TM252494W

Reg. No :.....

Name :.....

MASTER'S DEGREE (C.S.S) EXAMINATION, MARCH 2025

2020, 2021, 2022, 2023 ADMISSIONS SUPPLEMENTARY

SEMESTER II - CORE COURSE CHEMISTRY

CH2C05TM20 - Coordination Chemistry

Time : 3 Hours **Maximum Weight : 30**

Part A

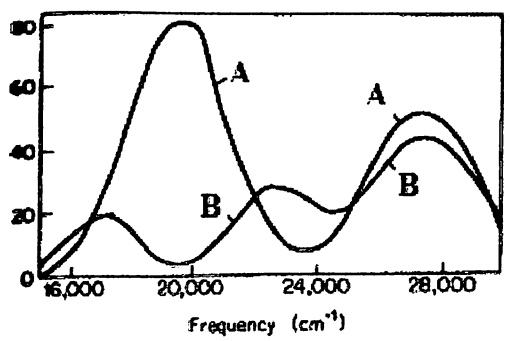
I. Answer any Eight questions. Each question carries 1 weight **(8x1=8)**

1. Define Nephelauxetic effect. Outline its significance in coordination chemistry.
2. Write a note on CO and NO ligands.
3. Define term symbol and compute the ground term of d^1 configuration.
4. $[Ru(bipy)_3]^{2+}$ gives a bright orange emission with a lifetime of about 1 microsecond. Identify the reason for this emission.
5. Judge which of the following has a smaller value of β, $[NiF_6]^{4-}$ or $[NiBr_4]^{2-}$? Explain the reason.
6. Discuss the effect of entering group on the substitution reactions of square planar complexes.
7. The self-exchange reaction between $[Co(NH_3)_6]^{3+}$ and $[Co(NH_3)_6]^{2+}$ is slow. Observe the reason.
8. In spite of the exceptional stability of +3 oxidation states of lanthanides, Ytterbium and Cerium show + 2 and +4 oxidation states respectively. Illustrate.
9. Discuss the principle and measurement of CD.
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. Give a diagrammatic representation of splitting of d orbitals in octahedral and square planar ligand field. Explain.
13. The figure below shows the spectra of cis and trans $[Cr(en)_2F_2]^+$. There are two curves labelled A and B. Categorize them as the *cis* or *trans* isomer. Explain.



14. Compare Curie's law and Curie Weiss's law.
15. Explain the reaction pathways of substitution reactions of square planar complexes.

16. On plotting k_{obs} against concentration of nucleophiles replacing Cl^- in trans $[PtCl_2\{py)_2]$ in methanol, straight line plots with the same intercept and different slopes were obtained. Predict the mechanism of this substitution reaction. Give evidences.

17. Discuss actinide contraction. Why do actinides show greater range of oxidation states than lanthanides.

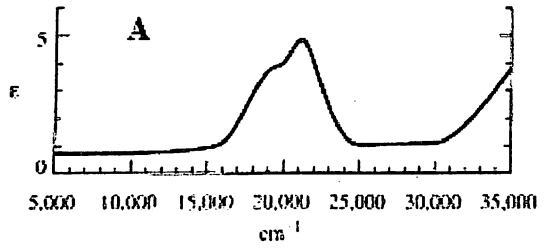
18. Explain Symbiosis. Outline symbiotic theory of linkage isomers.

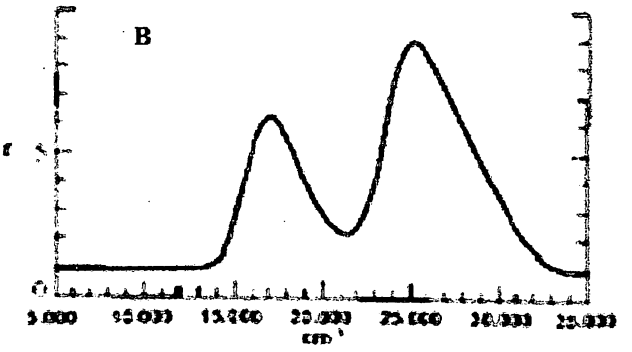
Part C

III. Answer any Two questions. Each question carries 5 weight **(2x5=10)**

19. Classify the following into sigma and pi bonding ligands - CO, NO, CN, R_3P and Ar_3P. Explain How they form coordination complexes.

20. Two spectra A and B are given below. Identify them as the spectra of $[V(H_2O)_6]^{3+}$ and $[Ti(H_2O)_6]^{3+}$. Explain your answer.





21. Explain the outer sphere mechanism. Explain how Marcus theory is used for studying the rate of self-exchange reactions.

22. a) Discuss the characteristics of lanthanides. Explain the oxidation states and electronic spectra of lanthanide complexes. b) Explain asymmetric synthesis catalyzed by co-ordination compounds.