MCC/20/M.SC./SEM.-IV/CEM/1

Total pages: 02

PG CBCS

M.Sc. Semester-IV Examination, 2022

CHEMISTRY

PAPER: CEM 402 (SPL PAPER) (ADVANCED INORGANIC CHEMISTRY-I)

Full Marks: 40

Time: 2 Hours

 $4 \times 4 = 16$

RECITYC

ESTD 201

NTRAL

GROUP – A

1. Answer any <u>four</u> questions from the following questions: $2 \times 4 = 8$

- a) The number of f-electron in Eu³⁺ and Am³⁺ is same, but they have different magnetic moment value. Explain.
- b) Discuss the magnetic property of [PdCl₂(PMe₃)₂].
- c) What is meant by magnetically concentrated substances? Give an example.
- d) What is zero field splitting? Cite an example.
- e) Graphically show the effect of temperature on paramagnetic susceptibility of a substance.

f) What are interstitial hydrides? Draw the structure of the cluster [HRu₆ (CO)₁₈],

<u>GROUP - B</u>

- 2. Answer any <u>four</u> questions from the following questions:
 - a) Determine the magnetic susceptibility of dimeric copper(II) acetate dihydrate and relate this value to the number of unpaired electron per copper atom. Given: Molecular weight of $[Cu_2(OAc)_4. 2H_2O]$ is 399.3 gm/mol; χ_{meas} of the sample is 1.30×10^{-3} emu mol⁻¹ at temperature of 296.5K.
 - b) How will you synthesize $[Mo_6Cl_{14}]^{2-}$ ion starting from MoCl₅? Discuss the structure of $[Mo_6Cl_{14}]^{2-}$ anion. 2+2

c) Calculate the χ_D for bipy and PPh₃ compounds by using Pascal's constant.

i. $\chi_D(C_{ring}) = -6.24; \quad \lambda(benzene) = -1.4;$

- ii. $\chi_D(P) = -6.3$; λ (pyridine) and λ (Ar-Ar) = -0.5;
- iii. $\chi_D(N_{ring}) = -4.61;$ $\chi_D(H) = -2.93;$ 2+2

 d) Give an example of metal compound containing M-M quintuple bond and discuss it structure. Write down the synthesis procedure of the compound. 1+2+1

 Between the given two complexes I and II which will shows lower carbonyl stretching frequency? - Explain.

(P.T.O.)



 f) What is meant by multiplet width? What will be the magnetic moment when multiplet width is small in comparison to thermal energy?
 2+2

GROUP - C

3. Answer any <u>two</u> questions from the following questions: $8 \times 2 = 16$

- a) Derive Langevin's theory of diamagnetism. Show that magnetic susceptibility is negative and independent of temperature.
- b) Prove that $\mu_l = \sqrt{l(l+1).\beta}$ where β =Bohr Magneton. Calculate the expected magnetic moment for Nd³⁺. For Sm³⁺(g=2/7) the calculated and experimental magnetic moment is different-Explain. 3+2+3
- c) Calculate the number of metal-metal bond in M₄(CO)₁₂ [M=Co, Rh, Ir] and explain the structures of the above clusters. Explain the metal- metal bonding in [Os₂Cl₈²⁻ cluster. Re₂Cl₈²⁻ is eclipsed while Os₂Cl₈²⁻ is staggered-Explain. (3+3+2)
- d) (i) Use Wades rule to predict the geometry of the cluster core of the following cluster compounds. (i) [Ni₆(CO)₁₂]² (ii) [Os₅C(CO)₁₅]
 2+2
 - (ii) Discuss edge-sharing bioctadra and face-sharing bioctadra geometry in M-M bonded system.
 2+2