

K-5/2110

7402/N

**Ligand Field Theory-311
(Semester-III)**

[Time: Two Hours]

[Maximum Marks: 55]

Note: Attempt any four questions. All questions carry equal marks.

Question 1: Derive the expression for d_{xy} and $d_{x^2-y^2}$ orbitals. Explain the shapes of orbitals represented by these expressions.

13.75

Question 2: Derive the expression for potential V_{tet} for tetrahedral ligand field.

13.75

Question 3: Quantitatively discuss the effect of octahedral ligand field on F term.

13.75

Question 4: Derive the terms which arise from the 120-fold degeneracy of the d^3 configuration.

13.75

Question 5: Discuss with example how the lattice energy of complex depends on crystal field stabilisation energy.

13.75

Question 6: (a) Explain what information is obtained from Tanabe-Sugano diagram. 7

(b) Explain and compare V_{oct} for $[\text{CoCl}_6]^{3-}$ and $[\text{Co}(\text{NH}_3)_6]^{3+}$ with the help of molecular orbital diagram. How will it affect the electronic transitions?

6.75

Question 7: (a) What do you understand by Nephelauxetic effects? Place the following ligands in the order of Nephelauxetic effects: H_2O , F, en, CN^- and NH_3 ? 7

(b) The following bands are found in the spectrum of $[\text{Cr}(\text{CN})_6]^{3-}$: 264nm, 310nm and 378 nm. Determine the values of V_{oct} and B' . 6.75

Question 8: Explain MLCT and LMCT absorptions in the electronic spectra of d block metal complexes. Give example to illustrate your answer.

13.75

Question 9: Write a note on

(a) Spin-orbit coupling.

7

(b) Term wave function

6.75