BOOKLET CODE

ENTRANCE EXAMINATION – 2021

M. Sc. Chemistry

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

HALL TICKET NUMBER:

BOOKLET CODE:

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 - 21** 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.

Useful Constants:

Rydberg constant = 109737 cm^{-1}; Faraday constant = 96500 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; 1 a.m.u. = 1.66×10^{-27} kg

PART – A

1. Relation between the pressure (p) and volume (V) for the adiabatic expansion of a perfect gas with heat capacities at constant pressure (C_p) and constant volume (C_v) is

   [A] $pV = \text{constant}$ [B] $pV^{C_p/C_v} = \text{constant}$

   [C] $pV^{C_p/C_v} = RT$ [D] $pV^{C_v/C_p} = \text{constant}$

2. Enthalpy is a function of temperature and pressure, $H = f(T,p)$, and the heat capacity C_p is defined as $\left(\frac{\partial H}{\partial T}\right)_p$. For an isenthalpic process, $\left(\frac{\partial T}{\partial p}\right)_H$ =

   [A] $C_p\left(\frac{\partial T}{\partial p}\right)_H$ [B] $\left(\frac{\partial H}{\partial p}\right)_T$

   [C] $\left(\frac{\partial H}{\partial p}\right)_T \Big/ \left(\frac{\partial T}{\partial p}\right)_H$ [D] $-\frac{1}{C_p}\left(\frac{\partial H}{\partial p}\right)_T$

3. The half-life of a reaction doubles when the initial concentration of the reactant is halved. The order of the reaction is

   [A] 0 [B] 1

   [C] 2 [D] 3

4. If the rate of consumption of B in the reaction A + 2 B → C + 3 D is 2.4 mol dm^{-3} s^{-1}, then the rate of formation of D in the unit of mol dm^{-3} s^{-1} is

   [A] 0.6 [B] 1.2

   [C] 2.4 [D] 3.6

5. The longest wavelength line in the Lyman series of the hydrogen spectrum is closest to (given: Rydberg constant = 1.097×10^{-2} nm^{-1}).

[A] 141.5 nm
[B] 126.5 nm
[C] 121.5 nm
[D] 117.5 nm

6. If the line y = x is rotated clockwise through 15° about the point (0.5, 0.5), the x-intercept of the resulting line is:

[A] 0.00
[B] -0.25
[C] -0.50
[D] 0.50

7. The number of points at which the function $y = x^3 - x^2 - x + 1$ cuts the x-axis is

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

8. A circle and a square have the same perimeter. Ratio of the area of the circle to that of the square, $\frac{A_{circle}}{A_{square}}$ is

[A] $\frac{4}{\pi}$
[B] $\frac{\pi}{3}$
[C] $\frac{3\pi^2}{4}$
[D] $\frac{6}{\pi}$

9. The method(s) used to get large crystals of silicon is/are
(i) Czochralski process
(ii) Zone melting method
(iii) Bayer process

[A] (i) and (ii)
[B] (i) and (iii)
[C] (ii) and (iii)
[D] (ii) only

10. The missing product of the reaction: $^{27}_{13}Al + {}^{4}_{2}He \rightarrow ? + {}^{1}_{0}n$ is

[A] $^{31}_{15}P$
[B] $^{30}_{14}Si$
[C] $^{30}_{15}P$
[D] $^{31}_{14}Si$

11. The non-hypervalent molecule among the following is

[A] PCl_4^+ [B] SF_4

[C] XeF_4 [D] ICl_4^+

12. Among the following bio-inorganic species, non-heme iron is found in

[A] Hemoglobin [B] Nitrogenase

[C] Myoglobin [D] Cytochromes

13. Reaction of concentrated H_2SO_4 with pure $KMnO_4$ yields a green, hygroscopic, highly explosive product above 263 K. The product is

[A] Mn_2O_7 [B] $MnSO_4$

[C] K_2MnO_4 [D] MnO

14. A salt produces black spot on the skin. Its aqueous solution gives positive brown ring test and also produces yellow precipitate with sodium iodide solution. The salt is

[A] $TlNO_3$ [B] $Cu(NO_3)_2$

[C] $AgNO_3$ [D] $Zn(NO_3)_2$

15. If 0.5 g of $CaCO_3$ is present in 1500 mL water, then the hardness of water (in ppm) is:

[A] 333 [B] 500

[C] 256 [D] 50

16. The amino acid with highest isoelectric point is:

[A] Asparagine [B] Cysteine

[C] Histidine [D] Lysine

17. In what form does the product of glycolysis enter the Krebs cycle?

[A] Oxaloacetate [B] Acetyl CoA

[C] Pyruvate [D] Glucose

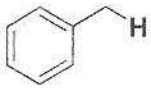
18. The carbons differed in deoxyribose and ribose of DNA and RNA, respectively, are

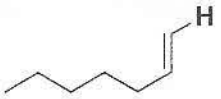
[A] 2' [B] 3'
[C] 4' [D] 5'

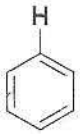
19. Which of the following drugs contains a β-lactum unit?

[A] Ibuprofen [B] Naproxen
[C] Penicillin [D] Sertraline

20. The compound that contains most acidic proton among the following is

[A] 

[B] 

[C] 

[D] 

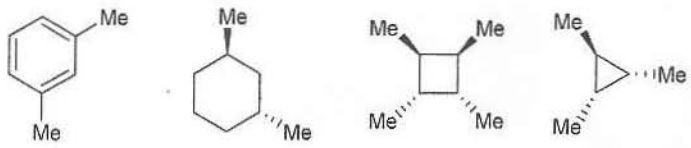
21. The respective order of tri, di, and monohydric phenols is

[A] pyrogallol, hydroquinone, and cresol
[B] thymol, resorcinol, and hydroquinone
[C] catechol, resorcinol, and hydroquinone
[D] cresol, pyrogallol, and thymol

22. The pH range of blood in a healthy human is

[A] 6.55–6.65 [B] 6.85–6.95
[C] 7.35–7.45 [D] 7.85–7.95

23. The chiral molecule(s) among the following is/are



I II III IV

[A] I and IV
[B] II only
[C] II and III
[D] III only

24. The amino acids having a hydroxyl functional group are

[A] Serine, Threonine, and Tyrosine
[B] Cysteine, Valine, and Lysine
[C] Serine, Valine, and Lysine
[D] Threonine, Cysteine, and Valine

25. The reagent used in the protein sequence analysis is

[A] van-Slyke reagent
[B] Sorenson reagent
[C] Sanger reagent
[D] Borsche's reagent

PART – B

26. The standard enthalpy and Gibbs free energy change for the combustion of sucrose at 25 °C are –5800 kJ mol^{-1} and –6300 kJ mol^{-1} respectively. The additional non-expansion work (in kJ mol^{-1}) that can be obtained from this reaction at 37 °C is

[A] 0 [B] 20

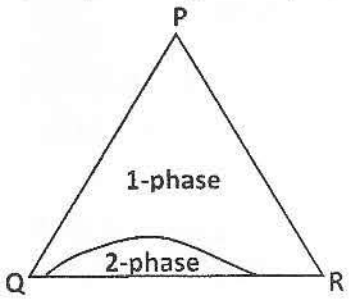
[C] 30 [D] 500

27. Absorption of a gas on a solid surface follows the Freundlich isotherm, $\frac{x}{m} = Kp^{1/n}$, where x and m are the masses of adsorbate and adsorbent respectively, p is the pressure of the gas at equilibrium, and K and n are constants for the system at a specific temperature. If the mass of gas adsorbed on a given solid increases 4 times when the pressure is increased 10 times, the value of n approximately is

[A] 1.0 [B] 1.5

[C] 1.7 [D] 2.0

28. Given the 3-component phase diagram (at a specific temperature and pressure) below, it can be concluded that



[A] P and Q are miscible in all proportions

[B] Q and R are miscible in all proportions

[C] Solubility of Q in R is less than the solubility of R in Q

[D] Addition of a small amount of R to the 1:1 mixture of P + Q causes phase separation

29. Vapor pressure, p, of a liquid in a specific temperature range follows the equation, $\ln[p(Torr)] = 16.3 - \frac{2200}{T\,(K)}$. The enthalpy of vaporization of the liquid in kJ mol^{-1} is (R = 8.314 J K^{-1} mol^{-1})

[A] 16.3 [B] 18.3

[C] 25.0 [D] 55.0

30. A first-order reaction is 24% complete in 20 min. The time it takes to complete 85% of the reaction is closest to

[A] 71 min
[B] 176 min
[C] 120 min
[D] 138 min

31. For a sequential reaction A $\xrightarrow{k_A}$ B $\xrightarrow{k_B}$ C, the rate constants are $k_A = 0.1\ s^{-1}$ and $k_B = 0.05\ s^{-1}$. B would reach its maximum concentration at time (in s)

[A] 2.0
[B] 6.9
[C] 13.9
[D] 4.6

32. At 300 K, the rates of decomposition of a gaseous compound were 11.29 Pa s^{-1} and 8.92 Pa s^{-1} when 10% and 20% of the compound had reacted, respectively. If the initial pressure was 12.6 kPa, the order of the reaction is

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

33. Of the following aqueous solutions, which one exhibits highest depression of freezing point?

[A] 0.1 M sucrose
[B] 0.1 M NaCl
[C] 0.1 M $CaCl_2$
[D] 0.2 M sucrose

34. Which one of the following is the most soluble salt in water? K_{sp} is the solubility product of the salt.

[A] $Fe(OH)_3$, $K_{sp} = 2.6 \times 10^{-39}$
[B] AgCN, $K_{sp} = 6.0 \times 10^{-17}$
[C] $Al(OH)_3$, $K_{sp} = 1.9 \times 10^{-33}$
[D] $Sn(OH)_2$, $K_{sp} = 1.6 \times 10^{-19}$

35. Two moles of ammonia gas are introduced into an evacuated vessel (volume = 1 litre) in which it partly dissociates at high temperature as

$$2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$$

At equilibrium, if 1.0 mol of ammonia gas remains, then the equilibrium constant (K_c) in $mol^2\ litre^{-2}$ is

[A] 1.7
[B] 2.0
[C] 3.0
[D] 0.8

36. At 298 K, the ratio (II: I) of the mean free path of Ar at two different pressures, $P_I = 0.005$ atm and $P_{II} = 380$ Torr is (assume ideal gas behavior, and cross sectional area σ to be independent of pressure)

[A] 0.01 : 1 [B] 100 : 1

[C] 10 : 1 [D] 1: 10

37. Three moles of water freeze reversibly at 1 atm. The specific enthalpy change of fusion of ice is 80 cal g^{-1} at its normal melting point. The entropy change of the system (in cal K^{-1}) is

[A] + 5.3 [B] + 15.8

[C] – 5.3 [D] – 15.8

38. A compound contains 49.3% C, 6.84% H and the rest is oxygen; its vapor density is 73. The molecular formula of the compound is

[A] $C_4H_6O_2$ [B] $C_4H_{10}O_2$

[C] $C_6H_{10}O_4$ [D] $C_6H_8O_4$

39. A 200 W bulb emits 10% of energy per second as light of wavelength 4500 Å. The number of photons emitted by the bulb per second is

[A] 5.42×10^{20} [B] 5.42×10^{19}

[C] 4.42×10^{19} [D] 4.52×10^{20}

40. The ionization energy (in eV) of Li^{2+} obtained from the Bohr's atomic model is equal to

[A] 13.6 [B] 27.2

[C] 40.8 [D] 122.4

41. At 298 K, the standard EMF of the cell given below is – 0.2254 V.

$Pb(s)|Pb^{+2}$ (aq, $a = 1$), NO_3^- (aq, $a = 1$) || Na^+ (aq, $a = 1$), SO_4^- (aq, $a = 1$)|$PbSO_4$ (s)|Pb(s)

The solubility product of $PbSO_4$ is closest to

[A] 1.2×10^{-8} [B] 2.4×10^{-8}

[C] 4.8×10^{-8} [D] 9.6×10^{-8}

42. The correct approach to determine the pK_a value of an acid in solution is

[A] Integrate the dissociation of the acid between two limits of pH
[B] Evaluate the negative of the logarithm of the pH value
[C] Take the negative of the logarithm of the dissociation constant
[D] Subtract the pH value of the solution from the ionization constant

43. Copper has an atomic radius of 0.128 nm, an FCC crystal structure, and an atomic weight of 63.5 g/mol. The theoretical density of copper in g/cm $^{-3}$ is

[A] 18.89 [B] 8.89

[C] 20.89 [D] 4.89

44. A dilute dye solution transmitted 60% visible light. If the concentration of the dye solution is doubled, then the % of light absorbed is

[A] 36 [B] 20

[C] 64 [D] 32

45. The mean ionic activity coefficient ($\gamma_{\pm}$) of 0.007 molal aqueous solution of Na_2SO_4 at 298.15 K is

[A] 71.15×10^{-2} [B] 35.52×10^{-2}

[C] 7.11×10^{-2} [D] 3.55×10^{-2}

46. Choose the correct option for a two-phase system with a curved interface between them.

[A] The pressure on the convex side is greater than the concave side
[B] The pressure on the concave side is greater than the convex side
[C] The pressures are equal on both the sides
[D] The excess pressure is inversely proportional to the interfacial surface tension

47. Given that $E^0 (Mg^{2+}/Mg) = -2.375$ V and $E^0 (Zn^{2+}/Zn) = -0.763$ V,

[A] Mg will displace Zn from $ZnSO_4$ solution

[B] Zn will displace Mg from $MgSO_4$ solution

[C] Mg will not undergo any reaction if introduced into $ZnSO_4$ solution

[D] Mg will form an alloy with Zn if introduced into $ZnSO_4$ solution

48. The sum of the infinite series $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \cdots$ is given by

[A] e^x

[B] $\cos x$

[C] $\ln(1+x)$

[D] $(1-x)^{-1}$

49. The value of the expression $\ln(1-x^2) + \ln(1+x)^{-1} - \ln(1-x)$ is

[A] -1

[B] 0

[C] 1

[D] 2

50. $e^{-(\pi/4)i + \ln 2}$ is equivalent to

[A] $2i$

[B] $\sqrt{2}(i-1)$

[C] $i+1$

[D] $2-i$

51. The determinant which is equivalent to $\begin{vmatrix} 1 & -1 & 3 \\ 4 & 0 & 2 \\ 1 & 2 & 1 \end{vmatrix}$ is

[A] $\begin{vmatrix} 1 & -1 & 3 \\ 2 & 0 & 2 \\ 1 & 2 & 1 \end{vmatrix}$

[B] $\begin{vmatrix} 0 & -1 & 3 \\ 4 & 0 & 2 \\ 3 & 2 & 1 \end{vmatrix}$

[C] $\begin{vmatrix} 1 & -1 & 3 \\ 4 & 0 & 2 \\ 2 & 2 & 1 \end{vmatrix}$

[D] $\begin{vmatrix} 0 & -1 & 3 \\ 4 & 0 & 2 \\ -1 & 2 & 1 \end{vmatrix}$

52. Lithium metal has a body centred cubic unit cell while KBr has NaCl type structure. The number of lithium atoms in its unit cell and of Br^- ions in KBr unit cell are, respectively,

[A] 2 and 4 [B] 4 and 2

[C] 9 and 8 [D] 4 and 8

53. The correct coordination numbers (anion, cation) in fluorite and antifluorite structures are

[A] Fluorite (4, 8); antifluorite (8, 4) [B] Fluorite (8, 4); antifluorite (4, 8)

[C] Fluorite (6, 3); antifluorite (3, 6) [D] Fluorite (3, 6); antifluorite (6, 3)

54. The correct statement(s) for the Slater's effective nuclear charge (Z_{eff}) is/are

(i) Z_{eff} for 3p electron for silicon is more than that for phosphorus.
(ii) Z_{eff} for 3d electron is more than that of 4s electron for vanadium.
(iii) Z_{eff} for 4s electron of potassium is less than that for vanadium.

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

[C] (ii) and (iii) [D] (ii) only

55. The solvent with acceptor ability among the following is

[A] Dimethylsulfoxide [B] Liquid SO_2

[C] CH_3CN [D] Tetrahydrofuran

56. Magic acid is composed of

[A] H_3BO_3 and H_2SO_4 [B] SbF_5 and HF

[C] HSO_3F and HF [D] HSO_3F and SbF_5

57. BBr_3 is a stronger Lewis acid than BF_3. This is explained on the basis of

[A] Electronic effect [B] Steric effect

[C] B-X π-interaction strength [D] Ability to form H-bond

58. The correct statement about the role of NH_4Cl and KNH_2 in liquid ammonia is

[A] Both are acids
[B] NH_4Cl is acid and KNH_2 is base
[C] NH_4Cl is base and KNH_2 is acid
[D] Both are bases

59. The polar molecule among the following is

[A] SiF_4 [B] XeF_4
[C] SF_4 [D] BF_3

60. The oxidation states of N in NO_3^-, N_2O, and NH_2F, respectively, are

[A] V, I, –I [B] V, II, –II
[C] III, I, –I [D] IV, I, –2

61. The molecular shapes of BrF_2^+ and BrF_4^- ions, respectively, are

[A] bent and square planar [B] linear and square planar
[C] bent and tetrahedral [D] linear and tetrahedral

62. The arsenic product of trimethylarsine and xenon difluoride is

[A] $[Me_3As....F\text{-}Xe\text{-}F]$ [B] $[Me_3AsF]^-\,[XeF]^+$
[C] Me_3AsF_2 [D] AsF_3

63. The red-violet compound formed during the treatment of $RhCl_3{\cdot}3H_2O$ with triphenylphosphine under reflux condition is

[A] Vaska's Complex [B] Wilkinson Catalyst
[C] Ziegler-Natta Catalyst [D] Perovskite

64. The metal **M** that can not form stable compound with formula $[(\eta^5\text{-}C_5H_5)\mathbf{M}(CO)_3]$ is

[A] Mn [B] Re
[C] Cr [D] Tc

2-9

65. The Curie's relation between χ and 1/T is obeyed by paramagnetic complexes only in

[A] dilute solution
[B] concentrated solution
[C] neutral solution
[D] acidic solution

66. In a tetrahedral complex, the angle (in degree) between a d_z^2 orbital and the ligand orbitals is

[A] 36.33
[B] 54.50
[C] 27.25
[D] 90.00

67. The total number of possible stereoisomers for the octahedral complex MA_3B_2C is

[A] 4
[B] 3
[C] 2
[D] 5

68. The reaction of sodium hypochlorite with hydrogen peroxide produces

[A] HOCl and NaOH
[B] NaCl and H_2O
[C] O_2, NaCl and H_2O
[D] H_2, NaOH and H_2O

69. If the standard reduction potentials (E°) of Fe^{3+}/Fe^{2+} and Sn^{4+}/Sn^{2+} couples are 0.77 V and 0.15 V, respectively, the potential (in V) at the equivalence point of the following reaction is

$2Fe^{3+} + Sn^{2+} \rightarrow 2Fe^{2+} + Sn^{4+}$

[A] 0.36
[B] 0.46
[C] 0.62
[D] 0.92

70. The amount of $Ba(IO_3)_2$ (MW = 487) that can be dissolved in 500 mL water at given that 25 °C (the solubility product, K_{sp} of $Ba(IO_3)_2 = 1.57 \times 10^{-9}$) is

[A] 0.0023 g
[B] 0.0279 g
[C] 0.3452 g
[D] 0.1783 g

71. The solubility product (K_{sp}) of $Mn(OH)_2$ calculated by using the data from the following half reactions is

$Mn(OH)_2\ (s) + 2e^- \rightarrow Mn(s) + 2OH^-$ $\quad E^0 = -1.59$ V

$Mn^{2+} + 2e^- \rightarrow Mn(s)$ $\quad E^0 = -1.18$ V

[A] 3.8×10^{-19} [B] 2.9×10^{-7}

[C] 1.3×10^{-14} [D] 1.8×10^{-5}

72. When 50 mL of 0.1 M CH_3COOH is titrated with 50 mL of 0.1 M NaOH (K_a for $CH_3COOH = 1.75 \times 10^{-5}$ and K_w for water = 1.00×10^{-14}), the pH of the resulting titration mixture at the equivalent point is

[A] 2.88 [B] 8.73

[C] 5.15 [D] 7.00

73. For the estimation of cations, the polarography technique uses

[A] overpotential [B] diffusion current

[C] limiting current [D] short circuit current

74. In the fluorescence spectrometer, the detector is kept at a position

[A] parallel to the incident beam direction

[B] perpendicular to the incident beam direction

[C] directly opposite to the incident beam direction

[D] besides the beam source

75. Match the following

(i) Cu^{2+}, Cd^{2+}, Sn^{2+}	(w) Precipitated in 1M HCl
(ii) Cr^{3+}, Fe^{2+}, Mn^{2+}, Ni^{2+}	(x) Precipitated in H_2S at pH 0.5
(iii) Ag^+, Pb^{2+}	(y) Precipitated in H_2S at pH 9
(iv) Ba^{2+}, Ca^{2+}	(z) Precipitated in $(NH_4)_2CO_3$ solution at pH 10

[A] (iii) = (w); (i) = (x); (ii) = (y); (iv) = (z)

[B] (ii) = (w); (iii) = (x); (ii) = (y); (iv) = (z)

[C] (iii) = (w); (i) = (x); (iv) = (y); (ii) = (z)

[D] (iv) = (w); (i) = (x); (ii) = (y); (iii) = (z)

76. The non-proteinaceous enzyme from the following is:

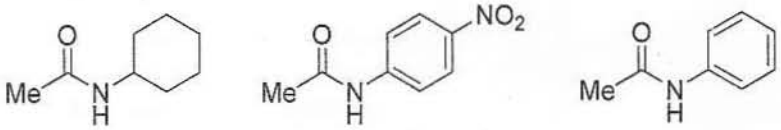
[A] Peptidase
[B] Xylanase
[C] Ribozyme
[D] DNA polymerase

77. Match the following

(a) Contact Process	(i) Sodium Carbonate
(b) Solvay Process	(ii) Sulfur
(c) Claus Process	(iii) Sulfuric acid
(d) Claude Process	(iv) N_2 and O_2

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

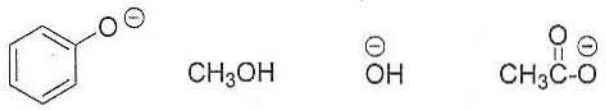
78. The increasing order of reactivity in the acid-catalyzed hydrolysis of the following amides is



(I) (II) (III)

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

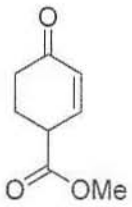
79. The increasing order of nucleophilicity of the following species in an aqueous solution is

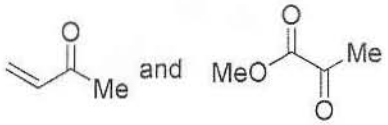


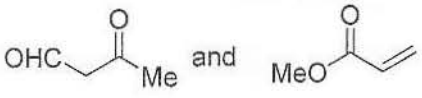
(I) (II) (III) (IV)

[A] (IV) < (I) < (II) < (III)
[B] (IV) < (I) < (III) < (II)
[C] (II) < (IV) < (I) < (III)
[D] (II) < (IV) < (III) < (I)

80. The precursors required for the synthesis of following compound via Robinson's annulation are



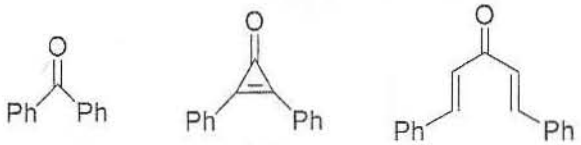
[A] 

[B] 

[C] 

[D] 

81. The decreasing order of dipole moment for compounds (I), (II), and (III) is



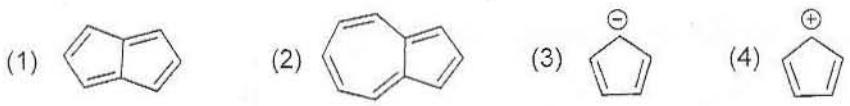
(I) (II) (III)

[A] (III) > (I) > (II)
[B] (II) > (III) > (I)
[C] (I) > (III) > (II)
[D] (II) > (I) > (III)

82. The compound with the shortest C–C bond is

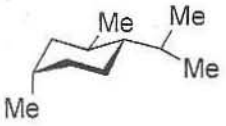
[A] benzene
[B] ethylene
[C] allene
[D] cyclohexane

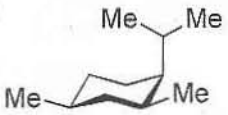
83. The anti-aromatic compounds among the following are

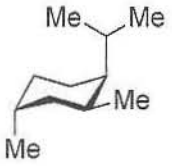


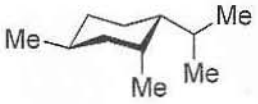
[A] 1 and 2
[B] 2 and 3
[C] 3 and 4
[D] 1 and 4

84. Identify (1*S*,2*R*,4*S*)-1-isopropyl-2,4-dimethylcyclohexane from the following:

[A] 

[B] 

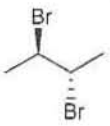
[C] 

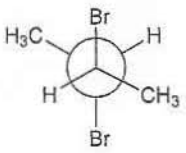
[D] 

85. A mixture contains (+)-2-bromobutane (3.0 g) and (–)-2-bromobutane (2.0 g). Find the optical rotation of the mixture. The specific rotation of (+)-2-bromobutane is +23.1°.

[A] 4.62°
[B] 11.72°
[C] 8.56°
[D] 5.45°

86. The following two compounds are



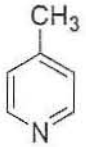


[A] enantiomers
[B] diastereomers
[C] identical
[D] constitutional isomers

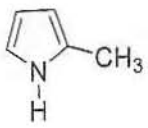
87. Identify the set of compounds that are alkaloid and terpenoid, respectively

[A] Quinine and morphine
[B] Morphine and α-pinene
[C] Menthol and quinidine
[D] Camphor and linonene

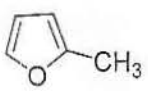
88. The heterocycle that undergoes a facile Diels-Alder reaction among the following is



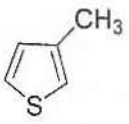
1



2



3



4

[A] 1 [B] 2

[C] 3 [D] 4

89. In qualitative organic analysis, aniline and diphenylamine are differentiated by

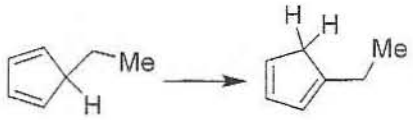
[A] Liebermann's test [B] Fehling's test

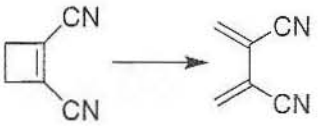
[C] Borche's test [D] Molisch's test

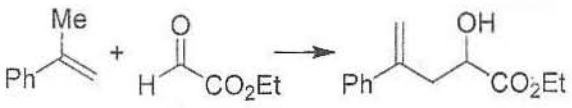
90. The IR stretching frequency of C–X bond (C = carbon and X = any other atom)

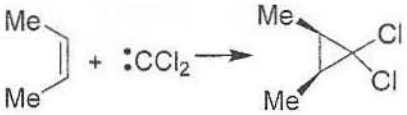
[A] increases with increase in the atomic mass of X
[B] decreases with increase in the atomic mass of X
[C] increases with increase in atomic number of X
[D] decreases with increase in atomic number of X

91. The electrocyclic reaction among the following process is

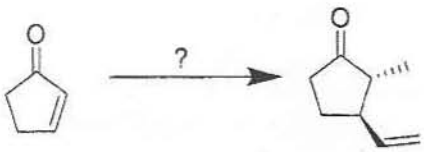
[A] 

[B] 

[C] 

[D] 

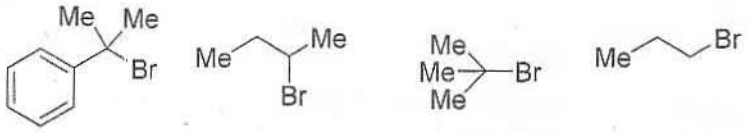
92. The suitable reagents required for the following transformation are



[A] (i) MeMgBr. (ii) $(H_2C{=}CH)_2CuLi$ [B] (i) $(H_2C{=}CH)_2CuLi$. (ii) MeMgBr

[C] (i) MeLi. (ii) $(H_2C{=}CH)_2CuLi$ [D] (i) $(H_2C{=}CH)_2CuLi$. (ii) MeBr

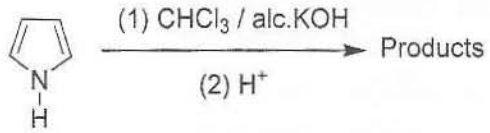
93. The increasing order of S_N1 reactivity among the following compounds is

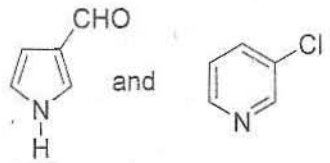


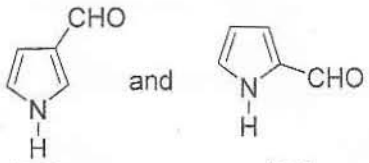
(I) (II) (III) (IV)

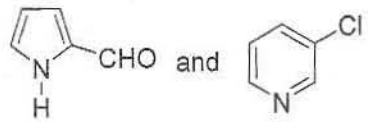
[A] (IV) < (II) < (III) < (I)
[B] (I) < (II) < (III) < (IV)
[C] (IV) < (I) < (III) < (II)
[D] (IV) < (I) < (II) < (III)

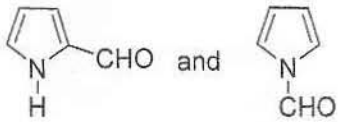
94. The products obtained in the following transformation are



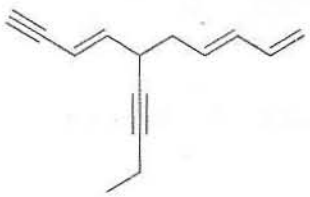
[A] 

[B] 

[C] 

[D] 

95. The IUPAC name of the following compound is

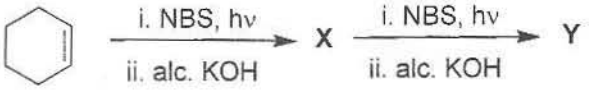


[A] (3*E*,7*E*)-6-[but-1-ene-3-ynyl]-deca-1,3-diene-7-yne
[B] (3*E*,7*E*)-6-[but-1-ynyl]-deca-1,3,7-triene-9-yne
[C] (3*E*,7*E*)-5-[but-1-ynyl]-deca-3,7,9-triene -9-yne
[D] (3*E*,7*E*)-5-[but-1-ene-3-ynyl]-deca-7,9-diene-3-yne

96. Ruff degradation of D-ribose followed by Kiliani-Fischer synthesis gives

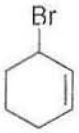
[A] D-ribose and D-arabinose
[B] D-xylose and D-lyxose
[C] D-arabinose and D-xylose
[D] D-ribose and D-lyxose

97. The products **X** and **Y** obtained in the following reactions are



[A] X =  Y = 

[B] X =  Y = 

[C] X =  Y = 

[D] X =  Y = 

98. Identify the respective hybridization of carbon atoms (C_1, C_2 and C_3) in an allene

[A] sp, sp^2, sp^3 [B] sp^2, sp, sp^3

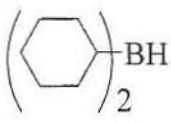
[C] sp^2, sp, sp^2 [D] sp, sp^2, sp

99. Acetyl chloride upon reaction with excess *n*-butyllithium provides

[A] Hexan-2-one [B] 5-Methylnonan-5-ol

[C] n-Butyl chloride [D] Octan-5-one

100. The reagents used in the following transformation are

[A] (i)  (ii) NaOH, H_2O_2 [B] (i) $NaBH_4$ (ii) $Hg(OAc)_2$

[C] (i) $HgSO_4$ (ii) H_3O^+ [D] (i) H_3O^+ (ii) $Hg(OAc)_2$

University of Hyderabad
Entrance Examinations - 2021

School/Department/Centre : School of Chemistry
Course/Subject : M. Sc. (Chemistry) Booklet Code: A

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

Note/Remarks : For Q. Nos. 6 and 39 correct answer is not given in the options. Therefore, these question may be omitted from grading. For Q. No. 78, although the correct answer was given in the key there is an error in option B. Therefore, this question may also be omitted from grading.

For the above question nos. 6, 39 and 78 benefit will be given to all candidates.

Signature of the Head/Dean