

TM242516I

Reg. No :

Name :

MASTER'S DEGREE (C.S.S) EXAMINATION, MARCH 2024

2023 ADMISSIONS REGULAR

SEMESTER II - CORE COURSE CHEMISTRY

CH2C05TM20 - Coordination Chemistry

Time : 3 Hours

Maximum Weight : 30

Part A

I. Answer any Eight questions. Each question carries 1 weight

(8x1=8)

1. Give four points for the theoretical failure of Crystal Field Theory.
2. Define Nephelauxetic effect. Outline its significance in coordination chemistry.
3. Distinguish between Neil temperature and Curie temperature.
4. Nephelauxetic ratio can be used to understand the extend of covalent bonding in metal complexes. Explain.
5. d-d transitions in centrosymmetric complexes are forbidden by the Laporte selection rule, yet we see them. Examine the reason.
6. Substitution reaction in square planar complexes is stereo retentive. Explain.
7. Predict the complex whose water exchange reaction proceeds faster: $[\text{Mg}(\text{H}_2\text{O})_6]^{2+}$ or $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$.
8. Discuss the type of isomerism shown by the following complexes a) $[\text{Co}(\text{en})_3]$ b) $[\text{Co}(\text{NH}_3)_5(\text{SCN})]^{2+}$
9. Explain the crystal structure of Prussian blue.
10. Classify lanthanide elements. Absorption bands are sharp for lanthanides. Justify.

Part B

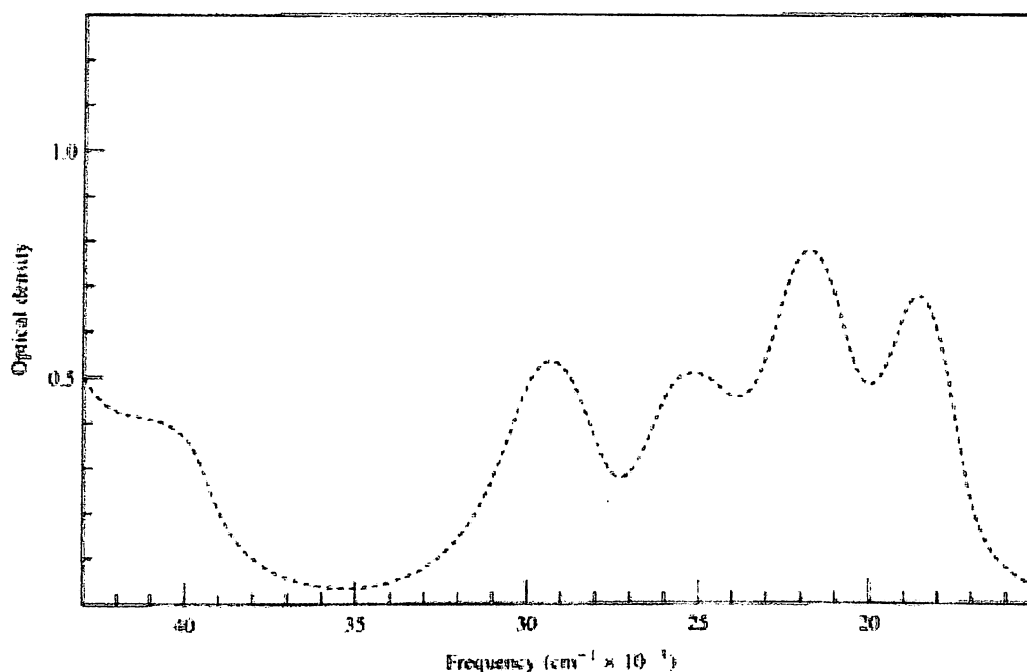
II. Answer any Six questions. Each question carries 2 weight

(6x2=12)

11. Jahn- Teller effect is more prominent in octahedral complexes. Identify the reason. Discuss the above observation with suitable examples.
12. Compare the splitting of d orbitals in octahedral and tetrahedral ligand fields. Explain the lesser value of delta in tetrahedral complexes.



13. The spectra of $[\text{Cr}(\text{en})_2\text{F}_2]^+$ is given below. Explain the appearance of the 5 bands.



14. Explain briefly about Orgel diagrams. List out the advantages of Tanabe Sugano diagrams over Orgel diagrams.
15. Explain the mechanism of reduction of Co(III) in $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$ by Cr(II) in $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$.
16. Explain the theories of trans effect.
17. Actinides form a wide range of complexes in different oxidation states. Explain with suitable examples.
18. Explain the resolution of the racemic mixture d & l- $\text{cis}[\text{Co}(\text{en})_3]\text{Cl}_3$.

Part C

III. Answer any Two questions. Each question carries 5 weight

(2x5=10)

19. Outline Molecular Orbital Theory. Explain MO energy level diagrams of octahedral and tetrahedral complexes without pi bonding.
20. a) Draw the Orgel diagram of hexaaquatitanium (II). b) Explain the differences between Orgel diagram and Tanabe-Sugano diagrams. c) Discuss the effects of spin orbit coupling and vibronic coupling on the selection rules of electronic transition.
21. Explain the inner sphere mechanism of electron transfer reactions in metal complexes.
22. a) Discuss linkage isomerism in coordination complexes. Explain the electronic and steric factors affecting linkage isomerism. b) Explain the factors that mitigate against the formation of lanthanide complexes

