



2021

M.Sc. Chemistry 1st Sem.

Paper: Inorganic Chemistry

Paper Code: CH-401

Time: 2 Hours

Full Marks: 50

The figures in the right-hand margin indicate marks

Answer all the questions

1. Answer all the following questions

[10 x 2 = 20]

- (a) Write the difference between trans effect and trans influence.
- (b) Electron transfer rate between $\text{Cr}^{2+}(\text{aq})$ and $[\text{Co}(\text{NH}_3)_6]^{3+}$ is slower than $\text{Cr}^{2+}(\text{aq})$
 $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$: Explain
- (c) Why the aquation of $[\text{Co}(\text{NH}_3)_5\text{F}]^{2+}$ is acid catalysed ?
- (d) Base hydrolysis rate constant of $[\text{Co}(\text{CN})_6]^{3-}$ is independent of $[\text{OH}]^-$ in the
pH range 8.0-9.0.
- (e) 'CCl₄ acts as solvent but SiCl₄ not'-explain.
- (f) 'N(CH₃)₃ is more basic than N(SiH₃)₃' - explain.
- (g) What is atomic inversion?
- (h) Why overall formation constant of $[\text{Co}(\text{NH}_3)_6]^{3+}$ is lower than that of $[\text{Co}(\text{en})_3]^{3+}$.
- (i) All octahedral complexes of Ni²⁺ are outer orbital complexes. Explain.
- (j) Explain the Chelate Effect with two suitable examples.

2. (a) Discuss the acid hydrolysis of $[\text{Co}(\text{NH}_3)_5\text{CO}_3]^+$ with mechanism. [4]
- (b) Explain how Mo⁵⁺ complexes are more labile than Mo³⁺ complexes on the [3]
basis of VBT although former bears higher positive charge.
- (c) Discuss the mechanism of inner sphere electron transfer reactions [3]

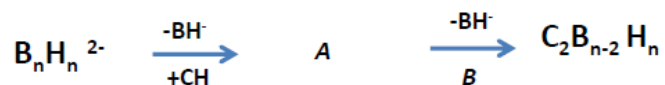
OR

- (d) What is SN₁CB mechanism? Give two evidences in favour of SN₁CB [4]
mechanism of base hydrolysis reaction.
- (e) Predict and explain the order of acid hydrolysis in the complexes of the type [3]
 $[\text{Co}(\text{NH}_3)_5\text{X}]^{2+}$ where X= F⁻, Cl⁻, Br⁻ and I⁻.
- (f) Explain the polarisation theory of trans effect. [3]

3. (a). Calculate energy of hybridization of sp and sp^2 orbital of carbon. [4]
 (b) Draw the molecular orbital diagram of BeH_2 . [3]
 (c) Draw the Walsh MO diagram of bent XH_2 molecule. [3]

OR

- (d). Find out skeletal electron of B_6H_{10} , B_5H_{11} and predict the structures. [4]
 (e). Find out the styx no. of B_4H_{10} . [3]
 (f) What is isolobal analogy? Find out A and B in the following -- [3]



4. (a) Describe the spectrophotometric method for determination of formation constant of a metal complex. [6]
 (b) Discuss the factors affecting the stability constants of metal complexes. [4]

OR

- (c) How will you determine the composition of a complex by Job's method of continuous variation? [7]
 (d) Establish the relation between stepwise and overall formation constant. [3]