

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

TEST BOOKLET

Sl. No. 01995

Subject Code : 04

Subject : Chemistry

LECTURERS FOR NON-GOVT. AIDED COLLEGES OF ODISHA

Time Allowed : 3 Hours

Maximum Marks : 165

: INSTRUCTIONS TO CANDIDATES :

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET CONTAINS 39 PAGES AND DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. You have to enter your Roll No. on the Test Booklet in the Box provided alongside. DO NOT write anything else on the Test Booklet. 

--	--	--	--	--	--	--	--	--	--
3. The Test Booklet contains 165 questions. Each question comprises four answers. You have to select the correct answer which you want to mark (darken) on the Answer Sheet. In case, you feel that there is more than one correct answer, you should mark (darken) the answer which you consider the best. In any case choose ONLY ONE answer for each question. If more than one answer is darkened it will be considered as wrong.
4. You have to mark (darken) all your answers ONLY on the separate OMR Answer Sheet provided, by using BLACK BALL POINT PEN. You have to do rough work on the space provided in the Test Booklet only. See instruction in the Answer Sheet.
5. All questions carry equal marks, i.e. of one mark for each correct answer and each wrong answer will result in negative marking of 0.25 mark.
6. Before you proceed to mark (darken) in the Answer Sheet the answers to various questions in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per the instructions in your Admit Card.
7. After you have completed filling in all your answers on the Answer Sheet and after completion of the examination, you should hand over to the Invigilator the Original Answer Sheet (OMR Answer Sheet) issued to you. You are allowed to take with you the candidate's copy/second page of the Answer Sheet along with the Test Booklet after completion of the examination for your reference.

Candidate's full signature

Invigilator's signature

RS - 11/16

(Turn over)

2018

SEAL

1. Identify, from the following, the property, which is intensive :
- (A) Heat capacity  
(B) Volume  
(C) Mass  
(D) Specific heat
2. Consider a reaction where the half-life time doubles when the initial concentration of the reactant is doubled. What is the order of the reaction ?
- (A) Zeroth order  
(B) First order  
(C) Second order  
(D) Pseudo first order
3. 10 moles of an ideal gas is compressed isothermally and reversibly from 230 L to 2.3L at 300 K. The free energy change during the process is close to ( $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ ):
- (A)  $-230 \text{ kJ}$   
(B)  $230 \text{ kJ}$   
(C)  $115 \text{ kJ}$   
(D)  $-115 \text{ kJ}$
4. The internal energy change ( $\Delta U$ ) for an ideal gas in isothermal reversible process is :
- (A) Zero  
(B) Positive  
(C) Negative  
(D) Infinite
5. Based on the first law of thermodynamics, which one of the following is correct ?
- (A) For an isothermal process,  $q = +w$   
(B) For an isochoric process,  $\Delta U = -q$   
(C) For an adiabatic process,  $\Delta U = -w$   
(D) For a cyclic process,  $q = -w$
6. The molar residual entropy for 1, 2-difluorobenzene is :
- (A) 0  
(B)  $R \ln 2$   
(C)  $R \ln 6$   
(D)  $3R \ln 2$
7. Argon gas (assumed to ideal) is expanded reversibly and adiabatically from a volume of 50 L to 200 L. If the initial temperature is 300 K then the final temperature would nearly be :
- (A) 120 K  
(B) 200 K  
(C) 225 K  
(D) 75 K

8.  $\left(\frac{\partial u}{\partial v}\right)_T$  for an ideal gas would be :
- (A) Zero  
(B) Positive  
(C) Negative  
(D) Infinite
9. According to the Debye-Hückel limiting law, at 25°C the mean ionic activity coefficient of aqueous solution of  $\text{CaCl}_2$  of molality 0.001 mol/kg will be :
- (A) 0.15  
(B) 0.33  
(C) 0.61  
(D) 0.88
10. What is the degree of dissociation of an aqueous solution of a weak acid with  $\text{pH} = 4.74$  and  $\text{pK}_a = 4.74$  ?
- (A) 0.34  
(B) 0.25  
(C) 0.9  
(D) 0.5
11. The average momentum of a particle confined in a one-dimensional box with length  $L$  is :
- (A)  $\frac{n\pi\hbar}{L}$   
(B)  $\frac{n^2\hbar^2}{4L^2}$   
(C) 0  
(D)  $\frac{n^2\hbar^2}{4L^2}$
12. An elementary step  $A \rightarrow B$  has a reaction enthalpy of  $-50\text{kJ/mol}$  and an activation energy of  $10\text{kJ/mol}$ . The activation energy for the reverse step  $B \rightarrow A$  is :
- (A) 30 kJ/mol  
(B) 40 kJ/mol  
(C) 50 kJ/mol  
(D) 60 kJ/mol
13. At constant temperature and pressure enthalpy change of mixing,  $\Delta H_{\text{mixing}}$ , of two ideal gases is :
- (A) Positive  
(B) Negative  
(C) Zero  
(D) Infinite
14. The total entropy change in a Carnot cycle is :
- (A) Positive  
(B) Negative  
(C) Zero  
(D) Infinite

15. The limiting molar conductivity of NaOH, NaF and  $\text{NH}_4\text{F}$  are 24.8, 10.5 and  $12.5 \text{ mS m}^2 \text{ mol}^{-1}$  respectively. The limiting molar conductivity of  $\text{NH}_4\text{OH}$  would be close to (in unit of  $\text{mS m}^2 \text{ mol}^{-1}$ ):
- (A) 29.1  
(B) 26.8  
(C) 10.7  
(D) 15.9
16. Choose the correct answer for a reversible chemical reaction catalyzed by an enzyme:
- (A) Enzyme accelerate both forward and backward reactions  
(B) Enzyme decelerate both forward and backward reactions  
(C) Enzyme accelerate forward reaction and decelerates backward reaction  
(D) Enzyme decelerate forward reaction and accelerates backward reaction
17. 2.0 mol of He, 3.0 mol of Ne and 1.0 mol of Ar are mixed at 300 K. Assuming that these gases behave ideally, the Gibbs free energy change of mixing in kJ is nearly equal to:
- (A) -13.82  
(B) -6.91  
(C) -1.73  
(D) -3.46
18. At 298K the standard free energy change ( $\Delta G^\circ$ ) in kJ/mol for the cell reaction  $\text{Cu}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Cu}(\text{s}) + \text{Zn}^{2+}(\text{aq})$  is ( $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.339$  and  $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.762$ ):
- (A) +106  
(B) -212  
(C) -106  
(D) +212
19. The Maxwell relation that can be derived directly from the equation,  $dG = Vdp - SdT$  is:
- (A)  $\left(\frac{\partial T}{\partial V}\right)_S = +\left(\frac{\partial p}{\partial S}\right)_V$   
(B)  $\left(\frac{\partial V}{\partial S}\right)_P = +\left(\frac{\partial p}{\partial T}\right)_S$   
(C)  $\left(\frac{\partial p}{\partial T}\right)_V = -\left(\frac{\partial S}{\partial V}\right)_T$   
(D)  $\left(\frac{\partial V}{\partial T}\right)_P = -\left(\frac{\partial S}{\partial p}\right)_T$

20. With increase in temperature for an exothermic chemical reaction the chemical equilibrium :
- (A) Shifts towards product side  
 (B) Shifts towards reactant side  
 (C) Remains unchanged  
 (D) Can't be predicted
21. The energy of a photon for a wavelength of 100 pm is (in J) :
- (A)  $1 \times 10^{-15}$   
 (B)  $2 \times 10^{-15}$   
 (C)  $3 \times 10^{-15}$   
 (D)  $4 \times 10^{-15}$
22. The ratio of ionic velocities of  $X^+$  and  $Y^-$  ions in aqueous solution of XY is 0.8. The transport numbers of  $X^+$  and  $Y^-$ , respectively, are :
- (A) 0.56 and 0.44  
 (B) 0.44 and 0.56  
 (C) 0.65 and 0.35  
 (D) 0.35 and 0.65
23. Calomel electrode consists of :
- (A) Zn,  $Zn^{+2}$   
 (B) Cu,  $Cu^{+2}$   
 (C) Hg,  $Hg_2Cl_2$   
 (D) Ag, AgCl
24. For an enzyme catalyzed reaction the Michaelis-Menten rate expression is given by (with usual meaning of various symbols) :
- (A)  $\frac{(k_1 + k_{-1})[S]}{k_2}$   
 (B)  $\frac{k_2[E]_0[S]}{k_2}$   
 (C)  $\frac{k_2[E]_0[S]}{(K_M + [S])}$   
 (D)  $\frac{k_2[S]}{(K_1 + [S])}$
25. The correct expression for energy of a particle in one dimensional box of length a is :
- (A)  $\frac{nh}{8ma^2}$   
 (B)  $\frac{n^2h}{8ma^2}$   
 (C)  $\frac{nh^2}{8ma^2}$   
 (D)  $\frac{n^2h^2}{8ma^2}$

26. The energy gap between subsequent energy levels for a quantized harmonic oscillator with angular frequency  $\omega$  is :

- (A)  $\hbar\omega$
- (B)  $n\hbar\omega$
- (C)  $h\omega$
- (D)  $nh\omega$

27. Which of the following model predicts linear decrease of electrical potential with distance in electrical double layer ?

- (A) Helmholtz model
- (B) Gouy-Chapman model
- (C) Stern model
- (D) Debye-Hückel model

28. The number of nodal planes in a  $p_x$  orbital has :

- (A) 3
- (B) 2
- (C) 1
- (D) 4

29. The ground state of  $V^{3+}$  ion is :

- (A)  ${}^3F_4$

(B)  ${}^3F_2$

(C)  ${}^5D_0$

(D)  ${}^2D_{5/2}$

30. Which of the following is acceptable wave function ?

(i)  $\psi = x^2$

(ii)  $\psi = e^{-x}$

(iii)  $\psi = e^{-x^2}$

(iv)  $\psi = \sin x$

(A) (i) and (ii)

(B) (ii) and (iii)

(C) (iii) and (iv)

(D) (iv) and (i)

31. The correct normalization factor for the wave function of a particle in an one dimensional box

$\left( \psi = \sin \frac{n\pi x}{a} \right)$  of length  $a$  is :

(A)  $\sqrt{a/2}$

(B)  $\sqrt{2/a}$

(C)  $\sqrt{a/\pi}$

(D)  $\sqrt{\pi/a}$

32. The value of the commutator  $[\hat{x}^n, \hat{p}_x]$  is (n is positive number) :
- (A)  $\frac{\hbar}{i} nx^{n-1}\psi$   
 (B)  $-\frac{\hbar}{i} nx^{n-1}\psi$   
 (C)  $\frac{\hbar}{i} (n-1)x^n\psi$   
 (D)  $-\frac{\hbar}{i} nx^{n-1}\psi$
33. The zero point energy of a harmonic oscillator with frequency  $\nu$  is :
- (A)  $k_B T$   
 (B)  $\frac{1}{2}k_B T$   
 (C)  $h\nu$   
 (D)  $\frac{1}{2}h\nu$
34. Elements in the same vertical group of the periodic table have the same :
- (A) Atomic mass  
 (B) Number of valence electrons  
 (C) Mass number  
 (D) Atomic number
35. Out of the 18 groups in the periodic table, the only group that contains examples of elements that are gas, liquid and solid at room temperature is :
- (A) 1
- (B) 6  
 (C) 12  
 (D) 17
36. According to VSEPR theory the shape of  $\text{SiCl}_3^-$  is :
- (A) Trigonal planar  
 (B) Tetrahedral  
 (C) Trigonal pyramidal  
 (D) T-shaped
37. In trigonal bipyramidal  $\text{PF}_3(\text{CH}_3)_2$  is :
- (A) The methyl groups are at equatorial positions  
 (B) The methyl groups are at axial positions  
 (C) One methyl is at equatorial position and the other one is at axial positions  
 (D) The methyl groups are in between axial and equatorial positions

38. Among the following molecules, which one has both  $p\pi - p\pi$  and  $p\pi - d\pi$  bonds ?
- (A)  $\text{NO}_2$   
 (B)  $\text{CO}_2$   
 (C)  $\text{SO}_2$   
 (D)  $\text{OF}_2$
39. The acidity of the hydrogen halides increases in the order :
- (A)  $\text{HI} < \text{HBr} < \text{HCl} < \text{HF}$   
 (B)  $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$   
 (C)  $\text{HI} < \text{HF} < \text{HBr} < \text{HCl}$   
 (D)  $\text{HBr} < \text{HI} < \text{HCl} < \text{HF}$
40. According to HSAB principle the equilibrium constant (K) of the following reaction  $\text{TiI}_4 + 2\text{TiF}_2 \rightleftharpoons \text{TiF}_4 + 2\text{TiI}_2$  will be :
- (A)  $> 1$   
 (B)  $< 1$   
 (C)  $= 1$   
 (D) No reaction
41. What is the concentration of  $\text{H}_3\text{O}^+$  for a solution at  $25^\circ\text{C}$  that has  $\text{pOH} = 5.64$  ?
- (A)  $1.29 \times 10^{-4}$   
 (B)  $2.34 \times 10^{-4}$   
 (C)  $3.27 \times 10^{-9}$   
 (D)  $4.37 \times 10^{-9}$
42. In liquid  $\text{SO}_2$ , reaction of  $\text{SOBr}_2$  with  $\text{K}_2\text{SO}_3$  will produce :
- (A)  $\text{K}_2\text{SO}_4$  and  $\text{SBr}_2$   
 (B)  $\text{KBr}$  and  $\text{SO}_2$   
 (C)  $\text{K}_2\text{S}$  and  $\text{BrO}_2$   
 (D)  $\text{K}_2\text{S}_2\text{O}_4$  and  $\text{Br}_2$
43. Reaction of Cu metal with conc.  $\text{HNO}_3$  will produce  $\text{Cu}(\text{NO}_3)_2$  and :
- (A)  $\text{H}_2$   
 (B)  $\text{N}_2$  and  $\text{H}_2\text{O}$   
 (C)  $\text{H}_2$  and  $\text{NO}_2$   
 (D)  $\text{NO}_2$  and  $\text{H}_2\text{O}$
44. The electronic configuration of  $\text{V}^{3+}$  is :
- (A)  $[\text{Ar}]3d^1$   
 (B)  $[\text{Ar}]3d^2$   
 (C)  $[\text{Ar}]3d^3$   
 (D)  $[\text{Ar}]3d^4$



45. In  $Mn_3O_4$ , the numbers of cobalt in tetrahedral and octahedral sites, respectively are :
- (A) One  $Mn^{2+}$  and two  $Mn^{3+}$   
 (B) One  $Mn^{3+}$  and two  $Mn^{2+}$   
 (C) Two  $Mn^{3+}$  and one  $Mn^{2+}$   
 (D) Two  $Mn^{2+}$  and one  $Mn^{3+}$
46. The ionic radii of  $La^{3+}$ ,  $Nd^{3+}$ ,  $Sm^{3+}$  and  $Dy^{3+}$  increases in the order :
- (A)  $La^{3+} < Nd^{3+} < Sm^{3+} < Dy^{3+}$   
 (B)  $Nd^{3+} < Dy^{3+} < La^{3+} < Sm^{3+}$   
 (C)  $Sm^{3+} < Nd^{3+} < Dy^{3+} < La^{3+}$   
 (D)  $Dy^{3+} < Sm^{3+} < Nd^{3+} < La^{3+}$
47. Electronic configuration of Lutetium (Lu) is :
- (A)  $[Xe]4f^{14}6s^2$   
 (B)  $[Xe]4f^{14}5d^16s^2$   
 (C)  $[Xe]4f^{14}5d^26s^1$   
 (D)  $[Kr]4f^{14}5d^16s^2$
48. A complex of formula  $[MA_2B_2]X_2$  having 1:2 electrolytic nature is found to have no geometrical isomers.
- Both A and B are neutral monodentate ligands and X is a halide. The structure of the complex dication is :
- (A) Tetrahedral  
 (B) Square-planar  
 (C) Square-pyramidal  
 (D) Octahedral
49. Both  $[Ni(CN)_4]^{2-}$  and  $[Zn(CN)_4]^{2-}$  are diamagnetic. The hybridization of valence orbitals of  $Ni^{2+}$  and  $Zn^{2+}$  will be :
- (A)  $sp^3$  for both  
 (B)  $sp^3$  and  $dsp^2$  respectively  
 (C)  $dsp^2$  for both  
 (D)  $dsp^2$  and  $sp^3$  respectively
50. The crystal field stabilization of tetrahedral  $[NiBr_4]^{2-}$  is :
- (A)  $-4/5\Delta_{td}$   
 (B)  $-4/9\Delta_{td}$   
 (C)  $-6/5\Delta_{td}$   
 (D)  $-6/9\Delta_{td}$

51. Match the complex ions given in Column I with the hybridization and number of unpaired electrons given in Column II :

Column I	Column II
(a) $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$	(i) $d^2sp^3, 1$
(b) $[\text{CrCl}_6]^{3-}$	(ii) $sp^3d^2, 1$
(c) $[\text{Fe}(\text{CN})_6]^{3-}$	(iii) $sp^3d^2, 2$
(d) $[\text{Ni}(\text{NH}_3)_6]^{2+}$	(iv) $sp^3d^2, 3$

- (A) a-i, b-ii, c-iii and d-iv  
 (B) a-ii, b-iv, c-i and d-iii  
 (C) a-iv, b-ii, c-iii and d-i  
 (D) a-iv, b-iii, c-ii and d-i

52. The CFSE for octahedral  $[\text{CoCl}_6]^{4-}$  is  $18,000 \text{ cm}^{-1}$ . The CFSE (in  $\text{cm}^{-1}$ ) for tetrahedral  $[\text{CoCl}_4]^{2-}$  will be :

- (A) 8,000  
 (B) 12,000  
 (C) 16,000  
 (D) 20,000

53. In tetragonally compressed octahedral low-spin  $[\text{CuF}_6]^{2-}$ , the unpaired electron of the metal centre resides in the following d-orbital :

- (A)  $d_{xz}$

- (B)  $d_{x^2-y^2}$   
 (C)  $d_{z^2}$   
 (D)  $d_{xy}$

54. Among octahedral  $\text{Ti}^{2+}$ ,  $\text{V}^{2+}$ ,  $\text{Ni}^{2+}$  and  $\text{Cu}^{2+}$  all are expected to show spin-only magnetic moment except for the following one which is expected to show both spin and orbital magnetic moments :

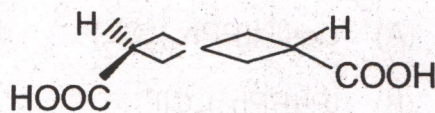
- (A)  $\text{Ti}^{2+}$   
 (B)  $\text{V}^{2+}$   
 (C)  $\text{Ni}^{2+}$   
 (D)  $\text{Cu}^{2+}$

55. The electronic spectrum of an aqueous solution of  $\text{CrO}_4^{2-}$  displays two ligand-to-metal charge transfer bands at  $26,700$  and  $37,000 \text{ cm}^{-1}$ . The approximate value of  $\Delta_{td}$  (in  $\text{cm}^{-1}$ ) from an assignment of the two bands in the MO diagram of chromate is :

- (A) 10,300  
 (B) 26,700  
 (C) 31,850  
 (D) 37,000

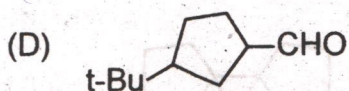
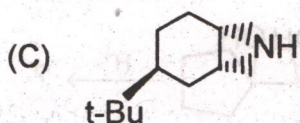
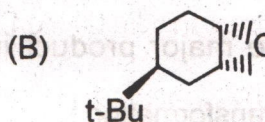
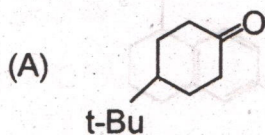
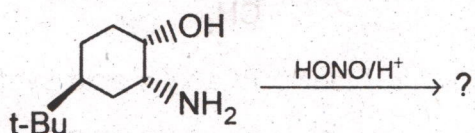
56. The ground state term symbol of  $\text{Cu}^{3+}$  is :
- (A)  $^2D_{3/2}$   
 (B)  $^3F_2$   
 (C)  $^3F_4$   
 (D)  $^2D_{5/2}$
57. An absorption band at  $9500 \text{ cm}^{-1}$  is observed in the electronic spectrum of an aqueous solution of  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ . The transition involved with this absorption and the  $10Dq$  value, respectively are :
- (A)  $^2E_g \rightarrow ^2T_{2g}$  and  $9500 \text{ cm}^{-1}$   
 (B)  $^5T_{2g} \rightarrow ^5E_g$  and  $9500 \text{ cm}^{-1}$   
 (C)  $^4T_{1g} \rightarrow ^4T_{2g}$  and  $11875 \text{ cm}^{-1}$   
 (D)  $^3A_{2g} \rightarrow ^3T_{2g}$  and  $9500 \text{ cm}^{-1}$
58. The product in the reaction of  $[\text{Pt}(\text{PPh}_3)_4]^{2+}$  with  $\text{Cl}^-$  in 1:2 mole ratio is :
- (A)  $\text{cis-}[\text{Pt}(\text{PPh}_3)_2\text{Cl}_2]$   
 (B)  $[\text{Pt}(\text{PPh}_3)_3\text{Cl}]^+$   
 (C)  $\text{trans-}[\text{Pt}(\text{PPh}_3)_2\text{Cl}_2]$   
 (D)  $[\text{Pt}(\text{PPh}_3)_3\text{Cl}]^-$
59. In the base-catalysed substitution of  $\text{Cl}^-$  by  $\text{OH}^-$  in  $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$  under strongly basic conditions, the first step in the mechanism is :
- (A) Conversion of an amine to amido ligand  
 (B) Dissociation of  $\text{Cl}^-$  to produce a 5-coordinated intermediate  
 (C) Dissociation of an ammine to produce a 5-coordinated intermediate  
 (D) Association of  $\text{OH}^-$  to produce a 7-coordinated intermediate
60. Which of the following lists contains only unstable isotopes ?
- (A)  $^{207}\text{Pb}$ ,  $^{99}\text{Tc}$ ,  $^{13}\text{N}$   
 (B)  $^{214}\text{Pb}$ ,  $^{47}\text{Ca}$ ,  $^{12}\text{N}$   
 (C)  $^{238}\text{U}$ ,  $^{99}\text{Tc}$ ,  $^{14}\text{N}$   
 (D)  $^{238}\text{U}$ ,  $^{40}\text{Ca}$ ,  $^{99}\text{Tc}$
61.  $^{222}\text{Rn}$  is unstable and decays by emitting two alpha and two beta particles. What is the final decay product ?
- (A)  $^{212}\text{Tl}$   
 (B)  $^{214}\text{Po}$   
 (C)  $^{216}\text{Pb}$   
 (D)  $^{218}\text{Bi}$

62. A radioisotope has a half-life of 5h. Starting with 32 g of the material, what will be the amount of the radioisotope after 20 h ?
- (A) 2g  
(B) 4g  
(C) 6g  
(D) 8g
63. Using 18-electron rule find the value of 'n' in  $[\text{Co}(\text{CO})_n(\text{NO})]$  :
- (A) 2  
(B) 3  
(C) 4  
(D) 5
64. If the compound  $[\text{W}(\text{Cp})_2(\text{CO})_2]$  obeys the 18-electron rule, the hapticities of the two Cp moieties are :
- (A)  $\eta^5$  and  $\eta^5$   
(B)  $\eta^5$  and  $\eta^3$   
(C)  $\eta^3$  and  $\eta^3$   
(D)  $\eta^1$  and  $\eta^5$
65. The catalyst used for the oxidation of ethylene to acetaldehyde by Wacker process is :
- (A)  $[\text{Ru}(\text{PPh}_3)_3\text{Cl}_2]$   
(B)  $[\text{Co}_2(\text{CO})_8]$  and  $\text{H}_2$   
(C)  $\text{PdCl}_2$  and  $\text{CuCl}_2$   
(D)  $\text{TiCl}_4$  and  $\text{AlEt}_3$
66. In Monsanto acetic acid synthesis ( $\text{CH}_3\text{OH} + \text{CO} \rightarrow \text{CH}_3\text{COOH}$ ) using  $[\text{Rh}(\text{CO})_2\text{I}_2]^-$  as the catalyst in presence of HI at  $180^\circ\text{C}$  and 30 bar pressure, the role of HI is :
- (A) To convert  $\text{CH}_3\text{OH}$  to  $\text{CH}_3\text{I}$   
(B) To reduce Rh(I) catalyst to Rh(0) species  
(C) To convert  $\text{CH}_3\text{OH}$  to a stronger nucleophile  $\text{CH}_3\text{O}^-$   
(D) To reduce a Rh(III) active species to Rh(I) to complete the catalytic cycle
67. Find out the absolute configuration of the following axially chiral compound :

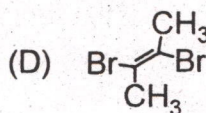
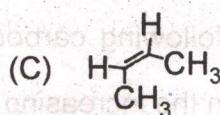
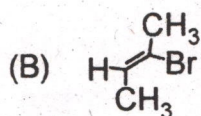
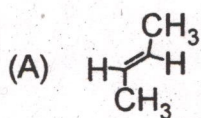
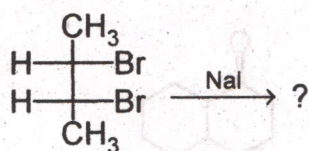


- (A) aR  
(B) aS  
(C) RR  
(D) SS

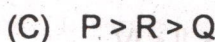
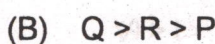
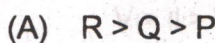
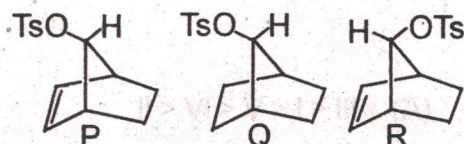
68. The major product obtained in the following transformation is :



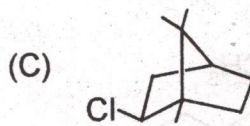
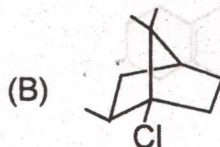
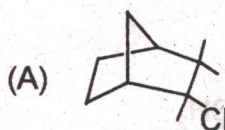
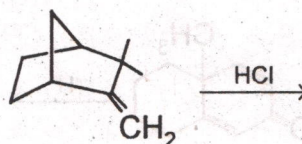
69. The product obtained in the following iodide induced elimination of meso-2,3-dibromobutane is :



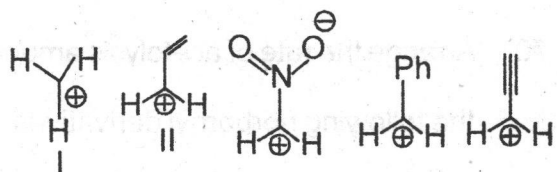
70. Arrange the rate of acetolysis among the following norbornyl derivatives :



71. The major product obtained in the following reaction is :

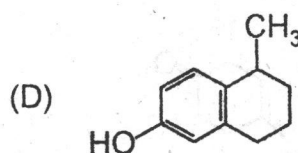
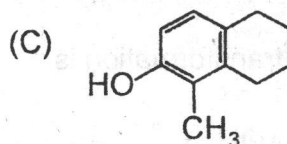
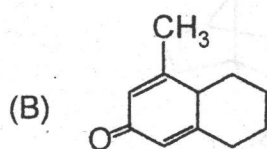
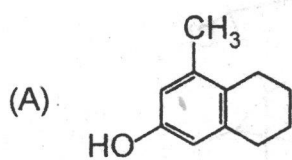
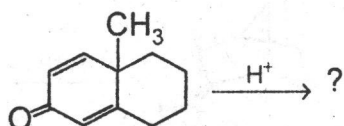


72. Arrange the following carbocation intermediate in the increasing order of their stability.

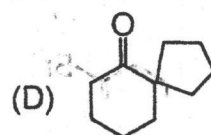
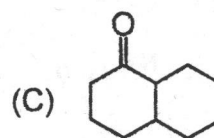
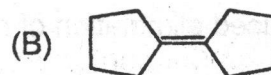
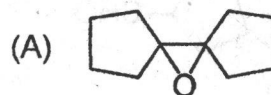
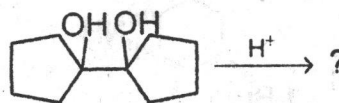


- (A) III < I < V < IV < II  
 (B) III < I < IV < II < V  
 (C) III < II < V < I < IV  
 (D) III < I < V < II < IV

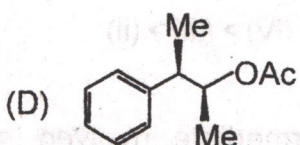
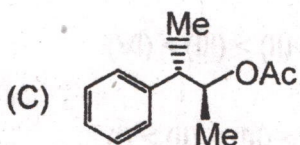
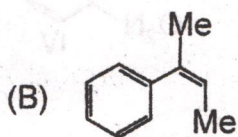
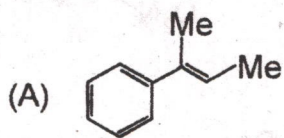
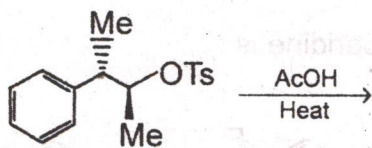
73. The major product obtained in the following transformation is :



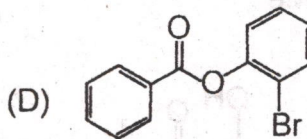
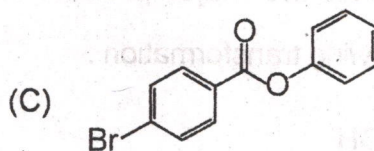
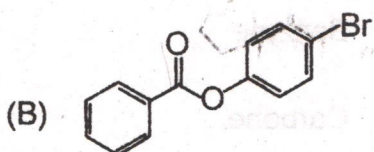
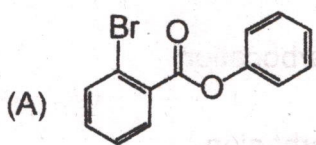
74. Predict the major product in the following transformation :



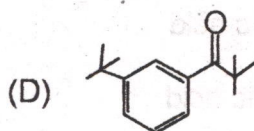
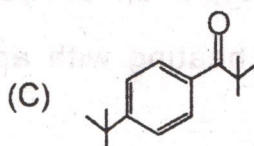
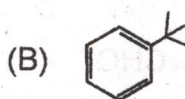
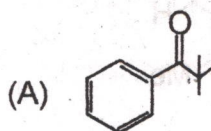
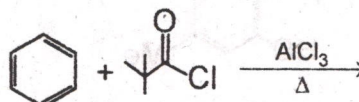
75. Predict the major product in the following transformation :



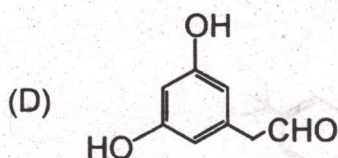
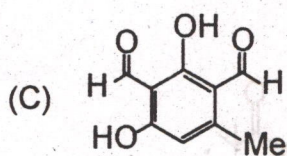
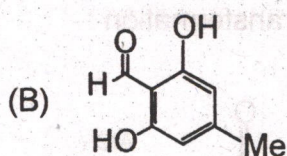
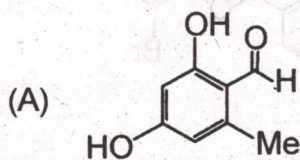
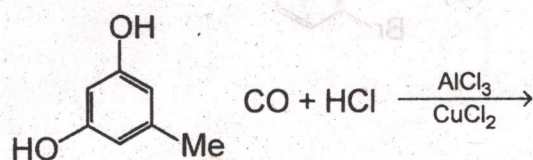
76. The major product obtained in the bromination of phenyl benzoate with  $\text{Br}_2/\text{AlBr}_3$  is :



77. Predict the major product in the following transformation :



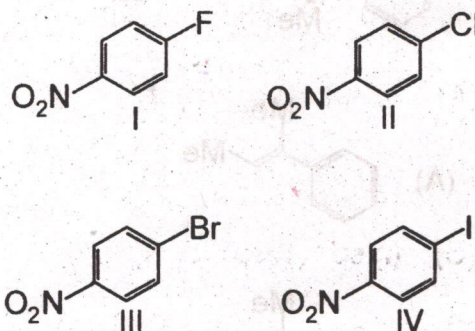
78. Predict the major product in the following transformation :



79. The one forms an anhydride fastest on heating with acetic anhydride is :

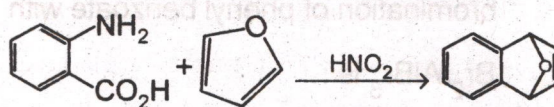
- (A) Maleic acid
- (B) Fumaric acid
- (C) Succinic acid
- (D) Glutaric acid

80. The correct order of the reactivity of the following compounds with piperidine is :



- (A) (IV) > (III) > (I) > (II)
- (B) (I) > (II) > (III) > (IV)
- (C) (IV) > (III) > (II) > (I)
- (D) (I) > (IV) > (III) > (II)

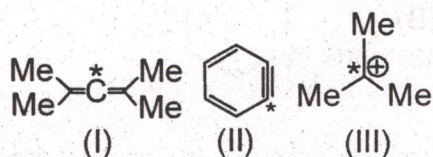
81. The intermediate involved in the following transformation is :



- (A) Carbocation
- (B) Carbanion
- (C) Benzyne
- (D) Carbene



82. The hybridization of the labelled carbon is :



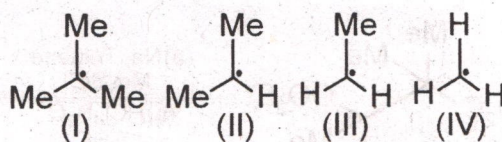
- (A) (i)  $sp^2$  (ii)  $sp$  (iii)  $sp^2$   
 (B) (i)  $sp$  (ii)  $sp^2$  (iii)  $sp^3$   
 (C) (i)  $sp^2$  (ii)  $sp^2$  (iii)  $sp^2$   
 (D) (i)  $sp$  (ii)  $sp^2$  (iii)  $sp^2$

83. Match the name reactions given in Column I with the final products given in Column II :

Column I	Column II
(a) Mannich	(i) $\alpha, \beta$ -unsaturated diester
(b) Knoevenagel	(ii) $\alpha$ -hydroxy ketone
(c) Stobbe	(iii) $\alpha, \beta$ -unsaturated carboxylic acid
(d) Benzoin	(iv) $\beta$ -aminoketone

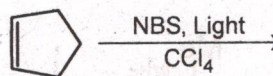
- (A) a-iv, b-i, c-iii and d-ii  
 (B) a-ii, b-iii, c-i and d-iv  
 (C) a-i, b-ii, c-iii and d-iv  
 (D) a-iv, b-iii, c-i and d-ii

84. The correct order of the stability of the following radicals is :



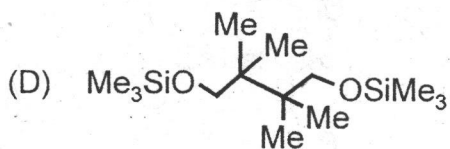
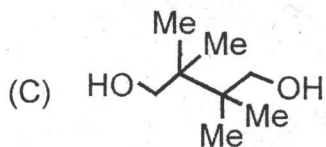
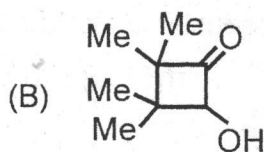
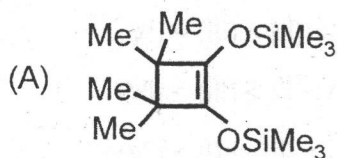
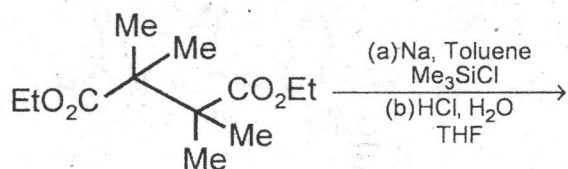
- (A) (IV) > (III) > (II) > (I)  
 (B) (I) > (II) > (III) > (IV)  
 (C) (II) > (I) > (III) > (IV)  
 (D) (II) > (III) > (I) > (IV)

85. Predict the product and intermediate involved in the following transformation :

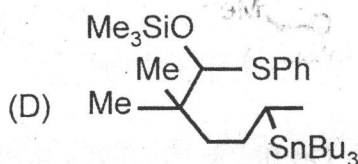
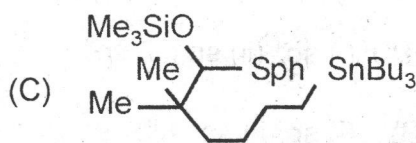
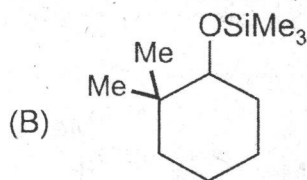
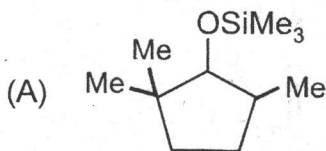
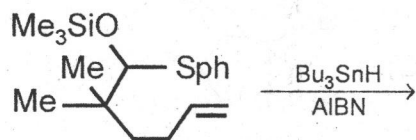


- (A) Free Radical  
 (B) Carbocation  
 (C) Free Radical  
 (D) Free Radical

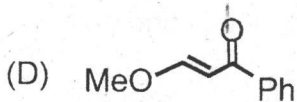
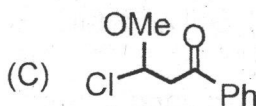
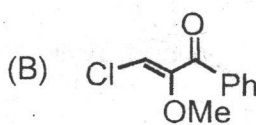
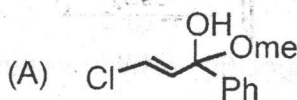
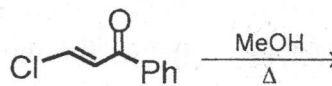
86. Predict the product in the following transformation :



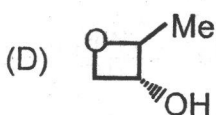
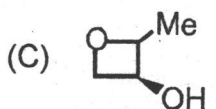
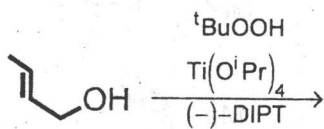
87. Predict the product in the following transformation :



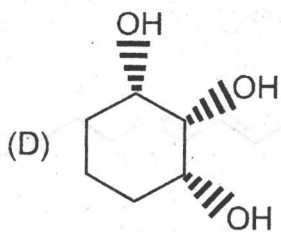
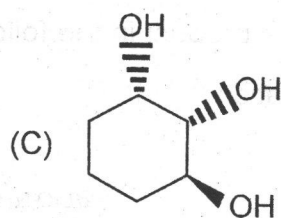
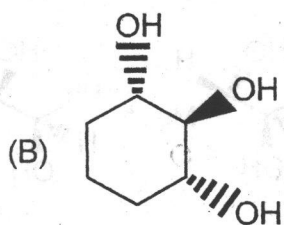
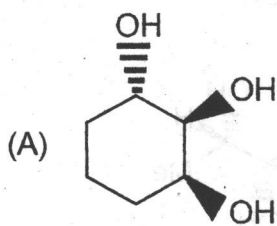
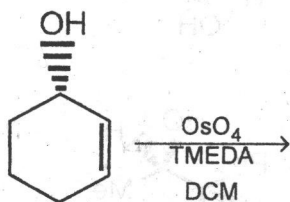
88. Predict the product in the following transformation :



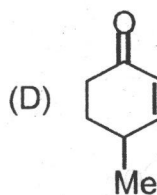
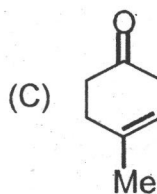
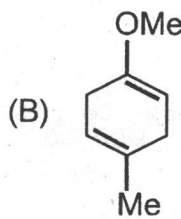
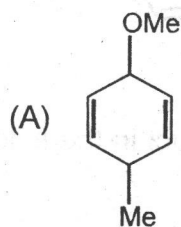
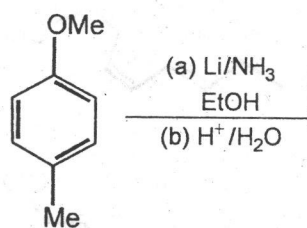
89. Predict the product in the following transformation :



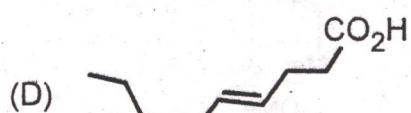
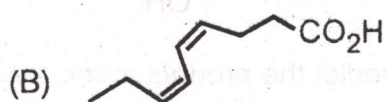
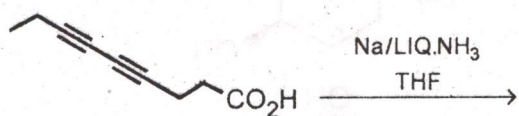
90. Predict the product in the following transformation :



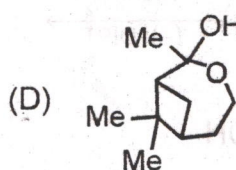
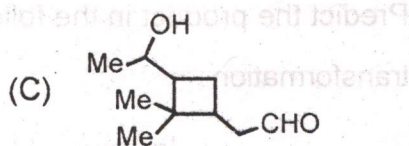
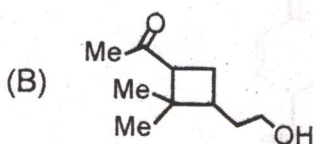
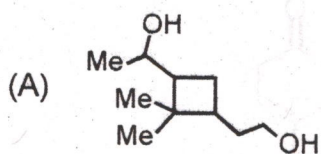
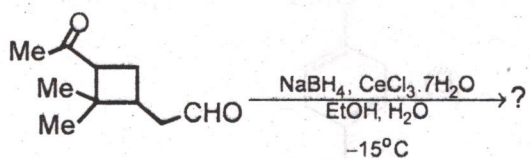
91. Predict the product in the following transformation :



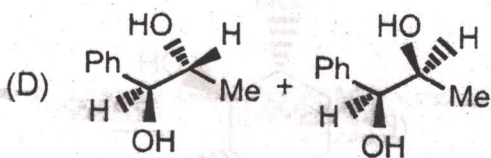
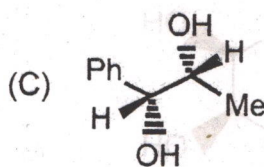
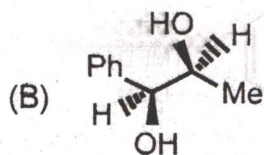
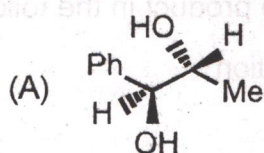
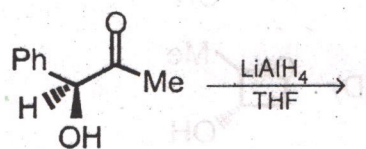
92. Predict the product in the following transformation :



93. Predict the product in the following transformation :

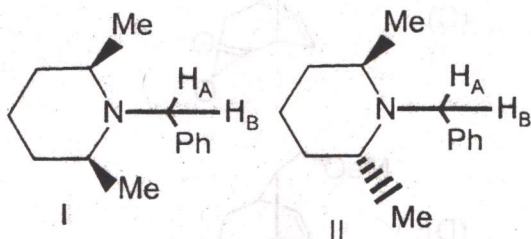


94. Predict the product in the following transformation :



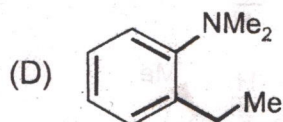
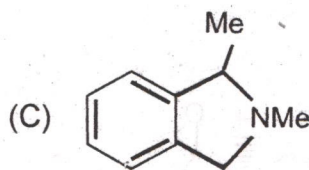
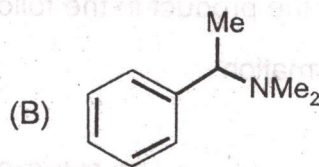
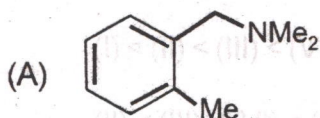
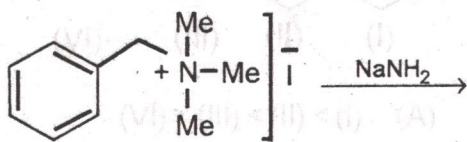
(1 : 1 Racemic mixture)

95. The two benzylic hydrogen's  $H_A$  and  $H_B$  in the compounds I and II, are :

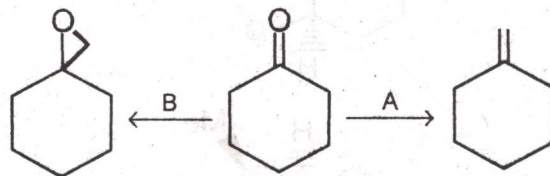


- (A) Diastereotopic in I and enantiotopic in II  
 (B) Diastereotopic in II and enantiotopic in I  
 (C) Diastereotopic in both I and II  
 (D) Enantiotopic in both I and II

96. Predict the product in the following transformation :

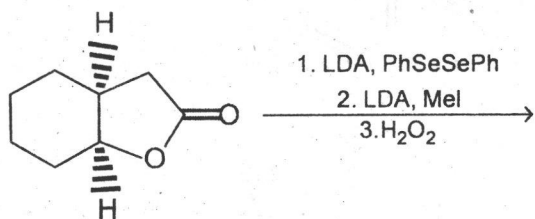


97. The reagents A and B in the following reactions are :



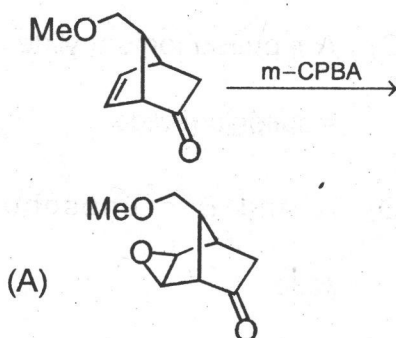
- (A) A = sulfonium ylide and B = phosphonium ylide  
 (B) A and B = sulfonium ylide  
 (C) A = phosphonium ylide and B = sulfonium ylide  
 (D) A and B = phosphonium ylide

98. Predict the product in the following transformation :



- (A)
- (B)
- (C)
- (D)

99. Predict the major product in the following transformation :

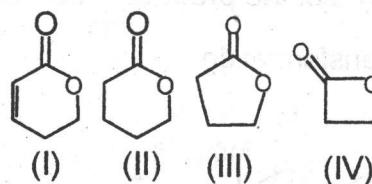


- (B)
- (C)
- (D)

100. First order  $^1\text{H}$  NMR spectra is obtained when :

- (A)  $\Delta\nu/J < 6$
- (B)  $\Delta\nu/J > 6$
- (C)  $J/\Delta\nu < 6$
- (D)  $J/\Delta\nu > 6$

101. The correct order of carbonyl stretching frequencies of the following compounds is :



- (A) (I) > (II) > (III) > (IV)
- (B) (IV) > (III) > (I) > (II)
- (C) (IV) > (III) > (II) > (I)
- (D) (I) > (IV) > (III) > (II)

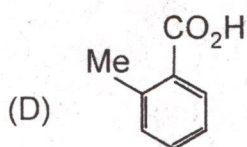
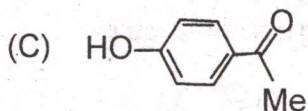
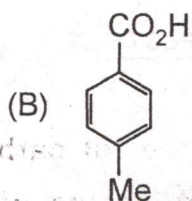
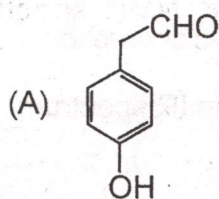
102. An unknown compound shows the following **representative** peaks.

**IR** : a broad peak from 2500-3500  $\text{cm}^{-1}$ , a peak at 1680  $\text{cm}^{-1}$ .

**$^{13}\text{C}$  NMR** : Shows four peaks in the region 125-145 ppm in addition to other peaks.

**Mass** : 136 (M), 119, 91, 65, 39.

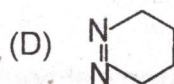
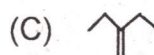
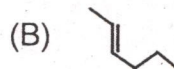
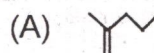
The structure of the compound is :



103. An unknown compound has the following **representative** spectral characteristics :

**IR** : peaks at 1650  $\text{cm}^{-1}$  and 880  $\text{cm}^{-1}$ ; **Mass** : 84 (M), 69, 56 (base peak), 41

The structure of the compound is :



104. Which of the following is correct with respect to increasing order of molecular ion lifetime ?

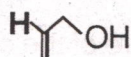
(A) Alcohols < ketones < unbranched hydrocarbons < aromatic compounds

(B) Alcohols < unbranched hydrocarbons < aromatic compounds < ketones

(C) Ketones < alcohols < unbranched hydrocarbons < aromatic compounds

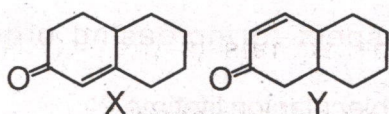
(D) Unbranched hydrocarbons < alcohols < ketones < aromatic compounds

105. The splitting pattern of the hydrogen (marked bold) in the following compound is :



- (A) quint
- (B) ddt
- (C) tdd
- (D) tt

106. The predicted electronic absorption maxima of X and Y are respectively :

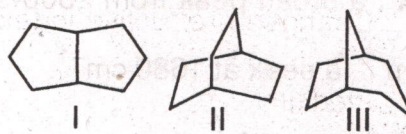


- (A) 239 nm and 245 nm
- (B) 244 nm and 245 nm
- (C) 239 nm and 227 nm
- (D) 244 nm and 227 nm

107. The ratio of the peaks at  $m/z$  146, 148 and 150 in the mass spectrum of dichlorobenzene is :

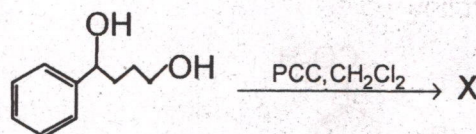
- (A) 1 : 1 : 1
- (B) 3 : 3 : 1
- (C) 1 : 2 : 1
- (D) 9 : 6 : 1

108. The number of signals (decoupled  $^{13}\text{C}$  NMR spectrum) for the bicyclooctane I-III, respectively, are :



- (A) Five, four and eight
- (B) Three, two and five
- (C) Five, four and five
- (D) Three, two and eight

109. In the following reaction, the X exhibited a strong absorption at  $\nu_{\text{max}}$  1756  $\text{cm}^{-1}$  in the IR spectrum. The structure of X is :



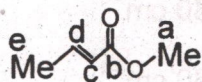
- (A)
- (B)
- (C)
- (D)



110. Which of the following will result in deviation from Beer's law :

- (A) Change in refractive index of medium
- (B) Dissociation of analyte on dilution
- (C) Polychromatic light
- (D) Path length of cuvette

111. The correct  $^{13}\text{C}$  NMR chemical shift values of carbons labelled a-e in the following ester are :

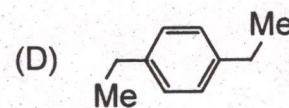
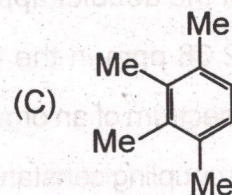
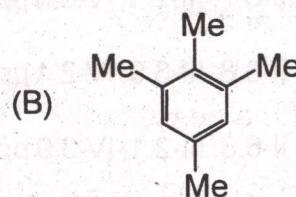
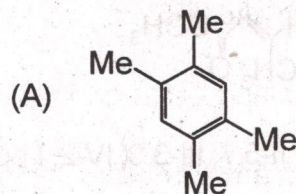


- (A) a : 19; b : 143; c : 167; d : 125; e : 52
- (B) a : 52; b : 143; c : 167; d : 125; e : 19
- (C) a : 52; b : 167; c : 143; d : 125; e : 19
- (D) a : 52; b : 167; c : 125; d : 143; e : 19

112. The number of lines in the ESR spectrum of  $\text{CD}_3$  is (the spin of D is 1) :

- (A) 1
- (B) 3
- (C) 4
- (D) 7

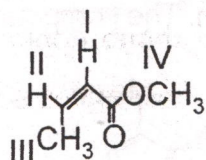
113. An organic compound having the molecular formula  $\text{C}_{10}\text{H}_{14}$  exhibited two singlets in the  $^1\text{H}$  NMR spectrum, three signals in the  $^{13}\text{C}$  NMR spectrum. The compound is :



114.  $^1\text{H}$  NMR spectrum of [18]-annulene shows :

- (A) Only one peak at  $\delta$  7.2 (18H)
- (B) Only one peak at  $\delta$  5.0 (18H)
- (C) Two peak at  $\delta$  9.0 (12H) and  $\delta$  - 3.0 (6H)
- (D) Two peak at  $\delta$  9.0 (6H) and  $\delta$  - 3.0 (12H)

115. Appropriate  $^1\text{H}$  NMR chemical shift ( $\delta$ ) for the protons I-IV for the following compound are :



- (A) I-6.8; II-5.7; III-3.9; IV-2.1 ppm
- (B) I-6.8; II-5.7; III-2.1; IV-3.9 ppm
- (C) I-5.7; II-6.8; III-3.9; IV-2.1 ppm
- (D) I-5.7; II-6.8; III-2.1; IV-3.9 ppm

116. The two lines of the doublet appear at  $\delta$  2.35 and 2.38 ppm in the 400 MHz  $^1\text{H}$  NMR spectrum of an organic compound. The coupling constant (J) value is :

- (A) 3.0 Hz
- (B) 6.0 Hz

(C) 9.0 Hz

(D) 12 Hz

117. "Phosphorescence" is represented as :

- (A)  $T_1 \rightarrow S_0 + h\nu$
- (B)  $T_1 \rightarrow S_0 + \Delta$
- (C)  $S_1 \rightarrow S_0 + h\nu$
- (D)  $S_1 \rightarrow T_1 + \Delta$

118. In the IR spectrum of p-nitrophenyl acetate, the carbonyl absorption band appears at :

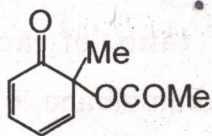
- (A)  $1670\text{ cm}^{-1}$
- (B)  $1700\text{ cm}^{-1}$
- (C)  $1730\text{ cm}^{-1}$
- (D)  $1760\text{ cm}^{-1}$

119. The angle at which the first order Bragg reflection is observed from (110) plane in a simple cubic unit cell of side  $3.238\text{ \AA}$ , when chromium  $K_{\alpha}$  radiation of wavelength  $2.29\text{ \AA}$  is used, as :

- (A)  $30^\circ$
- (B)  $45^\circ$
- (C)  $60^\circ$
- (D)  $90^\circ$

120. X-ray diffraction does not give any structural information for :
- (A) Metallic solids
  - (B) Ionic solids
  - (C) Molecular solids
  - (D) Amorphous solids
121. The spectroscopic technique, by which the ground state dissociation energies of diatomic molecules can be estimated, is :
- (A) Microwave spectroscopy
  - (B) Infrared spectroscopy
  - (C) UV-visible absorption spectroscopy
  - (D) X-ray spectroscopy
122. The compound that exhibits sharp bands at  $3300$  and  $2150\text{ cm}^{-1}$  in the IR spectrum is :
- (A) 1-butyne
  - (B) 2-butyne
  - (C) Butyronitrile
  - (D) Butylamine
123. A dilute solution of a mixture of acetone and dichloromethane in  $\text{CDCl}_3$  exhibits two singlets of 1 : 1 intensity in the  $^1\text{H}$  NMR spectrum. Molar ratio of acetone and dichloromethane in the solution is :
- (A) 3 : 1
  - (B) 1 : 3
  - (C) 1 : 1
  - (D) 1 : 2
124. In the mass spectrum of 1, 2-dichloroethane, approximate ratio of peaks at  $m/z$  values 98, 100, 102 will be :
- (A) 3 : 1 : 1
  - (B) 9 : 6 : 1
  - (C) 1 : 1 : 2
  - (D) 1 : 2 : 1
125. Intense absorption of the  $\alpha, \beta$ -unsaturated carbonyl compounds is due to the :
- (A)  $\pi \rightarrow \pi^*$  transition
  - (B)  $n \rightarrow \pi^*$  transition
  - (C)  $\sigma \rightarrow \pi^*$  transition
  - (D)  $\pi \rightarrow \sigma^*$  transition

126. Based on the Woodward's rule, predict the UV maximum of the following molecule :

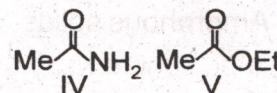
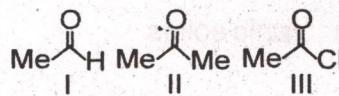


- (A) 215 nm
- (B) 254 nm
- (C) 280 nm
- (D) 300 nm

127. The ultraviolet spectrum of benzonitrile shows a primary absorption band at 224 nm. The solution of benzonitrile in water, with a concentration of  $1 \times 10^{-4}$  molar, is examined at a wavelength of 224nm, and the absorbance is determined to be 1.30. The cell length is 1.0 cm. What is the molar absorptivity of this absorption band ?

- (A)  $2.3 \times 10^4$
- (B)  $3.3 \times 10^4$
- (C)  $1.3 \times 10^4$
- (D)  $4.3 \times 10^4$

128. The correct order of  $\lambda_{\max}$  for  $n \rightarrow \pi^*$  transition for the given compounds is :



- (A) I > II > III > IV > V
- (B) I > IV > II > III > V
- (C) I > III > II > IV > V
- (D) V > IV > III > I > II

129. The mass spectrum of nitromethane,  $\text{CH}_3\text{NO}_2$ , shows major peaks at  $m/z$  61, 46, 30 (base peak) and 15. Which statement is inconsistent with these data ?

- (A) The parent ion is observed
- (B) C-N bond cleavage occurs
- (C)  $[\text{NO}]^+$  is a fragment ion
- (D)  $[\text{NO}_2]^+$  is not formed as a fragment

130. The data obtained from two sets of experiments A and B have the following characteristics :

Experiment	I	II
Mean	50 units	100 units
Standard Deviation	2 units	2 units

It may be concluded that :

- (A) I is more precise than II
- (B) I is less precise than II
- (C) I and II are of same precision
- (D) Relative precision of I and II cannot be accessed

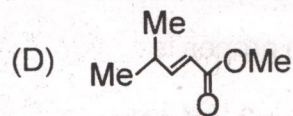
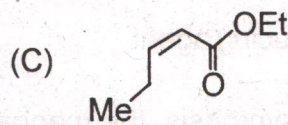
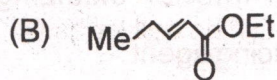
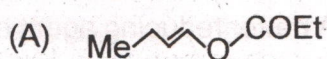
131. Bromine has two isotopes  $^{79}\text{Br}$  and  $^{80}\text{Br}$ , each  $\approx 50\%$  abundant. In the mass spectrum of tribromomethane ( $\text{CHBr}_3$ ), the highest mass peaks are at  $m/z = 250, 251, 252$  and  $253$ . The ratio of the intensities of these peaks is :

- (A) 1 : 1 : 1 : 1
- (B) 1 : 2 : 2 : 1
- (C) 1 : 3 : 3 : 1
- (D) 2 : 1 : 1 : 2

132. In column chromatography the stationary and the mobile phase are respectively made of :

- (A) Solid, liquid
- (B) Liquid, liquid
- (C) Liquid, gas
- (D) Solid, gas

133. An organic compound ( $\text{C}_7\text{H}_{12}\text{O}_2$ ) exhibited the following data in the  $^1\text{H}$  NMR spectrum.  $\delta$  7.10 (1H, dt,  $J = 16, 7.2$  Hz), 5.90 (1H, dt,  $J = 16, 2$  Hz), 4.1 (2H, q,  $J = 7.2$  Hz), 2.10 (2H, m), 1.25 (3H, t,  $J = 7.2$  Hz), 0.9 (3H, t,  $J = 7.2$  Hz) ppm.



134. The ion plays important role in enzymatic regulation processes is :
- (A)  $\text{Ca}^{2+}$   
 (B)  $\text{Ba}^{2+}$   
 (C)  $\text{Sr}^{2+}$   
 (D)  $\text{Cr}^{2+}$
135. The two essential parameters which control cooperative oxygen binding by hemoglobin are :
- (A) Temperature and oxygen partial pressure  
 (B) Viscosity and pH  
 (C) pH and oxygen partial pressure  
 (D) Viscosity and temperature
136. Compared to ground state, upon photoexcitation, chlorophyll acts as :
- (A) A better oxidizing agent only  
 (B) A better reducing agent only  
 (C) Both inferior oxidizing and reducing agent  
 (D) Both superior oxidizing and reducing agent
137. In photosynthesis, the manganese oxidation states involved for the water oxidation process is :
- (A) + 2, + 3, + 4 only  
 (B) + 2, + 3, + 4, + 5 only  
 (C) + 2, + 3 only  
 (D) + 3, + 4 only
138. The reduction reaction cannot be performed by nitrogenase is :
- (A) 2-electrons  
 (B) 3-electrons  
 (C) 4-electrons  
 (D) 6-electrons
139. In the active site of carboxypeptidase A, the coordination geometry of  $\text{Zn}^{2+}$  ion is :
- (A) Trigonal planar  
 (B) Perfectly tetrahedral  
 (C) Square planar  
 (D) Distorted tetrahedral
140. Variation of cytochromes is due to change of :
- (A) Metal ions  
 (B) Oxidation of metal ions  
 (C) Ligands attached to the metal ion  
 (D) Metal ions, their oxidation states and ligands

141. The metal ion complexes used for the treatment of cancer is :

- (A)  $\text{Au}^+$
- (B)  $\text{Pt}^{2+}$
- (C)  $\text{Gd}^{3+}$
- (D)  $\text{Bi}^{5+}$

142. The correct order of intensity of the following electronic transitions is :

- (A) Charge transfer > Laporte forbidden > Spin forbidden
- (B) Spin forbidden > Laporte forbidden > Charge transfer
- (C) Charge transfer > Spin forbidden > Laporte forbidden
- (D) Laporte forbidden > Charge transfer > Spin forbidden

143. The photosensitizer among the following is :

- (A) Myoglobin
- (B) Ferredoxin
- (C) Chlorophyll
- (D) Nitrogenase

144. The incorrect statement about Beer-Lambert law is :

- (A) It is valid under all the concentration of solutions
- (B) Solution should be homogeneous
- (C) There should not be any molecular association
- (D) The solution should not be turbid

145. The most preferred cation by valinomycin is :

- (A)  $\text{Ca}^{2+}$
- (B)  $\text{Na}^+$
- (C)  $\text{K}^+$
- (D)  $\text{V}^{2+}$

146. Which of the following species makes strongest complexation with [21]crown-7 ?

- (A)  $\text{Cs}^+$
- (B)  $\text{Na}^+$
- (C)  $\text{Li}^+$
- (D)  $\text{K}^+$

147. The correct affinity order of the following cryptands to sodium ion is :

- (A) [2.1.1] cryptand < [2.2.1] cryptand < [2.2.2] cryptand
- (B) [2.2.2] cryptand < [2.2.1] cryptand < [2.1.1] cryptand
- (C) [2.1.1] cryptand < [2.2.2] cryptand < [2.2.1] cryptand
- (D) [2.2.1] cryptand < [2.1.1] cryptand < [2.2.2] cryptand

148. The incorrect statement about  $\alpha$ -,  $\beta$ - and  $\gamma$ -cyclodextrins is :

- (A) They contain 6, 7 and 8 glucose units respectively
- (B) They have different internal cavity center diameters
- (C) They have similar cavity depth
- (D) They have similar solubility in water

149. The calixarene that does not bind with fullerene- $C_{60}$  is :

- (A) Calix [4] arene

(B) Calix [5] arene

(C) Calix [6] arene

(D) Calix [8] arene

150. The Quantum yield of a photochemical reaction was found to be 0.3. Light of Wavelength 256 nm was used to irradiate the reactant and  $3 \times 10^{-5}$  moles of product were formed at the end of the reaction. Calculate the total energy absorbed in the process :

(A) 25.24J

(B) 46.74J

(C) 76.45J

(D) 59.56J

151. Which of the following is not part of Jablonski Diagram ?

(A) Fluorescence

(B) Phosphorescence

(C) Delayed fluorescence

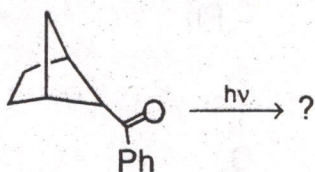
(D) Delayed phosphorescence



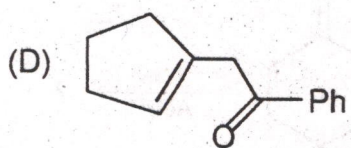
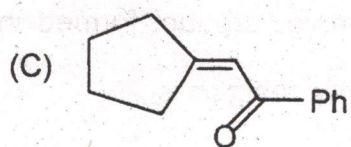
152. Internal conversion and intersystem crossing are transitions between electronic states of :

- (A) Same multiplicity and different multiplicity respectively
- (B) Same multiplicities
- (C) Different multiplicities
- (D) Different multiplicity and same multiplicity respectively

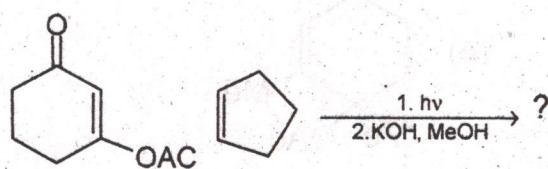
153. The major product formed in the following photochemical transformation is :



- (A)
- (B)

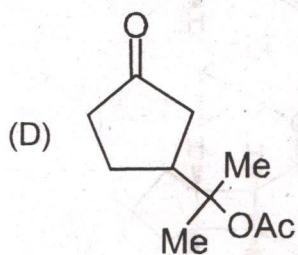
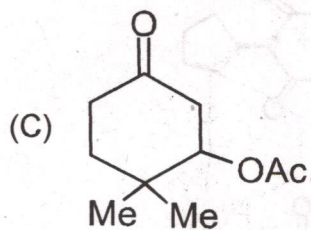
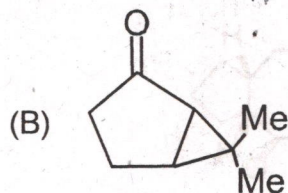
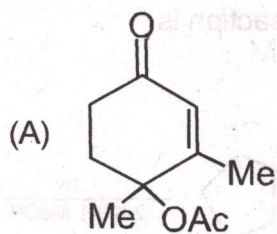
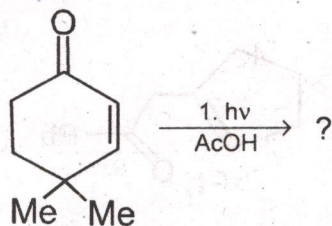


154. The major product formed in the following reaction is :

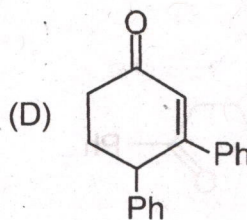
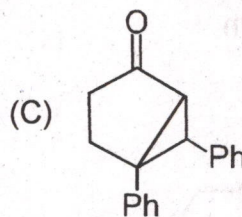
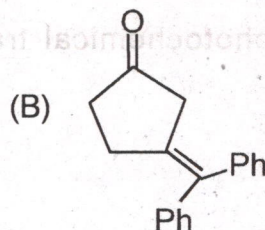
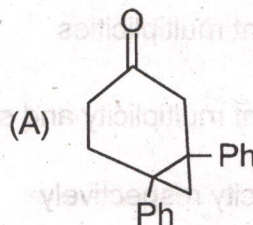
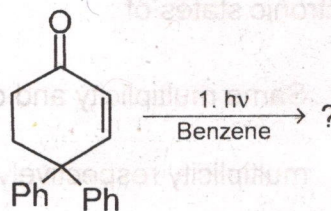


- (A)
- (B)
- (C)
- (D)

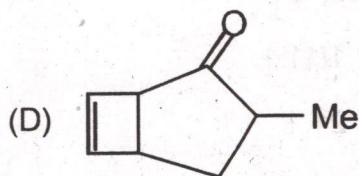
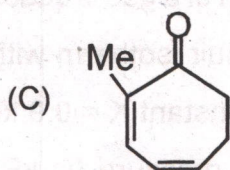
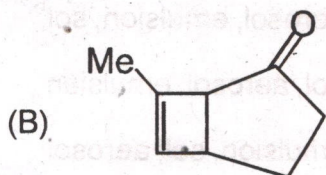
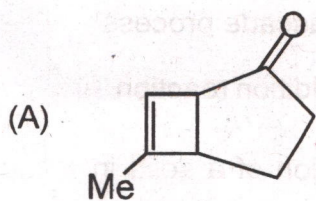
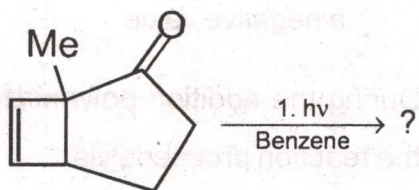
155. The major product formed in the following reaction is :



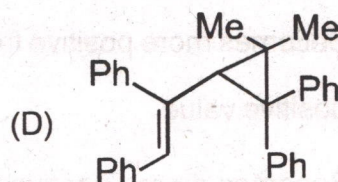
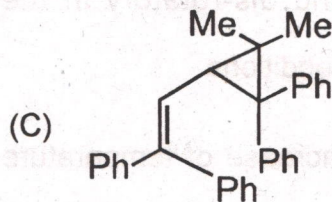
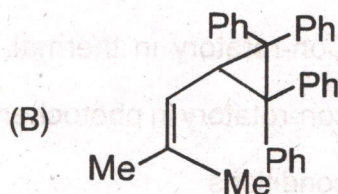
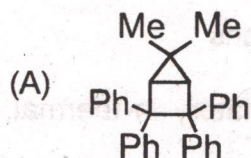
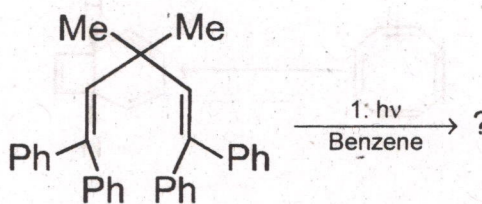
156. The major product formed in the following reaction is :



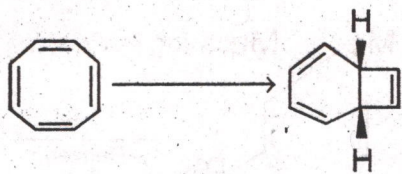
157. The major product formed in the following reaction is :



158. The major product formed in the following reaction is :



159. The most appropriate mode of cyclization in the following transformation is :



- (A) Con-rotatory in photochemical and dis-rotatory in thermal conditions
- (B) Con-rotatory in thermal, and dis-rotatory in photochemical conditions
- (C) Con-rotatory in thermal, and con-rotatory in photochemical conditions
- (D) Dis-rotatory in photochemical and dis-rotatory in thermal conditions
160. With increase of temperature, the Gibbs free energy of the adsorption of a gas on to a solid surface :
- (A) Becomes more positive from a positive value
- (B) Becomes more negative from a positive value

- (C) Becomes more positive from a negative value
- (D) Becomes more negative from a negative value

161. During the addition polymerization the reaction proceeds via :

- (A) Step-growth process
- (B) Free-radical chain reaction
- (C) Cascade process
- (D) Addition reaction

162. Dispersion of a solid in a liquid, a liquid in a gas and a liquid in a liquid are respectively known as :

- (A) Aerosol, emulsion, sol
- (B) Sol, aerosol, emulsion
- (C) Emulsion, sol, aerosol
- (D) Aerosol, sol, emulsion

163. The adsorption of a gas is described by the Langmuir isotherm with the equilibrium constant  $K = 0.9 \text{ kPa}^{-1}$  at  $25^\circ\text{C}$ . The pressure (in kPa) at which the fractional surface coverage is 0.95, is :

- (A) 1/11.1
- (B) 21.1
- (C) 11.1
- (D) 42.2

164. For a polydispersed macromolecular colloid, osmometry gives :

- (A) Weight-average molecular weight
- (B) Number-average molecular weight
- (C) Both weight-average molecular weight and number-average molecular weight
- (D) Viscosity-average molecular weight

165. In radical chain polymerization, the quantity given by 'the rate of monomer depletion, divided by the rate of propagating radical formation' is called :

- (A) Kinetic chain length
- (B) Propagation efficiency
- (C) Propagation rate constant
- (D) Polymerization time



**SPACE FOR ROUGH WORK**

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

SEAL