



Seat No:

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SARDAR PATEL UNIVERSITY
B.Sc. (SEMESTER-VI) NEW COURSE NEP EXAMINATION 2026
SUBJECT: INORGANIC CHEMISTRY, SUBJECT CODE: US06MACHE01

DATE: 01-04-2026
DAY : WEDNESDAY

TIME: 10:00 A.M. TO 12:30 P.M.
TOTAL MARKS : 50

NOTE: 1. All questions are to be attempted.
2. Figures to the right indicate full marks.

Q.1 ANSWER THE FOLLOWING MULTIPLE CHOICE QUESTIONS: [10]

1. Infinite fold axis of symmetry is present in which type of molecule?
(a) Octahedral (b) Tetrahedral (c) Linear (d) Pyramidal
2. Symbol of Rotation-Reflection is.....
(a) C_n (b) S_n (c) D_n (d) E
3. Which of the following point group is an abelian ?
(a) C_{2h} (b) C_{3v} (c) D_{2d} (d) C_{4v}
4. Distribution of d^7 electrons in strong ligand field octahedral complex is
(a) $t_{2g}^3 e_g^4$ (b) $t_{2g}^5 e_g^2$ (c) $t_{2g}^4 e_g^3$ (d) $t_{2g}^6 e_g^1$
5. CN^- field ligand .
(a) strong (b) weak (c) bidentate (d) octahedral
6. If the displacement occurs in the Y-direction, mathematically these motions can be described by functions of the form $y(x, t) = \dots\dots\dots$
(a) $f(x) d(y)$ (b) $f(x) \phi(t)$ (c) $f(x) \Theta(t)$ (d) $d(y) d(x)$
7. The function on which..... is carried out is often is called an operand.
(a) separation (b) motion (c) transformation (d) operation
8. Which of the following values of λ does not give well behaved wave function ?
(a) Zero (b) Real (c) Negative (d) Positive
9. Which of the following transition is forbidden according to Laporte's rule ?
(a) $d \rightarrow d$ (b) $s \rightarrow p$ (c) gerade $\rightarrow$ ungerade (d) ungerade $\rightarrow$ gerade
10. What is the value of L for D?
(a) 2 (b) 5 (c) 1 (d) 4

[P.T.O]

- Q.2 **ANSWER THE FOLLOWING QUESTIONS:**
- (a) Prove with suitable example, $S_n^n = E$, for $n = \text{even number}$. [05]
- (b) Construct the multiplication table for C_{3v} point group and prove that C_{3v} point group is a "non-abelian" point group. [05]

OR

- Q.2 **ANSWER THE FOLLOWING QUESTIONS:**
- (a) Write a note on D_n and D_{nh} point group. [05]
- (b) Give the symmetry elements and point group present in following molecules: [05]
(i) CH_4 (ii) SF_6 (iii) HCl (iv) SO_2

- Q.3 **ANSWER THE FOLLOWING QUESTIONS:**
- (a) Discuss energy level diagram of $[CoF_6]^{3-}$ ion. [05]
- (b) Discuss the crystal field splitting of d -orbitals in Tetrahedral complexes. [05]

OR

- Q.3 **ANSWER THE FOLLOWING QUESTIONS:**
- (a) Discuss the factors affecting the magnitude of Δ_o . [05]
- (b) Define: Trans effect. Discuss mechanism of trans effect by π -Bonding theory. [05]

- Q.4 **ANSWER THE FOLLOWING QUESTIONS:**
- (a) State the second postulate of quantum mechanics. Explain the Hermitian operator and Unitary operators. [05]
- (b) Write a note on: Normalization and Orthogonality [05]

OR

- Q.4 **ANSWER THE FOLLOWING QUESTIONS:**
- (a) Describe the Interpretation of ψ and Heisenberg's uncertainty principle. [05]
- (b) Calculate the energies of the lowest two quantum states for an electron confined to one dimensional box of $8\text{\AA}$ length and hence calculate the wave length of a radiation emitted in transition of electron from excited state ($n=2$) to the ground state ($n=1$). [05]
Where: $m = 9.108 \times 10^{-28} \text{ gm}$, $h = 6.625 \times 10^{-27} \text{ erg.sec}$, $C = 3 \times 10^{10} \text{ cm/sec}$.
Also sketch the plots of ψ for the electron in these two states.

- Q.5 **ANSWER THE FOLLOWING QUESTIONS:**
- (a) Explain John Teller effect in $[Cu(H_2O)_6]^{+2}$. [05]
- (b) Draw pigeon hole diagram for d^2 configuration and arranged according to their energy level. [05]

OR

- Q.5 **ANSWER THE FOLLOWING QUESTIONS:**
- (a) Explain: Orgel energy diagram of d^1 and d^9 which are opposite to each other. [05]
- (b) Calculate the number of microstates for: (i) p^2 (ii) d^1 (iii) $p^1 d^1$ (vi) 2D [05]

