Section 2 - Chemistry

61) What will be the nature of existence of an amino acid (containing one amino and one carboxylic acid group) in solution of pH < pKa_1?

A) It exists as anion

B) It exists as cation

C) It exists as zwitterion

D) It exists as neutral species with no charge

62) Dacron is a continuous filament yarn used in curtains, dress fabrics and pressure fire hoses. The reaction for preparing dacron is by the combination of which of the following?

A) Hexamethylene diamine and adipic acid

B) Caprolactum

C) Phenol and formaldehyde

D) Ethylene glycol and terephthalic acid

63) What final product will form when alcoholic KOH is treated with 1,1-dichloro ethane?

A) ethane-1,2-diol

B) ethene

C) ethyne

D) acetaldehyde

64) What will be the relation between the T_1 of gas 1 with M_1=56 and T_2 of gas 2 with M_2=44 if the average speed of gas 1 is equal to most probable speed of gas 2?

A) $T_1 = T_2^2$

B) $T_1 = T_2$

C) $T_1 = (T_2)^{1/2}$

D) $T_1 = 1/T_2$

65) What is the hybridization and geometry of the compound $XeOF_4$?

A) sp^3d^2 and octahedral

B) sp^3d and square pyramidal

C) sp^3d and trigonal bipyramidal

D) sp^3d^2 and square pyramidal

66) Identify the CORRECT increasing order of crystal field stabilization energy value for the given complexes.

A) $[Ir(NH_3)_6]^{3+} < [Rh(NH_3)_6]^{3+} < [Co(NH_3)_6]^{3+}$

B) $[Rh(NH_3)_6]^{3+} < [Co(NH_3)_6]^{3+} < [Ir(NH_3)_6]^{3+}$

C) $[Co(NH_3)_6]^{3+} < [Ir(NH_3)_6]^{3+} < [Rh(NH_3)_6]^{3+}$

D) $[Co(NH_3)_6]^{3+} < [Rh(NH_3)_6]^{3+} < [Ir(NH_3)_6]^{3+}$

67) Of the following, which species is primarily obtained in a solution containing KHF_2?

A) K^+, H^+ and F^-

B) H^+ and KF_2^-

C) KF and H^-

D) K^+ and HF_2^-

68) Identify the optically active cyclohexane from the given options.

A) *trans*-1,3-dimethyl cyclohexane

B) *cis*-1,3-dimethyl cyclohexane

C) *cis*-1,4-dimethyl cyclohexane

D) *trans*-1,4-dimethyl cyclohexane

69) What will be the CORRECT decreasing order of acid strength of the hydroxybenzoic acids?
(Symbols and notations carry their usual meanings)

A) p-hydroxybenzoic acid > benzoic acid > m-hydroxybenzoic acid > o-hydroxybenzoic acid

B) o-hydroxybenzoic acid > m-hydroxybenzoic acid > benzoic acid > p-hydroxybenzoic acid

C) o-hydroxybenzoic acid > benzoic acid > m-hydroxybenzoic acid > p-hydroxybenzoic acid

D) m-hydroxybenzoic acid > benzoic acid > o-hydroxybenzoic acid > p-hydroxybenzoic acid

70) What is the IUPAC nomenclature of isoprene monomers present in natural rubber?

A) 2-methyl-1,3-butadiene

B) 1,3-hexadiene

C) 2,3-dimethyl-1,3-butadiene

D) 2-methyl-1,3-pentadiene

71) The number of times the comparative mass of a neutron is heavier than an electron is

A) ~1842

B) ~182

C) ~102

D) ~4050

72) Which of the following is a branched polymer, having branched chain polysaccharide units?

A) Starch

B) Bakelite

C) High density polyethylene

D) Nylon

73) What product will form when N,N-dimethylaniline reacts with $NaNO_2$ and dilute HCl at low temperature?

A) *p*-nitroso-N,N-dimethylaniline

B) methyl-*n*-hexylamine

C) *m*-benzene diazonium chloride

D) N-nitroso-N-methylaniline

74) Which of the following is the CORRECT increasing order of coagulating power of electrolytes required to precipitate a negatively charged As_2S_3 colloid?

A) $NaCl < BaCl_2 < AlCl_3$

B) $BaCl_2 < AlCl_3 < NaCl$

C) $AlCl_3 < NaCl < BaCl_2$

D) $AlCl_3 < BaCl_2 < NaCl$

75) Which equation will explain the nature of PV versus P curve for CO_2 gas at moderately low pressure?

A) PV=RT+Pb

B) PV=RT+a/V

C) PV=RT-a/V

D) PV=RT-aV

76) What will be the equilibrium constant of the given reaction carried out in a 5 L vessel and having equilibrium amounts of A_2 and A as 0.5 mole and $2x10^{-6}$ mole respectively? The reaction: $A_2 = 2A$

A) $0.16x10^{-11}$

B) $0.25x10^{5}$

C) $0.4x10^{-5}$

D) $0.2x10^{-11}$

77) What condition will facilitate the spontaneity of a reaction if ΔH and ΔS both are negative?

A) low temperature

B) high temperature

C) low pressure

D) high pressure

78) What will be the half-cell potential of a hydrogen electrode acting as an anode and dipped in a solution of pH=2?

A) 0 V

B) 0.0196V

C) 0.276V

D) 0.118 V

79) How many electrons are involved during the oxidation reaction of $KMnO_4$ in acidic medium?

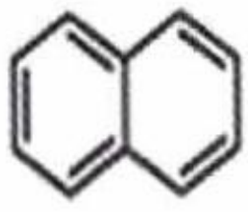
A) 1

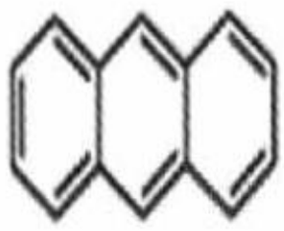
B) 3

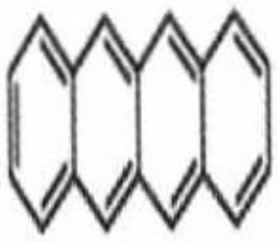
C) 5

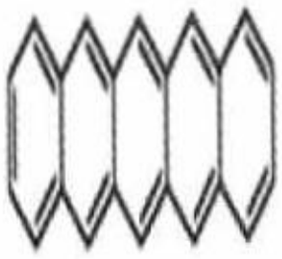
D) 4

80) Naphthalene is a white, volatile, solid polycyclic hydrocarbon with a strong mothball odor. Which of the following is the structure of naphthalene?

A) 

B) 

C) 

D) 

81) What will be the E_{cell} for the given cell:
$Zn/Zn^{2+}(0.1M)//\ Cu^{2+}(0.01M)/Cu$.
Given: $E^{o}Zn2+/Zn$=-0.76V and $E^{o}Cu2+/Cu$ = 0.34V.
Also predict whether the reaction is spontaneous or non-spontaneous.

A) 1.07V and spontaneous

B) -1.13V and non-spontaneous

C) -1.07V and non-spontaneous

D) 1.13V and spontaneous

82) What are the coordination numbers (C.N.) of Ca^{2+} and F^{-} ion in calcium fluoride (CaF_2) crystal structure?

A) C.N. of Ca^{2+} = 4 and F^{-} = 8

B) C.N. of Ca^{2+} = 6 and F^{-} = 6

C) C.N. of Ca^{2+} = 8 and F^{-} = 8

D) C.N. of Ca^{2+} = 8 and F^{-} = 4

83) What will be the geometry of the compound MB_4L_2? Here B is bond pair and L is lone pair.

A) Square planar

B) Octahedral

C) Square pyramid

D) Tetrahedral

84) What will be the product when benzaldehyde is treated with NaOD in D_2O?

A) $C_6H_5CH_2OD$ and C_6H_5COONa

B) $C_6H_5CH_2OD$ and C_6H_5COOD

C) C_6H_5CHDOD and C_6H_5COONa

D) $C_6H_5COOCHDC_6H_5$

85) What will be the geometry and magnetic moment of the complex $[NiCl_4]^{2-}$?

A) Tetrahedral and 3.87 BM

B) Tetrahedral and 2.82 BM

C) Square planar and 2.82 BM

D) Square planar and 4.89 BM

86) Which of the following is the CORRECT reason for HI solution turning brown on exposure to air?

A) HI reacts with H_2O to form I_2

B) HI dissolves NO_2

C) HI reacts with O_2 to form I_2

D) HI reacts with N_2 and O_2 to form NO_2

87) In a reaction A + B $\Leftrightarrow$ C + D, Le Chatelier's principle asserts that an equilibrium between A and B producing C and D can be shifted towards C and D by
(i) increasing the concentration of A or B
(ii) increasing the concentration of C or D
(iii) decreasing the concentration of A or B

A) (ii) only

B) Both (i) and (ii)

C) (iii) only

D) (i) only

88) With respect to atomic spectrum, each line in the Lymer series is due to electrons returning

A) from a particular higher energy level to n = 3

B) from a particular higher energy level to n = 2

C) from a particular higher energy level to n = 1

D) from a particular higher energy level to n = 4

89) The following equation is the Arrhenius Equation. $k = Ae^{-Ea/RT}$, where Ea is the minimum energy molecules must possess in order to react to form a product, k is the rate constant, A is the frequency factor, R is the gas constant and T is the Kelvin temperature. Under normal circumstances, the Arrhenius plot is obtained by plotting

A) logarithm of the inverse of rate constant 1/k, versus the inverse temperature 1/T

B) logarithm of the rate constant k, versus the temperature T

C) logarithm of the rate constant k, versus the inverse temperature 1/T

D) logarithm of the inverse of rate constant 1/k, versus the temperature T

90) What will be the entropy change of the system when expansion of 1 mole of a gas takes place from 3L to 6L under isothermal conditions?
Consider R = 2 cal $K^{-1}mole^{-1}$ and log 2 = 0.301.

A) 2.84 cal K^{-1}

B) 1.386 cal K^{-1}

C) 0.37 cal K^{-1}

D) 5.26 cal K^{-1}

91) What will be the CORRECT stability order of the different conformations of n-butane?

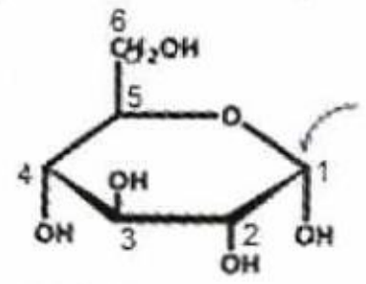
A) fully-eclipsed > eclipsed > gauche > anti-staggered

B) anti-staggered > eclipsed > gauche > fully-eclipsed

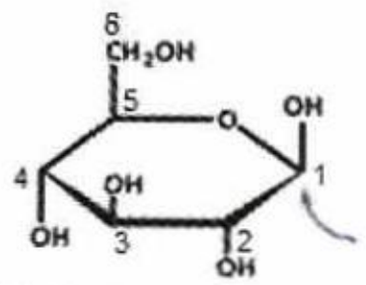
C) anti-staggered > gauche > eclipsed > fully-eclipsed

D) gauche > anti-staggered > eclipsed > fully-eclipsed

92) What is the relationship between the given structures (Look at the arrows)?



α-D-glucopyranose



β-D-glucopyranose

A) Enantiomers

B) Anomers

C) Diastereomers

D) Metamers

93) What will be the CORRECT unit of rate constant k for a reaction whose order is three?

A) $mole^{-1}$ lit sec^{-1}

B) $mole^{2}$ lit sec^{-1}

C) sec^{-1}

D) $mole^{-2}$ $lit^{2}sec^{-1}$

94) Which of following compounds has a highly intense red colour at room temperature?

A) $SnCl_4$

B) SnI_4

C) PbI_2

D) $PbCl_2$

95) A sample of HI(g) is placed in a flask at a pressure of 0.2 atm. At equilibrium, partial pressure of HI(g) is 0.04 atm. What is Kp for the given equilibrium?
$2\,HI(g) \Leftrightarrow H_2(g) + I_2(g)$

A) 0.04

B) 0.4

C) 40

D) 4

96) Calculate the molarity of a solution of 30 g of $Co(NO_3)_2$. $6H_2O$ in 4.3 L of solution? Consider atomic mass of Co = 59, N = 14, O = 16, H = 1

A) 0.023 M

B) 0.23 M

C) 0.046 M

D) 0.46 M

97) Which of the following product(s) is/are formed when fructose is treated with Na-Hg in water?

A) Sorbitol and Mannitol

B) Sorbitol and n-Hexane

C) Mannitol and n-Hexane

D) Gluconic acid

98) What will be the heat change at constant volume for the reaction whose heat change at constant pressure is -560 kcal at 27 °C? The reaction is:
$C_8H_{16}+12O_2 \rightarrow 8CO_2+8H_2O$ (Given R = 2 cal mol^{-1} K^{-1})

A) -558200 calories

B) 442800 calories

C) -561800 calories

D) 368240 calories

99) What will be the expression of Kp for the given reaction if the total pressure inside the vessel is P and degree of dissociation of the reactant is a? The reaction:
$N_2O_4 = 2NO_2$

A) $4a^2P/(1+a^2)$

B) $4a^2P/(1-a^2)$

C) $a^2P/(1-a^2)$

D) $a^2/(1-a)$

100) What is the CORRECT explanation of the non-reducing property of sucrose?

A) α-D-glucopyranose and β-D-fructofuranose are linked via C_2 and C_1 centres respectively

B) α-D-glucopyranose and β-D-fructofuranose are linked via C_1 and C_2 centres respectively

C) α-D-glucopyranose and β-D-fructofuranose are linked via C_2 and C_2 centres respectively

D) α-D-glucopyranose and β-D-fructofuranose are linked via C_3 and C_4 centres respectively

101) What is the main product formed when iodine reacts with hypo?

A) Na_2SO_4

B) $Na_2S_4O_6$

C) Na_2SO_3

D) Na_2S

102) What will be the resultant products formed when the phosphorus halide PBr_5 splits up?

A) $[PBr_4]^+$ and Br^-

B) $[PBr_6]^-$ and $[PBr_4]^+$

C) $[PBr_4]^+$

D) $[PBr_6]^-$

103) What will be the resultant product when ethyloxybenzene is reacted with HI?

A) phenyl iodide and ethanol

B) ethyl benzene

C) phenol and ethyl iodide

D) *p*-ethyl phenol

104) What will be the enthalpy of formation of NO_2 from the given bond dissociation enthalpy values? The bond dissociation enthalpy values for O_2, NO and NO_2 are as follows: $O_2(g)$: 0 kJ/mol, NO(g): 90.25 kJ/mol and $NO_2(g)$: 33.18 kJ/mol respectively.

A) +114.1 kJ

B) +52.7 kJ

C) -52.7 kJ

D) -114.1 kJ

105) How many geometrical isomers are possible with complexes of the type $[M(ab)_3]$?

A) 2

B) 4

C) 3

D) 5

106) Identify the CORRECT basicity order in the nitroanilines? (Symbols and notations carry their usual meanings)

A) o-nitroanilines < p-nitroanilines < m-nitroanilines

B) m-nitroanilines < p-nitroanilines < o-nitroanilines

C) p-nitroanilines < o-nitroanilines < m-nitroanilines

D) o-nitroanilines < m-nitroanilines < p-nitroanilines

107) Identify the anti-aromatic system from among the given options.

A) benzene

B) [14]-annulene

C) [18]-annulene

D) Cyclo-octatetraene

108) Which of the following is the CORRECT configuration of the complex $[RhCl_6]^{3-}$?

A) High spin $t_{2g}^4e_g^2$

B) Low spin $t_{2g}^6e_g^0$

C) Low spin $t_{2g}^3e_g^3$

D) High spin $t_{2g}^5e_g^1$

109) Which electronic configuration will show the HIGHEST first ionization potential?

A) $1s^22s^22p^1$

B) $1s^22s^22p^5$

C) $1s^22s^22p^3$

D) $1s^22s^2$

110) What is the CORRECT increasing order of ionic or atomic radii in the following?

A) $Si^{4+} < P^{5+} < S^{6+} < Cl^{7+}$

B) $P^{5+} < Si^{4+} < Cl^{7+} < S^{6+}$

C) $Cl^{7+} < S^{6+} < P^{5+} < Si^{4+}$

D) $S^{6+} < P^{5+} < Cl^{7+} < Si^{4+}$

111) What will be the first ionization energy of Be atom? Consider the first ionization energy of H atom as 13.6 eV.

A) 27.2 eV

B) 54.4 eV

C) 108.8 eV

D) 4 eV

112) Which of the following statements is/are TRUE for an electrochemical cell?

A) Oxidation occurs at the anode only

B) Reduction occurs at the anode only

C) Oxidation occurs at both the anode and cathode

D) Reduction occurs at both the anode and cathode

113) Which of the following shows the CORRECT reaction for nitrobenzene reduction?

A) Nitrobenzene reacts with Zn dust and NH_4Cl to produce aniline

B) Nitrobenzene reacts with $LiAlH_4$ to produce phenyl hydroxylamine

C) Nitrobenzene reacts with Fe and HCl to produce nitroso benzene

D) Nitrobenzene reacts with Zn dust and NH_4Cl to produce phenyl hydroxylamine

114) What is the hybridization and geometry of the given species? The species are XeF_2 and ICl_2^-.

A) sp^3d and trigonal bipyramidal

B) sp^3d^2 and square planar

C) sp^3d and linear

D) sp^3 and irregular tetrahedron

115) What product is formed when phenol is treated with $CHCl_3$ and NaOH?

A) 3-hydroxybenzaldehyde

B) 2-hydroxy benzoic acid

C) 3-hydroxy benzoic acid

D) 2-hydroxybenzaldehyde

116) What is the IUPAC nomenclature of the given compound?

A) 5-ethynyl-1,6-heptadiene

B) 3-ethynyl-1,6-heptadiene

C) 3-vinyl-hept-6-en-1-yne

D) 5-vinyl-hept-1-en-6-yne

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117) What is the number of octahedral void(s) per atom present in a cubic close-packed structure?

A) 1

B) 3

C) 2

D) 6

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118) What will be the percentage of dimerization of 61 g of benzoic acid in 1000 g of a solvent and producing a depression in freezing point of 2 °C? Consider K_f to be 6.

A) 72%

B) 67%

C) 43%

D) 28%

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119) Which of the statements is TRUE regarding chemisorption of a gas on a solid surface?

A) This type of adsorption first increases with increase of temperature

B) No compound formation takes place in this case

C) The forces operating in this are weak Van Der Waal's forces

D) It forms multimolecular layers of gas molecules on the surface

120) Which of the manganese oxides is the most acidic from the given options?

A) Mn_2O_3

B) MnO

C) MnO_2

D) Mn_2O_7