

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN  
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)  
Chromepet, Chennai - 600 044.

M.Sc. Chemistry - END SEMESTER EXAMINATIONS - APRIL 2025  
SEMESTER - II

**22PCHCT2005 - Coordination Chemistry: Bonding, Reaction and Spectra**

Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

**Section B**

Answer any **SIX** questions ( $6 \times 5 = 30$  Marks)

1. Illustrate the crystal field splitting in square planar complexes.
2. With suitable example, explain how stability of complex is determined from thermodynamic data.
3. Summarize the main characteristics of electron transfer reactions occurring through outer sphere mechanism.
4. Write down all the energy terms that are possible for a free gaseous atom having the configuration  $3d^2 4s^2$  and  $2s^2 2p^1$ .
5. Discuss the vibrational spectra of metal carbonyls.
6. Calculate the total number of microstates for  $p^2$  and  $d^2$  configurations.
7. How does VBT account for following fact that  $[Ni(CN)_4]^{2-}$  is diamagnetic and square planar.
8. Brief on inner sphere mechanism of electron transfer reaction with an example.

**Section C**

I - Answer any **TWO** questions ( $2 \times 10 = 20$  Marks)

9. Discuss the sigma and pi metal -ligand bonding in transition metal complexes with reference to octahedral complexes.
10. What type of octahedral complexes undergo acid hydrolysis by  $S_N2$  mechanism? What type of intermediates and products would be formed? Illustrate with example.
11. a. Describe the utility and limitations of Orgel diagram.  
b. Draw the Orgel diagram for  $d^4$  configuration of metal ions in octahedral ligand environment.
12. Elucidate the structure of  $NO_2$  and  $H_2O$  based on IR and Raman spectra

II - Compulsory question ( $1 \times 10 = 10$  Marks)

13. Outline the theories of trans effect.

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