

INORGANIC CHEMISTRY

(Common with B.Sc. Biotechnology)

Paper-I

Semester-V

Time Allowed : 3 Hours]

[Maximum Marks : 26

Note : The candidates are required to attempt two questions each from Sections A and B carrying 4 marks each and the entire Section C consisting of 5 short answer type questions carrying 2 marks each.

SECTION-A

- (a) What is Crystal field theory? How does this theory account for the fact that $[\text{Co}(\text{F})_6]^{3-}$ is paramagnetic but $[\text{Co}(\text{NH}_3)_6]^{3+}$ is diamagnetic though both are octahedral? (Z for Co=27). 3
(b) Explain why the complex ion of transition metals are mostly colored. 1
- (a) How do the d-orbital energy levels split when a transition metal ion is placed in a square planar crystal field of the ligands? 2
(b) Give the number of unpaired electrons in strong and weak fields of Cr^{2+} and Co^{3+} . 2
- (a) Discuss the various factors which determine the magnitude of crystal field splitting. 2
(b) CuSO_4 and Cu_2SO_4 lack color but $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ is blue. Explain. 2
- (a) How do you explain the Magnetic properties of the complexes of transition metals by the crystal field theory? 2
(b) What is Trans effect? Discuss the theories of Trans effect. 2

SECTION-B

- (a) Derive the terms for nd^2 electrons. 2
(b) Discuss briefly the Guoy's method for measuring Magnetic stability. Give its advantages and limitations. 2
- (a) Discuss the variation of Magnetic susceptibility with temperature. 2
(b) Explain Antiferromagnetism. 2
- (a) What is meant by the Electronic spectra? Give selection rules to explain the electronic absorption band in d^1, d^2, d^8 and d^9 tetrahedral and octahedral complexes. 2
(b) Calculate the term symbol for ground state of Cr. 2
- (a) Explain the term Orbital coupling. How different Spectroscopic states are derived with the help of this concept? 2
(b) Briefly discuss the Spectrochemical series. 2

SECTION-C

- (a) Draw the splitting of d-orbitals in tetrahedral crystal field of ligands. 2
(b) What do you mean by Thermodynamic stability of complexes? Explain. 2
(c) What relation exist between Δ (the crystal field Splitting) and the pairing energy in determining whether a given complex will be high spin or low spin? 2

- (d) How is CFSE Calculated? Explain with suitable examples. Why the Δt is always less than that of Δo ? 2
- (e) Describe the nature of electronic transition in metal complexes with d^9 electronic configuration with a suitable example. 2
-