BOOKLET CODE [A]

ENTRANCE EXAMINATION – 2019

M. Sc. Chemistry

TIME: 2 HOURS **MAXIMUM MARKS: 100**

HALL TICKET NUMBER: [ ]

INSTRUCTIONS

1. Write your **HALL TICKET NUMBER** and the **BOOKLET CODE** in the space provided above and also on the **OMR** ANSWER SHEET given to you.
2. Make sure that pages numbered from **1 - 17** are present (excluding 3 pages assigned for rough work).
3. There are 100 questions in this paper. All questions carry equal marks.
4. **There is negative marking. Each wrong answer carries – 0.33 mark.**
5. Answers are to be marked on the OMR answer sheet following the instructions provided on it.
6. Hand over the OMR answer sheet at the end of the examination.
7. In case of a tie, the marks obtained in the first 25 questions (**PART A**) will be used to determine the order of merit.
8. No additional sheets will be provided. Rough work can be done in the space provided at the end of the booklet.
9. Calculators are allowed. **Cell phones are not allowed.**
10. Useful constants are provided at the beginning, before **PART A** in the question paper.
11. Candidate should write and darken the correct Booklet Code in the OMR Answer Sheet, without which the OMR will not be evaluated. The candidates defaulting in marking the Booklet Code in the OMR shall not have any claim on their examination and University shall not be held responsible.

T-9

Useful Constants:

Rydberg constant = 109 737 cm^{-1}; Faraday constant = 96 500 C; Planck constant = 6.625×10^{-34} J s; Speed of light = 2.998×10^{8} m s^{-1}; Boltzmann constant = 1.380×10^{-23} J K^{-1}; Gas constant = 8.314 J K^{-1} mol^{-1} = 0.082 L atm K^{-1} mol^{-1} = 1.986 cal K^{-1} mol^{-1}; Mass of electron = 9.109×10^{-31} kg; Mass of proton = 1.672×10^{-27} kg; Charge of electron = 1.6×10^{-19} C; 1 D = 3.336×10^{-30} C m; 1 bar = 10^{5} N m^{-2}; RT/F (at 298.15 K) = 0.0257 V.

PART – A

1. The expected general order of strength of hydrogen bond is:

   [A] C–H···O > N–H···O > O–H···O [B] O–H···O > N–H···O > C–H···O
   [C] N–H···O > O–H···O > C–H···O [D] O–H···O > C–H···O > N–H···O

2. An organic compound containing carbon, hydrogen and oxygen requires 2.5 L of oxygen to burn completely at STP and gives two liters each of CO_2 and H_2O vapor. The empirical formula of the compound is likely to be

   [A] C_2H_4O [B] CH_2O
   [C] C_2H_2O [D] C_4H_2O

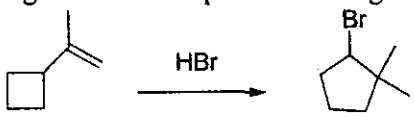
3. Among the following, the diamagnetic complex is

   [A] $[Mn(CN)_6]^{3-}$ [B] $[Fe(CN)_6]^{3-}$
   [C] $[Co(NH_3)_6]^{3+}$ [D] $[Ni(NH_3)_6]^{3+}$

4. The internal energy of a system (V = volume, T = Temperature, P = pressure, S = entropy) is a function of

   [A] V and T [B] V and S
   [C] P and T [D] P and S

5. The following reaction will proceed through



   I. addition of HBr across the double bond
   II. formation of a primary carbocation
   III. formation of a tertiary carbocation
   IV. formation of a secondary carbocation

   [A] (I) and (IV) [B] (III)
   [C] (I) [D] (III) and (IV)

T-9

6. The number of *real* solutions to the following system of equations is

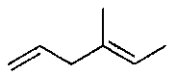
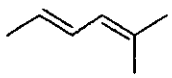
$$x^2 + 4y^2 = 5$$
$$4x^2 + y^2 = 5$$

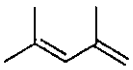
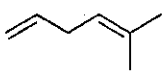
[A] 1 [B] 2
[C] 3 [D] 4

7. The elements present in all naturally occurring amino acids among the following are
(I) hydrogen (II) carbon (III) nitrogen (IV) oxygen (V) phosphorus

[A] (I), (II), (III) and (IV) [B] (I), (II), (III) and (V)
[C] (I), (II), (IV) and (V) [D] (I), (II), (III), (IV) and (V)

8. A compound upon oxidation using excess $KMnO_4$ gives a molecule each of formic acid, malonic acid and acetone. The structure of the compound is

[A]  [B] 

[C]  [D] 

9. Calcium estimation from milk is generally performed by

[A] gravimetric analysis [B] precipitation titration
[C] complexometric titration [D] redox titration

10. The equation $x^2 - y^2 = 0$ represents a

[A] pair of straight lines [B] circle
[C] ellipse [D] parabola

11. Chromosomes are made up of

[A] RNA and proteins [B] DNA and RNA
[C] DNA and proteins [D] Lipids and proteins

T-9

12. Atoms having radius 1.50 Å are arranged in a simple (primitive) cubic lattice. Radius of the largest atom (in Å) that can be placed at the body center of the cubic cell, without affecting the unit cell size is

[A] 0.75 [B] 1.10
[C] 1.35 [D] 1.50

13. The name reaction which is used for the conversion of salicylaldehyde to catechol is

[A] Vilsmeier-Haack reaction [B] Shapiro reaction
[C] Reimer-Tiemann reaction [D] Dakin reaction

14. The local maximum of the function, $y = x^2e^{-x}$, is at $x =$

[A] 2 [B] 1
[C] 0 [D] -2

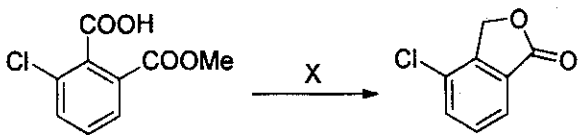
15. The photo-excitation and water oxidation processes in photosynthesis are associated respectively, with the metals

[A] Ca and Mg [B] Mn and Ca
[C] Mg and Co [D] Mg and Mn

16. Enthalpy change for the transition of solid Sn, from the grey form (density = 5.75 $g\ cm^{-3}$) to the white form (density = 7.31 $g\ cm^{-3}$) at 10.0 bar and 298 K is +2.1 kJ mol^{-1}. The internal energy change for this transition in kJ mol^{-1} is (1.0 bar = 10^5 Pa; atomic weight of Sn = 118.7)

[A] −4.4 [B] −2.1
[C] +2.1 [D] +4.4

17. Identify the most appropriate reagent, X, in the following reaction



[A] $LiAlH_4$ [B] $LiBH_4$
[C] $NaBH_4$ [D] BH_3·THF

18. Which of the following is not an extensive property?

[A] Mass [B] Volume
[C] Heat capacity [D] Specific heat

T-9

19. Air contains 78% N_2, 21% O_2, 0.9% Ar and 0.1% CO_2 by volume. The molecular weight of air is close to (Atomic weight of N, O, Ar, C are 14, 16, 40, 12 respectively)

[A] 29 [B] 31

[C] 28 [D] 30

20. The terpene that contains carbonyl group among the following is

[A] Limonene [B] Camphor

[C] 3-Carene [D] α-Pinene

21. The F–N–F bond angle in NF_3 is 102°30′, whereas H–N–H bond angle in NH_3 is 107°48′. This difference in bond angle can be explained based on

[A] VSEPR theory that the repulsion between bond pairs is less in NF_3 than in NH_3

[B] VSEPR theory that the repulsion between bond pairs is more in NF_3 than in NH_3

[C] molecular orbital theory that predicts low bond order for NF_3 molecule

[D] the fact that the first ionization energy of fluorine is higher than that of hydrogen

22. Among the following, the drug which contains a β-lactam unit is

[A] Ibuprofen [B] Naproxen

[C] Penicillin [D] Sertraline

23. The reaction between dioxygen and PtF_6 provides

[A] $[O]^+[PtF_6]^-$ [B] $[OF][PtF_5]^-$

[C] $[O]^-[PtF_6]^+$ [D] $[O_2]^+[PtF_6]^-$

24. The determinant $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$ is

[A] -2 [B] -1

[C] 0 [D] 3

25. $\lim_{x \to 0} \frac{sinx}{e^x - e^{-x}}$ is

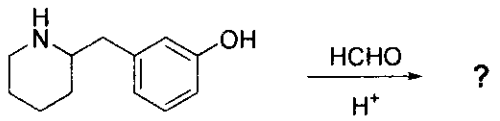
[A] $\frac{1}{2}$ [B] $\frac{\pi}{2}$

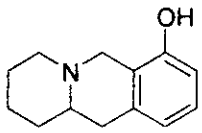
[C] $-\frac{\pi}{2}$ [D] ∞

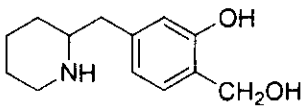
T-9

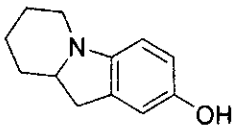
PART – B

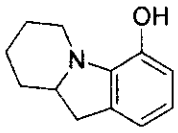
26. The major product formed in the following reaction is



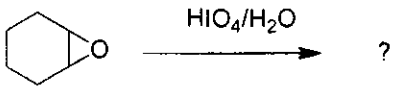
[A] 

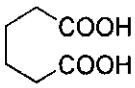
[B] 

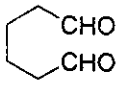
[C] 

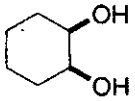
[D] 

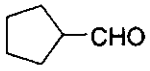
27. The product of the following reaction is



[A] 

[B] 

[C] 

[D] 

28. $\int e^x cos\ x\ dx =$

[A] $e^x sin\ x$ + constant

[B] $e^x(sin\ x - cos\ x)$ + constant

[C] $\frac{e^x}{2}(sin\ x + cos\ x)$ + constant

[D] $sin\ x$ + constant

29. The argument of the complex number $(-1 - i)$ is

[A] $\frac{\pi}{4}$

[B] $-\frac{\pi}{4}$

[C] $\frac{3\pi}{4}$

[D] $-\frac{3\pi}{4}$

30. $\frac{sin^3\theta}{\tan\theta - \sin\theta} =$

[A] $\cos\theta + cos^2\theta$

[B] $\cos\theta - cos^2\theta$

[C] $\sin\theta + sin^2\theta$

[D] $\sin\theta - sin^2\theta$

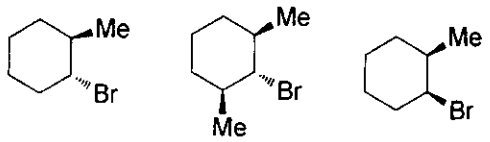
T-9

31. $\frac{(1-x^4)}{(1-x)} =$

[A] $1 + x^3$ [B] $1 + x + x^2 + x^3$

[C] $1 - x^3$ [D] $1 - x + x^2 - x^3$

32. Rates of E_2 reaction of the following bromides increases as

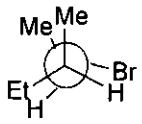


(I) (II) (III)

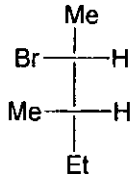
[A] (I) < (II) < (III) [B] (I) < (III) < (II)

[C] (III) < (II) < (I) [D] (II) < (I) < (III)

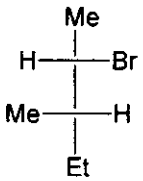
33. The Fischer projection that is identical to the following Newmann projection is



[A]



[B]



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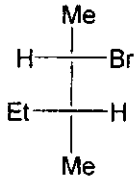

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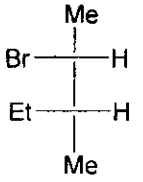
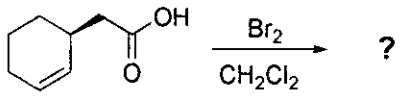
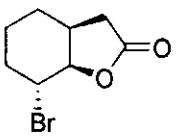


34. The major product formed in the following reaction is



[A]



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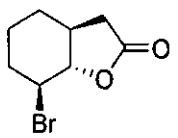
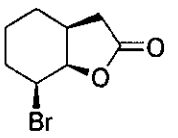
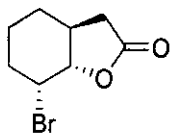


[C]



[D]



T-9

35. Heating resorcinol with 'X' and conc. H_2SO_4 followed by pouring the reaction mixture in aqueous NaOH solution gives greenish yellow color. The reagent 'X' is

[A] benzoic acid
[B] phthalic anhydride
[C] urea
[D] glucose

36. The major product obtained by the reaction of cyclohexanone oxime with conc. H_2SO_4 is

[A] Cyclopentane carboxaldehyde
[B] *N,N'*-Dicyclohexylcarbodiimide
[C] Caprolactam
[D] Bakelite

37. The reactivity of the following compounds in electrophilic substitution decreases as

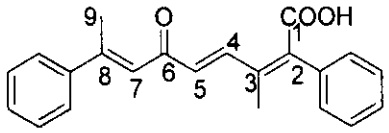
I: toluene ; II: nitrobenzene ; III: benzene ; IV: phenol

[A] I > II > III > IV
[B] IV > III > II > I
[C] I > III > IV > II
[D] IV > I > III > II

38. The reagent which is the source of nitrogen in the Gabriel synthesis of amines is

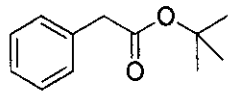
[A] sodium azide
[B] potassium phthalimide
[C] potassium cyanide
[D] sodium nitrite

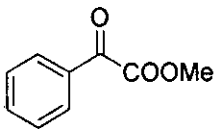
39. Stereochemistry of the double bonds in the following compound can be designated as

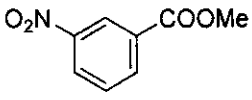


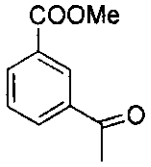
[A] (2*E*, 4*E*, 7*E*)
[B] (2*Z*, 4*E*, 7*Z*)
[C] (2*E*, 4*Z*, 7*E*)
[D] (2*Z*, 4*E*, 7*E*)

40. Among the following, the compound which undergoes the fastest decarboxylation under acid catalysis is

[A] 

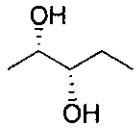
[B] 

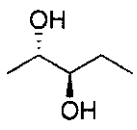
[C] 

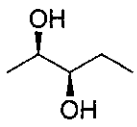
[D] 

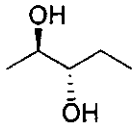
T-9

41. Structure of (2*R*, 3*R*)- 2,3-pentanediol is

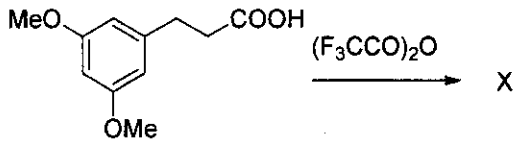
[A] 

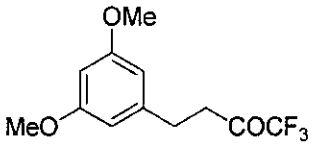
[B] 

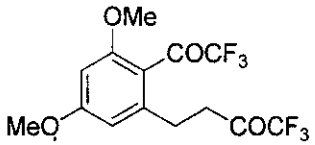
[C] 

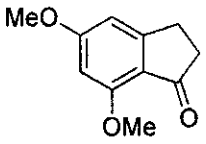
[D] 

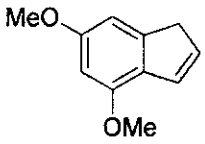
42. The product 'X' in the following reaction is



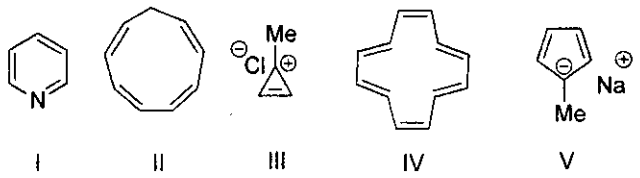
[A] 

[B] 

[C] 

[D] 

43. Among the following, the aromatic compounds are



I II III IV V

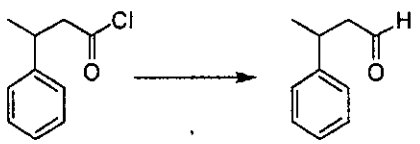
[A] I, II and III

[B] I, III and V

[C] I, IV and V

[D] II, IV and V

44. The reagent that can perform the following transformation is



[A] $NaBH_4$

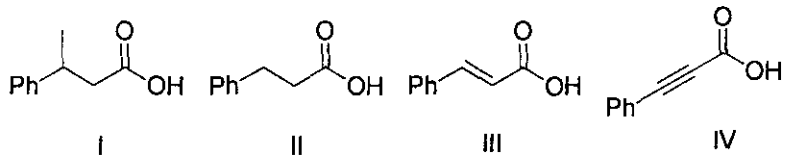
[B] NaH

[C] $LiAlH(O^tBu)_3$

[D] $LiAlH_4$

T-9

45. The decreasing order of the acidity of compounds **I-IV** is



I II III IV

[A] I > II > III > IV

[B] II > I > IV > III

[C] III > IV > I > II

[D] IV > III > II > I

46. The reaction which gives β -hydroxy carbonyl compound as the product is

[A] Cannizzaro reaction

[B] Claisen condensation

[C] Benzoin reaction

[D] Aldol reaction

47. The equation that is **not true** for mixing of two ideal gases at constant temperature and pressure is

[A] $\Delta U_{mix} = 0$

[B] $\Delta S_{mix} = 0$

[C] $\Delta H_{mix} = 0$

[D] $q_{mix} = 0$

48. The number of ways in which two electrons can be placed in the three p-orbitals (each eleetron having two possible spins) such that the two electrons satisfy Pauli's exclusion principle, is

[A] 9

[B] 18

[C] 30

[D] 36

49. The number of possible stereo-isomers of glucose is

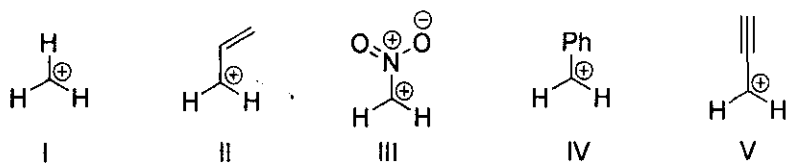
[A] 16

[B] 8

[C] 24

[D] 32

50. The order of increasing stability for the following carbocation intermediates is



I II III IV V

[A] III < I < V < IV < II

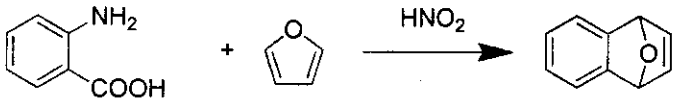
[B] III < I < IV < II < V

[C] III < II < V < I < IV

[D] III < I < V < II < IV

T-9

51. The intermediate involved in the following transformation is



[A] Carbocation
[B] Carbanion
[C] Benzyne
[D] Carbene

52. The biuret test is used to confirm the presence of proteins because the reagent reacts with the

[A] basic side chains in protein
[B] protein main chain CO group
[C] protein main chain NH group
[D] protein hydrophobic core

53. Edman degradation is generally used for

[A] the determination of the amino acid sequence in a protein
[B] the synthesis of nucleic acids from nucleosides
[C] the preparation of one carbon less aldose from parent aldose
[D] sequencing a nucleic acid

54. The pK_a values of HOCl, $HClO_2$ and $HClO_3$ follow the order

[A] $HClO_2 > HOCl > HClO_3$
[B] $HOCl > HClO_2 > HClO_3$
[C] $HOCl > HClO_3 > HClO_2$
[D] $HClO_3 > HClO_2 > HOCl$

55. The reagents used in the brown ring test for nitrate are

[A] conc. H_2SO_4 and ferrous sulfate
[B] conc. H_2SO_4 and ferric sulfate
[C] conc. HCl and ferric sulfate
[D] conc. HCl and ferrous sulfate

56. Among the following, the statement(s) that are correct for solid $BeCl_2$ are
(I) It forms infinite chains with tetrahedral beryllium.
(II) It forms infinite chains with planar beryllium.
(III) The Be–Cl distance is longer than that found in linear $BeCl_2$ vapor.

[A] (II) and (III)
[B] (I) and (III)
[C] (I) only
[D] (III) only

57. Among 18 groups in the periodic table, the only group that contains examples of elements that are gas, liquid and solid at room temperature (25 °C) is

[A] 1
[B] 17
[C] 12
[D] 6

T-9

58. Elemental fluorine is produced by the electrolysis of

[A] aqueous hydrogen fluoride

[B] aqueous potassium hydrogen difluoride (potassium bifluoride)

[C] anhydrous hydrogen fluoride

[D] a mixture of potassium fluoride and hydrogen fluoride

59. The CFSE for tetrahedral $[CoCl_4]^{2-}$ is 8,000 cm^{-1}. The CFSE (in cm^{-1}) for octahedral $[CoCl_6]^{4-}$ will be

[A] 12,000

[B] 16,000

[C] 18,000

[D] 20,000

60. The number of unpaired electrons in an octahedral complex $[CoF_6]^{3-}$ is

[A] 3

[B] 4

[C] 0

[D] 5

61. The active site of *Nitrogenase* contains

[A] Mg and Fe

[B] Cu and Co

[C] Mo and Fe

[D] Ni and Zn

62. The unpaired electron in the square planar cobalt(II) complexes is located in

[A] d_z^2 orbital

[B] $d_{x^2-y^2}$ orbital

[C] d_{xy} orbital

[D] d_{yz} orbital

63. In zinc blende structure of ZnS, each

[A] S^{2-} ion is octahedrally surrounded by six Zn^{2+} ions

[B] Zn^{2+} ion is octahedrally surrounded by six S^{2-} ions

[C] Zn^{2+} ion is tetrahedrally surrounded by four S^{2-} ions and each S^{2-} ion is octahedrally surrounded by six Zn^{2+} ions

[D] Zn^{2+} ion is tetrahedrally surrounded by four S^{2-} ions and each S^{2-} ion is tetrahedrally surrounded by four Zn^{2+} ions

64. Among the following, the correct statement(s) regarding $N(SiMe_3)_3$ is/are
(I) It has a pyramidal geometry around nitrogen.
(II) $p\pi-d\pi$ bonding is present in this compound.
(III) It is a strong Lewis base.
(IV) It has a trigonal planar geometry around nitrogen.

[A] (I) and (IV)

[B] (II)

[C] (II) and (IV)

[D] (III)

65. $Al(OH)_3$ reacts as a base with acids to form salts that contain $[Al(H_2O)_6]^{3+}$ ions. However, in dilute aqueous NaOH solution, it

[A] splits water and releases hydrogen gas
[B] get reduced to form metallic Al
[C] remains unaffected
[D] forms sodium aluminate

66. The solubility of $BaSO_4$ (molecular weight = 233) at 25 °C is 0.0023 mg/mL. The solubility product, K_{SP} (in $mol^2\ L^{-2}$) of $BaSO_4$ is close to

[A] 1.0×10^{-5}
[B] 1.0×10^{-10}
[C] 0.0023
[D] 2.3×10^{-3}

67. The spectroscopic technique used to study electronic transitions involved in molecules is

[A] IR
[B] UV-Vis
[C] EPR
[D] NMR

68. Among the following, the correct statement is

[A] Ce^{4+} is diamagnetic but La^{3+} is paramagnetic.
[B] Ce^{3+} is diamagnetic but La^{3+} is paramagnetic.
[C] Ce^{4+} and La^{3+} are diamagnetic.
[D] Ce^{3+} and La^{3+} are diamagnetic.

69. The hybridization of boron in diborane is

[A] sp^3d
[B] sp^3
[C] sp^2
[D] sp

70. The oxidation states of phosphorus in orthophosphoric acid and orthophosphorous acid are, respectively

[A] (V) and (IV)
[B] (III) and (IV)
[C] (V) and (III)
[D] (III) and (I)

71. The correct formula for the red solid of nickel(II)-dimethylglyoximato complex is

[A] $[Ni(C_8H_{12}N_4O_4)_2]^{2-}$
[B] $[Ni(C_8H_{14}N_4O_4)_2]$
[C] $[Ni(C_8H_{16}N_4O_4)_2]^{2+}$
[D] $[Ni(C_8H_{14}N_4O_4)_2(H_2O)_2]$

72. A wire frame in the form of an equilateral triangle is changed to a circle; length of the wire remains the same. Ratio of the areas $\left(\frac{A_{circle}}{A_{triangle}}\right)$ is

[A] 2
[B] 0.5
[C] $\frac{\sqrt{3\pi}}{9}$
[D] $\frac{3\sqrt{3}}{\pi}$

T-9

73. When a current of 2.0 A was passed for 80 min through a solution of a divalent cation, 2.8 g of the metal was deposited on the cathode. Atomic weight of the metal would be closest to

[A] 28 [B] 56
[C] 84 [D] 112

74. Among the following, the function that has a single maximum over its entire domain, and goes to zero as x goes to $\pm\infty$ is

[A] $sin\, x$ [B] $exp\, x$
[C] $sech\, x$ [D] $log\, x$

75. A coordination complex of the formula $[Co(NH_3)_5NO_2]Cl_2$ can exhibit

[A] coordination isomerism [B] optical isomerism
[C] ionization isomerism [D] linkage isomerism

76. Two parabolas given by the equations, $y = \frac{x^2}{2}$ and $x = \frac{y^2}{2}$ intersect at the points with coordinates $(0, 0)$ and

[A] $(0.5, 0.5)$ [B] $(2, 2)$
[C] $(1, 2)$ [D] $(2, 0)$

77. A die has numbers 1 to 6 marked on the six faces. If n dies are thrown simultaneously, the probability of all showing 1 on top is

[A] $\frac{1}{n^6}$ [B] $\frac{1}{6^n}$
[C] $\sqrt[n]{6}$ [D] $\frac{n}{6}\ (for\ n < 6)$

78. Given the vectors, $\vec{A} = \hat{x} + \hat{y} + \hat{z}$ and $\vec{B} = \hat{x} - \hat{y} + \hat{z}$ (where, $\hat{x}, \hat{y}, \hat{z}$ are unit vectors along the Cartesian axes), $(\vec{A} \times \vec{B}).(\vec{A} \times \vec{B}) =$

[A] 0 [B] 1
[C] 4 [D] 8

79. Given the standard reduction potential, $E° = +1.23$ V for $O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$, the equilibrium constant for the reaction $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$ at 25 °C is

[A] 1.6×10^{83} [B] 4.5×10^{67}
[C] 6.3×10^{20} [D] 1.9×10^{2}

T-9

80. In the X-ray diffractogram of NaCl, diffraction from the (1 1 1) plane is observed at $2\theta = 27.4^{\circ}$. The Miller plane corresponding to the peak at $2\theta = 56.5^{\circ}$ is

[A] (1 0 0) [B] (2 1 1)
[C] (1 1 1) [D] (2 2 2)

81. A photon with wavelength of 300 nm is absorbed by a gas and then emitted as two photons one with wavelength of 760 nm. The wavelength (in nm) of the second photon is close to

[A] 496 [B] 300
[C] 760 [D] 530

82. When a metal is irradiated with light of frequency 2×10^{15} Hz, the maximum kinetic energy of the ejected electron is found to be 6.63×10^{-19} J. The threshold frequency (in Hz) of the metal is close to

[A] 2.0×10^{15} [B] 1.0×10^{15}
[C] 3.0×10^{15} [D] 4.0×10^{15}

83. The longest wavelength (in Å) in the Lyman series of H- atom spectrum is

[A] 1125.7 [B] 1512.7
[C] 1215.7 [D] 1152.7

84. The root mean square speed of N_2 gas is equal to that of propane gas at STP at temperature close to

[A] 174 [B] 273
[C] 274 [D] 373

85. $\frac{\sin\varphi}{1-\cot\varphi} + \frac{\cos\varphi}{1-\tan\varphi} =$

[A] $\cot\varphi$ [B] $\tan\varphi$
[C] $\cos\varphi + \sin\varphi$ [D] $\cos\varphi - \sin\varphi$

86. Three circles each of radius 1.0 cm touch one another externally and they lie between two parallel lines. The minimum possible distance (in cm) between these parallel lines is

[A] $2+\sqrt{3}$ [B] $3+\sqrt{3}$
[C] $4+\sqrt{3}$ [D] $5+\sqrt{3}$

T-9

87. The van der Waals b constant of gases, A, B and C gases are 0.025, 0.045 and 0.035 L mol^{-1}, respectively. The correct descending order of the molecular volume of these gases is

[A] C > B > A
[B] A > B > C
[C] B > C > A
[D] A > C > B

88. Fraction of the unit cell occupied by atoms packed in an FCC lattice is

[A] $\frac{\sqrt{3}\pi}{8}$
[B] $\frac{\pi}{6}$
[C] $\frac{\sqrt{2}\pi}{3}$
[D] $\frac{\sqrt{2}\pi}{6}$

89. If the optical density of a solution is 1, then the % of light transmitted through the solution is

[A] 20
[B] 10
[C] 80
[D] 90

90. A reaction that is spontaneous at room temperature (27 °C) can have enthalpy, ΔH (kJ mol^{-1}) and entropy, ΔS (J K^{-1}) values respectively,

[A] $0, -300$
[B] $-70, -300$
[C] $+70, +300$
[D] $+70, -300$

91. The activity of K_3PO_4 solution of molarity (C) and mean activity coefficient ($\gamma_\pm$) is

[A] $27\ C^3\ \gamma_\pm^3$
[B] $9\ C^4\ \gamma_\pm^4$
[C] $9\ C^3\ \gamma_\pm^3$
[D] $27\ C^4\ \gamma_\pm^4$

92. A complex reaction consists of three steps with rate constants k_1, k_2 and k_3, and the corresponding activation energies are E_1, E_2 and E_3. If the overall rate constant of the reaction, $k = \frac{k_1 k_3}{k_2}$ then the overall activation energy of the reaction (E) is

[A] $E_1 - E_2 + E_3$
[B] $E_1 + E_2 + E_3$
[C] $E_1 + E_2 - E_3$
[D] $E_1 - E_2 - E_3$

93. Order of the reaction for which the half-life doubles when the initial concentration of the reactant is doubled is

[A] 0
[B] 1
[C] 2
[D] 3

T-9

94. 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] -15.12
[C] -1.73 [D] -3.46

95. The infrared spectrum of diatomic molecule, with reduced mass 2.52×10^{-26} kg, shows an intense line at 380 cm^{-1}. The force constant of the molecule (in N m^{-1}) is

[A] 0.129 [B] 12.9
[C] 129 [D] 1.29

96. The de Broglie wavelength (in m) for a cricket ball of weight 0.14 kg travelling at 40 m s^{-1} is close to

[A] 1.20×10^{-34} [B] 1.00×10^{-34}
[C] 2.40×10^{-34} [D] 1.80×10^{-34}

97. The isobaric thermal expansion coefficient of an ideal gas (T = temperature, V = volume) is

[A] $1/T$ [B] $1/T^2$
[C] $1/V$ [D] $1/V^2$

98. The function, $y = 2x^3 + 3x^2 + cx + 8$ intersects the x-axis at -4. The value of c is

[A] 20 [B] -18
[C] 2 [D] 10

99. The graphs of two linear equations $ax + by = c$ and $bx - ay = c$ where a, b and c are not equal to zero

[A] intersect at one point [B] are parallel
[C] intersect at two points [D] are perpendicular

100. The Miller planes that are mutually perpendicular are

[A] (1 0 0), (0 2 0) [B] (2 1 1), (4 2 2)
[C] (2 0 0), (1 1 0) [D] (1 1 1), (1 0 0)

T-9

University of Hyderabad
Entrance Examinations - 2019

School/Department/Centre : **CHEMISTRY**

Course/Subject : **M. SC. (CODE: T-9)**

ANSWER KEY – BOOKLET A

Q.No.	Answer	Q.No.	Answer	Q.No.	Answer	Q.No.	Answer
1	B	26	A	51	C	76	B
2	A	27	B	52	C	77	B
3	C	28	C	53	A	78	D
4	B	29	D	54	B	79	A
5	D	30	A	55	A	80	D
6	D	31	B	56	B	81	A
7	A	32	D	57	B	82	B
8	D	33	A	58	D	83	C
9	C	34	A	59	A	84	A
10	A	35	B	60	B	85	C
11	C	36	C	61	C	86	A
12	B	37	D	62	C	87	C
13	D	38	B	63	D	88	D
14	A	39	D	64	C	89	B
15	D	40	A	65	D	90	C
16	C	41	C	66	B	91	D
17	D	42	C	67	B	92	A
18	D	43	B	68	C	93	A
19	A	44	C	69	B	94	B
20	B	45	D	70	C	95	C
21	A	46	D	71	-	96	A
22	C	47	B	72	D	97	A
23	D	48	C	73	B	98	B
24	C	49	A	74	C	99	D
25	A	50	D	75	D	100	A

Note/Remarks :

1. Due to some typing error, all options were wrong for question no. 71. So the benefit may be given to all students for this question.
2. All other challenges are found to be incorrect; the correct options provided earlier stand.

4/6/19

Signature

School/Department/Centre

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