

# A

22104

120 MINUTES

1. A particle having a mass  $10^{-30}$  kg is moving with a velocity  $3.315 \times 10^7$  ms<sup>-1</sup>. The wave length associated with the particle is  
A)  $2 \times 10^{-11}$  m                      B)  $3.315 \times 10^{-11}$  m  
C)  $6.63 \times 10^{-11}$  m                      D)  $1 \times 10^{-11}$  m
2. If  $0 \leq x \leq a$ , the normalizing constant A in the wave function  $\Psi = Ae^{-iax}$  is  
A)  $\frac{1}{a}$                       B)  $\frac{1}{\sqrt{a}}$                       C)  $\frac{1}{\sqrt{2a}}$                       D)  $\frac{1}{2a}$
3. For a particle in a cubic box, which of the following energies represents a non-degenerate level?  
A)  $\frac{6h^2}{8ma^2}$                       B)  $\frac{11h^2}{8ma^2}$                       C)  $\frac{12h^2}{8ma^2}$                       D)  $\frac{14h^2}{8ma^2}$
4. Identify the correct order of stability of the species given below:  
A)  $NO^- > NO > NO^+$                       B)  $NO > NO^+ > NO^-$   
C)  $NO^+ > NO > NO^-$                       D)  $NO^- > NO^+ > NO$
5. The term symbol of O<sub>2</sub> molecule is:  
A)  $^3\Sigma_u^-$                       B)  $^3\Sigma_g^-$                       C)  $^3\Sigma_g^+$                       D)  $^3\Sigma_u^+$
6. Identify the correct statements among the following:  
1. C<sub>4</sub> is a cyclic group                      2. D<sub>2</sub> is an abelian group  
3. S<sub>5</sub> generates five operations  
A) 1 & 2 only                      B) 1 & 3 only                      C) 2 & 3 only                      D) 1, 2 & 3
7. Which of the following molecules belong to D<sub>3d</sub> point group?  
1. H<sub>3</sub>BO<sub>3</sub>                      2. cyclohexane (chair)  
3. ethane (staggered)  
A) 1 & 2 only                      B) 1 & 3 only                      C) 2 & 3 only                      D) 1, 2 & 3
8. The width of spectral lines is independent of  
A) molecular collision                      B) Doppler effect  
C) uncertainty principle                      D) transition probability

9. A part of the character table of the  $C_{3V}$  point group and a total representation are given below.

$C_{3V}$	E	$2C_3$	$3\sigma_v$
$A_1$	1	1	1
$A_2$	1	1	-1
E	2	-1	0
$\Gamma$	9	3	-1

The total representation is reduced as:

- A)  $\Gamma = 3A_1 + 2A_2 + 2E$                       B)  $\Gamma = 2A_1 + 3A_2 + 2E$   
 C)  $\Gamma = A_1 + 2A_2 + 3E$                       D)  $\Gamma = 2A_1 + A_2 + 3E$
10. For a particular diatomic molecule,  $\frac{kT}{hB} = 40$ , the value of the rotational quantum number with maximum population,  $J_{\max}$  is:  
 A) 2                      B) 3                      C) 4                      D) 5
11. Carbon dioxide molecule has four normal modes of vibration namely symmetric stretching ( $\nu_1$ ), antisymmetric stretching ( $\nu_2$ ) and a doubly degenerate bending ( $\nu_3$ ). Identify the correct statement among the following.  
 A)  $\nu_1$  is Raman active and  $\nu_2$  and  $\nu_3$  are infrared active.  
 B)  $\nu_1$  is infrared active and  $\nu_2$  and  $\nu_3$  are Raman active  
 C) All the three are Raman active and none is infrared active  
 D)  $\nu_1$  and  $\nu_2$  are Raman active and  $\nu_2$  and  $\nu_3$  are infrared active.
12. The fundamental band of a diatomic molecule is centred at  $\bar{\nu}_0 = 2.880 \times 10^5 m^{-1}$ . If the rotational constant  $\bar{B} = 1000 m^{-1}$ , the frequencies of the first lines of the P and R branches respectively are  
 A)  $\nu_R = 2.87 \times 10^5 m^{-1}; \nu_P = 2.89 \times 10^5 m^{-1}$   
 B)  $\nu_R = 2.90 \times 10^5 m^{-1}; \nu_P = 2.86 \times 10^5 m^{-1}$   
 C)  $\nu_R = 2.89 \times 10^5 m^{-1}; \nu_P = 2.87 \times 10^5 m^{-1}$   
 D)  $\nu_R = 2.86 \times 10^5 m^{-1}; \nu_P = 2.90 \times 10^5 m^{-1}$
13. A Mossbauer nucleus in a coordination compound has spins of  $3/2$  and  $5/2$  in its ground state and excited state respectively. If the nucleus is in the influence of an electric field gradient, the number of fine structure lines in its  $\gamma$ -ray spectrum will be  
 A) 3                      B) 4                      C) 5                      D) 6

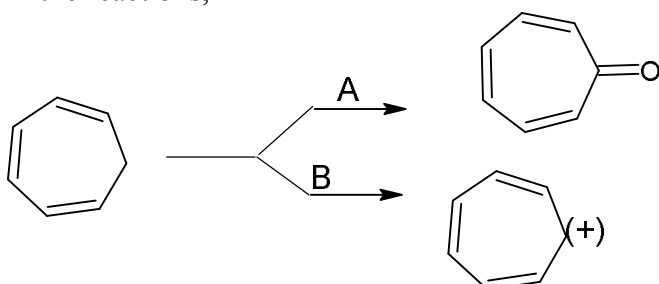
14. Which of the following equations is correct?
- A)  $\left(\frac{\partial T}{\partial P}\right)_V = \left(\frac{\partial V}{\partial S}\right)_T$       B)  $\left(\frac{\partial^2 G}{\partial P \partial T}\right) = -\left(\frac{\partial H}{\partial P}\right)_T$
- C)  $\left(\frac{\partial V}{\partial T}\right)_P = -\left(\frac{\partial S}{\partial P}\right)_T$       D)  $\left(\frac{\partial^2 A}{\partial V \partial T}\right) = -\left(\frac{\partial V}{\partial S}\right)_T$
15. In a three-component system, maximum number of phases that can coexist at equilibrium is :
- A) 6      B) 5      C) 4      D) 3
16. Match **List I** containing crystal types with **List II** their properties.
- | <b>List I</b>         | <b>List II</b>   |
|-----------------------|--|
| a. Molecular crystals | 1. Good electrical conductors only in the molten state |
| b. Covalent crystals  | 2. Good electrical conductors in the solid state       |
| c. Metallic crystals  | 3. Very low melting and boiling points                 |
| d. Ionic crystals     | 4. Very high melting points                            |
- A) a-2, b-4, c-1, d-3      B) a-4, b-3, c-2, d-1
- C) a-3, b-4, c-2, d-1      D) a-3, b-2, c-4, d-1
17. Helium gas effuses five times as fast as another gas A at the same temperature and pressure. The molecular mass of A is
- A) 25      B) 50      C) 75      D) 100
18. The half-life of a reaction increases to four-fold when the concentration is reduced to one half. The reaction is of
- A) zero order      B) first order      C) second order      D) third order
19. The EMF of the cell,  $\text{Zn}/\text{ZnSO}_4(\text{aq}) \parallel \text{Hg}_2\text{SO}_4(\text{s})/\text{Hg}, \text{Pt}$  is  $E=1.50 \text{ V}$  and its  $\left(\frac{\partial E}{\partial T}\right)_P = -1.0 \times 10^{-3} \text{ VK}^{-1}$ . The values of  $\Delta G$  and  $\Delta S$  for the cell reaction respectively are (Faraday Constant = 96500 C)
- A) 290 kJ; -193 J      B) -145 kJ; 193 J
- B) 145 kJ; -193 J      D) -290 kJ; 193 J
20. List I contains certain electrodes and List II contains their names. Match **List I** with **List II**
- | <b>List I</b>  | <b>List II</b>                |
|--|-------------------------------|
| a. $\text{CuSO}_4(\text{aq})/\text{Cu}$  | 1. Calomel electrode          |
| b. $\text{KCl}(\text{aq})/\text{AgCl}(\text{s})/\text{Ag}$                       | 2. Metal ion electrode        |
| c. $\text{KCl}(\text{aq})/\text{Hg}_2\text{Cl}_2(\text{s}), \text{Hg}/\text{Pt}$ | 3. Redox electrode            |
| d. $\text{Fe}^{2+}, \text{Fe}^{3+}/\text{Pt}$                                    | 4. Anion reversible electrode |
- A) a-2, b-1, c-4, d-3      B) a-2, b-4, c-1, d-3
- C) a-3, b-1, c-4, d-2      D) a-2, b-3, c-4, d-1

21. Decomposition of  $\text{H}_2\text{SO}_4(\text{aq})$  occurs at a potential of 1.67 V. The reversible cell EMF of  $\text{H}_2\text{-O}_2$  cell is 1.24 V. The polarization voltage of  $\text{H}_2\text{SO}_4$  is  
 A) 2.9 V      B) -0.43 V      C) 0.43 V      D) 1.36 V
22. A compact monolayer film of area  $450 \text{ m}^2$  is produced by  $7.20 \times 10^{-4} \text{ kg}$  of an alcohol,  $\text{C}_{16}\text{H}_{31}\text{OH}$ . The cross section of the alcohol molecule is (Avogadro number is  $6.0 \times 10^{23}$ )  
 A)  $2.5 \times 10^{-19} \text{ m}^2$       B)  $2.5 \times 10^{-10} \text{ m}^2$   
 C)  $1.25 \times 10^{-19} \text{ m}^2$       D)  $1.25 \times 10^{-10} \text{ m}^2$
23. Identify the correct statements:  
 1. Miscelles are associated colloids  
 2. Freundlich adsorption isotherm is an empirical one  
 3. BET isotherm is applicable only to chemisorption  
 4. Langmuir isotherm is also applicable to solute adsorption.  
 A) 1,2 & 3 only    B) 1,2 & 4 only    C) 2,3 & 4 only    D) 1,3 & 4 only
24. The ion which will not disproportionate is  
 A)  $\text{NO}_2^-$       B)  $\text{SO}_3^{2-}$       C)  $\text{Hg}_2^{2+}$       D)  $\text{IO}_4^-$
25. The geometry and the hybridization of central atom in  $\text{XeF}_4$  and  $\text{SF}_4$  are  
 A) square planar,  $\text{sp}^3\text{d}^2$ ; tetrahedral,  $\text{sp}^3$   
 B) tetrahedral,  $\text{sp}^3$ ; square planar,  $\text{dsp}^2$   
 C) square planar,  $\text{sp}^3\text{d}^2$ ; see-saw,  $\text{sp}^3\text{d}$   
 D) tetrahedral,  $\text{sp}^3$ ; square planar,  $\text{sp}^3\text{d}^2$
26. The number of S-S bonds in Sulphur trioxide trimer,  $\text{S}_3\text{O}_9$  is  
 A) two      B) one      C) zero      D) three
27. The interhalogen that will **not** be formed is:  
 A)  $\text{ClBr}_3$       B)  $\text{BrF}_5$       C)  $\text{IF}_7$       D)  $\text{ICl}$
28. Jahn-Teller distortion in an octahedral field is exhibited by d-orbital configurations  
 A)  $\text{d}^9$ ,  $\text{d}^4$ (high spin)      B)  $\text{d}^3$ ,  $\text{d}^6$ (low spin)  
 C)  $\text{d}^8$ ,  $\text{d}^9$       D)  $\text{d}^6$ (low spin),  $\text{d}^5$ (high spin)
29. The correct order of increasing s-character of the orbital of central atom which overlaps with orbital of hydrogen in  $\text{NH}_3$ ,  $\text{PH}_3$  and  $\text{H}_2\text{S}$  is  
 A)  $\text{H}_2\text{S} < \text{NH}_3 < \text{PH}_3$       B)  $\text{PH}_3 < \text{H}_2\text{S} < \text{NH}_3$   
 C)  $\text{NH}_3 < \text{PH}_3 < \text{H}_2\text{S}$       D)  $\text{H}_2\text{S} < \text{PH}_3 < \text{NH}_3$
30. Based on isolobal concept, the organometallic corresponding to cyclobutane is  
 A)  $[\text{Ru}_4(\text{CO})_{13}]^{2-}$       B)  $[\text{Os}_4(\text{CO})_{16}]$   
 C)  $[\text{Co}_4(\text{CO})_{12}]$       D)  $[\text{Fe}_4(\text{CO})_{14}]^{2-}$

31. Match the organometallics in **List I** with the processes given in **List II**
- | <b>List I</b>         | <b>List II</b>        |
|-----------------------|-----------------------|
| a. $[(PPh_3)_3RhCl]$  | 1. Hydroformylation   |
| b. $[Rh(CO)_2I_2]^-$  | 2. Wacker process     |
| c. $[PdCl_4]^{2-}$    | 3. Monsanto process   |
| d. $[HCo(CO)_4]$      | 4. Hydrogenation      |
| A) a-1, b-3, c-4, d-2 | B) a-4, b-3, c-2, d-1 |
| C) a-4, b-3, c-1, d-2 | D) a-1, b-2, c-3, d-4 |
32. The correct order of the given carbonyls in the increasing order of C-O stretching frequency is:
- A)  $[V(CO)_6]^- < [Cr(CO)_6] < [Mn(CO)_6]^+$   
 B)  $[V(CO)_6]^- < [Mn(CO)_6]^+ < [Cr(CO)_6]$   
 C)  $[Mn(CO)_6]^+ < [Cr(CO)_6] < [V(CO)_6]^-$   
 D)  $[Mn(CO)_6]^+ < [V(CO)_6]^- < [Cr(CO)_6]$
33. The complex  $[PtClBrNH_3Py]$  where chlorine and pyridine are trans to each other can be formed from  $[PtCl_4]^{2-}$  by which of the following sequences of substitutions of chloride ions?
- A) py,  $Br^-$ ,  $NH_3$     B)  $Br^-$ , py,  $NH_3$     C)  $Br^-$ ,  $NH_3$ , py    D)  $NH_3$ ,  $Br^-$ , py
34. The metal ion present in the enzyme carboxy peptidase A is
- A)  $Zn^{2+}$     B)  $Fe^{2+}$     C)  $Mo^{3+}$     D)  $Mg^{2+}$
35. 20 mL of 0.1 M Mohr's salt solution is completely oxidized by 20 mL of dichromate solution in acid medium. The molarity of the dichromate solution is
- A) 0.033    B) 0.016    C) 0.1    D) 0.05
36. Instability constants of metal complexes can be determined by:
- A) polarography    B) coulometry  
 C) electrogravimetry    D) thermometric titrations
37. Match the thermo analytical method given in **List I** with the thermogram given in **List II**.
- | <b>List I</b>                                  | <b>List II</b>                        |
|--|---------------------------------------|
| a. Thermogravimetric analysis (TGA)            | 1. $\Delta T$ versus temperature      |
| b. Derivative thermogravimetric analysis (DTG) | 2. Weight versus temperature          |
| c. Differential thermal analysis (DTA)         | 3. Temperature versus volume          |
| d. Thermometric titrations                     | 4. $\frac{dw}{dt}$ versus temperature |
| A) a-2, b-1, c-4, d-3                          | B) a-2, b-4, c-1, d-3                 |
| C) a-4, b-2, c-3, d-1                          | D) a-1, b-3, c-2, d-4                 |
38. Retardation factor  $R_F$  is related to
- A) ion-exchange chromatography  
 B) partition chromatography  
 C) thin layer chromatography  
 D) HPLC

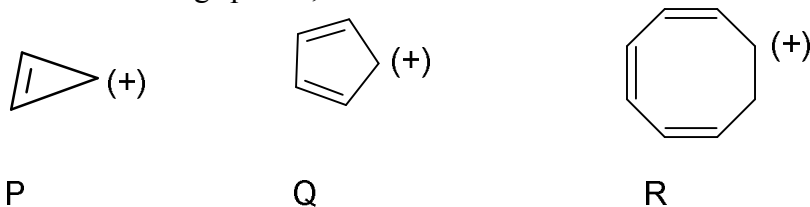
39. The styx number of a borane is 3203. Total number of 3c-2e bonds present in it are  
 A) 3                      B) 2                      C) 5                      D) 8

40. In the reactions,



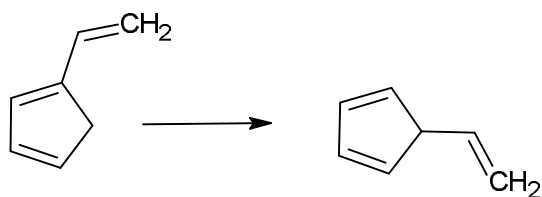
Reagents A and B are respectively,

- A) DDQ and  $\text{SeO}_2$                       B)  $\text{SeO}_2$  and DDQ/ $\text{HClO}_4$   
 C) Lead tetra acetate and  $\text{SeO}_2$       D)  $\text{SeO}_2$  and  $\text{LiAlH}_4$
41. In the following species,



- A) P is aromatic, Q is antiaromatic, R is homoaromatic  
 B) P is aromatic, Q and R are antiaromatic  
 C) P is homoaromatic, Q is aromatic, R is antiaromatic  
 D) P is antiaromatic, Q is aromatic, R is homoaromatic

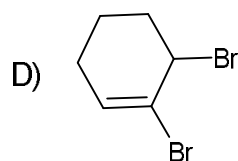
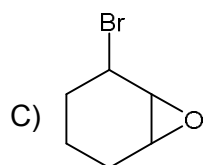
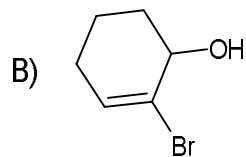
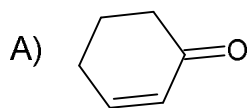
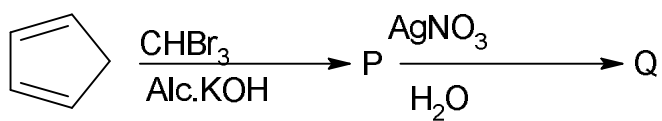
42. The reaction,



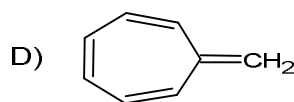
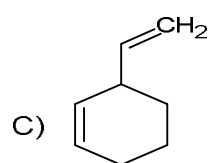
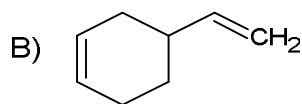
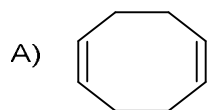
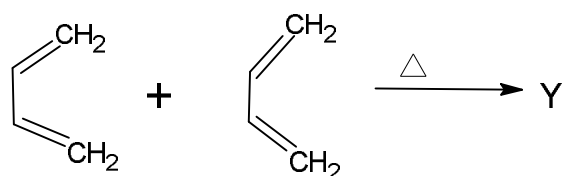
is

- A) allowed only photochemically  
 B) allowed only thermally  
 C) catalysed by  $\text{OH}^-$   
 D) catalysed by  $\text{H}^+$

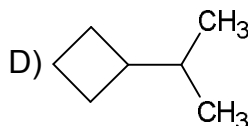
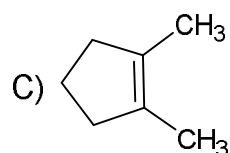
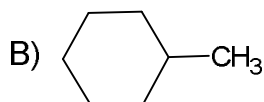
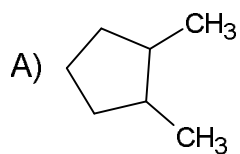
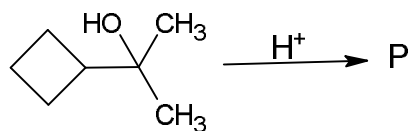
43. Identify Q in the following sequence:



44. Identify the product Y of the reaction,



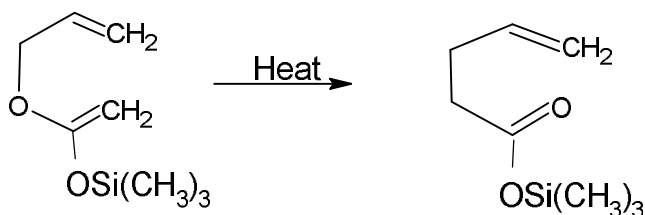
45. What is P in the following reaction?



46. List I contains certain name reactions and List II contains some associated species/process. Match **List I** With **List II**
- | <b>List I</b>              | <b>List II</b>  |
|----------------------------|-----------------|
| a. Sandmeyer reaction      | 1. Acylation    |
| b. Friedel Crafts reaction | 2. Carbene      |
| c. Reimer Tiemann reaction | 3. Carbocation  |
| d. Fries rearrangement     | 4. Free radical |
- A) a-4, b-3, c-1, d-2                      B) a-3, b-4, c-1, d-2  
 C) a-3, b-4, c-2, d-1                      D) a-4, b-3, c-2, d-1
47. Quantum well infrared photodetector consists of  
 A) WS<sub>2</sub> layer                      B) MoS<sub>2</sub> layer  
 C) NbS<sub>2</sub> layer                      D) GaAs layer
48. Material in nanophase employed in the manufacture of ceramic capacitor is  
 A) ZrO<sub>2</sub>                      B) ZnO                      C) Cu-Fe alloy                      D) BaTiO<sub>3</sub>
49. Which of the following does **not** exist as a zwitter ion?  
 A) p-amino benzoic acid                      B) Glycine  
 C) Glutamic acid                      D) Sulphanilic acid
50. The intermediate never formed during chain growth polymerization is  
 A) Carbocation                      B) Free radical  
 C) Carbene                      D) Carbanion
51. Identify the correct statements:  
 1. Alpha pinene contains exocyclic double bond  
 2. Dipentene is (±) limonene  
 3. Camphor is a bicyclic compound  
 4. Stigma sterol is commonly obtained from soya bean oil
- A) 1, 2 & 4 only    B) 1, 3 & 4 only    C) 2 & 3 only    D) 1 & 3 only
52. Which of the following can be used as the starting material for the preparation of chloroquine?  
 A) o-Chloraniline                      B) p-Chloraniline  
 C) m-Chloraniline                      D) o-Chloroacetanilide
53. Quantum dot nanocrystals can measure between  
 A) 8-10 nm                      B) 2-6 nm                      C) 5-10 nm                      D) 2-10 m
54. Anthracene can only be accommodated in  
 A) α-cyclodextrin                      B) γ-cyclodextrin  
 C) β-cyclodextrin                      D) crown ethers



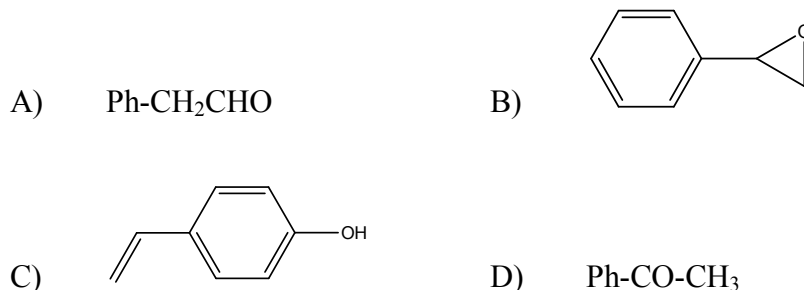
55.  $\pi - \pi$  Stacking interaction is **not** possible in  
 A) cyclodextrins B) cyclophanes  
 C) cryptands D) calixarenes
56. Photolytic conversion of organic nitriles into nitroso alcohol is known as  
 A) Barton reaction B) Ritter reaction  
 C) Paterno reaction D) Birch reaction
57. The reaction,



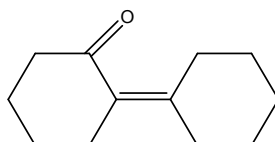
is called

- A) [3,3] sigmatropic shift B) Cope rearrangement  
 C) Claisen- Cope rearrangement D) Ireland-Claisen rearrangement
58. The spinels  $MgFe_2O_4$  and  $MgAl_2O_4$  respectively are  
 A) Inverse & Normal B) Inverse & Inverse  
 C) Normal & Normal D) Normal & Inverse
59. In the X-ray diffraction pattern for a body centered cubic (b.c.c) lattice,  $hkl$  can have  
 A) any value B) odd values  
 C) even values D)  $h + k + l$  even
60. The number of microstates associated with the  $d^2$  configuration is  
 A) 45 B) 54 C) 2 D) 90
61. According to Huckel Molecular Orbital(HMO) treatment, the resonance energy of 1,3-butadiene is  
 A) Zero B)  $4.472 \beta$  C)  $0.472\beta$  D)  $4\alpha + 4.472 \beta$
62. The mean free path ( $\lambda$ ) of a gas molecule  
 A)  $\lambda \propto P$  B)  $\lambda \propto 1/P$  C)  $\lambda \propto 1/T$  D)  $\lambda \propto T^2$
63. The selection rule for pure rotational Raman spectrum of a diatomic molecule is  
 A)  $\Delta J = 0, \pm 1$  B)  $\Delta J = \pm 1$  C)  $\Delta J = \pm 2$  D)  $\Delta J = 0, \pm 2$
64. The phenomenon of size-tuneable light emission is exhibited by  
 A) Silica nanoparticles B) Iron oxide nanoparticles  
 C) Quantum dots D) Metal nanoparticles

65. During tetragonal elongation, the point group of an octahedral complex changed to  
 A)  $T_d$                       B)  $C_{4v}$                       C)  $D_{4h}$                       D)  $D_{4h}$
66. A compound with molecular formula  $C_8H_8O$  has strong IR band near  $1690\text{ cm}^{-1}$ . The compound is most likely to be



67. According to the Woodward-Fieser rules, the theoretical value of  $\lambda_{\text{max}}$  for the following molecule is

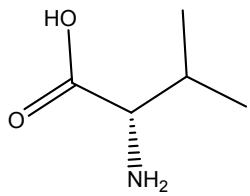
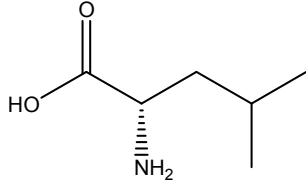
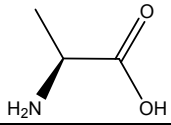
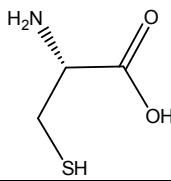


- A) 264 nm                      B) 254 nm                      C) 269 nm                      D) 259 nm
68. In the proton NMR spectrum of HD molecule, there will be  
 A) One singlet  
 B) One doublet ( intensity 1: 1)  
 C) One triplet ( intensity 1: 2: 1)  
 D) One triplet ( intensity 1:1: 1)
69. In the mass spectrum of a molecule which contain one chlorine atom, The relative intensities of M and M+2 peaks will be  
 A) 1: 1                      B) 3: 1                      C) 1: 3                      D) 35: 37
70. The enthalpy change ( $\Delta H$ ) of a reaction is equal to the slope in a plot of  
 A)  $\Delta G$  versus reciprocal of temperature  
 B)  $\Delta G$  versus temperature  
 C)  $[\Delta G/T]$  versus temperature  
 D)  $[\Delta G/T]$  versus reciprocal of temperature
71. 2 moles of an ideal gas expand reversibly from a volume of  $8\text{ dm}^3$  to  $80\text{ dm}^3$  at  $27^\circ\text{C}$ . The entropy change will be  
 A) 19.15 J/K                      B) 38.3 J/K  
 C) Zero                      D) -38.3 J/K
72. In statistical mechanics, the canonical ensembles are those with constant values for  
 A) E, V and N                      B) E, V and  $\mu$                       C) T, V and N                      D) T, V and  $\mu$

73. The conjugate acid and base of  $[\text{HPO}_4]^{2-}$  are, respectively  
 A)  $[\text{PO}_4]^{3-}$  and  $[\text{H}_2\text{PO}_4]^-$       B)  $\text{H}_3\text{PO}_4$  and  $[\text{H}_2\text{PO}_4]^-$   
 C)  $[\text{H}_2\text{PO}_4]^-$  and  $[\text{PO}_4]^{3-}$       D)  $\text{H}_3\text{PO}_4$  and  $[\text{PO}_4]^{3-}$
74. The rate constant of a second order reaction is  $3.33 \times 10^{-2} \text{ lit mol}^{-1}\text{s}^{-1}$ . What will be the half-life of the reaction if the initial concentration of the reactant is  $0.05 \text{ mol lit}^{-1}$ ?  
 A) 10 minutes    B) 1 minute    C) 6 seconds    D) 30 seconds
75. For a polymer sample, the number average and weight average molar mass can be respectively obtained by  
 A) Osmometry and viscometry  
 B) Viscometry and light scattering method  
 C) Light scattering and sedimentation method  
 D) Osmometry and light scattering method
76. Which of the following statements is true for the equilibrium?  
 $2\text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g}) \quad \Delta H = -114.1 \text{ kJ/mol}$   
 A) Increase in T shift the equilibrium to left  
 B) Increase in T shift the equilibrium to right  
 C) Increase in P shift the equilibrium to left  
 D) Increase in P has no effect on the equilibrium
77. The movement of the dispersion medium under the influence of an external electric field is termed as  
 A) Sedimentation potential      B) Electro osmosis  
 C) Electrophoresis      D) Streaming potential
78. For a first order reaction, a plot of logarithm of rate constant (k) against reciprocal of temperature (1/T) has slope  
 A)  $E_a/2.303R$     B)  $-2.303R/E_a$     C)  $2.303R/E_a$     D)  $-E_a/2.303R$
79. According to Michaelis-Menten theory of enzyme catalyst, the Michaelis constant  $K_m$  is the substrate concentration at which rate,  $r =$   
 A)  $V_{max}$       B)  $\frac{V_{max}}{2}$       C)  $\frac{V_{max}}{4}$       D)  $V_{max}^2$
80. Coagulation of 100ml of colloidal solution of gold is completely prevented by the addition of 0.25g of X to it before the addition of 1ml 10% NaCl. What is the gold number of X?  
 A) 0.25      B) 250      C) 2.5      D) 25
81. Under the influence of high potential gradient, for a solution of a strong electrolyte  
 A) Asymmetry effect vanishes  
 B) Asymmetry and electrophoretic effect vanishes  
 C) Electrophoretic and viscous effect vanishes  
 D) Asymmetry effect and viscous effect vanishes
82. The BOD is a water quality parameter. Drinking water should have BOD  
 A) Between 5- 10 ppm      B) Less than 5 ppm  
 C) Greater than 100 pm      D) Between 10- 20 ppm

83. Atomic Force Microscopy (AFM) belongs to which type characterization?
- A) Optical Probe Methods      B) Electron Probe Methods  
C) Scanning Probe Methods      D) Spectroscopic Methods
84. In liquid ammonia solvent, the compounds  $\text{NaNH}_2$  and  $\text{NH}_4\text{Cl}$  behave as
- A) Acid and base respectively      B) Base and acid respectively  
C) Both as acids      D) Both as bases
85. The thermo analytical method where the difference energy between the analyte and the reference material is measured as a function of temperature is
- A) TG      B) DTA      C) DSC      D) DTG
86. For colloidal purification, dialysis is a common method. The speed of dialysis can be increased by:
- A) Application of external magnetic field  
B) Application of external electric field  
C) Increase in osmotic pressure  
D) Decreasing the pore size of the membrane
87. Aqueous  $\text{KMnO}_4$  solutions are purple. A plot of absorbance against concentration is:
- A) Linear with a positive gradient  
B) Non-linear  
C) An exponential curve  
D) Linear with a negative gradient
88. In polarography, Ilkovic equation is used to calculate
- A) Half-wave potential      B) Diffusion current  
C) Residual current      D) Kinetic current
89. Which one of the following is correct about XPES?
- A) Low energy photons are used to ionize the core electrons  
B) Low energy photons are used to ionize the outer electrons  
C) X-rays are used to ionize the core electrons  
D) X-rays are used to ionize the outer electrons
90. Nanowires represent which type of nanomaterials?
- A) 0-D nanomaterials      B) 1-D nanomaterials  
C) 2-D nanomaterials      D) 3-D nanomaterials
91. Potential difference between the fixed charged layer and diffused layer having opposite charges is called
- A) Donnan potential      B) Diffusion potential  
C) Zeta potential      D) Redox potential

92. Match List I with List II

List I (amino acids)	List II (structure)
a. Alanine	1. 
b. Cysteine	2. 
c. Valine	3. 
d. Leucine	4. 

- A) a-2, b-1, c-3, d-4  
 B) a-4, b-2, c-3, d-1  
 C) a-3, b-4, c-1, d-2  
 D) a-3, b-4, c-2, d-1

93. The N-terminal amino acid of a polypeptide can be detected by using the reagent

- A) 2,4-dinitroaniline  
 B) 2,4-dinitrobenzoic acid  
 C) 2,4-dinitrophenyl hydrazine  
 D) 2,4-dinitro fluorobenzene

94. The fine and hyperfine EPR spectrum of the aqua ion  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$  has ( $I$  of Mn = 5/2)

- A) 6 and 30 lines  
 B) 5 and 30 lines  
 C) 3 and 36 lines  
 D) 6 and 36 lines

95. The Sulphur-nitrogen compound that exhibits colour change with temperature is

- A)  $(\text{SN})_x$   
 B)  $\text{S}_3\text{N}_3$   
 C)  $\text{S}_4\text{N}_4$   
 D)  $\text{S}_2\text{N}_2$

96. The Vaska's complex is

- A)  $[\text{Ir}(\text{CO})\text{Cl}(\text{PPh}_3)_2]$   
 B)  $[\text{Ir}(\text{CO})_2\text{Cl}(\text{PPh}_3)_2]$   
 C)  $[\text{Rh}(\text{CO})\text{Cl}(\text{PPh}_3)_2]$   
 D)  $[\text{RhCl}(\text{PPh}_3)_3]$

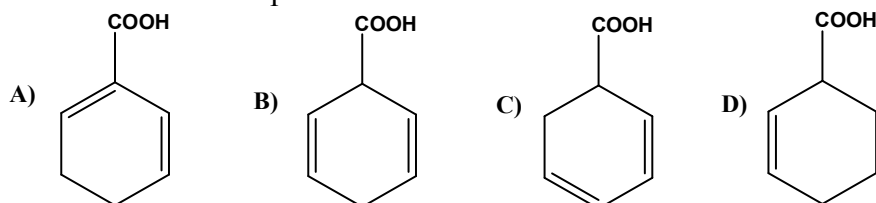
97. Which of the lanthanide ion has highest difference between observed and calculated magnetic moments?

- A)  $\text{Gd}^{3+}$   
 B)  $\text{Eu}^{3+}$   
 C)  $\text{Ce}^{3+}$   
 D)  $\text{Lu}^{3+}$

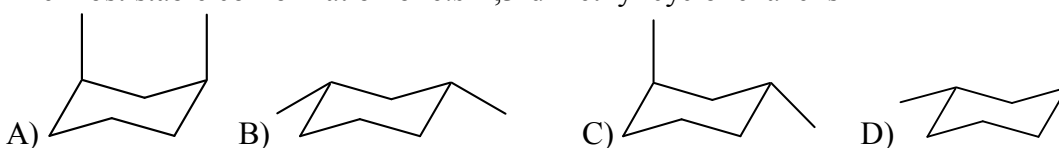
98. Which of the following statement is correct about the structure of  $\text{PCl}_3\text{F}_2$
- The fluorine atoms prefers to occupy the planar position
  - The fluorine atoms prefers to occupy the axial position
  - One fluorine is axial and the other is planar
  - None of these
99. In the given reaction, the product (X) is  
 $\text{HXeO}_4^- + \text{OH}^- \rightarrow (\text{X}) + \text{O}_2 + \text{H}_2\text{O}$
- $\text{XeO}_6^{4-}$
  - $\text{XeO}_6^{2-}$
  - $\text{XeO}_4^{2-}$
  - $\text{XeO}_4^{4-}$
100. Plastocyanin is a blue copper protein. The intense colour is attributed to
- Ligand to metal charge transfer ( $\text{S}_{\text{Cysteine}} \rightarrow \text{Cu}$ )
  - Ligand to metal charge transfer ( $\text{S}_{\text{Methionine}} \rightarrow \text{Cu}$ )
  - Ligand to metal charge transfer ( $\text{N}_{\text{Histidine}} \rightarrow \text{Cu}$ )
  - Metal to ligand charge transfer from Cu
101. The Bhor effect is
- pH dependence shown by Hemoglobin
  - Concentration dependence of Myoglobin
  - Solvents dependence shown by Hemoglobin
  - Temperature dependence shown by Hemoglobin
102. The term  $\text{IC}_{50}$  stands for
- Inhibitory concentration
  - Half maximal inhibition concentration
  - Inhibition concentration
  - Half maximal inhibitory concentration
103.  $^{99\text{m}}\text{Tc}$  is an isotope used in radiopharmaceuticals. It is produced by  $\beta$ -particle emission from an isotope X. What is X?
- $^{99}\text{Mo}$
  - $^{99}\text{Ru}$
  - $^{103}\text{Rh}$
  - $^{103}\text{Nb}$
104. The drug which is prepared by the acetylation of 2-hydroxy benzoic acid is
- Salol
  - Acetaminophen
  - Phenacetin
  - Aspirin
105. Which of the following acts as a sink for carbon monoxide?
- Algae
  - Microorganisms present in the soil
  - Haemoglobin
  - Green plants
106. Which of the following forms nematic type liquid crystal?
- Ethyl p-azoxy benzoate
  - Ethyl p-azoxy cinnamate
  - Cholesteryl formate
  - p-Azoxy anisole

107. Identify the correct statement about DEPT 90  $^{13}\text{C}$  NMR spectrum
- Produce signals for all protonated carbon atoms
  - CH and  $\text{CH}_3$  peaks are positive and  $\text{CH}_2$  peaks are negative
  - CH and  $\text{CH}_3$  peaks are negative and  $\text{CH}_2$  peaks are positive
  - Only CH peaks are visible

108. The Birch reduction product of benzoic acid is



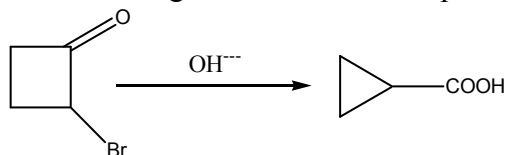
109. The most stable conformation of *cis*-1,3-dimethyl cyclohexane is



110. The Reimer-Tiemann reaction proceeds through the formation of:

- Carbonium ion
- Transition state
- Carbene
- Dichlororo carbene

111. The following reaction is an example for



- Wolff rearrangement
- Favorskii rearrangement
- Steven's rearrangement
- Wagner-Meerwein rearrangement

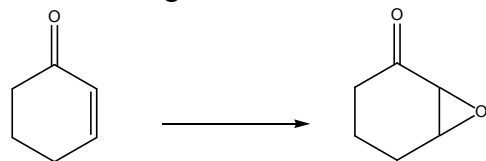
112. The Winkler method is used to determine

- Dissolved oxygen (DO)
- BOD
- COD
- Total organic pollutants

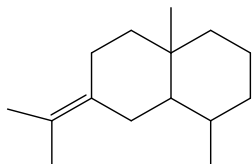
113. Inter system crossing (ISC) is essential for which of the following photophysical process?

- Fluorescence
- Internal conversion
- Vibrational cascade
- Phosphorescence

114. The transformation given below is achieved by



- A)  $\text{H}_2\text{O}_2/\text{NaOH}$                       B) Alkaline  $\text{KMnO}_4$   
C)  $\text{I}_2/\text{silver acetate}$                 D) m-CPBA
115. The nucleic acid DNA contain the pyrimidine bases  
A) cytosine and adenine                B) cytosine and thymine  
C) cytosine and guanine                D) cytosine and uracil
116. The reaction of  $\text{PhMgBr}$  with tertiary butanol results in the formation of  
A) Benzene                                  B) Phenol  
C) Tertiary butyl benzene                D) Tertiary butyl methyl ether
117. Hydroboration reaction is  
A) Stereoselectively Markownikoff addition and stereo specifically *syn*-addition  
B) Stereoselectively anti-Markownikoff addition and stereo specifically *syn*-addition  
C) Stereo specifically Markownikoff addition and stereo selectively *syn*-addition  
D) Stereoselectively Markownikoff addition and stereo specifically *anti*-addition
118. Starch contains . . . . of amylase and . . . . of amylopectin  
A) 20% , 80%    B) 30% , 70%    C) 80% , 20%    D) 70% , 30%
119. The following terpene can be considered as a



- A) Bicyclic monoterpene                B) Bicyclic sesquiterpene  
C) Bicyclic diterpene                    D) Bicyclic triterpene
120. The EDX- Spectrum is a plot of emitted X-ray intensity against its  
A) Energy                                    B) Wavelength  
C) Frequency                                D) Amplitude
-