

SEAT No. _____

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SARDAR PATEL UNIVERSITY

M.Sc (Semester-I) Examination

Monday, 9th April 2018

10:00 AM to 01:00 PM

CHEMISTRY:PS01CCHE21

Electron Spectroscopy and Magneto Chemistry

Note: Figures to the right indicate full marks:

Total marks:70

Q.1 Select the correct option from the following.**[08]**

- Which theory treats the ligand non-bonding electron pair as point charges?
(a) LFT (b) CFT (c) VBT (d) MOT
- According to molecular orbital diagram, the number of non-bonding electrons in $[\text{Co}(\text{NH}_3)_6]^{3+}$ complex is.
(a) Zero (b) Six (c) Two (d) Three
- _____ is first ion in decreasing order of Nephelauxetic series
(a) Oxalate (b) Chloride (c) Fluoride (d) Iodide
- The energy of ${}^3A_{2g}$ state is _____
(a) 12 Dq (b) -6 Dq (c) -12 Dq (d) 6 Dq
- For _____ system orbital contribution dose not observed.
(a) d^1 , Oh, HS (b) d^3 , Td, HS (c) d^4 , Td, LS (d) d^7 Oh, HS
- When _____ the low spin from becomes ground state
(a) $\Delta < P$ (b) $\Delta > P$ (c) $\Delta = P$ (d) $\Delta \leq P$
- Term symbol for Americium is _____
(a) 7F_0 (b) 5I_4 (c) 7F_1 (d) 5I_8
- The complex ion with a CFSE equal to $-12Dq + 3P$ is _____
(a) $[\text{Fe}(\text{CN})_6]^{4-}$ (b) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ (c) $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ (d) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$

Q.2 Answer the following (Any Seven).**[14]**

- LFT is mixing of CFT & MOT. Explain it.
- Explain the splitting of d-orbital's in Oxo-Vanadium (IV) complex.
- The term symbols for d^3 & d^7 configurations are $4F$. Explain it.
- Explain: 90° super exchange for Cr(III).
- Explain the effect of pressure on spin pairing.
- Explain the potential energy curves.
- Draw the Orgel diagram for d^2 & d^3 system.
- What is diamagnetic susceptibility?
- Explain magnetic, volume & gram susceptibility.

Q.3

- (A) Write a note on series which is related to the order of $10Dq$ values. **[06]**
 (B) Derive the terms arising out of d^2 - system and indicate the order of increasing energy of these terms. **[06]**

OR

- (B) Explain the splitting of d- orbitals in trigonal bipyramidal geometry & Octahedral geometry. **[06]**

C.P.T.O.)

Q.4

- (A) Draw and explain the correlation diagram for $[V(en)_3]^{3+}$ complex. [06]
(B) Calculate configuration interaction term(x), crystal field splitting energy, Nephelauxetic ratio, covalent character and Racah parameter for $[Co(H_2O)_6]^{2+}$ complex. [06]
Given $\nu_1 = 810\text{cm}^{-1}$; $\nu_2 = 16000\text{cm}^{-1}$; $\nu_3 = 20,000\text{cm}^{-1}$ & $B_0 = 971\text{cm}^{-1}$

OR

- (B) Illustrate T.S. diagram for d^4 and d^5 systems. & Write down all the possible transitions. [06]

Q.5

- (A) Discuss the Antiferromagnetic exchange path ways. [06]
(B) Derive the Langevin equation. [06]

OR

(B) Answer the following:

1. Calculate Diamagnetic susceptibility correction for Bis (salicylidene) ethylene diamine [03]
Given $\chi_c = -6.0 \times 10^{-6}$ cgs, $\chi_H = -2.93 \times 10^{-6}$ cgs, $\chi_O = -4.6 \times 10^{-6}$ cgs,
 $\chi_{N(\text{outside})} = -5.57 \times 10^{-6}$ cgs
 $\lambda_C = -0.24 \times 10^{-6}$ cgs & $\lambda_{C=N} = +8.15 \times 10^{-6}$ cgs
2. Explain the types of antiferromagnetism. [03]

Q.6

- (A) Derive the Curies – Weiss equation. [06]
(B) Explain spin-orbit coupling in details. [06]

OR

(B) Answer the following:

1. State and prove the Lande interval rule. [03]
2. Explain the electronic spectra of actinide complexes. [03]

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