Chemistry AIEEE-2007

81. The energies of activation for forward and reverse reactions of $A_2 + B_2 \rightleftharpoons 2AB$ are 180 kJ mol^{-1} and 200 kJ mol^{-1} respectively. The presence of catalyst lowers the activation energy of both (forward and reverse) reactions by 100 kJ mol^{-1}. The enthalpy change of the reaction ($A_2 + B_2 \rightarrow 2AB$) in the presence of catalyst will be (in kJ mol^{-1}).

(1) 300 (2) 120 (3) 280 (4) 20

82. The cell, $Zn|Zn^{2+}$ (1M)) || Cu^{2+} (1M)| $Cu\,(E^{\circ}_{cell} = 1.10V)$, was allowed to be completely discharged at 298 K. The relative concentration of Zn^{2+} to Cu^{2+} $\left[\frac{[Zn^{2+}]}{[Cu^{2+}]}\right]$ is

(1) antilog (24.08) (2) 37.3 (3) $10^{37.3}$ (4) 9.65×10^4

83. The pK_a of a weak acid (HA) is 4.5. The pOH of an aqueous buffered solution of HA in which 50% of the acid is ionized is

(1) 4.5 (2) 2.5 (3) 9.5 (4) 7.0

84. Consider the reaction,

$2A + B \rightarrow$ Products

When concentration of B alone was doubled, the half-life did not change. When the concentration of A alone was doubled, the rate increased by two times. The unit of rate constant for this reaction is :

(1) L mol^{-1} S^{-1} (2) no unit (3) mol $L^{-1}S^{-1}$ (4) S^{-1}

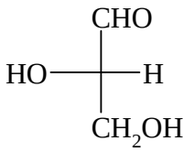
85. Identify the incorrect statement among the following

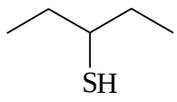
(1) d–Block elements show irregular and erratic chemical properties among themselves
(2) La and Lu have partially filled d orbital and no other partially filled orbital
(3) The chemistry of various lanthanides is very similar
(4) 4f and 5f orbitals are equally shielded

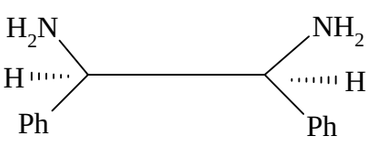
86. Which one of the following has a square planar geometry ?

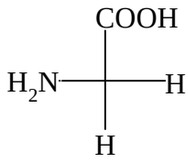
(1) $[CoCl_4]^{2-}$ (2) $[FeCl_4]^{2-}$ (3) $[NiCl_4]^{2-}$ (4) $[PtCl_4]^{2-}$

87. Which of the following molecules is expected to rotate the plane of plane polarized light?

(1) 

(2) 

(3) 

(4) 

88. The secondary structure of a protein refers to

(1) α-helical backbone
(2) hydrophobic interactions
(3) sequence of α-amino acids
(4) fixed configuration of the polypeptide backbone

89. Which of the following reactions will yield 2, 2-dibromopropane ?

(1) $CH_3 - C \equiv CH + 2HBr \longrightarrow$ (2) $CH_3CH = CHBr + HBr \longrightarrow$

(3) $CH \equiv CH + 2HBr \longrightarrow$ (4) $CH_3 - CH = CH_2 + HBr \longrightarrow$

90. In the chemical reaction,

$CH_3CH_2NH_2 + CHCl_3 + 3KOH \longrightarrow (A) + (B) + 3H_2O$, the compound (A) and (B) are respectively

(1) C_2H_5CN and 3KCl (2) $CH_2CH_2CONH_2$ and 3KCl

(3) C_2H_5NC and K_2CO_3 (4) C_2H_5NC and 3KCl

91. The reaction of toluene with Cl_2 in presence of $FeCl_3$ gives predominantly

(1) benzoyl chloride (2) benzyl chloride

(3) o–and p–chlorotoluene (4) m-chlorotoluene

92. Presence of nitro group in a benzene ring

(1) activates the ring towards electrophonic substitution

(2) renders the ring basic

(3) deactivates the ring towards nucleophilic substitution

(4) deactivates the ring towards electrophilic substitution.

93. In which of the following ionization processes, the bond order has increased and the magnetic behaviour has changed ?

(1) $C_2 \longrightarrow C_2^+$ (2) $NO \longrightarrow NO^+$ (3) $O_2 \longrightarrow O_2^+$ (4) $N_2 \longrightarrow N_2^+$

94. The actinoids exhibits more number of oxidation states in general than the lanthanides. This is because.

(1) the 5f orbitals more buried than the 4f orbitals

(2) there is a similarity between 4f and 5f orbitals in their angular part of the wave function

(3) the actinoids are more reactive than the lanthanoids

(4) the 5f orbitals extend further from the nucleus than the 4f orbitals.

95. Equal masses of methane and oxygen are mixed in an empty container at 25°C. The fraction of the total pressure exerted by oxygen is

(1) $\frac{2}{3}$ (2) $\frac{1}{3} \times \frac{273}{298}$ (3) $\frac{1}{3}$ (4) $\frac{1}{2}$

96. A 5.25% solution of a substance is isotonic with a 1.5% solution of urea (molar mass = 60 g mol^{-1}) in the same solvent. If the densities of both the solutions are assumed to be equal to 1.0 g cm^{-3}, molar mass of the substance will be

(1) 90.0 g mol^{-1} (2) 115.0 g mol^{-1} (3) 105.0 g mol^{-1} (4) 210.0 g mol^{-1}

97. Assuming that water vapour is an ideal gas, the internal energy (ΔU) when 1 mol of water is vaporized at 1 bar pressure and 100°C, (Given : Molar enthalpy of vaporization of water at 1 bar and 373 K = 41 KJ mol^{-1} and R = 8.3 J mol^{-1} K^{-1}) will be

(1) 4.100 kJ mol^{-1} (2) 3.7904 kJ mol^{-1} (3) 37.904 kJ mol^{-1} (4) 41.00 kJ mol^{-1}

98. In a saturated solution of the sparingly soluble strong electrolyte $AgIO_3$ (Molecular mass = 283) the equilibrium which sets in is $AgIO_{3(s)} \rightleftharpoons Ag^+_{(aq)} + IO^-_{3(aq)}$

If the solubility product constant K_{sp} of $AgIO_3$ at a given temperature is 1.0×10^{-8}, what is the mass of $AgIO_3$ contained in 100 ml of its saturated solution ?

(1) 28.3×10^{-2} g (2) 2.83×10^{-3} (3) 1.0×10^{-7} g (4) 1.0×10^{4} g

99. A radioactive element gets spilled over the floor of a room. Its half-life period is 30 days. If the initial activity is ten times the permissible value, after how many days will it be safe to enter the room?

(1) 1000 days (2) 300 days (3) 10 (4) 100 days

100. Which one of the following conformation of cyclohexane is chiral?

(1) Twist boat (2) Rigid (3) Chair (4) Boat

101. Which of the following is the correct order of decreasing SN^2 reactivity?

(1) $RCH_2X > R_3CX > R_2CHX$ (2) $RCH_2 > R_2CHX > R_3CX$

(3) $R_3CX > R_2CHX > RCH_2X$ (4) $R_2CHX > R_3CX > RCH_2X$

(X = a halogen)

102. In the following sequence of reactions,

$CH_3CH_2OH \xrightarrow{P+I_2} A \xrightarrow[ether]{Mg} B \xrightarrow{H_2O} D$ the compound 'D' is :

(1) butanal (2) n-butyl alcohol (3) n-propyl alcohol (4) propanal

103. Which of the following sets of quantum numbers represents the highest energy of an atom?

(1) n = 3, ℓ = 1, m = 1 s = +1/2 (2) n = 3, ℓ = 2, m = 1, s = +1/2

(3) n = 4, ℓ = 0, m = 0, s = + 1/2 (4) n = 3, ℓ = 0, m = 0, s = +1/2

104. Which of the following hydrogen bonds is the strongest ?

(1) O – H …… N (2) F – H …… F (3) O – H …… O (4) O – H ….. F

105. In the reaction. $2Al_{(s)} + 6HCl_{(s)} \longrightarrow 2Al^{3+}_{(aq)} + 6Cl^{-}_{(aq)} + 3H_{2(g)}$

(1) 6 L $HCl_{(aq)}$ is consumed for every 3L $H_{2(g)}$ produced

(2) 33.6 L $H_{2(g)}$ is produced regardless of temperature and pressure for every mole Al that reacts

(3) 67.2 L $H_{2(g)}$ at STP is produced for every mole AI that reacts

(4) 11.2 $H_{2(g)}$ at STP is produced for every mole $HCI_{(aq)}$ consumed.

106. Regular use of which of the following fertilizer increases the acidity of soil?

(1) Potassium nitrate (2) Urea

(3) Superphosphate of lime (4) Ammonium sulphate

107. Identify the correct statement regarding a spontaneous process

(1) For a spontaneous process in an isolated system, the change in entropy is positive

(2) Endothermic processes are never spontaneous

(3) Exothermic processes are always spontaneous

(4) Lowering of energy in the reaction process is the only criterion for spontaneity

108. Which of the following nuclear reactions will generate an isotope ?

(1) neutron particle emission (2) positron emission

(3) α-particle emission (4) β- particle emission

109. The equivalent conductances of two strong electrolytes at infinite dilution in H_2O (where ions move freely through a solution) at 25°C are given below :

$\wedge^{\circ}_{CH_3COONa} = 91.0\,S\,cm^2/equiv$

$\wedge^{\circ}_{HCl} = 426.2 S cm^2/equiv$

What additional information/quantity one needs to calculate $\wedge^{o}$ of an aqueous solution of acetic acid ?

(1) $\wedge^{o}$ of Nacl

(2) $\wedge^{o}$ of CH_3COOK

(3) The limiting equivalent conductance H^+ $(\wedge^{o}_{H^+})$

(4) $\wedge^{o}$ of chloroacetic acid ($ClCH_2COOH$)

110. Which one of the following is the strongest base in aqueous solution ?

(1) Trimethylamine (2) Aniline

(3) Dimethylamine (4) Methylamine

111. The compound formed as a result of oxidation of ethyl benzene by $KMnO_4$ is

(1) benzophenone (2) acetophenone

(3) benzoic acid (4) benzyl alcohol

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