(17) SEAT No._____ Printed pages:2

SARDAR PATEL UNIVERSITY

M.Sc. (SEMESTER-I) EXAMINATION

Tuesday, 19th March 2019

Time: 10:00 a.m. to 1:00 p.m.

CHEMISTRY: PS01CCHE21

Electron spectroscopy and Magneto chemistry

Note: -Figures to the right indicate full marks: **Total marks: 70**

Q.1 Answer the following: **[8]**

1.According to MO diagram the number of non-bonding electrons is $[Co(NH_3)_6]^{3-}$ complex is:

a) Two b) Zero c) Six d) Three

2. In Octahedral complexes the energy of t_{2g} orbital is decreased by.....

a) 6 Dq b) 4 Dq c) 3 Dq d) 2 Dq

3.Which of the following system has similar Orgel diagram?

a) Ti^{+2} and Co^{+2} b) Cr^{+2} and Co^{+2} c) Cu^{+2} and Co^{+3} d) Ti^{+2} and Ni^{+2}

4. The ground state of $[Ti(H_2O)_6]^{+2}$ complex is _____.

a) $^3T_{1g}$ b) $^4T_{1g}$ c) $^3T_{2g}$ d) $^4T_{2g}$

5. The effective magnetic moment value of $[Ni(H_2O)_6]^{2+}$ is...

a) 1.73 B.M. b) 3.87 B.M. c) Zero B.M. d) 2.83 B.M.

6. Which of the following system shows orbital contribution?

a) Td high-spin d^4 system b) Oh high-spin d^5 system

c) Oh low-spin d^8 system d) Td low-spin d^4 system

7. Curies law holds for a ferromagnet at a temperature _____than T_c.

a) < b) ≤ c) > d) ≥

8.The ground state value of J for ^3F term derive from V(III) is:

a) Four b) Two c) Three d) One

Q.2 Attempt any SEVEN of the following: **[14]**

1. Splitting of d-orbital's in oxo-vanadium(IV) complexes.

2.Explain the term whole equivalent with suitable examples.

3. The term symbols for d^4 and d^6 configuration is ^5D. Explain.

4. Specify the M_L, M_S and term symbol for following microstate, $(2^+,1^-)$, $(3^-,2^-)$.

5.Explain Orgel diagram for d^4 and d^6- system.

6. Explain diamagnetic correction and Pascal's constant.

7. Show that effective magnetic moment value Am(III) (z= 95) is zero B.M.

8. Explain the magnetic susceptibility and volume susceptibility.

9. Differentiate ξ and λ. Give the value of λ for high -spin d^1 to d^{10} configurations.

(P.T.O.)

Q.3.A. Derive the microstates for the d^2 complex. Find out the terms arising from it and Indicate the orders of increasing energy of these terms. **[6]**

B. Answer the following: **[6]**

1. Differentiate Spectrochemical series and Nephelauxetic series.
2. On the basis of molecular orbital theory, show that $[CoF_6]^{3-}$ is outer sphere complex.

OR

B. Explain the splitting of d-orbital in TBP & tetrahedral stereochemistry. **[6]**

Q.4.A. Draw and explain the correlation diagram for $[V(H_2O)_6]Cl_3$ complex and show that $^3T_{2g}$ State is lower energy state. **[6]**

B. Answer the following: **[6]**

1. Why Orgel diagram for d^2& d^7 and d^3& d^8 are identical.
2. Differentiate forbidden and allowed transitions giving suitable examples.

OR

B. Explain T.S. diagram for $[Co(H_2O)_6]^{2+}$ complex and calculate the value of electronic Parameters, Dq, %β, β and configuration interaction (x) [Given: ν_1 = 8,100 cm^{-1}, ν_2 = 16,000 cm^{-1},ν_3 = 20,000 cm^{-1} and B_o for Co(II) = 971 cm^{-1}]. **[6]**

Q.5.A. Explain first order Zeeman effect and second Zeemen effect. Derive Van-Vleck Equation for the magnetic susceptibility of the coordination compounds. **[6]**

B.Answer the following: **[6]**

1. Explain the Laporte orbital and spin selection rule.
2. Explain the Antiferromagnetic exchange pathways.

OR

B. Derive the diamagnetic susceptibility equation and find out the diamagnetic correction $\chi_{dia(corr.)}$ for bis(salicylidine)ethylene diamine.[Given: χ_C = -6.0 x 10^{-6}cgs, χ_H = -2.93 x 10^{-6}cgs, χ_O = -4.61 x 10^{-6}cgs, χ_{Nchain} = -5.57 x 10^{-6}cgs, $\lambda_{C=N}$ = 8.15 x 10^{-6}cgs, λ_c = -0.24 x 10^{-6}cgs.] **[6]**

Q.6.A. Explain spin orbit coupling on A, E and T terms. Calculate the effect of spin-orbit coupling on effective magnetic moment value of $[Cr(NCS)_6]^{4-}$complex. [Given: λ = -315 cm^{-1}&Dq = 900 cm^{-1}] **[6]**

B. Derive the term symbols, gyro magnetic ratio and magnetic moment value for the Tb(III) (z = 65), Bk(III) (z = 97), Pu(III) (z = 94) and Cm(III) (z = 96) **[6]**

OR

B. Answer the following: **[6]**

1. State and prove the Lande interval rule.
2. Explain the role of lanthanide complexes in ^1H NMR spectroscopy.

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