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PG (NEW) CBCS

M.Sc. Semester-IV Examination, 2020

CHEMISTRY

PAPER: CEM 402

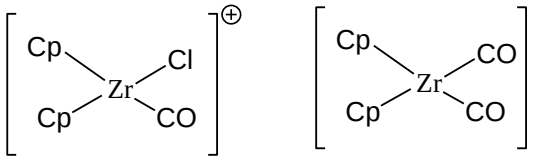
ADVANCED INORGANIC CHEMISTRY-I

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

Answer any one question from the following (within 250words): 40X1=40

1. (a) Spin angular momentum of electron act just opposite in direction as spin magnetic moment - Explain

(b) Between the given two complexes I and II which will show a lower carbonyl stretching frequency? - Explain.



I **II**

(c) Predict A and B in the following scheme of reaction :

$$Fe(CO)_5 \xrightarrow{NaOH} [A] \xrightarrow{MnO_2} [B]$$

2. (a) What are Neel temperature and Curie temperature? State their significance.

(b)What do you mean by "magnetically concentrated substance" ? Give an example.

(c) Is $[PdCl_2(PMe_3)_2]$ diamagnetic or paramagnetic?

3. (a) How will you synthesize $[Mo_6Cl_{14}]^{2-}$ starting from $MoCl_5$? Draw the structure of $[Mo_6Cl_{14}]^{2-}$.

(b) Draw the MO diagram of M-M quadruple bond in $[Mo_6Cl_8]^{4-}$ ion.

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;

$\chi_D(N_{ring}) = -4.61$; χ_D(H) = –2.93;

(b)Write short note on Direct metal-metal interaction.

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.

6. (a) Explain antiferromagnetic properties of MnO.

(b)Determine the paramagnetic 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 $1.30\ x10^{-3}$emu mol^{-1} at temperature of 296.5K.

7. Describe Langevin theory of diamagnetism. Show that magnetic susceptibility is negative and independent of temperature.

8. Show that magnitude of magnetization of a paramagnetic solid is

$$M(T) = n\mu \tanh\left(\frac{\mu B}{k_B T}\right)$$

9. (a) Discuss the 'semi bridging binding mode' of CO in $Fe_2(CO)_7$(4,4'-bipy).

(b) Cite one complex where CO acts as $6e^-$ donor. Show the binding mode of CO in this complex.

10. (a) Show the orbital overlap in 'tetragonal prismatic structure' in a metal-metal species.

(b) Explain the diamagnetic nature of bis(diazoaminobenzenato)copper(II) compound.

11. (a) Show that each Fe atom in $Fe_3(CO)_{12}$ conform to the 18-electron rule.

(b) Explain the subnormal magnetic moment of N-(hydroxyphenyl) salicylideneiminatooxovanadium(IV) compound.

12. (a) How does an antiferromagnetic substance differ from a diamagnetic substance?

(b) The number of f-electron in Eu^{3+} and Am^{3+} is same, but they have different magnetic moment value - Explain.

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