162/24

Question Booklet Alpha Code

A

A

Total Number of Questions : 100	Time : 90 Minutes

Maximum Marks : 100

A

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.

1. Wave number of the line in the visible region of hydrogen spectrum is
   A) $\bar{v} = 3R/4$ B) $\bar{v} = 5R/36$ C) $\bar{v} = 7R/144$ D) $\bar{v} = 3R/16$

2. Which of the following set of quantum numbers is possible for the valence electron of sodium atom ?
   A) n = 3, l = 0, m = 0, s = 0
   B) n = 3, l = 1, m = 1, s = – 1/2
   C) n = 3, l = 0, m = 0, s = +1/2
   D) None of the above

3. Correct order of the first ionisation energies of the following elements
   A) Li < Be < B < C < N
   B) Li > Be > B > C > N
   C) Li < B < C < Be < N
   D) Li < B < Be < C < N

4. Bridge bond in diborane is a
   A) 3c-2e bond   B) 3c-3e bond   C) 2c-2e bond   D) 2c-3e bond

5. Hybridisation and structure of BrF_3 compound is
   A) sp^2, Trigonal planar
   B) sp^3, Pyramidal
   C) sp^3d, T-shaped
   D) sp^3, Distorted tetrahedral

6. Helium does not form quinol clathrate because
   A) Helium is too large to fit in quinol
   B) Helium is too small to fit in quinol
   C) Helium reacts with quinol
   D) Helium does not react with quinol

7. Fajan's rules summarize the factors favouring
   A) Ionisation energy and bonding
   B) Electron affinity and bonding
   C) Ionisation energy and covalency
   D) Polarization and covalency

8. Bond order of the following molecules is in the order
   A) $O_2 > O_2^+ > O_2^- > N_2$
   B) $N_2 > O_2 > O_2^+ > O_2^-$
   C) $O_2 > N_2 > O_2^+ > O_2^-$
   D) $N_2 > O_2^+ > O_2 > O_2^-$

9. Which of the following statements are correct about hydrogen bonding ?
   i. H_2O is liquid.
   ii. Density of ice is greater than that of water.
   iii. o-nitrophenol is more volatile.
   A) i and ii   B) ii and iii   C) i and iii   D) i, ii and iii

10. F-centres are produced in
    A) Schottky defect
    B) Frenkel defect
    C) Metal excess defect
    D) Metal deficiency defect

11. Identify the correct statement.
    A) EDTA is a bi-dentate ligand.
    B) Ethylenediamine is a mono-dentate ligand.
    C) EDTA is a hexa-dentate ligand.
    D) Oxalate is a mono-dentate ligand.

A   -3-

12. The number of geometrical isomers possible for $[Co(NH_3)_3(NO_2)_3]$ is
    A) 3   B) 2   C) 4   D) 0

13. Which of the following electronic configuration exhibits Jahn-Teller distortion in an ML_6 complex ? (M refers to metal and L refers to ligand)
    A) d^3 B) d^6 (low spin)   C) d^7 D) d^5 (high spin)

14. What are the spin only magnetic moments of Mn^{2+} ion in high spin and low spin complexes, respectively ?
    A) 5.92 BM and 1.73 BM   B) 3.88 BM and 1.73 BM
    C) 2.83 BM and 5.92 BM   D) 0 BM and 1.73 BM

15. Which of the following is an ore of lead ?
    A) Pyrolusite   B) Sphalerite   C) Bauxite   D) Galena

16. Which electrolyte is used in the electrolytic reduction of Aluminium ?
    A) Cryolite   B) Aluminium sulphate
    C) Aluminium nitrate   D) Aluminium chloride

17. What is the initial step in the Kroll's process ?
    A) Chlorination of Titanium ore   B) Reduction of Titanium chloride
    C) Distillation of Titanium metal   D) Purification of Titanium metal

18. The metal ion centre present in Carbonic anhydrase is
    A) Magnesium   B) Zinc   C) Copper   D) Iron

19. In deoxyhaemoglobin, the Fe^{2+} exists in
    A) High spin state and exhibits paramagnetism
    B) Low spin state and exhibits diamagnetism
    C) High spin state and exhibits diamagnetism
    D) Low spin state and exhibits paramagnetism

20. What is the ratio of Sodium to Potassium ions transported by the Sodium – Potassium pump for every ATP breakdown ?
    A) 1 : 1   B) 2 : 1   C) 3 : 2   D) 4 : 3

21. Which of the following carbonyls is paramagnetic ?
    A) $Cr(CO)_6$ B) $Mn(CO)_5$ C) $Ni(CO)_4$ D) $Fe(CO)_5$

22. The CO stretching frequency in IR spectroscopy decreases when
    A) Backbonding is strong   B) Backbonding is weak
    C) CO acts only as a σ-donor   D) The metal is in a high oxidation state

A

23. Which of the following statements about Wilkinson's catalyst is correct ?
    I. It contains Rhodium in the + 1 oxidation state.
    II. It is used for alkene hydrogenation.
    III. It works via a mechanism involving oxidative addition and reductive elimination.
    A) Only I
    B) Only II and III
    C) Only I and II
    D) All are correct

24. Which of the following statements is correct about Fischer-Tropsch synthesis ?
    I. It converts syngas into hydrocarbons.
    II. It uses cobalt or iron as catalysts.
    III. It produces acetaldehyde from ethene.
    A) Only I and II   B) Only II and III   C) Only III   D) I, II and III

25. Match the following compounds with their descriptions.
    1. Ferrocene   a. Organometallic compound with a sandwich structure
    2. Zeise's salt   b. Catalyst for alkene hydrogenation
    3. Wilkinson's catalyst   c. Tetrameric structure with alkyl bridges
    4. Methyl lithium   d. Organometallic compound of platinum with ethylene

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

26. Which of the following statements is correct about the Wacker process ?
    I. The process converts ethylene to acetaldehyde.
    II. Palladium (II) chloride is reduced to metallic palladium in the reaction.
    III. Copper (II) chloride regenerates the palladium (II) catalyst.
    A) Only I and II   B) Only II and III   C) Only I and III   D) All are correct

27. Which of the following statements is false regarding Ziegler-Natta polymerization ?
    I. It is used for producing highly branched polymers.
    II. It involves coordination-insertion polymerization.
    III. Tetraethylaluminium serves as a co-catalyst.
    A) Only I   B) Only II   C) Only I and II   D) Only III

28. Which of the following ion is identified using the Chromyl chloride test ?
    A) Potassium   B) Barium   C) Lead   D) Chloride

29. In Thermo Gravimetric Analysis (TGA), what does a weight loss plateau indicate ?
    A) Sample decomposition   B) Sample stability
    C) Water evaporation   D) Instrument error

30. What is the pKa value of a weak acid if its Ka value is 2.0×10^{-4} ? (log 2 = 0.30)
    A) 3.70   B) 4.30   C) 2.30   D) 0.30

A

31. Which of the following reagents is used to separate Group III cations ?
    A) NaOH
    B) H_2S in basic medium
    C) $NH_4Cl + NH_3$
    D) HCl

32. Match the following flame colour with their descriptions.
    1. Apple green   a. Potassium
    2. Brick red   b. Barium
    3. Violet   c. Strontium
    4. Crimson red   d. Calcium
    A) 1 – a, 2 – b, 3 – c, 4 – d   B) 1 – c, 2 – a, 3 – d, 4 – a
    C) 1 – d, 2 – b, 3 – d, 4 – c   D) 1 – b, 2 – d, 3 – a, 4 – c

33. What is the purpose of the Q-test in data analysis ?
    A) Evaluate the spread of data
    B) Detect outliers in a dataset
    C) Determine correlation between variables
    D) Compare two sample means

34. Identify the correct statements regarding complexometric titrations.
    I. EDTA forms stable complexes with most metal ions.
    II. The indicator used changes color when it binds to metal ions.
    III. EDTA titrations are unaffected by pH changes.
    A) Only I   B) Only I and II
    C) Only I and III   D) I, II and III

35. Consider a compound $C_8H_{10}O_2$ labelled as compound P, which shows optical activity. Upon reaction with H2/Pd–C, it yields an achiral compound Q with the formula $C_8H_{12}O_2$. Additionally, when compound P undergoes ozonolysis, it produces two compounds : an optically active aldehyde R and an achiral ketone S. Which of the following could represent the structure of compound P ?
    A) (R)–2–Methyl–1–phenylprop–2–en–1–ol
    B) (S)–1–(3,4–Dimethylphenyl) ethene
    C) (R)–1–(4–Methylphenyl)prop–2–en–1–ol
    D) (S)–1–Phenylprop–2–en–1–ol

36. The inductive effect in organic compounds is primarily due to
    A) Delocalization of π-electrons
    B) Transfer of a lone pair of electrons
    C) Polarization of σ-bonds due to electronegativity differences
    D) Interaction of p-orbitals with π-bonds

A   -6-

37. Which of the following carbocations is the most stable ?
    A) Methyl carbocation (CH_3^+)
    B) Ethyl carbocation ($C_2H_5^+$)
    C) Isopropyl carbocation (($CH_3)_2CH^+$)
    D) Tertiary butyl carbocation (($CH_3)_3C^+$)

38. A compound C with molecular formula $C_5H_{10}O_2$ shows the following spectral data :
    • **IR Spectrum :** Strong absorption at 1730 cm^{-1} and a broad absorption between 2500–3300 cm^{-1}.
    • **UV Spectrum :** No significant absorption above 200 nm.
    • **^{1}H NMR Spectrum :** Shows a quartet at 4.1 ppm (2H, J=7.0 Hz), a triplet at 1.3 ppm (3H), and a broad singlet at 11.0 ppm (1H).
    • **^{13}C NMR Spectrum :** Shows four signals, with two of them at 170 ppm and 60 ppm.
    Based on this data, what is the most likely structure of compound C ?
    A) Ethyl acetate ($CH_3COOCH_2CH_3$)
    B) Butanoic acid ($CH_3CH_2CH_2COOH$)
    C) Methyl propenoate ($CH_3CH_2COOCH_3$)
    D) Propionic acid (CH_3CH_2COOH)

39. Which type of reaction mechanism is followed in the conversion of tert-butyl chloride (C_4H_9Cl) to tert-butyl alcohol (C_4H_9OH) in the presence of water ?
    A) S_N1 B) S_N2 C) E^1 D) E^2

40. The absolute configuration of a chiral centre in a molecule is assigned as R or S based on
    A) The orientation of substituents around a double bond
    B) The clockwise or counterclockwise arrangement of substituents according to Cahn-Ingold-Prelog rules
    C) The presence of optical activity
    D) The D/L configuration of the molecule

41. Which of the following would act as the strongest nucleophile in a protic solvent ?
    A) NH_3 B) H_2O C) OH^- D) CH_3O^-

42. Which of the following statements correctly describes the Wurtz reaction ?
    A) The Wurtz reaction is primarily used to synthesize alcohols from alkyl halides in the presence of zinc.
    B) The reaction is limited to the formation of symmetrical alkanes only, as it does not allow for the formation of mixed products.
    C) The use of sodium metal in the reaction facilitates the coupling of two alkyl halides to form a higher alkane.
    D) The Wurtz reaction proceeds via an S_N1 mechanism, resulting in the formation of a free carbocation intermediate.

A

43. According to Baeyer's strain theory, which of the following statements about cycloalkanes is most accurate regarding their stability and strain ?
    A) Cyclopropane is the most stable cycloalkane due to the absence of angle strain.
    B) Cyclobutane, while having some angle strain, can adopt at non-planar conformation that alleviates some torsional strain.
    C) Cyclohexane is unstable because it has both angle strain and torsional strain in its chair conformation.
    D) Baeyer's strain theory suggests that cycloalkanes with more than six carbons exhibit less strain due to increased angle flexibility.

44. Which of the following statements is true regarding the E^1 mechanism ?
    A) It involves a single concerted step.
    B) It occurs in two steps : formation of a carbocation and then deprotonation.
    C) It is favoured by strong bases.
    D) It produces stereoisomers with complete retention of configuration.

45. In a laboratory synthesis, a primary amine RNH_2 is treated with excess bromine and sodium hydroxide to produce an alkene via the Hofmann elimination reaction. Which of the following statements correctly describes the outcome of this reaction ?
    A) The reaction proceeds via an S_N2 mechanism, resulting in a substitution product before elimination occurs.
    B) The major product is determined by the stability of the formed alkene, favouring the more substituted alkene (Zaitsev's rule).
    C) The reaction results in the formation of a quaternary ammonium salt as an intermediate, which then undergoes dehydrohalogenation.
    D) The reaction produces an alkene and releases nitrogen gas as a byproduct due to the loss of the amine nitrogen.

46. In the hydration of alkenes, if water is added in accordance with Markovnikov's rule, which of the following products is formed from propene (C_3H_6) ?
    A) 1-Propanol   B) 2-Propanol   C) Propan-2-ol   D) Propan-1-ol

47. In the Diels-Alder reaction, the diene component must be in which conformation for the reaction to occur effectively ?
    A) Anti-periplanar   B) S-trans   C) S-cis   D) E-trans

48. Which of the following statements are correct ?
    i. Intramolecular Hydrogen bonding exists in ortho-nitro phenol but not in meta and para-nitro phenols.
    ii. Due to intermolecular H-bond simple phenols exist as associated molecules with higher boiling point.
    iii. The boiling point of o-nitrophenol is lower compared to its meta and para isomers.
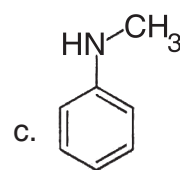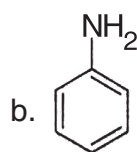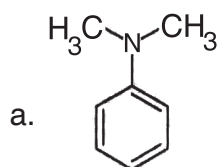   A) Only i and ii   B) Only i and iii   C) Only ii and iii   D) i, ii and iii

A

49. Arrange the following compounds in the increasing order of acidity.

a.

b.

c.

d.
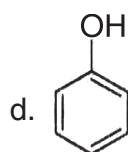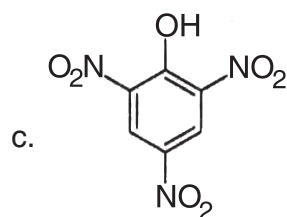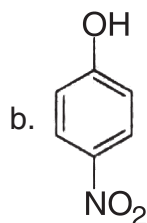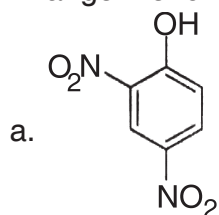
A) a < c < d < b   B) d < b < c < a
C) d < b < a < c   D) b < a < c < d

50. Arrange the following amino acids in the decreasing order of their basicity.
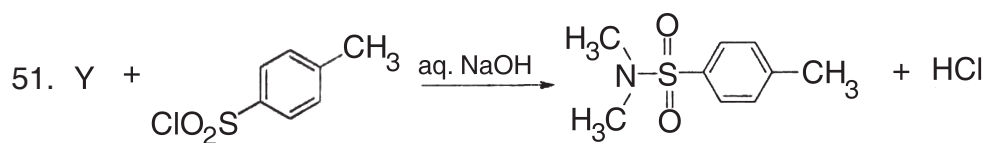
a.

b.

c.

A) a > c > b   B) b > c > a   C) b > a > c   D) None of the above

51. Y +

The amine 'Y' that reacts with p-toluene sulphonyl chloride in the above reaction can be

A) $(CH_3)_3N$ B) $CH_3–NH_2$ C) $(CH_3)_4N^+I^-$ D) $(CH_3)_2NH$

52. When vapours of secondary alcohols are passed over copper at a very high temperature of 300°C, the product formed due to dehydrogenation is

A) Aldehyde   B) Alkene

C) Ketone   D) None of the above

A

53. Identify the reagent 'Y' in the following conversion :
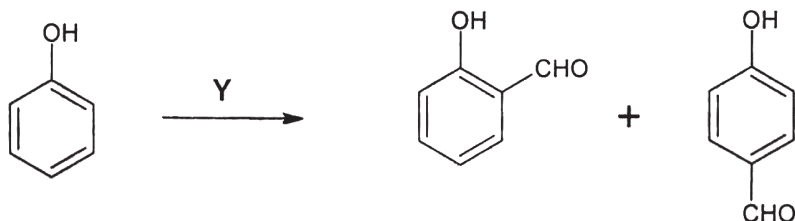
A) $CHCl_3$ / Alc. KOH   B) CO_2 / Heat

C) Conc. H_2SO_4 D) $NaNO_2$ / Conc. H_2SO_4

54. Walden inversion process is connected with which of these reactions ?

A) S_N1 B) S_N2 C) S_Ni D) SNAr

55. Hantzsch synthesis for the preparation of pyridine involves the condensation of β – dicarbonyl compound with an

A) Aldehyde and HCN   B) Ketone and H_2SO_4

C) Aldehyde and NH_3 D) Ketone and NH_3

56. Which among the following statements is false ?

a. S_N2 process is suppressed in the presence of polar aprotic solvent.

b. The reactivity rate of both S_N1 and S_N2 reactions of alkyl halides is in the order RI > RBr > RCl > RI.

A) only a   B) only b   C) a and b   D) none of the above

57. Identify the organic synthesis below.
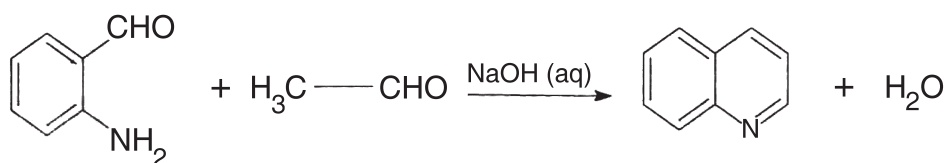
A) Skraup synthesis of quinoline   B) Friedlander's synthesis

C) Knorr quinoline synthesis   D) Bischler-Napieralski synthesis

58. Among these 3 heterocyclic compounds, which is the correct order of aromaticity ?

A) Thiophene > Pyrrole > Furan   B) Pyrrole > Furan > Thiophene

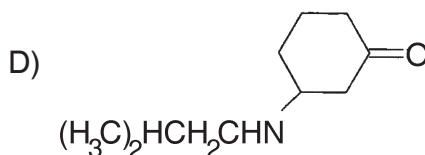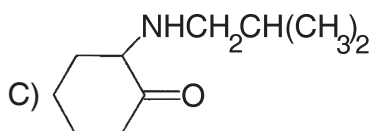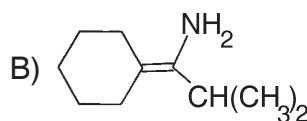C) Furan < Pyrrole > Thiophene   D) Pyrrole > Thiophene > Furan
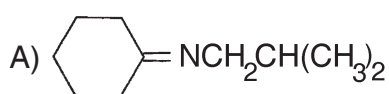
A

59. Formaldehyde reacts with the Grignard reagent - methyl magnesium iodide – to form
   A) n-propyl alcohol
   B) Ethyl alcohol
   C) Isopropyl alcohol
   D) Tert-butyl alcohol

60. Predict the product of the following reaction.
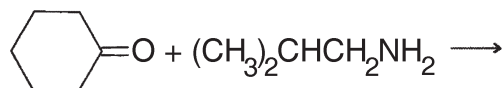
   Cyclohexanone   Isobutylamine

   A)   B)

   C)   D)

61. Which of the following product is formed when cyclohexanone undergoes Baeyer-Villiger oxidation ?
   A) Caprolactone
   B) Cyclohexanol
   C) Adipic acid
   D) Hexanoic acid

62. In a mixed Cannizzaro reaction involving benzaldehyde and formaldehyde, which of the following will be the major products ?
   A) Benzoic acid and methanol
   B) Benzyl alcohol and formic acid
   C) Phenol and formic acid
   D) Benzoic acid and formic acid

63. What is the major product formed when ethyl acetate is refluxed with sodium ethoxide in ethanol, followed by acidification ?
   A) Diethyl malonate
   B) Acetic acid
   C) Butanoic acid
   D) Ethyl acetoacetate

64. A + 2HI $\xrightarrow{\text{Reflux}}$ + H_2O + CO_2
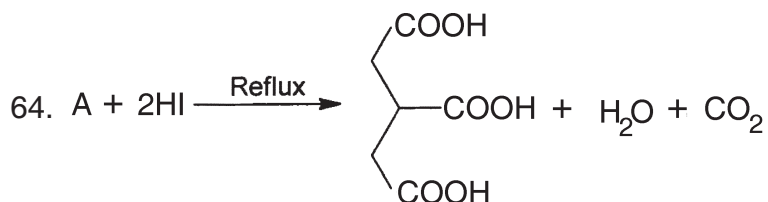
   What is A ?
   A) Lactic acid
   B) Tartaric acid
   C) Malic acid
   D) Citric acid

65. What type of compound is typically formed as the product of the Reformatsky reaction ?
    A) α-hydroxy ester
    B) β-hydroxy ester
    C) α-halo ester
    D) β-halo ester

66. Which of the following statements about the compressibility factor Z is true ?
    A) Z = 1 indicates that the gas behaves as a real gas under all conditions of temperatures and pressures.
    B) Z < 1 generally indicates that the gas has a larger molar volume than an ideal gas.
    C) Z > 1 indicates that the gas is less compressible than the ideal gas.
    D) The compressibility factor is always constant for a given gas regardless of temperature and pressure.

67. Which of the following statements accurately describes the relationship between the viscosity of a gas and temperature ?
    A) The viscosity of a gas decreases with increasing temperature.
    B) The viscosity of a gas is independent of temperature.
    C) The viscosity of a gas increases with increasing temperature.
    D) The viscosity of a gas is inversely proportional to the square of temperature.

68. What is the significance of the temperature 155 K for oxygen gas ?
    A) It is the temperature above which oxygen can be condensed into a liquid by increasing pressure alone.
    B) It is the boiling point of oxygen at atmospheric pressure, below which it can exist as a liquid.
    C) It is the critical temperature of oxygen, above which it cannot be liquefied regardless of pressure.
    D) It is the temperature at which oxygen transitions directly from solid to gas without becoming liquid.

69. Which of the following instruments is commonly used to measure surface tension ?
    A) Barometer   B) Stalagmometer   C) Calorimeter   D) Viscometer

70. The Miller indices for a plane with intercepts along the axes at 2a, 3b and 2c are
    A) (232)
    B) (131)
    C) $\left(\dfrac{1}{2}\ \dfrac{1}{3}\ \dfrac{1}{2}\right)$
    D) (323)

71. Number of atoms present in a body centred cubic (bcc) unit cell
    A) 1
    B) 2
    C) 3
    D) 4

72. The solubility product K_{sp} of a sparingly soluble salt A_2B is 4×10^{-9}. The molar solubility of the salt is _____ mol L^{-1}.
    A) 3×10^{-4}
    B) 3×10^{-3}
    C) 1×10^{-3}
    D) 1×10^{-4}

73. pK_a of an acid HA is 3.82. What will be the ratio of concentration of acid HA to concentration of A^- ions to have a solution with pH 4.82 ?

A) 1 : 1   B) 2 : 1   C) 10 : 1   D) 1 : 10

74. For the reaction $4NO_{2(g)} + O_{2(g)} \rightleftharpoons 2N_2O_{5(g)}$, which of the following is true ?

A) $K_p < K_c$ B) $K_p > K_c$ C) $K_p = K_c$ D) None of the above

75. The vapour pressure of a pure liquid A at 298 K is 50 mbar. When a solution B is prepared in A at the same temperature, the vapour pressure is found to be 25 mbar. The mole fraction of A in solution is

A) 0.35   B) 0.75   C) 0.5   D) 0.25

76. The freezing point of a solvent A was lowered by 0.55 °C on dissolving 2 g of a solute B in 100 g of A. The molar mass of solute B is (Given $K_f = 5.5$ K Kg mol^{-1})

A) 100   B) 200   C) 300   D) 400

77. The boiling points of 0.0001 M solution of $BaCl_2$ and 0.0001 M solution of $AlCl_3$ in same solvent are t_1 °C and t_2 °C respectively. Identify the correct relation.

A) $t_1 = t_2$ B) $t_2 > t_1$ C) $t_1 > t_2$ D) $t_2 = t_1/2$

78. For a chemical reaction $2X_{2(g)} + 5Y_{2(g)} \rightarrow 2X_2Y_{5(g)}$ at 27 °C, the difference between ΔH and ΔU is Z. The ratio $Z/R =$

A) 1500   B) $-$ 1500   C) 2/7   D) 7/2

79. Given that,

   i) $C + O_2 \rightarrow CO_2$ $\Delta H^0 = -$ x kJ
   ii) $2CO + O_2 \rightarrow 2CO_2$ $\Delta H^0 = -$ y kJ

The enthalpy of formation of CO will be

A) (y $-$ 2x)/2   B) (2x $-$ y)/2   C) y $-$ 2x   D) 2x $-$ y

80. 1 mol of an ideal gas at 27 °C is expanded reversibly from 3 L to 30 L. The entropy change is (R = 2 cal K^{-1} mol^{-1})

A) 46   B) 4.6   C) 92   D) 9.2

81. The work done during the expansion of an ideal gas from 2×10^{-3} L to 1×10^{-2} L at constant pressure of 1×10^5 NM^{-2} is

A) 800 kJ   B) $-$ 800 kJ   C) 800 J   D) $-$ 800 J

A

82. If the bond energy of N-H bond = x cal mol^{-1}, the change in internal energy in the following reaction is
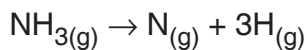
    $NH_{3(g)} \rightarrow N_{(g)} + 3H_{(g)}$
    A) x cal   B) 2x cal   C) 3x cal   D) 4x cal

83. A substance has a heat capacity of 200 J/°C. If 2 kJ of heat is added to this substance, what will be the increase in temperatures ?
    A) 20   B) 10   C) 0.01   D) 0.001

84. The unit of rate constant in a zero order reaction is
    A) mol L^{-1} sec^{-1} B) L mol^{-1} sec^{-1} C) L mol sec^{-1} D) sec^{-1}

85. The minimum amount of energy that the reacting molecules should possess to produce effective collision is
    A) Free energy   B) Internal energy
    C) Threshold energy   D) Activation energy

86. The reaction $2N_2O_{5(g)} \rightarrow 4NO_{2(g)} + O_{2(g)}$ is first order with respect to N_2O_5, which of the following graphs would yield a straight line ?
    A) PN_2O_5 vs time   B) $(PN_2O_5) - 1$ vs time
    C) $log(PN_2O_5)$ vs time with positive slope   D) $log(PN_2O_5)$ vs time with negative slope

87. The rate of reaction increases with increase in temperature. This is mainly due to
    A) Increase in activation energy
    B) Decrease in activation energy
    C) Increase in effective no. of molecules for collision
    D) Change in mechanism of the reaction

88. The unit of molar absorption coefficient is
    A) L mol^{-1} cm^{-1} B) mol L^{-1} m^{-1} C) mol L^{-1} cm^{-1} D) L mol^{-1} m^{-1}

89. The half life of a reaction is halved as the initial concentration of the reactant is doubled. What is the order of the reaction ?
    A) 1   B) 2   C) 0   D) Fractional

90. In the electrochemical reaction $2Fe^{3+}_{(aq)} + Sn^{2+}_{(aq)} \rightleftharpoons 2Fe^{2+}_{(aq)} + Sn^{4+}_{(aq)}$ increasing the concentration of Fe^{2+}
    A) Increases cell emf   B) Increases the current flow
    C) Decreases the cell emf   D) Alter the pH of the solution

91. A compound shows a proton NMR peak at 240 Hz down-field from the TMS peak in a spectrometer operating at 60 MHz. What are the values of the chemical shifts in δ and τ scale in ppm relative to TMS ?
    A) 6, 4   B) 6, 3   C) 4, 8   D) None of the above

A   -14-

92. Which of the following statement is false ?
    A) Conductance of a solution decreases with increase in concentration.
    B) Specific conductance of a solution decreases with increase in concentration.
    C) Equivalent conductance of a solution decreases with increase in concentration.
    D) Molar conductance of a solution decreases with increase in concentration.

93. Hypsochromic shift is due to
    A) A shift of absorption to shorter wavelength
    B) A shift of absorption to longer wavelength
    C) An increase in the intensity of an absorption band
    D) A decrease in the intensity of an absorption band

94. Choose the false statement.
    A) The intensity of an absorption band depends on the size of the dipole moment change associated with the vibration.
    B) The intensity of an absorption band depends on the no. of bonds responsible for the absorption.
    C) It takes more energy to stretch a bond than to bend it.
    D) The more polar the bond the less IR radiation it will absorb.

95. The relation between D_e and D_0, the two dissociation energies of an SHO is
    A) $D_e = D_0 + h\sqrt{}/2$
    B) $D_0 = D_e + h\sqrt{}/2$
    C) $D_e = D_0 + h\sqrt{}$
    D) $D_0 = D_e + h\sqrt{}$

96. The emf of Daniel cell at 298 K is E_1 Zn/ZnSO$_4$ (0.01 M)//CuSO$_4$ (1 M)/Cu when the concentration of ZnSO$_4$ is 1 M and that of CuSO$_4$ is 0.01 M, the emf changed to E_2. What is the relation between E_1 and E_2 ?
    A) $E_1 = E_2$
    B) $E_2 = 0 \ne E_2$
    C) $E_1 > E_2$
    D) $E_1 < E_2$

97. From the list given below, which of the following elements can oxidise fluoride to fluorine ?
    A) Mn
    B) Co
    C) Zn
    D) None of the above

98. Which statement is true ?
    A) Antistokes lines have higher frequency than stokes lines.
    B) Antistokes lines have lower frequency than stokes lines.
    C) Antistokes lines occur at higher wavelength than stokes lines.
    D) Antistokes lines occur at same wavelength as that of Rayleigh line.

99. Calculate the ionic strength of 0.2 molal K$_2$SO$_4$.
    A) 0.4 M
    B) 0.6 M
    C) 0.04 M
    D) 0.06 M

100. Calculate the liquid junction potential at 25☐C between two solutions of HCl having mean ionic activities of 0.01 and 0.001, respectively. The transference number of H$^+$ ion (t$^+$) in HCl may be taken as 0.83.
    A) 0.0039 V
    B) 0.0029 V
    C) 0.029 V
    D) 0.039 V

A

Space for Rough Work