



MBU-003-1104009 Seat No. _____

M. Sc. (Sem. IV) (CBCS) Examination

April / May - 2018

C(I) - 403 : Inorganic Chemistry

(Bonding In Complexes)

Faculty Code : 003

Subject Code : 1104009

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

- Instructions :** (1) All questions are compulsory.
(2) All questions carry equal Marks.

- 1** Answer the following : (Any **Seven**) **14**
- (a) What is hole formalism ?
 - (b) Explain Racah Parameters
 - (c) Draw shape of all the d-orbital on the basis of CFT
 - (d) Determine S, M_L, L, M_L and J in d^2 configuration
 - (e) Write note on laporte selection rules
 - (f) Give the use of correlation diagram
 - (g) Explain the splitting of d-orbital in Square Planer geometry
 - (h) Find out the spectral term for the Co^{++} and Ni^{++} ions
 - (i) Show that $P_I \cos \theta = 1/2(3\cos^2\theta - 1)$, where $I = 2$
 - (j) Explains S-S-coupling
- 2** Answer the following : (Any **Two**) **14**
- (a) Find out the ground state terms for d^3, d^8 configurations and calculate total multiplicity for each.
 - (b) What are Stepup and Stepdown operators?
Derive $L < 3, +2 >$, from $L < 3, +3 >$
 - (c) Write note on Jahn-Teller effect

3 Answer the following : (Any Two) 14

(a) Show that $\langle m/x^4 + y^2 + z^4/m \rangle = 13/21 r^4$, when
 $m = m \pm 2$

(b) Explain the Tanabe–Sugano diagram for d^1 and d^9

(c) Calculate energy of the integral $\langle \phi_2\phi_0 | V_{oct} | \phi_2\phi_0 \rangle$,
where $\langle \phi_0 | V_{oct} | \phi_0 \rangle = 6Dq$ and
 $\langle \phi_2 | V_{oct} | \phi_2 \rangle = Dq$

4 Answer the following : 14

(a) Show that $P_I \cos\theta = 1/8(35 \cos^4\theta - 30 \cos^2\theta + 3)$,
Where $I = 4$

(b) Prove that d^2 ion in a weak octahedral field gives
 $3T_{1g}$ at $-6Dq$, $3T_{2g}$ at $+2Dq$ and $3A_{2g}$ at $+12Dq$

5 Derive the formula $V_{oct} = 6Ze^2/a + (X^4 + Y^4 + Z^4 - 3/5r^4)$ 14

in Oh field.

OR

5 Answer the following : 14

(a) Explain charge transfer spectra

(b) Explain Orgel diagram for d^1 and d^9