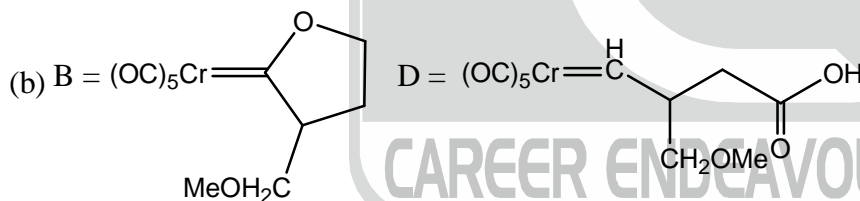
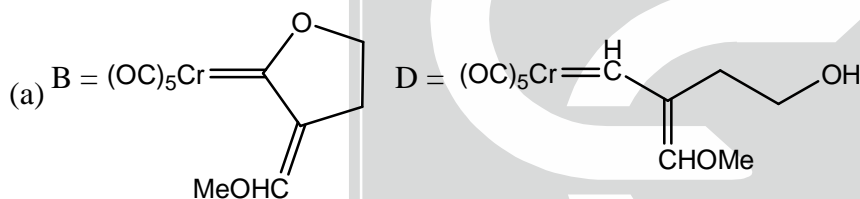
- (a) MLCT      (b) LMCT      (c) d-d transition      (d) ILCT

106. Consider the correct statement from following

- (a) The complex  $[\text{Co}(\text{NO}_2)_6]^{4-}$  has one unpaired electron and LFSE (in  $\Delta_0$ ) is  $-1.8$   
 (b) The magnetic moment of  $[\text{Co}(\text{NH}_3)_6]^{+3}$  is non-zero  
 (c) The geometry of  $[\text{Co}(\text{CO})_4]^-$  is square planar  
 (d)  $\text{K}_2[\text{NiF}_6]$  is diamagnetic while  $\text{K}_3[\text{CoF}_6]$  is paramagnetic



The major product (B) and (D) is





115. Incorrect statement about following compounds  
 (A) 1, 2 difluoroethane  
 (B) n-butane  
 (C) 1, 2-dihydroxyethane  
 (a) Most stable conformation of n-butane is anti  
 (b) Most stable conformation of 1, 2-difluoroethane is anti  
 (c) Most stable conformation of 1, 2-dihydroxyethane is gauche  
 (d) Most stable conformation of 1, 2-difluoroethane is gauche.

116. Molecular formula :  $C_9H_8O$

UV :  $\lambda_{max}$  285 nm

IR ( $cm^{-1}$ ) : 3090-3000, 1680, 1630, 1610-1455

NMR :  $\delta$ 6.62 doublet of doublet, 1H J = 16.3 and 7.4 Hz

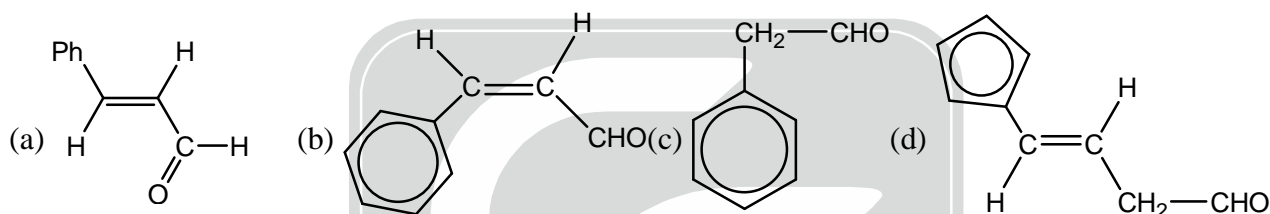
$\delta$ 7.41, doublet, 1H, J = 16.3

$\delta$ 7.40, multiplet, 5H

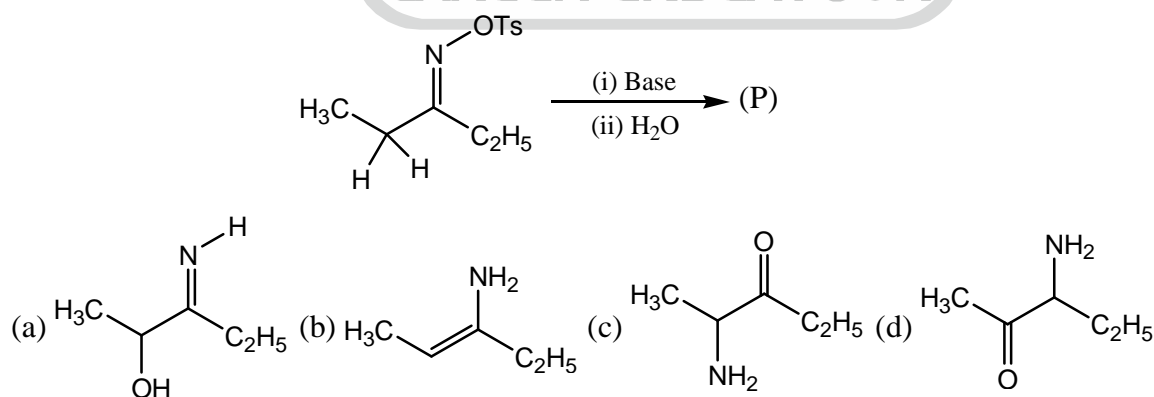
$\delta$ 9.66, doublet, 1H, J = 7.4 Hz

Mass (m/z) : 132, 131, 103, 91, 77, 51

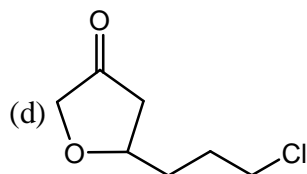
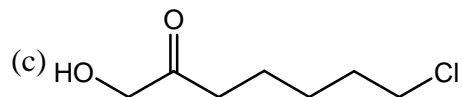
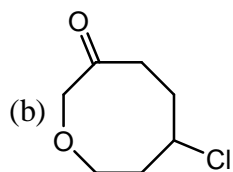
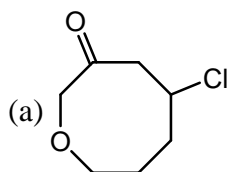
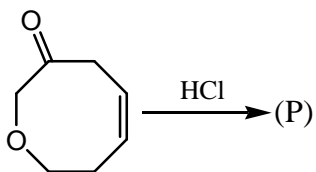
The correct possible structure is



117. The number of  $^1H$  NMR signals appear for the compound  $(\eta^1-Cp)(\eta^5-Cp)Fe(CO)_2$  at  $-80^\circ C$  with intensity ratio.  
 (a) 3 signals with 5 : 2 : 1 intensity ratio. (b) 4 signals with 5 : 2 : 2 : 1 intensity ratio  
 (c) 2 signals with 5 : 5 intensity ratio (d) only one signal of 10 Hs.
118. The number of isomers in carboranes,  $C_2B_3H_5$ ,  $C_2B_4H_6$ ,  $C_2B_5H_7$  respectively are  
 (a) 4, 2 and 3 (b) 3, 2 and 5 (c) 3, 2 and 4 (d) 2, 4 and 3
119. The major product (P) is



120. The major product (P) is



*Space for rough work*



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**CHEMICAL SCIENCES**  
**TEST SERIES-D**  
**[FULL LENGTH TEST-1]**

Date : 05-12-2017

**ANSWER KEY**

**PART-A**

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

**PART-B**

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

**PART-C**

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

