

## Section 2 - Chemistry

61) Which of the following is NOT true in case of reaction with heated copper at 573 K ?

- A) Phenol  $\rightarrow$  benzyl alcohol
- B) primary alcohol  $\rightarrow$  aldehyde
- C) secondary alcohol  $\rightarrow$  ketone
- D) tertiary alcohol  $\rightarrow$  olefin

62) The correct order of electrical conductivity of the given complexes is

- A)  $[\text{Ni}(\text{NH}_3)_4\text{Cl}_2] < \text{K}_2[\text{PtCl}_6] < \text{K}_4[\text{Fe}(\text{CN})_6] < [\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$
- B)  $\text{K}_2[\text{PtCl}_6] < \text{K}_4[\text{Fe}(\text{CN})_6] < [\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl} < [\text{Ni}(\text{NH}_3)_4\text{Cl}_2]$
- C)  $\text{K}_4[\text{Fe}(\text{CN})_6] < [\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl} < [\text{Ni}(\text{NH}_3)_4\text{Cl}_2] < \text{K}_2[\text{PtCl}_6]$
- D)  $[\text{Ni}(\text{NH}_3)_4\text{Cl}_2] < [\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl} < \text{K}_2[\text{PtCl}_6] < \text{K}_4[\text{Fe}(\text{CN})_6]$

63) The colligative properties of a dilute solution depend upon

- A) the nature of solute
- B) the diffusion of solvent
- C) the number of particles of solute
- D) the number of particles of solvent

64) Which of the following elements involves gradual filling of 4f-levels?

- A) Lanthanides
- B) Actinides
- C) Transition metals
- D) Coinage metals

65) What will be the product obtained when  $(\text{CH}_3)_2\text{CHCHO}$  is treated with  $\text{NaOH}$  at  $200^\circ\text{C}$ ?

- A)  $(\text{CH}_3)_2\text{CHCO}_2\text{Na}$  and  $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$
- B)  $(\text{CH}_3)_2\text{CHCO}_2\text{H}$
- C)  $(\text{CH}_3)_2\text{CHCH}_2\text{OH}$
- D)  $(\text{CH}_3)_2\text{C}(\text{CHO})\text{-CH}(\text{OH})\text{CH}(\text{CH}_3)_2$

66) What will be the spin only magnetic moment of high spin and low spin  $d^5$  electronic systems in an octahedral complex?

- A)  $\mu_{\text{high spin}} = 1.73 \text{ BM}$  and  $\mu_{\text{low spin}} = 5.92 \text{ BM}$
- B)  $\mu_{\text{high spin}} = 5.92 \text{ BM}$  and  $\mu_{\text{low spin}} = 1.73 \text{ BM}$
- C)  $\mu_{\text{high spin}} = 4.9 \text{ BM}$  and  $\mu_{\text{low spin}} = 2.83 \text{ BM}$
- D)  $\mu_{\text{high spin}} = 1.73 \text{ BM}$  and  $\mu_{\text{low spin}} = 1.73 \text{ BM}$

67) Which one of the following processes does NOT use adsorption?

- A) Froth floatation process
- B) Chromatography
- C) Decolourisation of sugar liquors
- D) Dissolution of sugar in water

68) Hydrogen bonding is NOT present in

- A) glycerine
- B) water
- C) hydrogen sulphide
- D) hydrogen fluoride

69) There are two statements, one labelled as Assertion (A) and the other as Reason (R). Examine both the statements carefully and mark the correct choice.

- (A) At equilibrium, the mass of each of the reactants and products remains constant.
- (R) At equilibrium, the rate of forward reaction is equal to the rate of backward reaction.

- A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C) (A) is correct but (R) is wrong
- D) (A) is wrong but (R) is correct

70) For the reaction,  $\text{CO}(\text{g}) + \text{H}_2\text{O} = \text{CO}_2(\text{g}) + \text{H}_2(\text{g})$  at a given temperature the equilibrium amount of  $\text{CO}_2(\text{g})$  can be increased by

- A) adding a suitable catalyst
- B) adding an inert gas
- C) increasing the volume of the container
- D) increasing the amount of  $\text{CO}(\text{g})$

71) At  $25^\circ\text{C}$  consider the density of water is  $1 \text{ g/L}$  and that of propanol to be  $0.925 \text{ g/L}$ . What volume of propanol will have same number of molecules as present in  $210 \text{ mL}$  of water?

- A)  $757 \text{ mL}$
- B)  $825 \text{ mL}$
- C)  $646 \text{ mL}$
- D)  $437 \text{ mL}$

72) What will be the product formed when 1-methyl cyclopentene is treated with  $\text{BH}_3$  and  $\text{H}_2\text{O}_2\text{-OH}^-$ ?

- A) 1-methyl cyclohexanol
- B) 2-methyl cyclohexanol
- C) 1-methyl cyclohexenol
- D) 2-methyl cyclohexenol





73) The geometry and type of hybrid orbital present around the central atom in  $\text{BF}_3$  is

- A) linear,  $sp$
- B) trigonal planar,  $sp^2$
- C) tetrahedral,  $sp^3$
- D) pyramidal,  $sp^3$

74) What is the correct order of bond strength for  $\text{NO}$ ,  $\text{NO}^+$  and  $\text{NO}^-$ ?

- A)  $\text{NO} > \text{NO}^+ > \text{NO}^-$
- B)  $\text{NO}^+ > \text{NO} > \text{NO}^-$
- C)  $\text{NO}^- > \text{NO} > \text{NO}^+$
- D)  $\text{NO}^+ > \text{NO}^- > \text{NO}$

75) What will be the molar entropy change when silver is heated from  $227^\circ\text{C}$  to  $727^\circ\text{C}$ ?

Consider the molar specific heat of Ag,  $C_p = 5.3 + 0.0028T$

- A) 7.873 eu
- B) 12.341 eu
- C) 3.214 eu
- D) 5.074 eu

76) Phosphorus pentoxide ( $\text{P}_2\text{O}_5$ ) is the starting material for phosphate esters used as surfactants and extraction agents.  $\text{P}_2\text{O}_5$  is extensively used as

- A) reducing agent
- B) preservative
- C) oxidising agent
- D) dehydrating agent

77) What are the monomers of polyester?

- A) Caprolactum
- B) Terephthalic acid and ethylene glycol
- C) Dimethylester of terephthalic acid
- D) Hexamethylene diamine and adipic acid

78) There are two statements, one labelled as Assertion (A) and the other as Reason (R). Examine both the statements carefully and mark the correct choice.

(A) Hydrogen has one electron in its orbit but it produces several spectral lines.

(R) There are many excited energy levels available.

- A) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C) (A) is correct and (R) is wrong
- D) (A) is wrong and (R) is correct

79) The viscosity of a liquid can be increased by

- A) increasing the temperature
- B) increasing the pressure
- C) decreasing the pressure
- D) heating beyond critical temperature

80) Which of the following is an octahedral molecule?

- A)  $\text{SF}_6$
- B)  $\text{BF}_4^-$
- C)  $\text{PCl}_5$
- D)  $\text{IF}_7$

81) A type of defect observed in stoichiometric compounds is Schottky defect. Schottky defect occur mainly in ionic compounds where

- A) positive and negative ions are of different sizes
- B) positive and negative ions are of same sizes
- C) positive ions are small and negative ions are big
- D) positive ions are big and negative ions are small

82) Let the energy of an  $n^{\text{th}}$  orbit of H atom be  $-21.76 \times 10^{-19}/n^2$  J. What will be the longest wavelength of energy required to remove an electron from the third orbit?

- A) 0.628 nm
- B)  $1.326 \times 10^{-7}$  m
- C) 0.798  $\mu\text{m}$
- D) 0.821  $\mu\text{m}$

83) Which one of the following options is CORRECT for the spontaneity of the reaction?

- A)  $\Delta G = \text{positive (+ve)}$ ;  $\Delta H = \text{positive (+ve)}$
- B)  $\Delta H = \text{positive (+ve)}$ ;  $\Delta S = \text{negative (-ve)}$
- C)  $\Delta G = \text{negative (-ve)}$ ;  $\Delta S = \text{negative (-ve)}$
- D)  $\Delta G = \text{negative (-ve)}$ ;  $\Delta S = \text{positive (+ve)}$

84) What should be the correct order of lattice energy values of the following alkali halides?

$\text{LiCl}$ ,  $\text{KI}$ ,  $\text{KCl}$  and  $\text{NaCl}$

- A)  $\text{KI} > \text{KCl} > \text{NaCl} > \text{LiCl}$
- B)  $\text{NaCl} > \text{KCl} > \text{LiCl} > \text{KI}$
- C)  $\text{LiCl} > \text{KCl} > \text{KI} > \text{NaCl}$
- D)  $\text{LiCl} > \text{NaCl} > \text{KCl} > \text{KI}$

85) According to the expression  $\Delta G^\circ = -nFE^\circ$ , the cell reaction is spontaneous when

(Notations and symbols carry their usual meanings)

- A)  $\Delta G^\circ$  is positive
- B)  $\Delta G^\circ$  is zero
- C)  $E^\circ$  is negative
- D)  $E^\circ$  is positive





86) What will be the pH at which precipitation of  $Zn(OH)_2$  will take place from a solution containing 0.3 M  $Zn^{2+}$  ion?  $K_{sp}$  of  $Zn(OH)_2 = 1.2 \times 10^{-17}$

- A) 5.7  
B) 8.3  
C) 11.4  
D) 6.2

87) What is the probable free amino acid product formed when  $R^1CH(NH_2)CONHCHR^2COOH$  reacts with 1-fluoro-2,4-dinitrobenzene in presence of  $NaHCO_3$  followed by acid hydrolysis?

- A)  $R^1CH(NH_2)COOH$   
B)  $NH_2CHR^2COOH$   
C)  $R^1CH(NH_2)COOH + NH_2CHR^2COOH$   
D)  $NH_2CR^1R^2COOH$

88) What will be the CORRECT order of the C-F bond distance among the following?

$CHF_3$ ,  $CF_4$ ,  $CH_3F$  and  $CH_2F_2$

- A)  $CH_3F < CH_2F_2 < CHF_3 < CF_4$   
B)  $CH_2F_2 > CH_3F > CHF_3 > CF_4$   
C)  $CH_3F > CH_2F_2 > CHF_3 > CF_4$   
D)  $CH_3F > CHF_3 > CF_4 > CH_2F_2$

89) What will be the order of the reaction for hydrolysis of methylacetate with  $NaOH$  by using the data provided?

Time (min) 0 5 10 15  
Vol of acid (mL) 10.12 6.24 1.40 0.981

- A) 1  
B) 2  
C) 0  
D) 3

90) Which of the following pairs of organic compounds give positive Tollen's test?

- A) Formic acid, acetone  
B) Formic acid, ethanal  
C) Ethanal, acetone  
D) Formic acid, acetic acid

91) What will be the boiling point of 30 g benzene containing 0.75 g of benzoic acid which undergoes 75% dimerization? Boiling point of pure benzene =  $80.1^\circ C$  and  $K_2 = 2.53 \text{ Kmol}^{-1}\text{kg}$

- A)  $90.52^\circ C$   
B)  $104.35^\circ C$   
C)  $76.12^\circ C$   
D)  $80.42^\circ C$

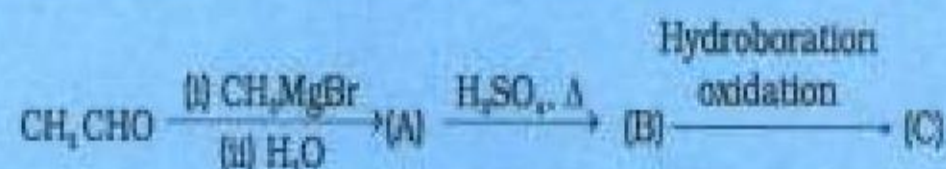
92) The correct electronic configuration of  $d^4$  in low spin state according to Crystal Field Splitting theory is

- A)  $t_{2g}^4 e_g^0$   
B)  $t_{2g}^3 e_g^1$   
C)  $t_{2g}^2 e_g^2$   
D)  $t_{2g}^1 e_g^3$

93) What will be the value of activation energy ( $E_a$  in kJ) and rate constant ( $k$  in  $\text{min}^{-1}$ ) for the given equation at  $27^\circ C$ ? The equation:  $\ln k = -2576/T + 12.1$

- A)  $E_a = 21.416 \text{ kJ}$  and  $k = 0.335 \times 10^2 \text{ min}^{-1}$   
B)  $E_a = 11.46 \text{ kJ}$  and  $k = 0.335 \times 10^2 \text{ min}^{-1}$   
C)  $E_a = 20.23 \text{ kJ}$  and  $k = 0.43 \times 10^2 \text{ min}^{-1}$   
D)  $E_a = 21.416 \text{ kJ}$  and  $k = 1.44 \times 10^2 \text{ min}^{-1}$

94) Compounds A and C in the following reaction are



- A) identical  
B) positional isomers  
C) optical isomers  
D) functional isomers

95)  $IF_7$  is known to exist while  $BrF_7$  does not exist. The reason is

- A) stability of higher oxidation state increases with the size  
B) Br is more electronegative than I  
C) Br cannot gain 7 electrons  
D) I can easily react with F

96) What will be the  $\Delta H^\circ$  and  $\Delta S^\circ$  values for the given cell having  $E^\circ$  at  $20^\circ C$  and  $30^\circ C$  to be 0.18V and 0.28 V respectively?

The cell:  $(Pt) H_2/H^+ // KCl/Hg_2Cl_2/Hg$  (Given:  $1F = 96500 \text{ Coulombs}$ )

- A)  $\Delta S^\circ = 2017 \text{ JK}^{-1}$  and  $\Delta H^\circ = 630.54 \text{ kJ}$   
B)  $\Delta S^\circ = -4632 \text{ JK}^{-1}$  and  $\Delta H^\circ = 768.73 \text{ kJ}$   
C)  $\Delta S^\circ = 3425 \text{ JK}^{-1}$  and  $\Delta H^\circ = -530.75 \text{ kJ}$   
D)  $\Delta S^\circ = 1930 \text{ JK}^{-1}$  and  $\Delta H^\circ = 530.75 \text{ kJ}$





97) There are two statements, one labelled as Assertion (A) and the other as Reason (R). Examine both the statements carefully and mark the correct choice.

(A) The O-H bond angle in  $\text{H}_2\text{O}$  is greater than S-H bond angle in  $\text{H}_2\text{S}$ .  
(R) Due to larger size of S, hydrogen bonding does not occur in  $\text{H}_2\text{S}$ .

- A) Both (A) and (R) are correct and (R) is the correct explanation of (A)  
B) Both (A) and (R) are correct but (R) is not the correct explanation of (A)  
C) (A) is correct but (R) is wrong  
D) (A) is wrong but (R) is correct

98)  $\alpha$ -Tocopherol belongs to vitamin-E group. It is a derivative of which of the following organic compounds?

- A) Coumaran  
B) Nicotinic acid  
C) Pyridoxine  
D) Cyanocobalamin

99) Cu crystallizes as face centred cubic lattice with edge length of 3.56 Å. What will be the nearest distance between Cu atoms?

- A) 1.5 Å  
B) 2.5 Å  
C) 3.7 Å  
D) 4.8 Å

100) What will be the enthalpy of formation of toluene considering the data given?

Bond energies of C-C = 79 kcal, C=C = 135 kcal, C-H = 102 kcal, heat of atomisation of C = 156.8 kcal and heat of atomisation of H = 49.5 kcal

- A) -43.4 kcal  
B) 43.4 kcal  
C) 114.6 kcal  
D) -114.6 kcal

101) A common observation seen in  $\text{Fe}_3\text{O}_4$  is that it is ferrimagnetic at room temperature but at 850 K it becomes

- A) Diamagnetic  
B) Paramagnetic  
C) Ferromagnetic  
D) Non-magnetic

102) How and which alkylcyanide will produce 2-butanone?

- A)  $\text{CH}_3\text{CH}_2\text{MgBr} + \text{CH}_3\text{CH}_2\text{CN}$   
B)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CN}$  reduced with  $\text{LiAlH}_4$   
C)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CN}$  reduced with  $\text{SnCl}_2\text{-HCl}$  followed by hydrolysis  
D)  $\text{CH}_3\text{CH}_2\text{MgBr} + \text{CH}_3\text{CN}$

103) Why is  $\text{F}_2$  the strongest oxidizing agent (among halogens) although electron affinity of  $\text{Cl}_2$  is higher than  $\text{F}_2$ ?

- A) Low enthalpy of dissociation and high free energy of hydration  
B) Low enthalpy of dissociation  
C) High free energy of hydration  
D) High electronegativity and low free energy of hydration

104) Thermodynamic properties are divided into two broad types: intensive properties and extensive properties. Which of the following is NOT an intensive property?

- A) Pressure  
B) Volume  
C) Temperature  
D) Density

105) How many bridging carbonyl(s) is/are present in the compound  $\text{Fe}_3(\text{CO})_{12}$  compound?

- A) Three  
B) Four  
C) Two  
D) Five

106) The order of stability of the following alkenes with the first being the most stable and last being the least stable is

- I  $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$   
II  $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_3)_2$   
III  $\text{CH}_3\text{CH}=\text{C}(\text{CH}_3)_2$   
IV  $(\text{CH}_3)_2\text{C}=\text{CH}_2$

- A) I > II > III > IV  
B) II > III > IV > I  
C) IV > III > II > I  
D) III > IV > I > II

107) There are four conformational isomers of n-butane: Eclipsed, Fully eclipsed, Gauche, Staggered

Arrange these isomers of n-butane in increasing order of energy.

- A) Gauche < Eclipsed < Staggered < Fully eclipsed  
B) Staggered < Gauche < Eclipsed < Fully eclipsed  
C) Fully eclipsed < Eclipsed < Gauche < Staggered  
D) Gauche > Eclipsed < Staggered < Fully eclipsed

108) What product forms when  $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{CH}_3$  is treated with Cu at 300 °C?

- A)  $(\text{CH}_3)_2\text{C}(=\text{O})\text{CH}_2\text{CH}_3$   
B)  $(\text{CH}_3)_2\text{C}(=\text{O})\text{C}(=\text{O})\text{CH}_3$   
C)  $(\text{CH}_3)_2\text{CH}_2\text{CH}_2\text{CH}_3$   
D)  $(\text{CH}_3)_2\text{C}=\text{CHCH}_3$





109) What is the IUPAC nomenclature of vanillin used as a flavouring agent in ice-cream?

- A) 3-chloro-4-methoxy benzoic acid
- B) 4,6-dimethoxy benzaldehyde
- C) 3,4-dihydroxy benzaldehyde
- D) 4-hydroxy-3-methoxy benzaldehyde

110) Under what condition, will  $x/m$  value be equal to pressure of the gas on the surface of the absorbent?

- A) At low pressure
- B) At high pressure
- C) At low temperature
- D) At high temperature

111) Allene ( $C_3H_4$ ) contains

- A) one triple and two double bonds
- B) two double and four single bonds
- C) two triple and one double bond
- D) one double and one triple bond

112) Which of the conditions correctly represents product formation in the reaction between  $B_2H_6$  and  $NH_3$ ?

- A) When the ratio between  $B_2H_6$  and  $NH_3$  at high temperature is 1:1, borazine is produced
- B) When the ratio between  $B_2H_6$  and  $NH_3$  at high temperature is 1:2, borazine is produced
- C) Excess  $NH_3$  with  $B_2H_6$  at low temperature produces boron nitride
- D) Excess  $NH_3$  with  $B_2H_6$  at high temperature produces  $B_2H_6 \cdot 2NH_3$

113) The distinction between primary, secondary and tertiary amines can be done experimentally by using

- A) Hinsberg's reagent
- B) Lucas reagent
- C) Benedict's reagent
- D) Tollen's reagent

114) What should be possible d-orbital energy levels of Ni in  $[Ni(CN)_4]^{2-}$ ?

- A)  $d_{z^2} < d_{xy} < d_{yz} = d_{xz} < d_{x^2-y^2}$
- B)  $d_{x^2-y^2} < d_{xy} < d_{z^2} < d_{yz} = d_{xz}$
- C)  $d_{xy} = d_{yz} < d_{z^2} < d_{xz} < d_{x^2-y^2}$
- D)  $d_{z^2} < d_{xy} = d_{yz} < d_{xz} < d_{x^2-y^2}$

115) What will be the correct nucleophilicity order in protic or aprotic solvents?

- A)  $SH^- > CN^- > I^- > OH^-$  in aprotic solvent
- B)  $CN^- > SH^- > OH^- > I^-$  in protic solvent
- C)  $SH^- > CN^- > I^- > OH^-$  in protic solvent
- D)  $I^- > Br^- > Cl^- > F^-$  in aprotic solvent

116) Hoffmann's bromamide reaction is used to

- A) prepare tertiary amine
- B) prepare all types of amines
- C) step up the series
- D) step down the series

117) What is the hydrolysis product of sucrose?

- A) Fructose and glucose
- B) Glucose and galactose
- C) Galactose and fructose
- D) Lactose and glucose

118) When each of the aldopentoses are stepped up by one carbon atom by Kiliani reaction followed by oxidation with  $HNO_3$ , optically active or inactive dicarboxylic acids are produced. Which of the following is TRUE?

- A) D-ribose produces two optically active dicarboxylic acids
- B) D-arabinose produces two optically active dicarboxylic acids
- C) D-xylose produces one optically active and one optically inactive dicarboxylic acid
- D) D-lyxose produces two optically inactive dicarboxylic acids

119) Which combination will produce polyurethane polymers?

- A)  $C_6H_5-CH_2-C_6H_5-N=C=O + HO-CH_2-CH_2-OH$
- B)  $O=C=N-C_6H_4-CH_2-C_6H_4-N=C=O + HO-CH_2-CH_2-OH$
- C)  $HCHO + NH_2CONH_2$
- D)  $HOOC(CH_2)_4COOH + NH_2(CH_2)_6NH_2$

120) Select the correct match from the following options.

- A) Melamine: cross-linked; PVC: linear; glycogen: branched chain polymer
- B) PVC: cross-linked; melamine: linear; glycogen: branched chain polymer
- C) Glycogen: cross-linked; PVC: linear; melamine: branched chain polymer
- D) Glycogen: cross-linked; melamine: linear; PVC: branched chain polymer

