PG – 177

II Semester M.Sc. Degree Examination, July 2017
(CBCS)
CHEMISTRY
C – 201 : Inorganic Chemistry – II

Time : 3 Hours Max. Marks : 70

Instruction : *Answer Question No.* ***1*** *and* ***any five*** *of the following.*

1. Answer **any ten** of the following : **(2×10=20)**

a) How is the overall stability constant of a complex related to its stepwise stability constant ?

b) For Cu^{2+}/NH_3 system, the log of the stepwise stability constant are $\log K_1 = 4.25$, $\log K_2 = 3.55$, $\log K_3 = 2.85$ and $\log K_4 = 2.15$. Calculate the overall stability constant of $[Cu(NH_3)_4]^{2+}$ species.

c) The formation of $[Cu(en)_3]^{2+}$ not observed in solution. Why ?

d) How do the pi-bonding ligands help in the stabilization of metal complex ?

e) Which of the two, $[Co(Cl)_4]^{2-}$ and $[Co(I)_4]^{2-}$ is expected to have higher Δ_t and why ?

f) What are hetero crowns and spherandes ? Give an example.

g) Complete the following reactions :

i) $[Co(CN)_6]^{3-} + H_2O \xrightarrow{h\nu} ?$

ii) $Co[(NH_3)_6]^3 + H_2O \xrightarrow{h\nu} ?$

h) 'Aquation reaction in Rh^{3+} and Ir^{3+} complexes is very difficult' substantiate.

i) On the basis of molecular orbital, explain why the Mn-O distance in $[MnO_4]^{2-}$ is longer by 3.9 pm than in $[MnO_4]^{-}$.

j) What are the possible magnetic moments of Co(II) in tetrahedral and octahedral complexes ?

k) Illustrate antiferromagnetic coupling.

l) What do you mean by nephelauxetic ratio ? How does it relates with delocalization of metal ligand bond ?

2. a) Discuss the structure and different modes of bonding of NO with transition metal complexes.

   b) Give the ground state terms for d^2 and d^7 systems.

   c) Explain Laporte and spin selection rule. **(4+3+3=10)**

3. a) With a suitable example, explain the kinetic and thermodynamic stability of metal complexes.

   b) Discuss the determination of binary formation constant by an ion-exchange method.

   c) Point out the uses and limitations of CFT. **(4+3+3=10)**

4. a) In what Tanaube Sugano diagrams are different from Orgel diagrams ? Draw Orgel diagram for an octahedral chromium (III) complex. Explain the possible transitions.

   b) $[Co(NH_3)_6]^{2+}$ has absorption band at 9000 cm^{-1} and 21100 cm^{-1}. Calculate Δ_0 and B for d^7 ion.

   c) The complexes $[Co(NH_3)_5X]^{2+}$ (X = Cl, Br, I) have charge transfer to metal bands. Which of these complexes would you expect to have the lowest-energy charge-transfer band ? Why ? **(4+3+3=10)**

5. a) Depict MO diagram involving sigma orbital for an octahedral complex and discuss the salient features of the diagram.

   b) Discuss any two spectral evidences for metal ligand covalency in complexes.

   c) Explain the self-assembly concept and its application in molecular and supra molecular Chemistry. **(4+3+3=10)**

6. a) Discuss the determination of magnetic susceptibility of metal complexes by Gouy method.

   b) Calculate the crystal field stabilization energies for a d^8 system in octahedral and tetrahedral complexes.

   c) Represent the different polyhedrons for co-ordination number 7 and 8. **(4+3+3=10)**

7. a) Mention the importance of spin-orbit coupling and report a Jabolnskii diagram for an octahedral complex of Cr^{3+}.

   b) Illustrates the variation of redox potentials in photochemical processes.

   c) Write a note on light-harvesting Antennae. **(4+3+3=10)**

8. a) Explain the inter-and intra-molecular photo process.

   b) K_4 [NiF_6] is diamagnetic while K_3[CoF_6] is paramagnetic. Account for this.

   c) State Kasha's rule. Discuss the main principle of Kasha's rule and Stokes shifts. **(4+3+3=10)**