

PART III

13 - CHEMISTRY

(Answer ALL questions)

56. Hydrogen like atom has a potential energy of the system as a result of coulombic attraction between the nucleus and electron is, with standard notation
- $-Ze^2 / 4\pi \epsilon_0 r$
 - $Ze^2 / 4\pi \epsilon_0 r$
 - $Ze^2 / 4\pi \epsilon_0 r^2$
 - $Ze^2 / 4\pi \epsilon_0 r^{-1}$
57. An atomic orbital may be generated by
- Combination of magnetic quantum and spin quantum numbers
 - Combination of azimuthal quantum and spin quantum numbers
 - Combination of magnetic quantum and principal quantum numbers
 - Combination of magnetic quantum and azimuthal quantum numbers
58. The basic property of any state function is represented by (with standard notation)
- $\Delta E = SE_{\text{final}} - SE_{\text{initial}}$
 - $\Delta E = \Delta SE_{\text{final}} - \Delta SAE_{\text{initial}}$
 - $\Delta E = E_{\text{final}} - E_{\text{initial}}$
 - $\Delta E = \Delta SAE_{\text{final}} - \Delta SAE_{\text{initial}}$
59. In any thermodynamic process, the internal energy change of the system, for a real gas, with standard notation is
- $(\delta E / \delta V)_T = 0$
 - $(\delta E / \delta V)_T = -(\delta P / \delta V)_T (\mu C_p + V) - P$
 - $(\delta E / \delta V)_T = -(\delta P / \delta V)_T (\mu C_p - V) - P$
 - $(\delta E / \delta V)_T = -(\delta P / \delta V)_T (\mu C_p + V) + P$
60. In a reversible isothermal isobaric phase change, with standard notations
- $\Delta E = q + w$
 - $-\Delta E = q + w$
 - $\Delta E = q - w$
 - $\Delta E = w - q$
61. Under isothermal conditions, $\Delta E = 0$ for the expansion of an ideal gas. If 100 J of work is done on the system consisting of 1 mol of an ideal gas, what amount of heat must be transferred?
- 100 J
 - 100 KJ
 - 10 J
 - 120 J
62. What is the value of S_0° for Co or NO?
- 11.526 $\text{JK}^{-1}\text{mol}^{-1}$
 - 5.763 $\text{JK}^{-1}\text{mol}^{-1}$
 - 10 $\text{JK}^{-1}\text{mol}^{-1}$
 - 120 $\text{JK}^{-1}\text{mol}^{-1}$
63. What is the potential at 25°C of the cell, if $t_+ = 0.837$?
- $\text{Pt} | \text{H}_2(1 \text{ bar}) | \text{HCl}(0.5 \text{ M}) | \text{HCl}(1.0 \text{ M}) | \text{H}_2(1 \text{ bar}) | \text{Pt}$
- 0.300 V
 - 0.030 V
 - 0.0030 V
 - 0.3330 V
64. What is $G - G^\circ$ for 1.00 mol of an ideal gas at 0.100 Pa and 25°C?
- 34.20 kJ
 - 3.420 kJ
 - 0.342 kJ
 - 342.0 kJ
65. The number of degrees of freedom with p phases for two component system is
- 4 + p
 - 3 - p
 - 3 + p
 - 4 - p

66. The blocks of magnesium are often strapped to the steel hulls of ocean going ships in view of
- Magnesium acts by cathodic protection to prevent oxidation of steel
 - Magnesium acts by anodic protection to prevent oxidation of steel
 - Magnesium acts by cathodic protection to prevent reduction of steel
 - Steel acts by cathodic protection to prevent reduction of steel
67. A reaction is 50% complete in 10 minutes. It is allowed to proceed for another 5 minutes. How much of the reaction would be completed at the end of these 15 minutes if the reaction follows zero order kinetics?
- 50 mol/dm³
 - 125 mol/dm³
 - 500 mol/dm³
 - 250 mol/dm³
68. Which one of the following is a complex reaction?
- $2\text{NO} + \text{Cl}_2 \rightarrow 2\text{NOCl}$
 - $\text{NO} + \text{N}_2\text{O}_5 \rightarrow 3\text{NO}_2$
 - $2\text{N}_2\text{O}_5 \rightarrow 4\text{NO}_2 + \text{O}_2$
 - $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
69. Alkylation of isopropyl benzene by n-butylamine is a
- Consecutive reaction
 - Parallel reaction
 - Simple reaction
 - Opposing reaction
70. The rate or rate constant calculated with the help of transition state theory is based on
- An equilibrium does not exist between activated complex and reactants
 - An equilibrium exists between activated complex and products
 - An equilibrium exists between products and reactants
 - An equilibrium exists between activated complex and reactants
71. Which of the following statement is correct?
- Catalyst initiates a reaction
 - Catalyst does not initiate the reaction
 - Catalyst affect the equilibrium
 - Catalyst is chemically changed at the end of the reaction
72. In retardation the retarding effect is
- independent of the pressure of the retarding substance
 - proportional to the temperature of the retarding substance
 - indirectly proportional to the pressure of the retarding substance
 - proportional to a simple power of the pressure of the retarding substance
73. The most effective wavelength used for photochemical reaction between Chlorine and Hydrogen is
- less than 4785 Å
 - between 5000 and 6000 Å
 - between 6001 and 7000 Å
 - between 7001 and 8000 Å
74. The extent of adsorption of gas in Langmuir adsorption, when the pressure of gas is low, is
- indirectly proportional to the pressure of the gas
 - directly proportional to the pressure of the gas
 - independent of Pressure
 - directly proportional to the square of the pressure of the gas
75. A particular substance will be adsorbed from the solution by a solid adsorbent
- if the substance reduces the surface tension of the solvent
 - if the substance increases the surface tension of the solvent
 - if the substance does not affect the surface tension of the solvent
 - if the solvent increases the surface tension of the substance
76. Which of the following hydride is less stable?
- MgH₂
 - CaH₂
 - BeH₂
 - SrH₂

77. Which of the following hydride is covalent?
- MgH₂
 - CaH₂
 - BaH₂
 - SrH₂
78. Which of the following fluoride is water soluble?
- MgF₂
 - CaF₂
 - BeF₂
 - SrF₂
79. Which of the following element only form nitrides?
- Mg
 - Ca
 - Be
 - Li
80. Which of the following is an amphoteric oxide?
- B₂O₃
 - Al₂O₃
 - SiO₂
 - B(OH)₃
81. The addition of silicon to steel is to
- oxidize
 - neutralize
 - deoxidise
 - precipitate
82. The addition of which of the following greatly reduces frothing of cooking oil
- Silicon
 - Silicones
 - Quartz
 - Silica
83. The number of particles formed from a complex molecule determines
- the size of depression of freezing point
 - total number of charges obtained from conductivity measurements
 - molecular weight
 - magnetic moment
84. The shape and stability of the complex are predicted by
- molecular weight
 - the valence
 - density of the metal
 - the atomic orbitals on the metal
85. The crystal field theory is known as Ligand field theory when
- ion dipole interaction exists
 - ion ion interaction exists
 - some allowance is made for covalency
 - coordinate bonds are formed
86. Which of the following has increased σ donation?
- halide donors
 - O donors
 - N donors
 - C donors
87. In octahedral complexes the tetragonal distortion forms in
- z-axis
 - x-axis
 - y-axis
 - x-y-axis
88. Which lanthanide ion is stable in aqueous solution?
- Ln³⁺
 - Ln⁴⁺
 - Ln²⁺
 - Ln¹⁺
89. Which salt of lanthanide is soluble in water?
- Oxalates
 - Carbonates
 - Fluorides
 - Chlorides
90. Which of the following is more reactive?
- Alkyl magnesium bromide
 - Alkyl magnesium iodide
 - Alkyl magnesium chloride
 - Aryl magnesium bromide

91. Ziegler-Natta catalysts are used to prepare
- Cross linked polymer
 - Graft copolymer
 - Stereo regular Polymer
 - Atactic polymer
92. In the Fischer-Tropsch process
- Carbon monoxide and hydrogen or water gas is converted into liquid hydrocarbons
 - Carbon and hydrogen is converted into solid hydrocarbons
 - Carbon and Nitrogen is converted into liquid hydrocarbons
 - Carbon monoxide and Nitrogen is converted into liquid hydrocarbons
93. The process of spontaneous decomposition of a heavy nucleus into fragments of lighter nuclei is known as
- Nuclear Fusion
 - Nuclear Fission
 - Double decomposition
 - Substitution
94. The Uranium series is represented using standard notation, by
- $4n + 3$ series
 - $4n + 1$ series
 - $5n + 2$ series
 - $4n + 2$ series
95. A semiconductor behaves as an insulator
- at High temperature
 - at absolute zero
 - by decreasing the band gap
 - by adding electrons
96. Which one of the following is optical active?
- lactic acid
 - propionic acid
 - formic acid
 - acetic acid
97. Diastereo isomers are
- optically inactive isomers and mirror images
 - optically active isomers and mirror images
 - optically active isomers but not mirror images
 - optically inactive isomers and not mirror images
98. Which one of the following undergoes both unimolecular Nucleophilic substitution reaction and bimolecular Nucleophilic substitution?
- Tertiary butyl halides
 - Ethylbromide
 - Isopropyl chloride
 - Methylbromide
99. In the addition of bromine to ethylene, under electrophilic addition, the Π complex breaks down into
- Carbanion
 - Carbonium ions
 - Ethyl radical
 - Ethane
100. In alkyl benzene, the electron density of Π ring systems increases in
- meta position only
 - ortho and meta position only
 - para and meta position only
 - ortho and para position
101. Benzene reacts with chlorine in the presence of Lewis acid to form
- chlorobenzene
 - dichlorobenzene
 - trichlorobenzene
 - toluene
102. Addition of three molecules of bromine to benzene in presence of UV light forms
- Bromobenzene
 - Tribromobenzene
 - Hexabromohexane
 - Cyclohexane

103. Ethylene reacts with HgSO_4 dissolved in H_2SO_4 at 75° yields
- Acetaldehyde
 - Formaldehyde
 - Acetone
 - Ethane
104. Which one of the following is electrophiles?
- Boron trifluoride
 - Aluminium chloride
 - Dichlorocarbene
 - Diazonium ions
105. Which one of the following undergoes free radical mechanism?
- Addition of HCN to acetone
 - Chlorination of methane in sunlight
 - Aldol condensation
 - Nitration of benzene
106. In electrocyclization reactions linear conjugated polyene is converted into a
- cyclic product
 - open chain product
 - addition product
 - substitution product
107. In sigmatropic rearrangement
- an addition product is formed
 - cyclic product is formed
 - a high level of stereochemical control is formed
 - substitution product is formed
108. Woodward-Hoffman rule
- considers the feasibility of a reaction
 - considers symmetry of Frontier orbitals involved in the reaction
 - considers lowest energy orbitals
 - is independent of symmetry of Frontier orbitals involved in the reaction
109. The conversion of ergosterol to vitamin D₂ involves
- elimination reaction
 - substitution reaction
 - adduct reaction
 - sigmatropic shift
110. In Diels-Alder reaction. When the electron withdrawing groups are present on the alkene
- the HOMO/LUMO energy levels are closer
 - the HOMO/LUMO energy levels are wide
 - no effect on the HOMO/LUMO energy levels
 - the reaction not favoured
111. When a mixture of acetylene and ammonia is passed through a red hot tube, it forms
- Furan
 - Pyridine
 - Pyrrole
 - Indole
112. Electrophillic substitution reactions of furan are not carried out in the presence of strong acids, because of
- polymerization
 - decomposition
 - cyclization
 - degradation
113. The best method of removing thiophene from benzene is
- distillation
 - evaporation
 - fractional precipitation
 - shaking with Raney Nickel
114. Indole is
- strong acid
 - strong base
 - weak base and also weak acid
 - neutral
115. Dehydrogenation of piperidine with concentrated sulphuric acid at 300°C gives
- Isatin
 - Pyridine
 - Aniline
 - Pyrrole