

C 83027

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Name.....

Reg. No.....

**SECOND SEMESTER M.A./M.Sc./M.Com. DEGREE EXAMINATION  
JUNE 2020**

(CBCSS)

Chemistry

**CHE 2C 06—CO-ORDINATION CHEMISTRY**

(2019 Admissions)

Time : Three Hours

Maximum : 30 Weightage

**Section A**

*Answer any eight questions.*

*Each question carries a weight of 1.*

1. What is meant by stability constant of a metal complex ? Explain.
2. Why chelate effect is called an entropy effect ?
3. Calculate the LFSE of  $d^6$  octahedral complex having  $\Delta_0 = 25000 \text{ cm}^{-1}$  and pairing energy  $P = 15000 \text{ cm}^{-1}$ .
4. Differentiate between spectrochemical series and nephelauxetic series.
5. How do charge transfer transitions differ from d-d transitions in transition metal complexes?
6. Derive the ground state term symbols for  $\text{Ni}^{2+}$  and  $\text{Cr}^{2+}$  ions.
7. ESR transition occurs in the microwave region while NMR transition occurs in the radio frequency region ; why ?
8. What is aquation reaction ? Explain with an example.
9. Explain *cis* effect.
10. What are prompt and delayed reactions ? Explain with suitable examples.

(8 × 1 = 8 weightage)

**Turn over**

### Section B

*Answer any six questions.*

*Each question carries a weight of 2.*

11. Outline the spectrophotometric method for the determination of stability of a metal complex.
12. Differentiate between thermodynamic stability and kinetic stability of metal complexes.
13. Discuss the factors that affect crystal field splitting energy.
14. Construct the Orgel diagram for  $[\text{V}(\text{H}_2\text{O})_6]^{3+}$  and assign the possible electronic transitions.
15. How do paramagnetism, antiferromagnetism and ferromagnetism vary with temperature ?
16. Sketch the different bonding modes of acetate group to a metal ion. How IR spectroscopy can be used to identify these bonding modes ?
17. Write a note on substitution reactions in square planar complexes.
18. Explain photoaquation and photoisomerization reactions with suitable examples.

(6 × 2 = 12 weightage)

### Section C

*Answer any two questions.*

*Each question carries a weight of 5.*

19. What are the postulates of molecular orbital theory ? Draw the molecular orbital diagram for  $[\text{CoF}_6]^{3-}$  ion and discuss its salient features. Discuss the effect of  $\pi$ -bonding on splitting energy  $\Delta_0$ .
20. (a) Construct the Orgel diagram for  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$  and assign the possible electronic transitions. What are the limitations of Orgel diagrams ?  
 (b) Calculate  $10Dq$  and  $\beta$  value for the complex  $[\text{Ni}(\text{CH}_3\text{NH}_2)_6]^{2+}$  from the following data :  $\nu_1 = 10000 \text{ cm}^{-1}$ ,  $\nu_2 = 16780 \text{ cm}^{-1}$ ,  $\nu_3 = 27320 \text{ cm}^{-1}$  and  $B = 1030 \text{ cm}^{-1}$  for free  $\text{Ni}^{2+}$  ion.
21. Discuss the principle involved in Mössbauer spectroscopy. What do you mean by the terms, isomer shift and hyperfine interactions ? How this technique is useful in the study of spin crossover in iron (II) complexes ?
22. Describe the D, A and I mechanisms of substitution reactions in octahedral complexes, bringing out the factors that favour these reactions.

[2 × 5 = 10 weightage]