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**B.M.S. COLLEGE FOR WOMEN, AUTONOMOUS**  
**BENGALURU-560004**  
**SEMESTER END EXAMINATION-SEPT/OCT-2023**

**M.Sc. in Chemistry-2<sup>nd</sup> Semester**

**INORGANIC CHEMISTRY-II**

**Course code: MCH201T**

**Duration: 3 Hours**

**QP Code: 12007**

**Max.Marks:70**

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

**1. Answer any TEN questions**

**(2X10 =20)**

- How do the pi bonding in ligands help in the stabilization of metal complex?
- Define the term Cotton effect?
- Mention the different types of mode of bonding in metal dinitrogens.
- Why tetrahedral complexes are mostly high spin complexes? Give reason.
- Which of the following metal complex do not shows J-T distortion? Justify your answer
  - $[\text{CrF}_6]^{2-}$
  - $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$
- What is the nephelauxetic ratio? Arrange following ligands in the order of increasing nephelauxetic effect.  $\text{NH}_3, \text{I}^-, \text{F}^-, \text{Cl}^-$
- Derive the possible term symbols for  $\text{Mn}^{2+}$  and  $\text{Fe}^{2+}$
- Lanthanide exhibit sharp absorption bands. Justify
- Mention the reason for origin of the intense yellow color in  $\text{K}_2\text{Cr}_2\text{O}_7$
- Calculate the spin only magnetic moment of  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$
- Point out the significance of diamagnetic correction.
- Write photosubstitution reaction of metal complex.

**2. a) Explain how nature of ligand influences the stability of metal complex.**

**b) Write a note on Magnetic circular dichroism (MCD). How it is unique from CD technique.**

**(5+5=10)**

**3. a) Discuss the splitting of d-orbitals in octahedral and tetrahedral geometries.**

**b) Sketch the MO energy level diagram for  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$  involving sigma bonding**

**(5+5=10)**

4. a)  $[\text{Co}(\text{DMSO})_4]^{2+}$  shows three spin allowed transitions at  $7400\text{ cm}^{-1}$ ,  $14600\text{ cm}^{-1}$  and  $18700\text{ cm}^{-1}$ . Calculate the values of  $B^1$ ,  $\beta$  and % of covalency.  
(Given  $B$  for  $\text{Co}^{2+}$  ion  $1120\text{ cm}^{-1}$ ).
- b) In what way Tanabe-Sugano diagrams are more useful than Orgel diagram? Set up Orgel diagram for a complex where the metal has  $d^3$  electron configuration and explain the salient features. **(5+5=10)**
- 5 a) Define the term magnetic susceptibility. Explain how VSM method is useful for the determination of magnetic susceptibility of metal complex.
- b) Sketch the Jablonskii diagram. Discuss various photophysical processes. **(5+5=10)**
6. a) With the help of hysteresis loop explain the term reactivity and coercivity.
- b) Distinguish between spin allowed and spin forbidden transition.
- c) Discuss any two evidences for metal ligand covalent bonding. **(4+3+3=10)**
7. a) Describe the utility of CD and ORD in determination of absolute configuration of metal complexes
- b) Comment on the spectral properties of lanthanide and actinide metal complexes
- c) Point out the factors that influence the magnitude of  $10Dq$  in octahedral metal complexes. Describe any two factors in detail. **(4+3+3=10)**
8. a) Explain spin crossover with an example
- b) Write an account on stereochemical non-rigidity
- c) What are the various types of magnetic behaviour found in coordination compounds? **(4+3+3=10)**

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