

12. (a) Explain spin orbit coupling. 6
 (b) Determine the number of microstates for d^2 and p^3 configuration. 6
13. (a) Explain crystal field splitting in octahedral complexes. 6
 (b) Determine the value of CFSE in d^4 -high spin and low spin complexes. 3
 (c) What are the factors affecting the magnitude of CFSE ? 3

B-3251

6

200

Roll No.

(11/16-1)

3251

M. Sc. EXAMINATION

(For Batch 2010 & Onwards)

(First Semester)

CHEMISTRY

CH-101

Inorganic Chemistry-I

Time : Three Hours

Maximum Marks : 80

Section A

Note : Q. No. 1 is compulsory. It carries 16 marks.

1. (a) How many chelate rings are present in the following complexes :
- (i) $[\text{Co}(\text{dien})_2]^{3+}$
 (ii) $[\text{Co}(\text{EDTA})]^{2-}$
- (b) Explain Zeeman and Stark effect.

(3-30/6) B-3251

P.T.O.

- (c) Explain Trans effect.
- (d) Determine ground state term for Na in Excited state.
- (e) Determine the normal and inverse spinel in the following complexes :
 - (i) FeCr_2O_4
 - (ii) Co_3O_4 .
- (f) Calculate magnetic moment for the following complexes :
 - (i) $[\text{Co}(\text{NH}_3)_6]^{2+}$
 - (ii) $[\text{CoF}_6]^{3-}$
- (g) Define Frank-Condon principle.
- (h) Explain ferromagnetism, ferrimagnetism and anti-ferromagnetism. $8 \times 2 = 16$

Section B

Note : Attempt any five questions. Each question carries 8 marks.

2. Determine the hybridization and geometry in the complexes :
 - (a) $[\text{Mn}(\text{CN})_6]^{4-}$ 8

B-3251

2

- (b) $[\text{Fe}(\text{NO})(\text{H}_2\text{O})_5]^{2+}$
 - (c) $\text{Ni}(\text{CO})_4$
 - (d) $[\text{Cu}(\text{NH}_3)_4]^{2+}$.
3. (a) Explain Spectrochemical series. 2
 - (b) Weak ligands form high spin complexes whereas strong ligands form low spin complexes with 3d transition metal ions. Explain. 6

4. Draw Orgel diagram for $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ and $[\text{CoCl}_4]^{2-}$ complex ions and explain the electronic transitions. 8

5. Explain tetragonal elongation and compression on the basis of Jahn-Teller distortion. 8

6. (a) Define Racah parameter and Nephelauxetic series. 2
- (b) Explain quenching of orbital angular momentum in octahedral field. 6

(3-307) B-3251

3

P.T.O.

Section C

Note : Attempt any two questions. Each question carries 12 marks.

7. (a) What are forbidden and allowed transitions ? Explain. 4

- (b) The three absorption bands for $[\text{CrF}_6]^{3-}$ are observed in an electronic spectrum at 14900 cm^{-1} , 22700 cm^{-1} and 34400 cm^{-1} . Determine the values of B' and Δ_0 . 4

8. (a) Define magnetic susceptibility. 2

- (b) Explain, why $[\text{NiCl}_4]^{2-}$ is paramagnetic whereas $[\text{PdCl}_4]^{2-}$ and $[\text{PtCl}_4]^{2-}$ are diamagnetic. 6

9. Determine the symmetry elements and point groups of the following molecules : 8

- (a) H_2O_2
(b) BF_3
(c) Cl_2O
(d) C_2H_6

B-3251

4

10. (a) Define the following with the help of examples : 6

- (i) Symmetry elements
(ii) Symmetry operations
(iii) Point groups.

- (b) Derive the reducible representation of H_2O molecule using the character table below : 6

	C_{2v}	E	C_2	σ_v	σ_v'
A_1	1	1	1	1	1
A_2	1	1	1	-1	-1
B_1	1	1	-1	1	-1
B_2	1	1	-1	-1	1

11. Explain thermodynamic and kinetic stability of complexes and the factors affecting the stability. 12

(3-30/8) B-3251

5

P.T.O.