163/24

Question Booklet Alpha Code

A

Question Booklet Sl. No.

A

Total Number of Questions : 100 **Time : 90 Minutes**

Maximum Marks : 100

INSTRUCTIONS TO CANDIDATES

1. The Question Paper will be given in the form of a Question Booklet. There will be four versions of Question Booklets with Question Booklet Alpha Code viz. **A, B, C** & **D**.
2. The Question Booklet Alpha Code will be printed on the top left margin of the facing sheet of the Question Booklet.
3. The Question Booklet Alpha Code allotted to you will be noted in your seating position in the Examination Hall.
4. If you get a Question Booklet where the alpha code does not match to the allotted alpha code in the seating position, please draw the attention of the Invigilator IMMEDIATELY.
5. The Question Booklet Serial Number is printed on the top right margin of the facing sheet. If your Question Booklet is un-numbered, please get it replaced by new Question Booklet with same alpha code.
6. The Question Booklet will be sealed at the middle of the right margin. Candidate should not open the Question Booklet, until the indication is given to start answering.
7. Immediately after the commencement of the examination, the candidate should check that the Question Booklet supplied to him/her contains all the 100 questions in serial order. The Question Booklet does not have unprinted or torn or missing pages and if so he/she should bring it to the notice of the Invigilator and get it replaced by a complete booklet with same alpha code. This is most important.
8. A blank sheet of paper is attached to the Question Booklet. This may be used for rough work.
9. **Please read carefully all the instructions on the reverse of the Answer Sheet before marking your answers.**
10. Each question is provided with four choices **(A), (B), (C)** and **(D)** having one correct answer. Choose the correct answer and darken the bubble corresponding to the question number using Blue or Black Ball Point Pen in the OMR Answer Sheet.
11. **Each correct answer carries 1 mark and for each wrong answer 1/3 mark will be deducted. No negative mark for unattended questions.**
12. No candidate will be allowed to leave the examination hall till the end of the session and without handing over his/her Answer Sheet to the Invigilator. Candidates should ensure that the Invigilator has verified all the entries in the Register Number Coding Sheet and that the Invigilator has affixed his/her signature in the space provided.
13. Strict compliance of instructions is essential. Any malpractice or attempt to commit any kind of malpractice in the Examination will result in the disqualification of the candidate.

A

1. Which of the following is a hard acid ?
   A) K^+ B) Cu^+ C) Ag^+ D) Au^+

2. The bond dissociation energy is maximum for
   A) F_2 B) Cl_2 C) Br_2 D) I_2

3. Which of the following is an arachno borane ?
   A) B_5H_9 B) B_5H_{11} C) $[B_{12}H_{12}]^{2-}$ D) B_6H_{10}

4. The carborane which is analogous to the borane $[B_6H_6]^{2-}$ is
   A) $B_4C_2H_6$ B) $B_{10}C_2H_{12}$ C) $[B_9C_2H_{11}]$ D) $[B_9C_2H_{11}]^{2-}$

5. _____ belong to the class of three dimensional aluminosilicate.
   A) Feldspar B) Kaolinite C) Pyrophyllite D) Talc

6. Trace amount of _____ is necessary in diet for maintaining correct level of glucose in blood.
   A) Mo B) W C) Cr D) V

7. The CFSE of $[Fe(CN)_6]^{3-}$ is
   A) $-0.6\ \Delta o$ B) $-0.4\ \Delta o$ C) $-2.0\ \Delta o$ D) $0\ \Delta o$

8. The bonding present between Nitrogen and Phosphorous in phosphonitrilic compound is
   A) $p\pi - p\pi$ bonding B) $p\pi - d\pi$ bonding
   C) Covalent bonding D) Coordinate bond

9. Which of the following ions give colourless salts ?
   A) Ce^{3+} B) Ce^{4+} C) Sm^{3+} D) Sm^{2+}

10. Mn (VII) prefers to form complex with
    A) CN^- B) CO C) NH_3 D) S^{2-}

11. The ground state term symbols for Sc^{2+} and Ni^{2+} ions are respectively
    A) ^3D and ^6S B) ^2D and ^3F C) ^3D and ^4F D) ^2D and ^4F

12. When NO^+ ion is reduced to neutral N-O molecule, what happened to bond order and N-O stretching frequency ?
    A) Bond order and N-O stretching frequency increases
    B) Bond order increases and N-O stretching frequency decreases
    C) Bond order decreases and N-O stretching frequency increases
    D) Bond order and N-O stretching frequency decreases

13. The hyperfine splitting in ESR is due to the interaction of electron spin with nuclear spin. The selection rules which govern hyperfine transition in ESR spectroscopy are
    A) $\Delta m_s = \pm 1$ and $\Delta m_I = +1$
    B) $\Delta m_s = 0$ and $\Delta m_I = \pm 1$
    C) $\Delta m_s = \pm 1$ and $\Delta m_I = 0$
    D) $\Delta m_s = +1$ and $\Delta m_I = -1$

14. The ^{11}B NMR spectrum of BH_4^- ion consists of (nuclear spin of ^{11}B and ^1H are 3/2 and 1/2 respectively)
    A) A quintet with intensity ratio 1 : 4 : 6 : 4 : 1
    B) A quintet with all lines has equal intensity
    C) A quartet with intensity ratio 1 : 3 : 3 : 1
    D) A quartet all lines has equal intensity

15. Which among the following complex ion exhibit lowest C-O stretching band in the IR-spectrum ?
    A) $[V(CO)_6]^-$ B) $[Mn(CO)_6]^+$ C) $[Fe(CO)_6]^{2+}$ D) $[Ti(CO)_6]^{2-}$

16. Select the appropriate option regarding the quadrupole splitting in the Mossbauer spectrum of ferricyanide and ferrocyanide ions.
    A) Both ions exhibit quadrupole splitting
    B) Ferricyanide ion exhibit quadrupole splitting, whereas ferrocyanide do not
    C) Ferrocyanide ion exhibit quadrupole splitting, whereas ferricyanide do not
    D) Both ions do not exhibit quadrupole splitting

17. The point group to which Ferrocene in its staggered form belongs is
    A) D_{5h} B) D_{5d} C) C_{5h} D) C_{5v}

18. In $[Re_2Cl_8]^{2-}$ the bond is formed by the sideways overlap of
    A) d_{xz} orbitals of Re atom
    B) d_{yz} orbitals of Re atom
    C) d_{xy} orbitals of Re atom
    D) d_{z2} orbitals of Re atom

19. Which of the following pairs is not isolobal ?
    A) CH_2 and CH^-
    B) BH_3 and $Cr(CO)_5$
    C) BH_3 and $[HCr(CO)_5]^-$
    D) CH_3 and CH^-

20. Which of the following is the correct order of CO stretching frequency for metal carbonyls ?
    A) $MCO > M_2CO > M_3CO$
    B) $MCO < M_2CO < M_3CO$
    C) $MCO < M_2CO > M_3CO$
    D) $MCO > M_2CO = M_3CO$

21. Which among the following pair is magic numbers for closed nuclear shells ?
    A) 12, 20 B) 20, 30 C) 50, 82 D) 82, 128

22. The only metal known to exist in a simple cubic lattice form
A) Copper B) Polonium C) Gold D) Iron

23. Which among the following electrolytes is not employed in a Solid Oxide Fuel Cell (SOFC) ?
A) Yttria-doped Barium Zirconate B) Scandia-doped Zirconia
C) Yttria-doped Zirconia D) Gadolinium-doped Ceria

24. Which among the following statements is not true about ZEBRA batteries ?
A) Sodium-Nickel Chloride batteries B) Fully rechargeable
C) Operating temperature below 0°C D) Uses β-alumina solid electrolyte

25. The type of semiconduction shown by (a) boron-doped silicon and (b) arsenic-doped silicon are
A) (a) p-type (b) n-type B) (a) n-type (b) p-type
C) (a) p-type (b) p-type D) (a) n-type (b) n-type

26. Which of the following colour centres occurs as a result of $[Cl_2]^-$ ion occupying a single anionic site in NaCl ?
A) V-centre B) M-centre C) R-centre D) H-centre

27. What is the chemical composition of the widely used ferroelectric material PZT ?
A) Phosphorous Zirconium Tungstate B) Lead Zirconium Titanate
C) Potassium Zinc Titanate D) Potassium Zirconium Tungstate

28. The lattice systems for which $\alpha \neq \beta \neq \gamma \neq 90°$, $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90°$, $a \neq b \neq c$ are respectively
A) Monoclinic and Triclinic B) Triclinic and Orthorhombic
C) Orthorhombic and Monoclinic D) Rhombohedral and Tetragonal

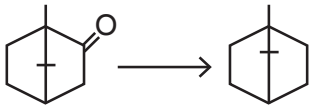
29. In a cubic crystal both 111 and 200 reflections are present but not 100. What is the Bravais lattice ?
A) P B) I C) C D) F

30. Silsbee effect is
A) When a superconductor is cooled below its critical temperature, it expects all the magnetic flux from its interior
B) When an alternating current flows through a conductor, it creates an alternating magnetic field that induces Eddy currents in nearby conductors
C) When the current in a superconductor exceeds a critical value, the superconductivity is destroyed
D) When temperature decreases, the resistance of a conductor to electricity decreases

31. Which of the following reaction is/are not correctly associated with S_N1 reaction ?
    i. Reaction proceed with racemisation.
    ii. Strong nucleophile favours S_N1 reaction.
    iii. S_N1 reaction proceed more rapidly in aprotic solvent like DMF, DMSO than water and alcohol.
    iv. Rearrangement takes place in S_N1 mechanism.
    A) Only ii
    B) Only ii and iii
    C) Only i, ii, iv
    D) All of the above

32. Lindlar's catalyst is
    A) H_2/Pt
    B) Pd on $CaCO_3$
    C) Tetraethyl lead
    D) Lithium Aluminium hydride

33. The reagent used for the conversion of



    A) NH_2NH_2, C_2H_5ONa
    B) Na, Dry ether
    C) Li, Liq.NH_3
    D) All of the above

34. Which of the following reactions gives carbene as intermediate ?
    i. $CH_2N_2 \xrightarrow{h\upsilon}$
    ii. $Ph_2C = N - NH_2 \xrightarrow[h\upsilon]{HgO}$
    iii. $Ph - \underset{\underset{O}{\|}}{C} - \underset{\underset{Ph}{|}}{C} = N^+ = N^- \xrightarrow{h\upsilon}$
    iv. $CH_3 - N = N^+ = N^- \xrightarrow{h\upsilon}$
    A) Only i and iv
    B) Only i and iii
    C) Only i, ii and iii
    D) Only i

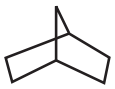
35. Which of the following compound is not aromatic ?
    A) [10] annulene
    B) [14] annulene
    C) [18] annulene
    D) Cyclopentadienyl anion

36. Which of the following reaction is used for synthesis of α-pinene from ethyl pinonate and α haloester ?
    A) Mannich reaction
    B) Darzen condensation
    C) Benzoin condensation
    D) Cannizaro reaction

37. Order of reactivity of the following alkyl halide for S_N2 reaction in methanol solution is

A) $CH_3F > CH_3Cl > CH_3Br > CH_3I$ B) $CH_3F > CH_3Br > CH_3Cl > CH_3I$

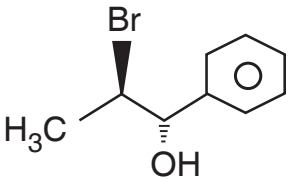
C) $CH_3I > CH_3Br > CH_3Cl > CH_3F$ D) $CH_3I > CH_3Br > CH_3F > CH_3Cl$

38. IUPAC name of 

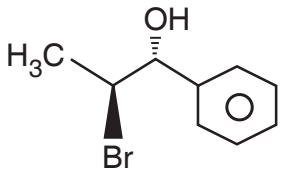
A) bicyclo [2.2.0] heptane B) bicyclo [1.1.0] heptane

C) bicyclo [2.2.1] heptane D) bicyclo [1.1.1] heptane

39. Assign R and S descriptors to I and II.



I



II

A) I is 2R 3R and II is 2S 3R B) I is 2R 3S and II is 2S 3R

C) I is 2S 3R and II is 2S 3R D) I is 2R 3S and II is 2R 3S

40. The cyclization of dinitrile in the presence of base is

A) Dieckmann reaction B) Thorpe reaction

C) Claisen condensation D) Knoevenagel reaction

41. The Gilman reagent is

A) n-butyl lithium B) Alkyl magnesium halide

C) Lithium dialkyl copper D) Lithium borohydride

42. Which of the following statement is correct for Beckmann rearrangement ?

i. Beckmann rearrangement take place with retention of configuration.
ii. It is a base catalysed transformation of a ketoxime to N-substituted amide.
iii. The rearrangement is highly stereospecific.
iv. Reaction is used for enlargement of rings.

A) Only i B) Only ii and iii

C) Only i, iii and iv D) All of the above

43. Reaction of α–haloketone with alkoxide gives rearranged ester. This reaction is known as

A) Favorskii rearrangement B) Beckmann rearrangement

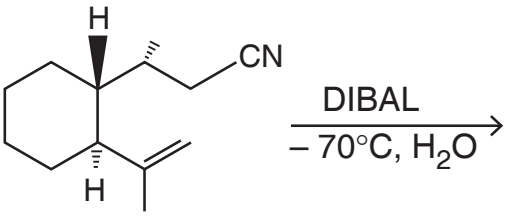
C) Wittig rearrangement D) Lossen rearrangement

44. Which among the following is/are correct for 1, 3-dithiane ?
    A) It is a weak proton acid
    B) It is used for preparation of ketone
    C) 1, 3-dithiane can be deprotonated by n-butyl lithium
    D) All of the above

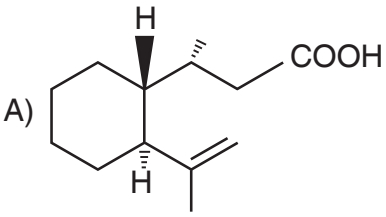
45. Quarternary ammonium ion which contain β-hydrogen atom undergo Hofmann elimination with base is known as
    A) Stevens rearrangement
    B) Fries rearrangement
    C) Demjanov rearrangement
    D) Benzidine rearrangement

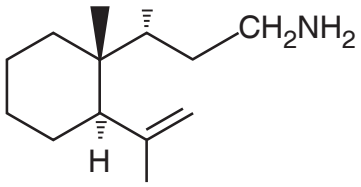
46. Catalyst used in Suzuki coupling is
    A) Pd (IV) complex
    B) Pd (O) complex
    C) Pd (II) complex
    D) All of the above

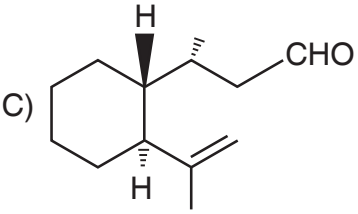
47. The coupling of terminal alkyne with vinyl halide under palladium catalyst is
    A) Kumada coupling
    B) Stille coupling
    C) Negishi coupling
    D) Sonogashira coupling

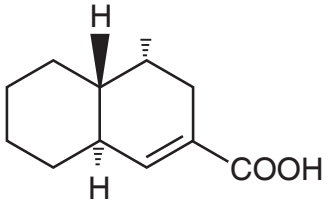
48. 

The product of the reaction is

A) 

B) 

C) 

D) 

49. Chromic anhydride in Conc.H_2SO_4 and water is called
    A) Tebbe reagent
    B) PCC
    C) Jones reagent
    D) Swern reagent

50. The correct statement about Hammett equation is
    A) A positive Hammett reaction constant 'P' means fewer electron in the transition state than starting material
    B) The more positive the charge induced on the ring by a substituent the larger its Hammett substituent constant (σ)
    C) If Hammett substituent constant (σ) is positive, the substituent is electron donating
    D) All of the above

51. Which of the following statements about photophysical processes are true ?
    I. Internal conversion is responsible for the non-radiative loss of energy between different vibrational levels of the same electronic state.
    II. Intersystem crossing is more likely to occur in molecules containing heavy atoms, such as bromine or iodine.
    III. Phosphorescence typically occurs on a timescale of nanoseconds.
    IV. Both fluorescence and phosphorescence involve radiative transitions.
    A) I and II
    B) I, II and IV
    C) I and III
    D) I,II, III and IV

52. In ^{13}C NMR, the signal intensity is generally lower than in ^{1}H NMR because
    A) ^{13}C nuclei have a lower gyromagnetic ratio
    B) ^{13}C is less abundant
    C) ^{13}C relaxation times are longer
    D) All of the above

53. Match the following reactions with their key features :

Reactions	**Features**
1. Norrish Type I	a. Radical cyclization of halogenated amines
2. Norrish Type II	b. Cleavage of the bond α-to the carbonyl group followed by radical recombination
3. Paterno-Buchi reaction	c. Cleavage of the bond β-to the carbonyl group followed by intermolecular hydrogen abstraction
4. Hofmann-Löffler-Freytag Reaction	d. Photochemical (2+2) cycloaddition between a carbonyl group and an alkene

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

54. What is the primary feature of sigmatropic rearrangements ?
    A) Homolytic bond cleavage
    B) Concerted mechanism with no intermediates
    C) Formation of cyclic products
    D) Involves a dipolar transition state

55. Match the following terms with their correct descriptions :

Column – I	Column – II
1. Prosthetic group	a. Active enzyme consisting of both protein and non-protein components
2. Holoenzyme	b. Protein part of an enzyme without its non-protein component
3. Apoenzyme	c. Non-protein component permanently attached to the enzyme

    A) 1 – c, 2 – a, 3 – b
    B) 1 – a, 2 – b, 3 – c
    C) 1 – b, 2 – c, 3 – a
    D) 1 – c, 2 – b, 3 – a

56. The IR spectrum of an organic compound shows a broad band near 3300 cm^{-1} when recorded neat, but becomes sharp and shifts to 3600 cm^{-1} when recorded in dilute benzene. This indicates
    A) The presence of a primary amine group
    B) The compound contains a carboxylic acid group
    C) The compound has intermolecular hydrogen bonding, likely from an OH group
    D) The presence of a nitrile group

57. In the context of lanthanide shift reagents, what does “pseudo contact shift” refer to ?
    A) Shifts caused by nearby electronegative atoms
    B) Shifts influenced by the paramagnetic nature of the lanthanide
    C) Shifts resulting from molecular vibrations
    D) Shifts caused by temperature variations

58. The type of bond that links nucleotides together in a ribonucleic acid (RNA) strand is
    A) Hydrogen bonds
    B) Ionic bonds
    C) Peptide bonds
    D) Phosphodiester bonds

59. The primary purpose of Ziegler-Natta catalysts in polymer chemistry is
    A) To facilitate dehydration reactions
    B) To catalyze the polymerization of alkenes
    C) To initiate condensation reactions
    D) To enhance the solubility of polymers

60. Which of the following alkaloids is isolated from the opium poppy plant ?
A) Caffeine B) Morphine C) Quinine D) Atropine

61. Which of the following statements are correct in the light of phase rule ?
i. The degree of freedom in case of a pure substance at its critical point is zero.
ii. Critical temperature and critical pressure are fixed at critical point for a pure substance.
iii. The degree of freedom in case of a pure substance at its critical point is one.
A) i and ii B) ii and iii C) i only D) iii only

62. What is the work done when 100 g of iron reacts with HCI in a closed vessel (volume constant) ? Atomic weight of iron = 56.
A) – 4.5 kJ B) 0 C) 2.4 kJ D) 4.5 kJ

63. Which phase equilibria is involved in distillation method of separation ?
A) Solid-vapour B) Liquid-liquid
C) Liquid-vapour D) Solid-solid

64. Choose the wrong statement.
A) Maxwell-Boltzmann statistics is applicable to ideal gas molecules
B) Fermi-Dirac statistics is applicable to electrons of high concentration
C) At high temperature both Fermi-Dirac and Bose-Einstein distribution approaches Maxwell-Boltzmann distribution
D) Restriction in the number of particles in a given quantum state is in Bose Einstein Statistics

65. Which of the following is not a transport phenomenon ?
A) Heat conduction B) Viscosity
C) Diffusion D) None of these

66. The phenomenon of enhanced conductance at high potential is called
A) Asymmetry effect B) Electrophoretic effect
C) Wien effect D) Debye-Falkenhage effect

67. Select the wrong statement.
A) Fuel cells have high efficiency
B) Noise levels of fuel cells are very high
C) Fuel cells are free from heat and vibration
D) Emission levels of fuel cells are very low

68. Cubic close packing of n spheres generates the following number of interstitial sites.
    A) 2n Octahedral and n tetrahedral sites
    B) n Octahedral and n tetrahedral sites
    C) 2n Octahedral and 2n tetrahedral sites
    D) n Octahedral and 2n tetrahedral sites

69. For a first order reaction, the half life is 50 seconds. Identify the correct statement from the following.
    A) The reaction is completed in 100 seconds
    B) The reaction begins after 50 seconds
    C) The reaction is completed in 40 seconds
    D) None of the above

70. Choose the correct set of miller indices for the planes with intercept along cartesian co-ordinate axes.
    i) OA = a, OB = 2a, OC= a and ii) OA = a, OB = a/2, OC= a/2 from the below given options.
    A) (122) and (212)
    B) (211) and (112)
    C) (1 ½ ½) and (121)
    D) (221) and (122)

71. For a gas phase reaction $NO_2 \Leftrightarrow = NO + ½\ O_2$, InKp (700K) = – 0.854 and InKp(600K) = – 2.172. Calculate the enthalpy change for this reaction.
    A) 40.67 kJ
    B) 45.67 kJ
    C) 40.37 kJ
    D) 20.57 kJ

72. The cell diagram for the electro chemical cell with the following chemical reaction is $H_2(g) + Hg_2Cl_2(s) = = = =$ 1HgCI (aq) + 2HCI (aq)
    A) $Pt/Hg/Hg_2Cl_2/H_2/HCI/Pt$
    B) $H_2/Pt/HCI/Hg_2Cl_2/Pt/Hg$
    C) $Pt/H_2/HCI/Hg_2Cl_2/Hg/Pt$
    D) $Pt/H_2/HCI/Pt/Hg/Hg_2Cl_2$

73. The commonly used cell as standard for calibration of potentiometers is
    A) Galvanic cell
    B) Weston cell
    C) Calomel
    D) Std. Hydrogen Electrode

74. The ionic strength of a 5.22×10^{-4} m Na_3PO_4 solution is
    A) 4.16×10^{-3} m
    B) 3.132×10^{-3} m
    C) 5.16×10^{-4} m
    D) 3.132×10^{-4} m

75. The phenomenon in which molecules escape through a small opening without disturbing the equilibrium distribution is
    A) diffusion
    B) osmosis
    C) effusion
    D) reverse osmosis

76. The technique of breaking the molecules with intense pulse of light and monitoring the subsequent reactions is called
    A) Nuclear magnetic resonance spectroscopy
    B) Flash photolysis
    C) Continuous flow method
    D) Stopped flow method

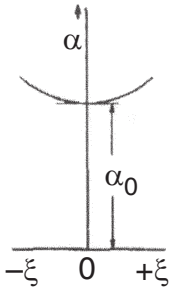
77. The point at the centre of contour map of potential energy surface is
    A) Critical constant B) Saddle point C) Centroid D) Morse curve

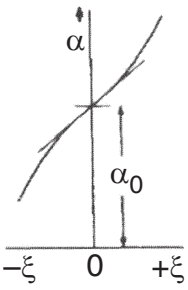
78. Pick the correct statement which is true for a first order reaction.
    A) Half life is independent of initial concentration
    B) Half life is inversely proportional to the initial concentration
    C) Half life is directly proportional to the initial concentration
    D) None of the above

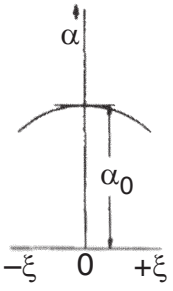
79. Choose the correct statement which is true from below.
    A) Mean free path of a gas molecule is inversely proportional to pressure
    B) Mean free path of a gas molecule is directly proportional to pressure
    C) Mean free path of a gas molecule is independent of pressure
    D) Mean free path of a gas molecule is inversely proportional to volume

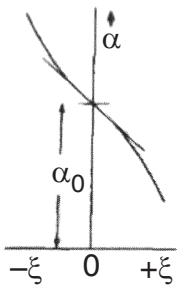
80. The high specific heat capacity and high surface tension of water is due to the presence of
    A) High surface energy B) High surface area
    C) Increased polarity D) Inter molecular hydrogen bonding

81. The variation in the polarizability ellipsoid corresponding to the symmetric stretching of CO_2 can be shown as

A)


B)


C)


D)


82. The observed electronic spectral transitions of Cu^{2+} systems in distorted octahedral environment can be

A) $^2E_g \leftarrow {}^2B_{1g}$ and $^2B_{2g} \leftarrow {}^2A_{1g}$ B) $^2B_{2g} \leftarrow {}^2B_{1g}$ and $^2A_{1g} \leftarrow {}^2B_{1g}$

C) $^2B_{2g} \leftarrow {}^2B_{1g}$ and $^2E_g \leftarrow {}^2B_{1g}$ D) $^2E_g \leftarrow {}^2B_{1g}$ and $^2B_{2g} \leftarrow {}^2E_g$

83. Allene and Ethane (staggered) belong to _____ and _____ point groups respectively.

A) D_{3d} and D_{3h} B) D_{3d} and D_{2d} C) D_{4d} and D_{3d} D) D_{2d} and D_{3d}

84. Which among the following is expressed by the relation $nRT^2(\partial \ln q/\partial T)v$?

A) Internal Energy B) Enthalpy

C) Gibbs Free Energy D) Pressure

85. For N particles, each with g possible one particle states accessible, the number of N-particle states accessible to the system for bosons is given by

A) $\Omega = (g - N - 1)!/N!(g - N)!$ B) $\Omega = g!/N!(g - N)!$

C) $\Omega = N!(g - N)!/g!$ D) $\Omega = (g + N - 1)!/N!(g - N)!$

86. A Gaussian 6 – 31 G* calculation on CH_2 uses _____ basis functions.

A) 9 B) 15 C) 19 D) 13

87. The degree of degeneracy of the energy level $14h^2/8ma^2$ of particle in 3D box is

A) 0 B) 6 C) 14 D) 3

88. $E = A^2 + 4A - 3$ corresponds to the approximate energy of a system where A is the vibrational parameter. Value of A leads to the minimum energy and that minimum energy are _____ and _____ respectively.

A) – 2 and – 4 B) – 7 and – 2 C) – 2 and – 7 D) – 1 and 0

89. As per Pauli's exclusion principle, which among the following combinations correctly represent the ground state of He atom ?

A) 1s(1) 1s(2) [$\alpha(1)\ \alpha(2)$]

B) 1s(1) 1s(2) $(1/\sqrt{2})$ [$\alpha(1)\ \beta(2) - \alpha(2)\ \beta(1)$]

C) 1s(1) 1s(2) [$\beta(1)\ \beta(2)$]

D) 1s(1) 1s(2) $(1/\sqrt{2})$ [$\alpha(1)\ \beta(2) + \alpha(2)\ \beta(1)$]

90. What is the ground state term symbol of free Fe^{2+} ion ?
A) $^5D_4$ B) $^6S_{5/2}$ C) $^3F_4$ D) $^4F_{9/2}$

91. The Lycurgus cup appears green when
A) light is transmitted B) light is absorbed
C) light is scattered D) light is reflected

92. Which crown ether exhibits affinity for sodium ion ?
A) 18-Crown-6 B) 15-Crown-4
C) 12-Crown-4 D) 15-Crown-5

93. How many significant figures are there in the numbers 0.001204000 and 0.001204 respectively ?
A) 6, 4 B) 9, 6 C) 7, 4 D) 4, 4

94. The apparatus used to determine surface tension is
A) stalagmometer B) refractometer
C) viscometer D) spectrometer

95. An example for halochromic material is
A) Gallium nitride B) Methyl orange
C) Iron-Aluminium alloy D) Iron-Phosphorus alloy

96. An example for 1D nanomaterial is
A) fullerene B) graphene C) graphite D) diamond

97. The dark organic material in soil which is formed by the decomposition of plant and animal matter is
A) fibre B) clay C) humus D) lignite

98. Which parameter is measured using differential scanning calorimetry ?
A) Change in mass B) ΔT
C) Volume D) dH

99. Meteorites burn up in which layer while entering earth's atmosphere
A) Troposphere B) Mesosphere
C) Stratosphere D) Thermosphere

100. The basic principle of column chromatography is
A) adsorption B) absorption
C) partition D) separation

Space for Rough Work