

SARDAR PATEL UNIVERSITY
M.Sc (Semester-II) Examination
Monday, 18th March 2019
10:00 AM to 01:00 PM
CHEMISTRY:PS02CCHE01
INORGANIC CHEMISTRY - II

Note: Figures to the right indicate full marks:

Total marks:70

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

- Number of revolution per second is known as :
 (a) Angular Frequency (b) Velocity (c) Angular velocity (d) None of these
- According to M. O. diagram, the number of antibonding electrons in $[\text{CoF}_6]^{3-}$ complex is.
 (a) Zero (b) One (c) Two (d) Four
- Which of the following term has lowest energy?
 (a) $4F$ (b) $4G$ (c) $3I$ (d) $2H$
- Which of the following orbital is most stabilized in trigonal prismatic geometry?
 (a) dxz, dyz (b) dx^2-y^2 (c) dxy (d) dz^2
- Which of the following complex has CFSE value $-4 Dq + P$?
 (a) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ (b) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ (c) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ (d) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$
- The canting angle is:
 (a) 0 to 60° (b) 0 to 45° (c) 0 to 15° (d) 0 to 90°
- The ground state term for $[\text{CoCl}_4]^{2-}$ complex is:
 (a) $3A_{2g}$ (b) $4T_{1g}(F)$ (c) $4T_{1g}(P)$ (d) $4A_{2g}$
- In which weak field octahedral System, orbital contribution does not expected?
 (a) $(t_{2g})^2$ (b) $(t_{2g})^1$ (c) $(t_{2g})^5 (eg)^2$ (d) $(t_{2g})^3 (eg)^1$

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

- Explain the crystal field theory.
- Explain the splitting of d-orbitals in Oxo-Vanadium (IV) complex.
- The term symbols for d^4 & d^6 configurations are $5D$. Explain it.
- What is tetragonal elongation and compression?
- Explain the selection rules.
- Explain that $\text{K}_4[\text{Ru}_2\text{OCl}_{10}]$ is diamagnetic in nature.
- Calculate the energy of high spin, low spin, extra CFSE, extra pairing energy for d^5 system.
- Which are the important characteristics of diamagnetic susceptibility?
- Explain the 90° super exchange for $\text{Cr}(\text{III})$.

Q.3

- (A) Write a note on series, which is based on Racah parameter. [06]
 (B) Derive the microstates for the P^2 configuration. Also find out the terms arising from it. [06]
- OR**
- (B) Explain the splitting of d- orbitals in Octahedral & Square planar complexes. [06]

Q.4

- (A) Explain T.S. diagram for $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ complex and Calculate configuration interaction term(x), crystal field splitting energy, Nephelauxetic ratio, covalent character, ionic character and Racah parameter for this complex. [06]

Given $\nu_1 = 7800\text{cm}^{-1}$; $\nu_2 = 12000\text{cm}^{-1}$; $\nu_3 = 24,000\text{cm}^{-1}$ & $B_0 = 1040\text{cm}^{-1}$

- (B) Draw and explain the correlation diagram for $[\text{V}(\text{edta})]^-$ complex. [06]

OR

- (B) **Answer the following:**

1) Draw and explain the T.S. Diagram for $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ complex. [03]

2) Draw and explain the Orgel diagram for d^2 & d^3 system. [03]

Q.5

- (A) Define the magnetic susceptibility and derive the Van vleck equation for magnetic susceptibility. [06]

- (B) Derive the langevin equation for multiple width larger than thermal energy. [06]

OR

- (B) Calculate Diamagnetic susceptibility correction for Bis (salicylidene) ethylene diamine and Aniline. [06]

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

Q.6

- (A) Find out spin orbit coupling constant and also find out λ values for d^1 to d^9 octahedral system for high spin and low spin complexes. [06]

- (B) Derive the equation $\chi = C / T - T_C$. [06]

OR

- (B) **Answer the following:**

1. Write a note on Shift reagent. [03]

2. Discuss the effect of pressure on the high spin – low spin equilibrium and also find out equilibrium constant. [03]

← X →
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