CHEMISTRY

Atomic numbers: Mn = 25, Fe = 26, Co = 27, Ni = 28
Atomic masses: C = 12, O = 16, Cl = 35.5, K = 39, Mn = 55
Universal gas constant, R = 0.0821 L atm mol^{-1} K^{-1} = 8.314 J mol^{-1} K^{-1}

81. The bond order in NO is 2.5 while that in NO^+ is 3. Which of the following statements is true for these two species?
(a) Bond length in NO^+ is greater than in NO
(b) Bond length is unpredictable
(c) Bond length in NO^+ is equal to that in NO
(d) Bond length in NO is greater than in NO^+

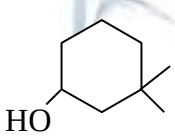
82. Which one of the following has the regular tetrahedral structure?
(a) XeF_4 (b) $[Ni(CN)_4]^{2-}$
(c) BF_4^- (d) SF_4

83. For the reaction, $CO(g) + Cl_2(g) \rightleftharpoons COCl_2(g)$ the $\frac{K_p}{K_C}$ is equal to
(a) $\frac{1}{RT}$ (b) 1.0
(c) $\sqrt{RT}$ (d) RT

84. Excess of KI reacts with $CuSO_4$ solution and then $Na_2S_2O_3$ solution is added to it. Which of the statements is incorrect for this reaction?
(a) Cu_2I_2 is formed (b) Evolved I_2 is reduced
(c) $Na_2S_2O_3$ is oxidised (d) CuI_2 is formed

85. Which one of the following complexes is an outer orbital complex?
(a) $[Fe(CN)_6]^{4-}$ (b) $[Ni(NH_3)_6]^{2+}$
(c) $[Co(NH_3)_6]^{3+}$ (d) $[Mn(CN)_6]^{4-}$

86. The IUPAC name of the compound



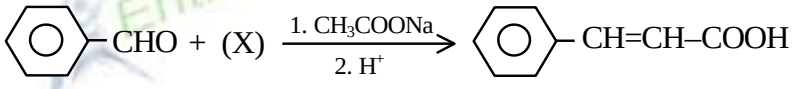
is
(a) 3, 3-dimethyl-1-hydroxy cyclohexane (b) 1,1-dimethyl-3-cyclohexanol
(c) 3, 3-dimethyl-1- cyclohexanol (d) 1,1-dimethyl-3-hydroxy cyclohexane

87. Consider the acidity of the carboxylic acids.
(I) PhCOOH (II) o – $NO_2C_6H_4COOH$
(III) p – $NO_2C_6H_4COOH$ (IV) m – $NO_2C_6H_4COOH$
Which of the following order is correct?
(a) (I) > (II) > (III) > (IV) (b) (II) > (III) > (IV) > (I)
(c) (II) > (IV) > (I) > (III) (d) (II) > (IV) > (III) > (I)

88. The quantum numbers +1/2 and –1/2 for the electron spin represent
(a) rotation of the electron in clockwise and anticlockwise direction respectively
(b) rotation of the electron in anticlockwise and clockwise direction respectively
(c) magnetic moment of the electron pointing up and down respectively
(d) two quantum mechanical spin states which have no classical analogue

89. The equivalent weight of an element is 29.4. The electrochemical equivalent of this element is
(a) 3.04×10^{-4} (b) 4.56×10^{-4}
(b) 6.08×10^{-4} (d) 1.52×10^{-4}

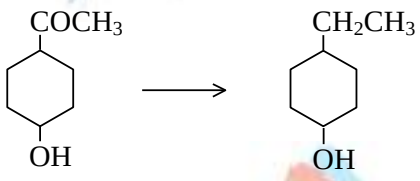
90. The number of O–O bonds in (CrO_5) is
(a) three (b) two
(c) one (d) zero

91. 

Identify the compound (X).
(a) CH_3COOH (b) $(CH_3CO)_2O$
(c) $BrCH_2COOH$ (d) CHO–COOH

92. The order of reactivity of the following compounds with PhMgBr is
(I) PhCOPh (II) CH_3CHO (III) CH_3COCH_3
(a) (I) > (II) > (III) (b) (III) > (I) > (II)
(c) (II) > (I) > (III) (d) (II) > (III) > (I)

93. Which of the following compound will not give a positive iodoform test?
(a) $CH_3–\underset{\displaystyle OH}{\underset{|}{CH}}–COOH$ (b) $CH_3–\underset{\displaystyle OH}{\underset{|}{CH}}–CH_3$
(c) $C_6H_5–\underset{\displaystyle OH}{\underset{|}{CH}}–CH_3$ (d) $C_6H_5–\underset{\displaystyle O}{\underset{\|}{C}}–CH_2I$

94. The appropriate reagent for the following transformation is


(a) Zn–Hg, HCl (b) NH_2NH_2, KOH
(c) $LiAlH_4$ (d) HI, P_4

95. Which of the following dicarboxylic acid gives cyclic ketone on heating?
(a) $CH_2(COOH)_2$ (b) $\begin{matrix} CH_2COOH \\ | \\ CH_2COOH \end{matrix}$

(c) $HOOC(CH_2)_3COOH$ (d) $HOOC(CH_2)_4COOH$

96. For a hypothetical reaction, A + B $\longrightarrow$ C + D, the rate = $k[A]^{-1/2}[B]^{3/2}$. On doubling the concentration of A and B, the rate will be (assume that the concentration of A & B initially were same)

(a) 4 times (b) 2 times
(c) 3 times (d) none of these

97. If the equilibrium constant for the reaction,

$$2N_2O_5(g) \rightleftharpoons 4NO_2(g) + O_2(g)$$

is $x\ M^{-3}$. The equilibrium constant for the reaction

$$2NO_2(g) + \tfrac{1}{2}O_2(g) \rightleftharpoons N_2O_5(g) \text{ is}$$

(a) $\sqrt{x}$ (b) $\sqrt{x^{-1}}$
(c) x^2 (d) x

98. For the combustion reaction at 298 K,

$$2Ag(s) + \tfrac{1}{2}O_2(g) \longrightarrow 2Ag_2O(s)$$

which of the following relation will be true?

(a) $\Delta H = \Delta U$
(b) $\Delta H > \Delta U$
(c) $\Delta H < \Delta U$
(d) ΔH and ΔU bear no relation with each other

99. For which of the following equation, will ΔH be equal to ΔU?

(a) $H_2(g) + \tfrac{1}{2}O_2(g) \longrightarrow H_2O(l)$ (b) $H_2(g) + I_2(g) \longrightarrow 2HI(g)$
(c) $2NO_2(g) \longrightarrow N_2O_4(g)$ (d) $4NO_2(g) + O_2(g) \longrightarrow 2N_2O_5(g)$

100. For a system, $A(g) + 2B(g) \rightleftharpoons 3C(g) + D(g)$ at equilibrium, if volume is doubled, the reaction shifts in

(a) forward direction (b) backward direction
(c) equilibrium will not be disturbed (d) none of these

101. The degree of dissociation for a reaction, $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ is 0.01. What would be K_c for the reaction assuming initial concentration of N_2O_4 is 1 M.

(a) 0.4×10^{-3} M (b) 0.5×10^{-3} M
(c) 0.3×10^{-3} M (d) 0.2×10^{-3} M

102. When a poly atomic gas undergoes an adiabatic expansion, its temperature and volume are related by the equation TV^n = constant, the value of n will be

(a) 1.33 (b) 0.33
(c) 2.33 (d) 1

103. Concentration of NaOH at 25°C is 10^{-3} M. pH at this temperature is
(a) 7 (b) 8
(c) 9 (d) 11

104. In a mixture of two volatile liquids A and B, the mole fraction of A is 0.4. What would be the mole fraction of A in the vapour phase if the vapour pressure of pure components are given as P_A^o = 100 mm Hg and P_B^o = 100 mm Hg.
(a) 0.4 (b) 0.6
(c) 0.25 (d) none of these

105. The molal depression constant for water is 1.86 K kg/mol. What will be, the freezing point of 0.1 M KCl in water assuming molality is same as molarity?
(a) +1.86°C (b) –0.186°C
(c) –0.372°C (d) –0.093°C

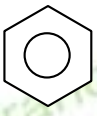
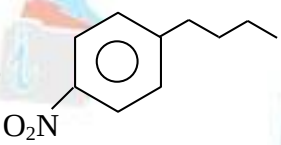
106. If the anions (A) form hexagonal closed packing and cations (C) occupy only 2/3 of the octahedral voids in it, then the general formula of the compound would be
(a) CA (b) CA_2
(c) C_2A_3 (d) C_3A_2

107. A solid has a structure in which tungsten (W) atoms are located at the corners of a cubic lattice, O atoms at the center of edges and Na atom at the center of cube. The formula for the compound is
(a) $NaWO_2$ (b) $NaWO_3$
(c) Na_2WO_3 (d) $NaWO_4$

108. The amount of $KMnO_4$ required to prepare 100 ml of 0.1 N solution in alkaline medium when $KMnO_4$ is reduced to K_2MnO_4 is
(a) 1.58 g (b) 0.52 g
(c) 3.16 g (d) 0.31 g

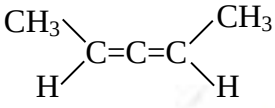
109. In Bohr's hydrogen atom, the electronic transition emitting light of longest wavelength among the following is
(a) n = 5 to n = 4 (b) n = 4 to n = 3
(c) n = 3 to n = 2 (d) n = 4 to n = 2

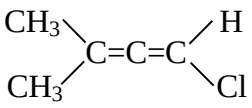
110. If E_1, E_2 and E_3 represent respectively the kinetic energies of an electron, α–particle and a proton, each having same de–Broglie's wave length, then
(a) $E_1 > E_3 > E_2$ (b) $E_2 > E_3 > E_1$
(c) $E_1 > E_2 > E_3$ (d) $E_1 = E_2 = E_3$

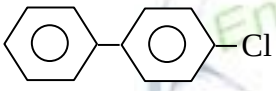
111. To transform  into 

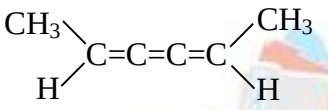
, initial steps could be
(a) Nitration followed by Friedel–Crafts alkylation.
(b) Friedel–Crafts alkylation followed by nitration.
(c) Nitration followed by Friedel–Crafts acylation.
(d) Friedel–Crafts acylation followed by Clemmensen's reduction followed by nitration.

112. Which of the following compound is optically active?

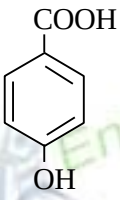
(a) 

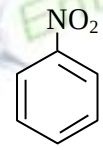
(b) 

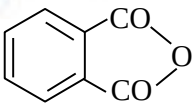
(c) 

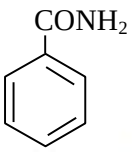
(d) 

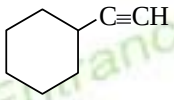
113. Buff coloured precipitate is obtained when $FeCl_3$ is treated with

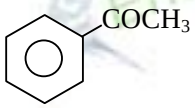
(a) 

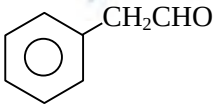
(b) 

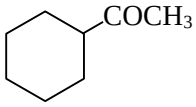
(c) 

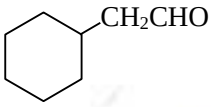
(d) 

114. Hydration of  in presence of $H_2SO_4/HgSO_4$ gives

(a) 

(b) 

(c) 

(d) 

115. The standard heat of formation values of $SF_6(g)$, S(g) and F(g) are: –1100, 275 and 80 kJ mol^{-1} respectively. Then the average S – F bond energy in SF_6 would be

(a) 301 kJ mol^{-1} (b) 320 kJ mol^{-1} (c) 309 kJ mol^{-1} (d) 280 kJ mol^{-1}

116. The oxidation of oxalic acid by acidified $KMnO_4$ becomes fast as the reaction progresses due to:

(a) auto catalysis by Mn^{+2} (b) presence of SO_4^{-2}

(c) presence of K^+ (d) presence of MnO_4^-

117. Which of the following is/are diamagnetic?

(i) $Ni(CO)_4$ (ii) $[NiCl_4]^{2-}$

(iii) $[Ni(CN)_4]^{2-}$ (iv) $[Fe(H_2O)_6]^{2+}$

(a) (i) only (b) (ii) only

(c) (i) and (iii) only (d) (iv) only

118. During the electrolysis of aqueous nitric acid solution using Pt electrodes

(a) O_2 is liberated at the cathode. (b) N_2 is liberated at the anode.

(c) O_2 is liberated at the anode. (d) H_2 is liberated at the anode.

119. Colloidal solution is

(a) true solution.
(b) suspension.
(c) heterogeneous sol.
(d) homogenous sol.

120. To make E_{cell} of the following concentration cell positive, what should be the relative concentration of Cl^- ions in the two half cells?

Pt | Cl_2 (1 atm) | $Cl^-(C_1)$ || Cl^- (C_2) | Cl_2 (1 atm) | Pt

(a) $C_1 > C_2$
(b) $C_1 < C_2$
(c) $C_1 = C_2$
(d) E_{cell} cannot be positive