



PT-003-1104009

Seat No. _____

M. Sc. (Sem. IV) Examination

August - 2020

Inorganic Chemistry

(C(I) - 403 : Bonding In Complexes)

Faculty Code : 003

Subject Code : 1104009

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

[Total Marks : 70

1 Answer the following : (Any Seven) 14

- What is hole formalism?
- Explain Racah Parameters.
- Draw shapes of all the d -orbitals on the basis of CFT.
- Determine S, M_L, L, M_L and J in d^2 configuration.
- Write note on Laporte selection rules.
- Give the use of correlation diagram.
- Explain the splitting of d -orbital in Square Planar geometry.
- Find out the spectral term for the Co^{++} and Ni^{++} ions.
- Show that $P_I \cos\theta = 1/2(3\cos^2\theta - 1)$, where $I = 2$.
- Explain S-S-coupling.

2 Answer the following : (Any Two) 14

- Find out the ground state terms for d^3, d^8 configurations and calculate total multiplicity for each.
- What are Stepup and Stepdown operators ?
Derive $L < 3, +2 >$, from $L < 3, +3 >$
- Write note on Jahn-Teller effect.

- 3** Answer the following : (Any Two) **14**
- (a) Show that $\langle m/x^4 + y^4 + z^4/m \rangle = 13/21 r^4$, 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 $P_4 \cos \theta = 1/8(35 \cos^4 \theta - 30 \cos^2 \theta + 3)$, 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 $V_{oct} = 6Ze^2/a + (X^4 + Y^4 + Z^4 - 3/5r^4)$ in Oh field. **14**

OR

- 5** Answer the following : (Any Two) **14**
- (a) Explain charge transfer spectra.
- (b) Explain Orgel diagram for d^1 and d^9 .
