

**BMS COLLEGE FOR WOMEN AUTONOMOUS
BENGALURU-560004**

**END SEMESTER EXAMINATION – OCTOBER 2022
(CBCS)**

**M.Sc. in Chemistry- II Semester
Inorganic Chemistry-II**

**Course Code: MCHE201T
Duration: 3 hrs**

**QP Code:21007
Max.Marks:70**

Instruction: Answer Question No. 1 and any FIVE of the remaining.

1. Answer any TEN questions. (2×10=20)

- Formation constant of $[\text{Cu}(\text{en})(\text{H}_2\text{O})_2]^{2+}$ is higher than that of $[\text{Cu}(\text{NH}_3)_2(\text{H}_2\text{O})_2]^{2+}$. Why?
- Distinguish between kinetic and thermodynamic stability of metal complexes.
- What is meant by Cotton effect?
- Which of the two, $[\text{Co}(\text{Cl})_4]^{2-}$ and $[\text{Co}(\text{I}_4)_6]^{2-}$ is expected to have higher Δ_t and why?
- Among the following which complex exhibit higher tendency to absorb in the visible region of spectrum? Give reason
 $[\text{Co}(\text{NH}_3)_6]^{3+}$ $[\text{Co}(\text{CN})_6]^{3-}$ & $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
- Which of the following metal complexes is expected to be subject to a Jahn – Teller distortion? Justify the answer i) $[\text{CrF}_6]^{2-}$ ii) $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$
- Why d-d transitions are forbidden?
- What do you mean by nephelauxetic ratio? How does it relate with delocalization of metal ligand bond?
- Derive the ground state term symbols for Ni^{2+}
- What are Curie and Neel temperatures?
- What is Kasha's rule?
- For $\text{Hg}[\text{Co}(\text{SCN})_4]$, the value of corrected molar magnetic susceptibility was found to be 16.44×10^{-6} erg at 300 K. Calculate its effective magnetic moment.

2. a) What are metal chelate and macrocyclic effect? Explain with suitable examples.

b) The stepwise stability constant values for $\text{Cu}^{2+}/\text{NH}_3$ system are as follows: $\log k_1 = 4.25$, $\log k_2 = 3.56$, $\log k_3 = 2.96$ and $\log k_4 = 2.35$. Calculate the overall stability constant of



- c) Write a note on MCD (4+3+3)
3. a) Discuss any two experimental evidences for covalency in M-L bonding of complexes
b) Draw and explain the splitting pattern of metal d-orbitals in $[\text{NiCl}_4]^{2-}$ and $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ complexes.
c) Sketch the MO energy level diagram for $[\text{Co}(\text{NH}_3)_6]^{3+}$ involving sigma bonding (4+3+3)
4. a) Calculate the values of B^1 , \square and % of covalency for $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ which exhibits absorption bands at 8700, 14,500 and 25,300 cm^{-1} (Given B for Ni^{2+} ion 1040 cm^{-1}).
Assign these transitions
b) Predict the possible transitions for $[\text{V}(\text{H}_2\text{O})_6]^{3+}$ based on Orgel diagrams
c) Discuss the spectral properties of lanthanide and actinide metal complexes (4+3+3)
- 5 a) Explain Gauy's method and VSM method for the determination of magnetic susceptibility of a compound.
b) With the help Jablonskii diagram, indicate the various photophysical processes. (6+4)
6. a) Differentiate between T.S and Orgel diagram? Sketch the TS diagram for $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$
b) What are the different ways of bonding of O_2 to metal complexes? Give an example for each.
c) Discuss how CFT explains colour of a complex. (4+3+3)
7. a) Discuss the utility of CD and ORD in determination of absolute configuration of metal complexes
b) Write a note on stereochemical non-rigidity of a metal complex
c) What is meant by spin cross over? Explain with example. (4+3+3)
8. a) Describe the determination of formation constant of a metal complex by spectrophotometric method.
b) Explain the selection rules in electronic spectroscopy
c) With suitable examples, explain photo substitution and photo-redox reactions. (4+3+3)
