

**19P212**

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Name.....

Reg. No.....

**SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2020**

(CUCSS - PG)

**CC19P CHE2 C06 - COORDINATION CHEMISTRY**

(Chemistry)

(2019 Admissions - Regular)

Time: Three Hours

Maximum: 30 Weightage

**Section A**

Answer any *eight* questions. Each question carries 1 weightage.

1. Identify which of the following complexes expect to have the largest and smallest  $K_f$  value.  $[\text{Ni}(\text{en})_3]^{2+}$ ,  $[\text{Ni}(\text{EDTA})]^{2-}$ , and  $[\text{Ni}(\text{NH}_3)_6]^{2+}$  Explain.
2. What you mean by template effect in metal complexes? Write one example.
3. The Racah parameter B is  $460 \text{ cm}^{-1}$  in  $[\text{Co}(\text{CN})_6]^{3-}$  and  $615 \text{ cm}^{-1}$  in  $[\text{Co}(\text{NH}_3)_6]^{3-}$  Consider the nature of bonding with the two ligands and explain the difference in nephelauxetic effect.
4. Arrange the splitting of d-orbitals, in the increasing order of energy of square planar and tetrahedral fields.
5. Write a short note on Metal complex sensitizers.
6. Tetrahedral complexes are always high spin, Explain.
7. Differentiate Curies Law and Curie-Weiss Law.
8. When the Mossbauer Effect will occur? Why the Mossbauer line splits into a doublet in  $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]\cdot 2\text{H}_2\text{O}$ ?
9. In a complex, there is one unpaired electron in  $\text{Cu}^{2+}$  ( $I=3/2$ ) and the copper ion is coordinated by one nitrogen atom ( $I=1$ ) and one  $\text{OH}^-$  ( $I=1/2$ ), how many lines can be expected in the EPR spectrum?
10. Write an expression for the effective magnetic moment of a complex having spin-orbital coupling. Explain the terms involved in it.

**(8 x 1 = 8 Weightage)**

**Section B**

Answer any *six* questions. Each question carries 2 weightage.

11. Chelate effect is entropy-driven; explain the statement with suitable example
12. Explain the spectrophotometric method for the determination of binary formation constants of metal complexes.
13. Explain nephelauxetic effect in the metal complexes.

14. Briefly discuss the LMCT spectra in  $\text{KMnO}_4$  complex with the help of a MO diagram
15. Six-coordinate  $d^9$  complexes of copper (II) usually depart considerably from octahedral geometry. Justify.
16. What are Orgel diagrams? Discuss the Orgel diagram of  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$  complex ion.
17. Explain trans effect, with its utility by taking suitable example.
18. Differentiate between Prompt and delayed reactions with examples.

**(6 x 2 = 12 Weightage)**

### Section C

Answer any *two* questions. Each question carries 5 weightage.

19. (a) What is crystal field stabilization energy? Calculate the CFSE of both octahedral and tetrahedral fields, in terms of  $\Delta_0$  for  $d^3$ ,  $d^4$  and  $d^7$  ions (b) Draw an approximate MO diagram for the formation of  $[\text{ML}_6]^{n+}$  complex ( $M$  = first row metal) using the ligand group orbital approach.
20. (a) Explain the term quenching of the magnetic moment (b) Discuss the Gouy balance method for the determine the magnetic susceptibility of complexes.
21. Explain the  $\text{S}_{\text{N}}1$  mechanism of base hydrolysis as taking the example of substitution reactions of Co(III) ammine complexes
22. (a) Discuss, with examples, the differences between inner and outer-sphere mechanisms (b) Illustrate the redox reactions in the photoexcitation of the compound,  $[\text{Ru}^{\text{II}}(\text{bpy})_3]^{2+}$

**(2 x 5 = 10 Weightage)**

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