45. If one mole of monoatomic gas $\left(\gamma=\frac{5}{3}\right)$ is mixed with one mole of diatomic gas $\left(\gamma=\frac{7}{5}\right)$, the value of γ for the mixture is

(a) 1.40 (b) 1.50 (c) 1.53 (d) 3.07

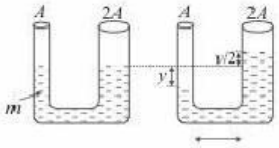
46. In a series resonant circuit, having L, C and R as its elements, the resonant current is i. The power dissipated in circuit at resonance is

(a) $\frac{i^2R}{(\omega L-1/\omega C)}$ (b) zero

(c) $i^2\omega L$ (d) i^2R

Whereas ω is angular resonant frequency

47. A U-tube is of non uniform cross-section. The area of cross-sections of two sides of tube are A and 2A (see fig.). It contains non-viscous liquid of mass m. The liquid is displaced slightly and free to oscillate. Its time period of oscillations is



(a) $T=2\pi\sqrt{\frac{m}{3\rho gA}}$ (b) $T=2\pi\sqrt{\frac{m}{2\rho gA}}$

(c) $T=2\pi\sqrt{\frac{m}{\rho gA}}$ (d) None of these

48. From a supply of identical capacitors rated 8 mF, 250V, the minimum number of capacitors required to form a composite 16 mF, 1000V is

(a) 2 (b) 4 (c) 16 (d) 32

49. An α-particle of energy 5 MeV is scattered through 180° by a fixed uranium nucleus. The distance of closest approach is of the order of

(a) 10^{-12} cm (b) 10^{-10} cm

(c) 10^{-20} cm (d) 10^{-15} cm

50. A moving coil galvanometer has N number of turns in a coil of effective area A, it carries a current I. The magnetic field B is radial. The torque acting on the coil is

(a) NA^2B^2I (b) $NABI^2$

(c) N^2ABI (d) $NABI$

CHEMISTRY

51. KO_2 (potassium super oxide) is used in oxygen cylinders in space and submarines because it

(a) absorbs CO_2 and increases O_2 content

(b) eliminates moisture

(c) absorbs CO_2

(d) produces ozone.

52. Which of the following is a bactericidal antibiotic?

(a) Ofloxacin (b) Tetracycline

(c) Chloramphenicol (d) Erythromycin

53. An ideal gas expands against a constant external pressure of 2.0 atmosphere from 20 litre to 40 litre and absorbs 10 kJ of heat from surrounding. What is the change in internal energy of the system? (given : 1atm-litre = 101.3 J)

(a) 4052 J (b) 5948 J

(c) 14052 J (d) 9940 J

54. In a solution of $CuSO_4$ how much time will be required to precipitate 2 g copper by 0.5 ampere current ?

(a) 12157.48 sec (b) 102 sec

(c) 510 sec (d) 642 sec

55. Which of the following compounds will undergo self aldol condensation in the presence of cold dilute alkali?

(a) $CH_2=CH-CHO$ (b) $CH\equiv C-CHO$

(c) C_6H_5CHO (d) CH_3CH_2CHO

56. An element having an atomic radius of 0.14 nm crystallizes in an fcc unit cell. What is the length of a side of the cell ?

(a) 0.56 nm (b) 0.24 nm

(c) 0.96 nm (d) 0.4 nm

57. 120 g of an ideal gas of molecular weight 40 g mol^{-1} are confined to a volume of 20 L at 400 K. Using

R=0.0821 L atm K^{-1} mol^{-1}, the pressure of the gas is

(a) 4.90 atm (b) 4.92 atm

(c) 5.02 atm (d) 4.96 atm

58. Fluorobenzene (C_6H_5F) can be synthesized in the laboratory
(a) by direct fluorination of benzene with F_2 gas
(b) by reacting bromobenzene with NaF solution
(c) by heating phenol with HF and KF
(d) from aniline by diazotisation followed by heating the diazonium salt with HBF_4

59. Substance used for the preservation of coloured fruit juices is
(a) benzene
(b) benzoic acid
(c) phenol
(d) sodium meta bisulphite

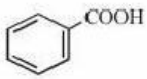
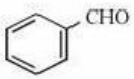
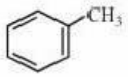
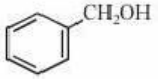
60. Which of the following compounds gives dye test?
(a) Aniline (b) Methylamine
(c) Diphenylamine (d) Ethylamine

61. The correct statement with regard to H_2^+ and H_2^- is
(a) Both H_2^+ and H_2^- do not exist
(b) H_2^- is more stable than H_2^+
(c) H_2^+ is more stable than H_2^-
(d) Both H_2^+ and H_2^- are equally stable

62. 18 g of glucose ($C_6H_{12}O_6$) is added to 178.2 g of water. The vapour pressure of water for this aqueous solution is
(a) 76.00 torr (b) 752.40 torr
(c) 759.00 torr (d) 7.60 torr

63. Mark the oxide which is amphoteric in character
(a) CO_2 (b) SiO_2 (c) SnO_2 (d) CaO

64. The standard EMF for the cell reaction,
$Zn + Cu^{2+} \longrightarrow Cu + Zn^{2+}$ is 1.1 volt at 25°C. The EMF for the cell reaction, when 0.1 M Cu^{2+} and 0.1 M Zn^{2+} solutions are used, at 25°C is
(a) 1.10V (b) 0.10 V
(c) –1.10 V (d) –0.110 V

65. The reactant (X) in the reaction
$(X) \xrightarrow[(CH_3CO)_2O]{CH_3COONa}$ Cinnamic acid, is
(a) 
(b) 
(c) 
(d) 

66. The brown ring complex is formulated as $[Fe(H_2O)_5 NO]SO_4$. The oxidation number of iron is
(a) 1 (b) 2 (c) 3 (d) 0

67. A substance $C_4H_{10}O$ yields on oxidation a compound, C_4H_8O which gives an oxime and a positive iodoform test. The original substance on treatment with conc. H_2SO_4 gives C_4H_8. The structure of the compound is
(a) $CH_3CH_2CH_2CH_2OH$
(b) $CH_3CHOHCH_2CH_3$
(c) $(CH_3)_3COH$
(d) $CH_3CH_2–O–CH_2CH_3$

68. Number of moles of $KMnO_4$ required to oxidize one mole of $Fe(C_2O_4)$ in acidic medium is
(a) 0.167 (b) 0.6 (c) 0.2 (d) 0.4

69. Predict the product C obtained in the following reaction of butyne-1.
$CH_3CH_2 - C \equiv CH + HCl \longrightarrow B \xrightarrow{HI} C$
(a) $CH_3 - CH_2 - CH_2 - \underset{\displaystyle Cl}{\overset{\displaystyle I}{\underset{|}{\overset{|}{C}}}} - H$
(b) $CH_3 - CH_2 - \overset{\displaystyle I}{\overset{|}{CH}} - CH_2Cl$
(c) $CH_3CH_2 - \underset{\displaystyle Cl}{\overset{\displaystyle I}{\underset{|}{\overset{|}{C}}}} - CH_3$
(d) $CH_3 - \underset{\displaystyle Cl}{\underset{|}{CH}} - CH_2CH_2I$

70. The vapour pressure of a solvent A is 0.80 atm. When a non-volatile substance B is added to this solvent its vapour pressure drops to 0.6 atm. the mole fraction of B in the solution is
(a) 0.25 (b) 0.50 (c) 0.75 (d) 0.90

71. The electric cookers have a coating that protects them against fire. The coating is made of
(a) heavy lead (b) zinc oxide
(c) magnesium oxide (d) sodium sulphate

72. Chlorine is liberated when we heat
(a) $KMnO_4 + NaCl$ (b) $K_2Cr_2O_7 + MnO_2$
(c) $Pb(NO_3)_2 + MnO_2$ (d) $K_2Cr_2O_7 + HCl$

73. Which of the following solutions will have the maximum lowering of vapour pressure at 300 K
(a) 1 M $CaCl_2$ (b) 1 M NaCl
(c) 1 M Phenol (d) 1 M sucrose

74. Which of the following electrolyte will be most effective in coagulation of negative sol?
(a) KNO_3 (b) $K_4[Fe(CN)_6]$
(c) Na_3PO_4 (d) $MgCl_2$

75. The element which has not yet been reacted with F_2 is
(a) Ar (b) Xe (c) Kr (d) Rn

76. Which is the best oxidising agent among the following ?
(a) S (b) O (c) Se (d) Te

77. Which of the following is correct for a first order reaction?
(a) $t_{1/2} \propto a$ (b) $t_{1/2} \propto 1/a$
(c) $t_{1/2} \propto a^0$ (d) $t_{1/2} \propto 1/a^2$

78. Standard enthalpy and standard entropy changes for the oxidation of ammonia at 298 K are -382.64 kJ mol^{-1} and -145.6 JK^{-1} mol^{-1}, respectively. Standard Gibb's energy change for the same reaction at 298 K is
(a) -22.1 kJ mol^{-1} (b) -339.3 kJ mol^{-1}
(c) -439.3 kJ mol^{-1} (d) -523.2 kJ mol^{-1}

79. Which of the following polymers do not involve cross linkages?
(a) Melmac (b) Bakelite
(c) Polythene (d) Vulcanised rubber

80. When a metal is to be extracted from its ore and the gangue associated with the ore is silica, then
(a) an acidic flux is needed
(b) a basic flux is needed
(c) both acidic and basic fluxes are needed
(d) Neither of them is needed

81. $A \rightarrow B$, $\Delta H = -10$kJ mol^{-1}, $E_{a(f)} = 50$ kJ mol^{-1}, then E_a of $B \rightarrow A$ will be
(a) 40 kJ mol^{-1} (b) 50kJ mol^{-1}
(c) -50kJ mol^{-1} (d) 60 kJ mol^{-1}

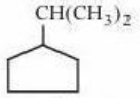
82. At anode in the electrolysis of fused NaCl
(a) Na^+ is oxidized (b) Cl^- is oxidized
(c) Cl is reduced (d) Na is reduced

83. Molarity of liquid HCl will be, if density of solution is 1.17 g/cc
(a) 36.5 (b) 32.05
(c) 18.25 (d) 42.10

84. Which of the following bicarbonates does not exist as solid?
(a) $KHCO_3$ (b) $NaHCO_3$
(c) $CsHCO_3$ (d) $LiHCO_3$

85. P_2O_5 is heated with water to give
(a) hypophosphorous acid
(b) phosphorous acid
(c) hypophosphoric acid
(d) orthophosphoric acid

86. What is the IUPAC name of the compound ?



(a) 1, 1 – dimethyl – 1 – cyclopentyl methane
(b) 2 – cyclopentyl propane
(c) 1 – (1 – methyl) ethyl cyclopentane
(d) Cumene.

87. Which one of the following reactions is expected to readily give a hydrocarbon product in good yields ?
(a) $RCOOK \xrightarrow[\text{oxidation}]{\text{Electrolytic}}$
(b) $RCOO^-Ag^+ \xrightarrow{Br_2}$
(c) $CH_3CH_3 \xrightarrow[h\upsilon]{Cl_2}$
(d) $(CH_3)_3CCl \xrightarrow{C_2H_5OH}$

88. Among the trihalides of nitrogen which one is most basic ?
(a) NF_3 (b) NCl_3
(c) NI_3 (d) NBr_3

89. Omeoprazole and lansoprazole are used as –
(a) antifertility (b) antiallergic
(c) antibiotic (d) antacid

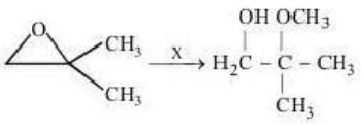
90. Hydrolysis of sucrose is called
(a) hydration (b) saponification
(c) esterification (d) inversion

91. van Arkel method of purification of metals involves converting the metal to a
(a) volatile stable compound
(b) volatile unstable compound
(c) non volatile stable compound
(d) None of the above

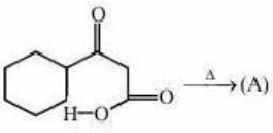
92. When SO_2 is passed through acidified solution of potassium dichromate, then chromium sulphate is formed. The change in valency of chromium is
(a) +4 to +2 (b) +5 to +3
(c) +6 to +3 (d) +7 to +2

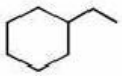
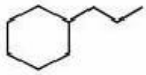
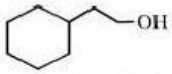
93. Which of the following polymer is used for manufacturing of buckets, dustbins, pipes etc ?
(a) Low density polythene
(b) High density polythene
(c) Teflon
(d) Polyacrylonitrile

94. What is X in the following reaction ?



(a) CH_3OH, H_2SO_4
(b) $CH_3OH, CH_3O^-\overset{+}{N}a$
(c) H_2O / H_2SO_4 followed by CH_3OH
(d) CH_3MgBr / ether followed by H_3O^+

95. 

In the above reaction, product (B) is:
(a) 
(b) 
(c) 
(d) 

96. The compounds $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)_4]Cl_2$ constitutes a pair of
(a) coordination isomers
(b) linkage isomers
(c) ionization isomers
(d) optical isomers

97. Which of the following factors may be regarded as the main cause of lanthanoid contraction?
(a) Greater shielding of 5*d* electrons by 4*f* electrons
(b) Poorer shielding of 5*d* electrons by 4*f* electrons
(c) Effective shielding of one of 4*f* electrons by another in the subshell
(d) Poor shielding of one of 4*f* electron by another in the subshell

98. The polymer used in making synthetic hair wigs is made up of
(a) $CH_2=CHCl$
(b) $CH_2=CHCOOCH_3$
(c) $C_6H_5CH=CH_2$
(d) $CH_2=CH-CH=CH_2$

99. Which of the following is called Wilkinson's catalyst?
(a) $[(Ph_3P)_3RhCl]$ (b) $TiCl_4+(C_2H_5)_3Al$
(c) $(C_2H_5)_4Pb$ (d) $[PtCl_2(NH_3)_2]$

100. One mole of an ideal gas is allowed to expand reversibly and adiabatically from a temperature of 27°C. If the work done during the process is 3 kJ, the final temperature will be equal to ($C_v = 20\,JK^{-1}$)
(a) 150 K (b) 100 K
(c) 26.85 K (d) 295 K