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PG (CBCS)

M.SC. Semester-IV Examination, 2021

CHEMISTRY

PAPER: CEM-402

(ADVANCED INORGANIC CHEMISTRY-I)

Full Marks: 40 **Time: 2 Hours**

Answer any FOUR questions from the following: **4 X10=40**

1. (a) Spin angular momentum of electron act just opposite in direction as spin magnetic moment.-Explain.
   (b) Predict A and B in the following scheme of reaction,
   $$Fe(CO)_5 \xrightarrow{NaOH} [A] \xrightarrow{MnO_2} [B]$$
   (c) How does an antiferromagnetic substance differ from a diamagnetic substance?
   (d) The number of f-electron in Eu^{3+} and Am^{3+} is same, but they have different magnetic moment value. Explain. 3+2+3+2
2. (a) What are "Neel" temperature and "Curie" temperature? State the significance of this temperature.
   (b)What is meantby magnetically concentrated substances? Give an example.
   (c) Is $[PdCl_2(PMe_3)]$ diamagnetic or paramagnetic? –Explain 3+4+3
3. (a) How will you synthesize $[Mo_6Cl_{14}]^{2-}$ion starting from $MoCl_5$? Draw the structure of $[Mo_6Cl_{14}]^{2-}$.
   (b) Describe the structure and bonding of $[Re_2Cl_8]^{2-}$ anion, which features a quadruple Re–Re bond. 5+5
4. (a) Calculate the χ_D for bipy and PPh_3 by using Pascal's constant.
   $\chi_D(C_{ring}) = -6.24$; λ(benzene) = –1.4;
   $\chi_D(P) = -6.3$; λ(pyridine) and λ(Ar-Ar) = – 0.5;
   $\chi_D(N_{ring}) = -4.61$; $\chi_D(H) = -2.93$;
   (b) Write short notes on: metal-metal interaction 5+5
5. (a) What is interstitial hydride? Draw the structure of $[Ru_6H(CO)_{18}]^-$.
   (b) Give an example of metal compound containing M-M quintuple bond and synthesized this compound. 5+5
6. (a) Explain antiferromagnetic properties of MnO.
   (b) Determine the paramagnetic susceptibility of dimeric copper(II) acetate hydrate and relate this value to the number of unpaired electron per copper atom.
   Given: Molecular weight of $[Cu_2(OAc)_4(H_2O)]$ is 399.3 gm/mol; χ_{meas} of the sample is 1.30×10^{-3}emumol^{-1}at temperature of 296.5K. 5+5
7. Describe Langevin theory of diamagnetism. Show that magnetic susceptibility value is negative and independent of temperature. 10
8. Show that magnitude of magnetization of a paramagnetic solid is $M(T) = n\mu\tanh\left(\frac{\mu B}{k_B T}\right)$. 10

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