

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. THIRD SEMESTER EXAMINATION, DECEMBER 2011

SECOND YEAR

CHEMISTRY (Honours)

Date : 16/12/2011

Time : 11 am – 12.30 pm

Paper : III

Full Marks : 25

Group – C

Unit – I

Answer **any one** from the following :

9. a) Arrange the following ions with increasing order of acidity and justify
 $[\text{Ni}(\text{H}_2\text{O})_6]^{+2}$, $[\text{Mn}(\text{H}_2\text{O})_6]^{+2}$, $[\text{Sc}(\text{H}_2\text{O})_6]^{+3}$ [2]
- b) What will be the effect on the acidity of the solution when urea is added to liquid ammonia? [1]
- c) Write down the criteria of a redox indicator. What is the mechanism of action of barium diphenyl amine sulfonate indicator? [3]
- d) What are superacids? Give an example. [2]
- e) Which of the following reactions have equilibrium constant value greater than one?
i) $\text{R}_3\text{PBr}_3 + \text{R}_3\text{NBF}_3 \rightleftharpoons \text{R}_3\text{PBF}_3 + \text{R}_3\text{NBr}_3$
ii) $\text{CH}_3\text{HgI} + \text{HCl} \rightleftharpoons \text{CH}_3\text{HgCl} + \text{HI}$ [2]
Explain in the light of SHAB concept.
- f) Construct the Frost diagram from the following Latimer diagram : [2]
 $\text{O}_2 \xrightarrow{0.70\text{v}} \text{H}_2\text{O}_2 \xrightarrow{1.76\text{v}} \text{H}_2\text{O}$
- g) Using Pauling's rules predict the structure of each that is consistent with the pKa value mentioned against each in parenthesis H_3PO_4 (2.12), H_3PO_3 (1.80), H_3AsO_3 (9.2) [3]
10. a) What is formal potential? Discuss its importance in the reaction,
 $2\text{Fe}(\text{CN})_6^{4-} + \text{I}_2 \rightleftharpoons 2\text{Fe}(\text{CN})_6^{3-} + 2\text{I}^-$
in presence of ZnSO_4 . Given— [3]
 $E^\circ \text{Fe}(\text{CN})_6^{3-} / \text{Fe}(\text{CN})_6^{4-} = 0.36\text{v}$
 $E^\circ \frac{1}{2} \text{I}_2 / \text{I}^- = 0.54\text{v}$
- b) AlF_3 is insoluble in liquid HF. However, it dissolves if NaF is added to a mixture of AlF_3 and HF but reappears with addition of excess BF_3 . Explain giving necessary equations. [3]
- c) Ferric chloride oxidises iodide to iodine but oxidation does not occur in presence of excess fluoride. —Explain [2]
- d) Why does cuprous ion behave differently in water and in aqueous solution of potassium iodide? [2]
Given E° of $\text{Cu}^{+2} / \text{Cu}^+ = 0.15\text{v}$
 E° of $\text{Cu}^+ / \text{Cu} = 0.52\text{v}$ [2]
Solubility product of $\text{CuI} = 10^{-12}$
- e) H_2SO_4 may behave as an acid as well as a base— explain [1]
- f) Discuss the feasibility of the reaction
 $\text{MnO}_2 + 4\text{HCl} (\text{conc}) = \text{MnCl}_2 + \text{Cl}_2 + 2\text{H}_2\text{O}$
Given E° of $\text{MnO}_2 / \text{Mn}^{+2} = 1.23\text{v}$
 E° of $\frac{1}{2} \text{Cl}_2 / \text{Cl}^- = 1.36\text{v}$ [2]

Unit – II

Answer **any one** from the following :

11. a) Explain 'Walsh rule' for linear and bent molecules. [1]
b) Illustrate the structure of BeH_2 with the help of Walsh diagram. [2]
c) Give examples of a binuclear carbonyl hydride and polynuclear carbonyl hydride both with bridged hydrogen atom. [2]
d) Distinguish between extrinsic semiconductor and intrinsic semiconductor. [2]
e) Distinguish between
i) ambidentate ligand and flixidentate ligand
ii) inert complex and labile complex [3]
12. a) Sketch the molecular orbital energy level diagram of B_2 and suggest its magnetic behaviour. [3]
b) Write the IUPAC names of $\text{K}[\text{PtCl}_3(\eta^2\text{C}_2\text{H}_4)]$ and $\left[(\text{H}_3\text{N})_4\text{CO} \begin{array}{c} \text{OH} \\ \diagdown \quad \diagup \\ \text{NH}_2 \end{array} \text{CO}(\text{NH}_3)_4 \right]^{4+}$. [2]
c) Stability of a chelate complex is greater than that of a non chelate complex— Explain. [2]
d) Answer **any one** of the followings : [3]
i) From the molecular orbital energy level diagram of carbon monoxide explain its dipole moment value.
ii) Give a concise account of 'inner metallic complexes'.

