BBC-003-1104009 Seat No. _____

M. Sc. (Sem. IV) Examination

June-July - 2021

Inorganic Chemistry

C(I)-403 : Bonding in Complexes

Faculty Code : 003

Subject Code : 1104009

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) Answer any five questions.
(2) All Questions carry equal Marks.

1 Answer the following. **14**

(a) Calculate the spectral term for the Cr^{++} and Cr^{+++} ions.
(b) Calculate the magnetic moment of Ni^{+2} complexes.
(c) Define J-J coupling
(d) What is spin multiplicity
(e) Determine S, M_L, L. M_L. and J in d^3 configuration
(f) Give the use of Tanabe-Sugano diagram
(g) How Racah Parameters can be evaluated?

2 Answer the following. **14**

(a) Define L-S coupling.
(b) What is hole formalism?
(c) Name the Racah Parameters with symbols.
(d) Determine ground spectral term in d^6 configuration
(e) Find out the spectral term for the Fe^{++} and Fe^{+++} ions.
(f) Calculate the magnetic moments of Co^{+2} and Co^{+3}
(g) Define S-S coupling

3 Answer the following. **14**

(a) Find out the ground state terms for d^2, d^9 configurations & calculate total multiplicity for each.
(b) What are Step-up and Step-down operators ? Derive L < 3, -2 >, from L< 3, -1 >

4 Answer the following. 14

(a) Construct the correlation diagram for d^2 in Oh weak field and strong Field.

(b) Explain vibrionic coupling, laporte's forbidden transition, spin multiplicity

5 Answer the following. 14

(a) Show that $< m/x^4+y^4+z^4/m' > = 5/7\ r^4$, when $m = m' \pm 0$

(b) Discuss the Electronic spectra of d^1 and d^9

6 Answer the following. 14

(a) Explain the Tanabe-Sugano diagram for d^4 & d^5 configurations

(b) Show that $P_I\ Cos\ \theta = 1/2\ (5Cos^3\theta - 3\ Cos\theta)$, where I = 3

7 Answer the following. 14

(a) Calculate energy of the integral $< \phi 2\phi 1 \mid Voct \mid \phi 2\phi 1 >$, where $< \phi 1 \mid Voct \mid \phi 1 > = -4Dq$ and $< \phi 2 \mid Voct \mid \phi 2 > = Dq$

(b) Discuss Jahn-Teller effect with suitable example.

8 Answer the following. 14

(a) Explain charge transfer spectra with suitable example.

(b) Discuss the spectrum of $[Cr(H_20)_6]^{+3}$ in detail. Show that how β, B and 10Dq can be determined from the spectra.

9 Answer the following. 14

(a) Derive the formula $Voct = 6Ze^2/a+(X^4+Y^4+Z^4-3/5r^4)$ in Oh field

(b) Explain d- orbital splitting in Tetrahedral field.

10 Answer the following. 14

(a) Explain Orgel diagram for d^2 and d^8

(b) Show that $P_1\ Cos\ \theta = 1/2(5Cos^2\theta - 1)$, where I = 2
