Bachelor of Science (B.Sc.) Semester—VI Examination

CH—601 INORGANIC CHEMISTRY

Compulsory Paper—1

(Chemistry)

Time : Three Hours] [Maximum Marks : 50

N.B. :— (i) All **five** questions are compulsory and carry equal marks.

(ii) Write equations and draw diagram wherever necessary.

1. (A) Define crystal field splitting energy. Explain splitting of d orbitals in the following complexes on the basis of CFT :

(i) $[Fe(CN_6)]^{3-}$ and

(ii) $[Fe(H_2O)_6]^{3+}$. 5

(B) Draw absorption spectra of $[Ti(H_2O)_6]^{3+}$ and $[Cu(H_2O)_6]^{2+}$. Compare them on the basis of :

(i) Position of band and

(ii) Symmetry of absorption band. 5

OR

(C) Explain spin allowed and spin forbidden transition on the basis of spin selection rule with examples. 2½

(D) Calculate CFSE in terms of Δt in d^4 and d^6 tetrahedral complexes. 2½

(E) Give limitations of valence bond theory of metal complexes. 2½

(F) What is Jahn Teller distortion ? Give conditions of Jahn Teller distortion with examples. 2½

2. (A) Explain magnetic behaviour of d^5 and d^7 octahedral complexes in weak and strong crystal field using energy splitting diagram. 5

(B) (i) What is stepwise and overall stability constants ? How are they correlated ?

(ii) How nature of ligand affects stability of metal complexes ? 5

OR

(C) What is spin only magnetic moment ? Explain orbital contribution to magnetic moment. 2½

(D) Explain which of the following configurations show quenching towards orbital moments ?

(i) $t2g^3eg^\circ$

(ii) $t2g^4eg^2$

(iii) $t2g^3eg^2$

(iv) $t2g^5eg^2$

(v) $t2g^4eg^\circ$. 2½

(E) Describe Gouy's method for determination of magnetic susceptibility. 2½

(F) How the composition of Fe – SSA complex is determined by Job's method ? 2½

3. (A) State and derive Beer-Lambert's law. A solution having concentration 1.5×10^{-3} M of a compound in a cell of path length 2.0 cm shows % T of 65. Calculate molar absorptivity of the solution. 5

(B) Define chromatography. How it is classified ? Discuss the principle and technique involved in paper chromatography. 5

OR

(C) Draw flowsheet diagram of Single beam photoelectric colorimeter. 2½

(D) Discuss application of colorimetry in estimation of Cu(II) as copper ammonia complex. 2½

(E) What is ion exchange capacity ? How is it determined for anion exchanger ? 2½

(F) Discuss the principle involved in solvent extraction. 2½

4. (A) What are silicones ? How are cross linked silicones manufactured ? What is the action of :

(i) RMgCl

(ii) Alkyl Lithium and

(iii) $LiAlH_4$ on silicone ? 5

(B) What are phosphazenes ? Discuss the structure of Triphosphonitrilic chloride. 5

OR

(C) Write a note on silicon resins. Give its three applications. 2½

(D) What are silicon elastomers ? Give its two applications. 2½

(E) What is the action of :

(i) Ammonia and

(ii) Sodium alkoxide on $(NPCl_2)_3$? 2½

(F) Give any two methods for preparation of $(NPCl_2)_4$. 2½

5. Attempt any **ten** from the following :

(i) Define crystal field stabilization energy.

(ii) State Laporte selection rule.

(iii) Draw crystal field splitting diagram of $[Ni(CN)_4]^{2-}$.

(iv) Define kinetic stability.

(v) Why are low spin tetrahedral complexes not observed ?

(vi) Define molar magnetic susceptibility.

(vii) Define chromatogram and eluate.

(viii) What are penetration complexes ?

(ix) Define R_f and λ_{max}.

(x) Give two uses of phosphagen.

(xi) Give two applications of silicon oils.

(xii) What is island of π characters ? 1×10=10