I.P.S.Sr.Sec.School

Max Time : 3 hr **Class : 12th Chemistry** **Max Marks : 70**

Mid Term Exam [H.B.S.E]

Section – A

Q.1 Multiple choice Questions: [1 x 20 = 20]

1) In comparison to a 0.01 M solution of glucose, the depression in freezing point of a 0.01 M $MgCl_2$ solution is _____.
   a) the same b) about twice c) about 3 times d) about 6 times

2) Which of the following is π – acid ligand?
   a) NH_3 b) CO c) F^- d) ethylenediamine

3) In the graph plotted between ln [R] and t for first order reaction, the intercept on y axis is :
   a) - k b) $[R]_0$ c) ln $[R]_0$ d) k/2.303

4) In a leclanche dry cell, the cathode is :
   a) Zn container b) MnO_2 c) Graphite rod d) NH_4Cl

5) Which set of ions exhibit specific colours? (At. no. : Sc = 21 , Ti = 22, V = 23, Mn = 25 , Fe = 26, Ni = 28 , Cu = 29 , Zn = 30)
   a) Sc^{3+}, Ti^{4+} , Mn^{3+} b) Sc^{3+}, Zn^{2+} , Ni^{2+} c) V^{3+}, V^{2+} , Fe^{3+} d) Ti^{3+}, Ti^{4+} , Ni^{2+}

6) The magnetic moment is associated with its spin angular momentum and orbital angular momentum. Spin only magnetic moment value of Cr^{3+} ion is :
   a) 2.87 B.M. b) 3.87 B.M. c) 3.47 B.M. d) 3.57 B.M.

7) Predict the number of ions produced per formula unit in an aqueous solution of $[Co(en)_3]Cl_3$
   a) 4 b) 3 c) 6 d) 2

8) An azeotropic mixture of two liquids has a boiling point higher than either of the two liquids when it :
   a) Shows large negative deviation from Raoult's law b) Shows no deviation from Raoult's law
   c) Shows large positive deviation from Raoult's law d) Obeys Raoult's law.

9) Solubility of gases in liquids decreases with rise in temperature because dissolution is an :
   a) endothermic and reversible process b) exothermic and reversible process
   c) endothermic and irreversible process d) exothermic and irreversible process

10) Pressure does not have any significant effect on solubility of solids in liquids because :
   a) Solids are highly compressible.
   b) Liquids are highly compressible.
   c) Solubility of solid in liquid is directly proportional to partial pressure.
   d) Solids and liquids are highly compressible.

11) A compound undergoes complete dimerization in a given organic solvent. The Van't Hoff factor is :
   a) 2 b) 0.5 c) 0.25 d) 1

12) If Molality of a dilute solution is doubled, the value of the molal elevation constant (K_b) will be :
   a) halved b) doubled c) tripled d) unchanged

13) Water retention or puffiness due to high salt intake occurs due to :
   a) Diffusion b) Vapour pressure difference
   c) Osmosis d) Reverse osmosis

14) What is the Molarity of 0.2 N Na_2CO_3 solution?
   a) 0.1 M b) 0 M c) 0.4 M d) 0.2 M

15) Which of the following solutions of KCl will have the highest value of molar conductivity?
   a) 0.01 M b) 1 M c) 0.5 M d) 0.1 M

16) If the initial concentration is reduced to 1/4th in a zero order reaction, then the time taken for half the reaction to complete:
   a) remains the same b) reduces to one-fourth c) increases 4 times d) Doubles

17) The paramagnetic species among the following are :
   a) Zn^{2+} b) Ni^{2+} c) Cu^+ d) Hg^{2+}

18) In which of the following does the central metal atom exhibits an oxidation state of + 3?
   a) $K_2[Ni(CN)_4]$ b) $K_4[Fe(CN)_6]$ c) $[Fe(C_2O_4)_3]^{3-}$ d) $[Cu(NH_3)_4]^{2+}$

19) Which of the following is a polydentate ligand?
   a) NH_3 b) $H_2N - CH_2 - CH_2 - NH_2$ c) $EDTA^{4-}$ d) $C_2O_4^{2-}$

20) The CFSE of $[CoCl_6]^{3-}$ is 18000 cm^{-1} the CFSE for $[CoCl_4]^-$ will be :
   a) 18000 cm^{-1} b) 8000 cm^{-1} c) 2000 cm^{-1} d) 16000 cm^{-1}

Section – B [2 X 7 = 14]

Q.2 State Henry's law. Calculate the solubility of CO_2 in water at 298 K under 760 mm Hg.
(K_H for CO_2 in water at 298 K is 1.25 x 10^6 mm Hg).

Q.3 Define conductivity for the solution of an electrolyte. Why does the conductivity of solution decreases with dilution?

Q.4 Calculate the molar ionic conductance of Al^{3+} ions at infinite dilution, given that the molar conductance of $Al_2(SO_4)_3$ and molar ionic conductance of SO_4^{2-} ions at infinite dilution are 858 S cm^2 mol^{-1} and 160 S cm^2 mol^{-1} respectively.

Q.5 (a) The conversion of molecule A to B followed second order kinetics. If concentration of A increased to three times. How will it affect the rate of formation of B?

(b) Define pseudo first order reaction with an example.

Or

Define half life of a reaction. Write the expression of half-life for: (i) Zero order reaction (ii) First order reaction

Q.6 Write the preparation of $KMnO_4$ from K_2MnO_4.

Q.7 What is the difference between an ambidentate ligand and a chelating ligand?

Q.8 Write the hybridization and shape of the following complexes : (a) $[CoF_6]^{3-}$ (b) $[Ni(CN)_4]^{2-}$

Section – C [3 X 7 = 21]

Q.9 18 g of glucose is dissolved in 1 kg of water in a saucepan. At what temperature will this solution boil?
(K_b for water = 0.52 K Kg/mol ; boiling point of pure water = 373.15 K.)

Or

0.3 mL of acetic acid (M = 60 g/mol) dissolved in 30 g of benzene shows a depression in freezing point equal to 0.45°C. Calculate the percentage association of acid if it forms a dimer in the solution. (K_f = 5.12 K kg/mol).

Q.10 What is meant by crystal field splitting energy? On the basis of crystal field theory, write the electronic configuration of d^4 in terms of t_{2g} and e_g in an octahedral field when: (i) $\Delta_0 > P$ (ii) $\Delta_0 < P$.

Q.11 For the reaction ; A + B $\longrightarrow$ Products, the following initial rates were obtained at various given initial concentrations :

S. No.	[A] mol/L	[B] mol/L	Initial rate M/s
1	0.1	0.1	0.05
2	0.2	0.1	0.10
3	0.1	0.2	0.05

Determine the half life period

Q.12 Calculate $\Delta_r G^o$ and Log Kc for the following reaction : Cd^{2+} (aq) + Zn (s) $\longrightarrow$ Zn^{2+} (aq) + Cd (s)
[Given : $E^o_{Cd^{2+}/Cd}$ = − 0.403 volt , $E^o_{Zn^{2+}/Zn}$ = − 0.763 volt]

Q.13 Write configuration of the following : (i) Cd (ii) Gd (iii) Zn

Q.14 Complete the following chemical equations : (a) MnO_4^- + H^+ + NO_2^- $\longrightarrow$ (b) $Cr_2O_7^{2-}$ + H^+ + I^- $\longrightarrow$

Q.15 Using Valence bond theory, explain the following in relation to the paramagnetic complex $[Mn(CN)_6]^{3-}$.

(a) Type of hybridization (b) Magnetic moment (c) Type of complex – Inner or outer orbital complex.

Section – D [5 X 3 = 15]

Q.16 (i) A cell is prepared by dipping a zinc rod in 1 M zinc sulphate solution and a silver electrode in 1 M silver nitrate solution. The standard electrode potential given : $E^o_{Zn^{2+}/Zn}$ = − 0.76 V ; $E^o_{Ag^+/Ag}$ = + 0.80 V.
What is the effect of increase in concentration of Zn^{2+} on the E_{cell}?

(ii) Calculate e.m.f. of the following cell at 298 K. Ni | Ni^{2+} (0.01 M) || Cu^{2+} (0.1 M) | Cu. Write the overall cell reaction.
[Given : $E^o_{Ni^{2+}/Ni}$ = − 0.25 volt , $E^o_{Cu^{2+}/Cu}$ = 0.34 volt].

Or

(i) At 26°C, the molar conductance at infinite dilution for strong electrolytes NaOH and $BaCl_2$ are 2.48 x 10^{-4} S m^2 mol^{-1} and 2.8 x 10^{-4} S cm^2 mol^{-1} respectively. Calculate Λ^o_m $Ba(OH)_2$.

(ii) If molar conductivity of Ca^{2+} and Cl^- ions are 119 and 715 cm^2 mol^{-1}, what is the molar conductivity of $CaCl_2$ at infinite dilution.

Q.17 (i) For a reaction, A + B $\longrightarrow$ P the rate is given by Rate = k [A] $[B]^2$

(a) How is the rate of reaction affected, if the concentration of B is doubled?

(b) What is the overall order of reaction if A is present in large excess?

(ii) A first order reaction takes 30 min for 50 % completion. Calculate the time required for 90 % completion of this reaction.

Q.18 (i) Define the following terms : (a) Activation energy (b) Rate constant

(ii) The rate of reaction quadruples when temperature changes from 293 K to 313 K. calculate E_a assuming that it does not change with temperature. [R = 8.314 J K^{-1} mol^{-1}].