ENTRANCE EXAMINATION FOR ADMISSION, MAY 2010.

M.Sc. (CHEMICAL SCIENCES)

COURSE CODE : 369

Register Number :

Signature of the Invigilator
(*with date*)

COURSE CODE : 369

Time : 2 Hours

Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.

2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.

3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.

4. Avoid blind guessing. A wrong answer will fetch you −1 mark and the correct answer will fetch 4 marks.

5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.

6. Do not open the question paper until the start signal is given.

7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.

8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.

9. Use of Calculators, Tables, etc. are prohibited.

1. Which one of the following statements is **incorrect**?

   (A) Gaseous PCl_5 is covalent and has trigonal bipyramidal structure

   (B) PCl_5 splits into $[PCl_4]^+$ and $[PCl_6]^-$ ions in solid state, which have tetrahedral and octahedral structures respectively

   (C) PCl_5 reacts vigorously with water

   (D) PCl_5 is pyrophoric.

2. What is the bond order in O_2^{2-}

   (A) 1.5   (B) 1   (C) 2.5   (D) 3

3. Ni is purified by

   (A) making $Ni(CO)_4$ and decomposing it at high temperatures

   (B) making $[NiCl_4]^{2-}$ and reducing it with $LiAlH_4$

   (C) making $[NiI_4]^{2-}$ and reducing it with $LiAlH_4$

   (D) making $[Ni(CN)_4]^{2-}$ and reducing it with Raney nickel

4. In a close packed arrangement of metallic structures, coordination number of a given atom is

   (A) 12   (B) 10   (C) 6   (D) 8

5. Which one of the following molecular orbitals has center of symmetry?

   (A) $\pi\,(p-p)$ (B) $\pi^*\,(p-p)$

   (C) $\sigma\,(p-s)$ (D) $\sigma^*\,(p-s)$

6. Triiodide ion, I_3^-, has

   (A) two lone pairs of electrons and has bent structure

   (B) three lone pairs of electrons and has bent structure

   (C) three lone pairs of electrons and has linear structure

   (D) two lone pairs of electrons and has linear structure

7. Which one of the following compounds has *dimeric structure*?

   (A) BCl_3 (B) $AlCl_3$ (C) $SiCl_4$ (D) PCl_3

8. In liquid ammonia, NH_4Cl acts as

   (A) a base   (B) an acid

   (C) a salt   (D) an amphoteric substance

9. The factor that **does not** influence ionization energy is

(A) the charge on the nucleus

(B) type of electron involved (s, p, d, f)

(C) the number of electrons present in the outer shells

(D) the size of the atom

10. Carbon dating is based on

(A) the isotope ^{11}C (B) the isotope ^{12}C

(C) the isotope ^{13}C (D) the isotope ^{14}C

11. Talc (soap stone) is an example of

(A) sheet silicates   (B) 3D silicates

(C) chain silicates   (D) discrete silicates

12. Which one of the following metal carbonyl complexes does not obey the EAN rule?

(A) $Ni(CO)_4$ (B) $Fe(CO)_5$

(C) $V(CO)_6$ (D) $Fe_2(CO)_9$

13. The metal present in Wilkinson's catalyst is

(A) Mg   (B) Pt   (C) Rh   (D) Co

14. Which of the following is **not** a radioactive technique?

(A) $^{14}C_6$ dating   (B) $^{235}U_{92}$ nuclear bomb making

(C) $^{31}P_{15}$ nuclear magnetic resonance   (D) $^{60}Co_{27}$ radiography

15. The ground state atomic term symbol for carbon atom is

(A) $^3P_0$ (B) $^1D_2$ (C) $^3D_2$ (D) $^5P_0$

16. The IUPAC nomenclature of $[Fe(CN)_2(CH_3NC)_4]$ is

(A) dicyanotetrakis(methylisocyanide)iron(II)

(B) tetrakis(methylisocyanide)iron(II)cyanide

(C) dicyanotetrakis(methyl isocyano)iron(IV)

(D) dicyanoiron(IV)methylisocyanide

17. CFSE of low-spin Co(III) in octahedral field is

(A) $0.4\,\Delta_0$ (B) $2.4\,\Delta_0$ (C) $0\,\Delta_0$ (D) $1.8\,\Delta_0$

18. Acid rains are mostly due to the

   (A) burning of carbon present in coal

   (B) burning of sulfur present in coal

   (C) burning of phosphorous present in coal

   (D) burning of nitrogenous material present in coal

19. Which one of the following statements is **incorrect**?

   (A) Lattice energy in ionic solids depends on the product of the ionic charges

   (B) Lattice energy in ionic solids is inversely proportional to inter ionic distance

   (C) Crystals with high lattice energy melt at high temperatures

   (D) Madelung constant does not depend on the geometry of the crystal

20. The hybridization in XeF_4 is

   (A) sp^3 (B) sp^3d (C) sp^3d^2 (D) sp^3d^3

21. XeO_2F_2 has

   (A) trigonal bipyramidal structure with a lone pair of electrons in equatorial position

   (B) trigonal bipyramidal structure with a lone pair of electrons in axial position

   (C) square pyramid with a lone pair of electrons in axial position

   (D) square pyramid with a lone pair of electrons in equatorial position

22. The identical size of Zr and Hf is due to

   (A) nephelauxetic effect

   (B) lanthanide contraction

   (C) crystal field splitting

   (D) the presence of both the metals in the same group

23. IUPAC nomenclature of the complex $[CoCl_2(CN)(NH_3)_3]$ is

   (A) cyanodichlorotriamminecobalt(III)

   (B) dichlorocyanotriamminecobalt(III)

   (C) cyanotriamminecobalt(III)chloride

   (D) triamminedichlorocyanocobalt(III)

24. Which one of the following metals is highly toxic?

   (A) Fe   (B) Zn   (C) Cu   (D) Hg

25. Which one of the following metals is used in Ziegler-Natta catalyst

(A) Pd   (B) Ti   (C) Fe   (D) Pt

26. Order of the d orbitals in terms of energy in square planar geometry

(A) $d_{xy} > d_{xz}$ & $d_{x^2-y^2} > d_{z^2} > d_{yz}$ (B) d_{xz} & $d_{yz} > d_{xy} > d_{z^2} > d_{x^2-y^2}$

(C) $d_{yz} > d_{z^2} > d_{xz}$ & $d_{x^2-y^2} > d_{xy}$ (D) $d_{x^2-y^2} > d_{z^2} > d_{xy} > d_{xz}$ & d_{yz}

27. Which one of the following ions has magnetic moment of 5.9 BM

(A) Fe(II)   (B) Co(II)   (C) Mn(II)   (D) Cr(II)

28. The correct order of the ligands CO, H_2O, I⁻ and PR_3 based on the ligand field strength is

(A) $CO > H_2O > I⁻ > PR_3$ (B) $CO > PR_3 > H_2O > I⁻$

(C) $I⁻ > PR_3 > CO > H_2O$ (D) $PR_3 > CO > H_2O > I⁻$

29. The acidity of hydrogen halides is in the order

(A) HI > HBr > HCl > HF   (B) HF > HCl > HBr > HI

(C) HCl > HBr > HI > HF   (D) HBr > HCl > HI > HF

30. Which one of the following statements is correct?

(A) Both TiO_2 and $TiCl_3$ are violet   (B) Both TiO_2 and $TiCl_3$ are colorless

(C) TiO_2 is colorless and $TiCl_3$ is violet   (D) TiO_2 is violet and $TiCl_3$ is colorless

31. IUPAC nomenclature of
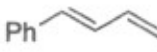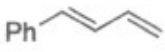

(A) E-4-hexen-1-ol   (B) E-4-hexen-1-al

(C) Z-4-hexen-1-al   (D) Z-4-hexen-1-ol

32. Stereochemical descriptor at C2 and C5 are
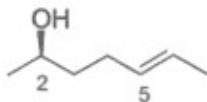
(A) R, E (B) S, E (C) R, Z (D) S, Z

33. The order of boiling point among the following is

    i.   Ethane   ii.   Ethanol
    iii. Ethylamine   iv.   Ethanoic acid

    (A) i > iii > ii > iv   (B) iv > iii > ii > i
    (C) iv > ii > iii > i   (D) ii > iv > ii > i

34. Major product formed in the electrolysis of butanoic acid would be

    (A) butane   (B) 1-butene   (C) hexane   (D) octene

35. The major product from the reaction of cyclohexene with NBS in ethanol is

    (A) *cis*-1-bromo-2-ethoxycyclohexane   (B) *trans*-1-bromo-2-ethoxycyclohexane

    (C) 3-bromo-1-cyclohexene   (D) 3-ethoxy-1-cyclohexane

36. Major product formed in the reaction of 1-phenylbutadiene with HBr is

    Ph⌒⟍⟍⧸

    (A) *E*-bromo-1-phenyl-2-butene   (B) *E*-1-bromo-1-phenyl-2-butene

    (C) *E*-4-bromophenyl-2-butene   (D) *Z*-4-bromo-1-phenyl-2-butene

37. When 1 g of bromobenzene was nitrated, 0.5 g of 4-bromonitrobenzene was isolated. Yield of the reaction is about

    (A) 55%   (B) 75%   (C) 40%   (D) 10%

38. Rate the following for the use as solvent in Friedel-Crafts reaction

    i. CS$_2$ ii.   EtOEt   iii. Hexane

    (A) i > ii > iii   (B) i > iii > ii   (C) ii > i > iii   (D) ii > iii > i

39. The major product formed in the reaction of phenol with excess of Br$_2$ in AcOH is

    (A) 2,4,6-tribromophenol   (B) 2,3,5-tribromophenol

    (C) 2,4-dibromophenol   (D) 4-bromophenol

40. Which among the four organic compounds is the strongest acid?

    (A) Acetyl acetone   (B) Acetyl chloride

    (C) Acetophenone   (D) Acetone

41. Which among the following carbocation is most stable?

    (A) Methyl carbocation   (B) Acyl carbocation

    (C) Benzyl carbocation   (D) Vinyl carbocation

33. The order of boiling point among the following is

    i.   Ethane   ii.   Ethanol
    iii. Ethylamine   iv.   Ethanoic acid

    (A) i > iii > ii > iv   (B) iv > iii > ii > i
    (C) iv > ii > iii > i   (D) ii > iv > ii > i

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    (C) 3-bromo-1-cyclohexene   (D) 3-ethoxy-1-cyclohexane

36. Major product formed in the reaction of 1-phenylbutadiene with HBr is

    Ph ⌇⌇⌇

    (A) *E*-bromo-1-phenyl-2-butene   (B) *E*-1-bromo-1-phenyl-2-butene
    (C) *E*-4-bromophenyl-2-butene   (D) *Z*-4-bromo-1-phenyl-2-butene

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    i. CS_2 ii.   EtOEt   iii.   Hexane

    (A) i > ii > iii   (B) i > iii > ii   (C) ii > i > iii   (D) ii > iii > i

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    (C) Acetophenone   (D) Acetone

41. Which among the following carbocation is most stable?

    (A) Methyl carbocation   (B) Acyl carbocation
    (C) Benzyl carbocation   (D) Vinyl carbocation

42. The major product formed in the reaction of 2-bromo-2-methylbutane with potassium *t*-butoxide in *t*-buOH is

(A)   2-methyl-2-butene   (B)   1-methyl-2-butene

(C)   1-pentene   (D)   *E*-2-pentene

43. An organic compound of molecular weight 107 was analyzed for C: 78.6%; H: 8.4% and N: 12.92%. Molecular formula of the compound is

(A) C_7H_7O (B) C_6H_5NO (C) $C_5H_5N_2$ (D) C_7H_9N

44. Identify two electrophiles among the following

i.   EtSH   ii. Ph_3P iii. Et_2AlCl iv. BBr_3

(A)   i and ii   (B)   i and iii

(C)   iii and iv   (D)   ii and iv

45. Reagent used for the conversion of propiophenone to *n*-propylbenzene is

(A) Na/NH_3 (B) $H_2N.NH_2$ H_2O/KOH

(C) $KMnO_4$ (D) $Br_2/AcOH$

46. When 1-butene is reacted with i. B_2H_6 ii. H_2O_2, ^-OH the product formed is

(A)   1-butanol   (B)   2-butanol

(C)   *t*-butanol   (D)   2-butanone

47. A gaseous hydrocarbon (bp = 9° C) of MF: C_4H_6 on bubbling through ammonical silver nitrate provides a white precipitate. The compound could be

(A)   1-butyne   (B)   2-butyne

(C)   1,3-butadiene   (D)   1,2-butadiene

48. The reaction of silver benzoate with ethyl bromide is expected to provide

(A)   benzoic acid   (B)   ethylalcohol

(C)   ethyl benzoate   (D)   bromobenzene

49. The reaction of aniline with chloroform and potassium hydroxide provides

(A)   2,4-dichloroaniline   (B)   2-chloroaniline

(C)   phenyl cyanide   (D)   phenyl isocyanide

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50. Bromobenzene reacts with Mg to afford **X**. **X** on reaction with CO_2 gives **Y**. **X** and **Y** are

   (A) 2-bromophenylmagnesium and 2-bromobenzoic acid

   (B) biphenyl and phenylacetic acid

   (C) benzene and benzoic acid

   (D) phenylmagnesium bromide and benzoic acid

51. A hydrocarbon of MF: C_6H_{10} on reaction with i. $Hg\,(OAc)_2$ ii. $NaBH_4$ provides 1-methyl-1-cyclopentanol. X is

   (A) Cyclohexene   (B) 1-methyl-1-cyclopentene

   (C) 3-methyl-1-cyclopentene   (D) 1,2-dimethylcyclobutene

52. A hydrocarbon X of MF: C_7H_{12} on oxidation with conc. $KMnO_4$ provided cyclohexanone and formic acid. X is

   (A) ethylydine cyclopentane   (B) 3-methylcyclohexene

   (C) 1-methyl cyclohexene   (D) methylene cyclohexane

53. The reaction of cyclohexanol with i. TsCl, ii. LAH gives

   (A) cyclohexane   (B) cyclohexene

   (C) cyclohexadiene   (D) cyclohexanone

54. Product formed in the following rearrangement is
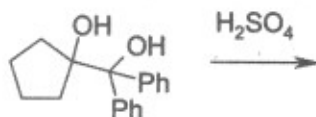
   (A)

   (B)

   (C)

   (D)

55. Phenylmagnesium bromide reacts with acetaldehyde to form a salt which on hydrolysis gives

   (A) diphenyl methanol   (B) benzylacohol

   (C) 1-phenyl-ethanol   (D) benzoic acid

56. An organic alcohol $C_6H_{12}O$ (**X**) reacts with sodium dichromate to form Y which in turn gives red precipitate with acidic solution of 2,4-DNP. X and Y are

(A) 2-hexenal and hexanoic acid

(B) cyclohexanol and cyclohexanone

(C) 2-methylpentanal and 2-methylpentanoic acid

(D) 3-methyl-2-pentanone and butyric acid

57. An organic compound of MF: $C_9H_{18}O$ answers Tollens test. The compound is

(A) 3-methyl-2-octanone   (B) 2-methyl-2-octanone

(C) 2-nonanone   (D) 1-nonanal

58. Cyclohexanone reacts with HNO_3 to provide a dibasic acid. The acid is

(A) oxalic acid   (B) succinic acid

(C) malonic acid   (D) adipic acid

59. Which among the following diketones has most acidic hydrogens?

(A) Cyclohexane-1,2-dione   (B) Cyclohexane-1,3-dione

(C) Cyclohexane-1,4-dione   (D) Hexane-2,5-dione

60. Treatment of ethyl chloroacetate with potassium pthalimide followed by reaction with hydrazine provides

(A) glycine   (B) alanine   (C) valine   (D) leucine

61. Representing solvent and solute in a binary solution by subscripts 1 and 2, respectively, the conversion expression for molarity in to mole fraction is

(A) $x_2 = \dfrac{MM_1}{\rho + M(M_1 - M_2)}$ (B) $x_2 = \dfrac{mM_1}{1 + mM_1}$

(C) $x_2 = \dfrac{1 + mM_1}{mM_1}$ (D) $x_2 = \dfrac{MM_1}{\rho - M(M_1 + M_2)}$

62. A solution containing 2.68×10^{-3} mol of A^{n+} ions require 1.61×10^{-3} mol of MnO_4^- for the oxidation of A^{n+} to AO_3^- in acidic medium. The value of n is

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

63. The expression of root mean square speed of the molecules of a gas is given as

(A) $\sqrt{\dfrac{3RT}{M}}$ (B) $\sqrt{\dfrac{3RT}{m}}$ (C) $\sqrt{\dfrac{3kT}{M}}$ (D) $\sqrt{\dfrac{8RT}{\pi M}}$

64. The temperature of a given mass of gas is increased from 19° C to 20° C at constant pressure. The volume, V, of the gas is increased by

(A) V(20/19)

(B) 1/273.15 of its volume at 0°C

(C) 1/273.15 of its volume at 0 K

(D) a factor of 1/273.15 of its volume at 19°C

65. Which of the following statements regarding a liquid is NOT correct?

(A) On dissolving sodium chloride in water, its surface tension decreases

(B) The variation of surface tension of a liquid is given by the expression $\gamma(Mv)^{2/3} = k(t_c - t - 6)$

(C) Soap is a surface active substance

(D) $1 Nm^{-1} = 10^3 \, dyn \, cm^{-1}$

66. In the closest packing of atoms A and B, the ratio of their radius that can be fitted in to tetrahedral void is

(A) 0.155   (B) 0.225   (C) 0.414   (D) 0.732

67. Which of the following expressions is correct in case of sodium chloride unit cell with edge length = a

(A) $r_c + r_a = a$ (B) $r_c + r_a = a/2$ (C) $r_c + r_a = 2a$ (D) $r_c + r_a = \sqrt{2}a$

68. A gaseous mixture of helium and oxygen is found to have a density of 0.5 g/dm³ at 300 K and 760 Torr. The mass percent of helium in the mixture is about

(A) 30%   (B) 35%   (C) 40%   (D) 50%

69. The angular momentum of an electron in an orbital is given as

(A) $L = \left(n / \sqrt{l(l+1)}\right)(h/2\pi)$ (B) $L = l(l+1)(h/2\pi)$

(C) $L = \sqrt{l(l+1)}(h/2\pi)$ (D) $L = m(h/2\pi)$

70. The wavelength of the first line of the Balmer series of hydrogen atom is 656.1 nm, the wavelength of the second line of this series would be

(A) 218.7 nm   (B) 328.0 nm

(C) 486.0 nm   (D) 640.0 nm

71. In the plot or $r^2R^2_{1,0}$ versus r for hydrogen atom, maximum occurs at

    (A)   r = 0   (B)   r = a₀   (C)   r = 2a₀   (D)   r = infinity

72. The word "standard" in standard molar enthalpy change implies

    (A)   temperature 298 K

    (B)   pressure 1 bar

    (C)   temperature 298 K and pressure 1 bar

    (D)   temperature 298 K and pressure 1 atm

73. Which of the following results in decrease in entropy?

    (A)   Crystallization of sucrose from solution

    (B)   Rusting of iron

    (C)   Conversion of ice to water

    (D)   Vaporization of camphor

74. Given the following reaction at equilibrium $N_2(g) + 3H_2(g) = 2NH_3(g)$. Some inert gas is added at constant volume. Predict which of the following facts will be affected?

    (A)   more of ammonia gas is produced

    (B)   less of ammonia gas is produced

    (C)   no affect on the degree of advancement of the reaction at equilibrium

    (D)   equilibrium constant of the reaction is increased

75. Predict which of the following facts for the equilibrium reaction $2NH_3(g) = N_2(g) + 3H_2(g)$ holds good?

    (A)   Equilibrium constant of the reaction is changed with increase in pressure of the system

    (B)   Equilibrium constant of the reaction remains unaffected with increase in pressure of the system

    (C)   More of ammonia gas is decreased with increase in pressure

    (D)   Less of hydrogen gas is formed as compared to nitrogen gas

76. If 0.2 mol of hydrogen gas and 2.0 mol of solid sulphur are mixed in a 1.0 L vessel at 90°C to form hydrogen sulphide gas. The equilibrium constant of this reaction is 6.8×10^{-2}. Then, the partial pressure of hydrogen sulphide gas formed in the reaction would be

    (A)   0.19 atm   (B)   0.38 atm

    (C)   0.6 atm   (D) $6.8 \times 10^{-2}/(0.2 \times 2)$ atm

77. The solubility of $Pb(OH)_2$ in water is 7×10^{-6} M. The solubility of $Pb(OH)_2$ in a buffer solution of pH = 8 will be about

    (A) 1.372×10^{-1} M

    (B) 1.372×10^{-2} M

    (C) 1.372×10^{-3} M

    (D) 1.372×10^{-4} M

78. The density of Cu is 8.94 g/cm³. The quantity of electricity needed to plate an area of 10 cm × 10 cm to a thickness of 0.01 cm using copper sulphate solution is

    (A) 13586 C (B) 27172 C (C) 40758 C (D) 20348 C

79. The equilibrium constant of acetic acid in aqueous solution of concentration c is given by

    (A) $K = \dfrac{c\Lambda_c^2}{\Lambda^\infty - \Lambda_c}$

    (B) $K = \dfrac{c\Lambda_c^2}{\Lambda^\infty\left(\Lambda^\infty - \Lambda_c\right)}$

    (C) $K = \dfrac{c\Lambda_c^2}{\Lambda^\infty + \Lambda_c}$

    (D) $K = \dfrac{c\Lambda_c^2}{\Lambda^\infty\left(\Lambda^\infty + \Lambda_c\right)}$

80. The standard reduction potential values of three metallic cations, X, Y, Z are 0.52, −3.03 and −1.18 V respectively. The order of reducing power of the corresponding metals is

    (A) Y > Z > X (B) X > Y > Z (C) Z > Y > X (D) Z > X > Y

81. The quantity of electricity that would be required to reduce 12.3 g of nitrobenzene (molar mass: 123 g/mol) to aniline is about

    (A) 42900 C (B) 47900 C (C) 52900 C (D) 57900 C

82. Which of the following plots does not represent the behavior of an ideal binary liquid solution?

    (A) Plot of p_A versus x_A is linear

    (B) Plot of p_B versus x_B is linear

    (C) Plot of p_{total} versus x_A (or x_B) is linear

    (D) Plot of p_{total} versus x_A is nonlinear

83. A binary solution of h-heptane and ethyl alcohol is prepared. Which of the following statements correctly represents the behavior of this liquid solution?

    (A) The solution formed is an ideal solution

    (B) The solution formed is nonideal solution with positive deviation from Raoult's law

    (C) The solution formed is nonideal solution with negative deviation from Raoult's law

    (D) n-Heptane exhibits positive deviation whereas ethyl alcohol exhibits negative deviation from Raoult's law

84. The substance, with initial concentration a, reacts according to zero-order kinetics. The time it takes for the completion of the reaction is

(A) a/k (B) a/2k (C) k/a (D) 2k/a

85. Which of the following statements is NOT correct for a lyophilic sol?

(A) It is not easily solvated

(B) It carries charge

(C) The coagulation of this sol is irreversible in nature

(D) It is quite stable in solvent

86. The number of EPR hyperfine lines expected for methyl radical are

(A) Two (B) Three (C) Four (D) None

87. Nuclear quadrupolar effect is due to

(A) electron spin value equal to zero (B) nuclear spin value equal to zero

(C) electron spin value greater than 1/2 (D) nuclear spin value greater than 1/2

88. For a molecule to be Raman active, the condition is

(A) change in dipole moment (B) change in electron spin value

(C) change in polarizability (D) change in nuclear spin value

89. The number of normal modes of vibration for water and carbon dioxide are

(A) 3 and 4 (B) 4 and 3 (C) 3 and 3 (D) 4 and 4

90. In a system, $a \neq b \neq c$; $\alpha = \beta = \gamma = 90$ degrees, then it belongs to

(A) cubic (B) triclinic

(C) monoclinic (D) orthorhombic

91. When one operates with d^2/dx^2 on the function $8 \sin(2x)$, one finds that

(A) the function is an eigen function with the eigen value -32

(B) the function is an eigen function with the eigen value 4

(C) the function is an eigen function with the eigen value -4

(D) the function is not an eigen function

92. The reason for normalizing a wave function ψ is

 (A) to guarantee that ψ is square-integrable

 (B) to make $\psi * \psi$ equal to the probability distribution of the particle

 (C) to make ψ an eigenfunction of the Hamiltonian operator

 (D) to make ψ display the proper symmetry characteristics

93. The integral $\int \sin(x) \cos(x)\, dx$ in the interval $-a$ to $+a$

 (A) is zero for any value of a and $\cos(x)$ is antisymmetric in this range

 (B) is not zero except for certain values of a and $\cos(x)$ is symmetric in this range.

 (C) is zero for any value of a and $\cos(x)$ is symmetric in this range

 (D) is zero for any value of a and $\sin(x)$ is symmetric in this range.

94. The energy gap between the n and n+1 level in the particle in a sphere

 (A) increase with increasing in n (B) decrease with increasing in n

 (C) independent of the value of n (D) none of the above

95. The energy of the particle in a box is independent of

 (A) length of the box (B) potential energy barrier of the box

 (C) mass of the particle (D) none of the above

96. The energy of hydrogen atom is a function of

 (A) primary quantum number n (B) azimuthal quantum number l

 (C) magnetic quantum number m (D) all of the above

97. The equation $(x^2/a^2) - (y^2/b^2) = 1$ describes a

 (A) straight line (B) circle

 (C) parabola (D) hyperbola

98. If three Persons A, B and C toss a coin in the same order repeatedly till somebody gets a head, what is the probability of A getting the head?

 (A) 1/7 (B) 2/7 (C) 3/7 (D) 4/7

99. In the differential equation $3(d^2y/dx^2) + (dy/dx)^3 = x$, the degree and order is

 (A) 3, 3 (B) 1, 2 (C) 2, 1 (D) 3, 2

100. The translational analogue of force in rotational motion is

 (A) moment of Inertia (B) angular momentum

 (C) angular velocity (D) torque