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Second Semester Online Examination, May-June, 2022

M. Sc. CHEMISTRY

Paper I

[Transition Metal Complexes and Diffraction Methods]

Time : Three Hours] [Maximum Marks : 80

Note : *Part A and B of each question in each unit consist of 'very short answer type question' which are to be answered in one or two sentences. Part C 'Short answer type' and D 'Long answer type' of each question should be answered within the word limit mentioned.*

UNIT-I

1. (A) Write the Hund's rule for the determination of ground state. **2**

(B) Draw the orgel diagram for d^1 ion. **2**

(C) What is spin-selection rule ? Explain the Relaxation for spin-selection rule.

(word limit 200-250) **4**

OR

Discuss the metal to ligand to metal and Inter-Ligand transitions.

P.T.O.

(D) Describe the spectra of octahedral complexes of matal ions of d^4, d^6 and d^8 configurations. *(word limit 400-450)* **12**

OR

What is R-S coupling ? Find out the ground state term for d^1 to d^9 configuration ?

UNIT-II

2. (A) What are the ferromagnetic and Antiferromagnetic materials with examples. **2**

(B) Write the curie and Curie-Weiss law equation. **2**

(C) Discuss the orbital magnetic moment for a single electron. *(word limit 200-250)* **4**

OR

What is magnetic anisotropy ? Explain the molecular anisotropy.

(D) What is the Anmalous magnetic moments ? Explain the solute solvent and solute-solute interactions for the anomalous magnetic behaviour.

(word limit 400-450) **12**

OR

What are A, E and T terms ? Discuss the effect of spin orbit coupping on the magnetic moment of an octahedral copper (II) complex [^{2}Eg].

UNIT-III

3. (A) What is X-ray diffraction ? Who proposed it ? **2**

(B) What is Wieft equation ? Also write their extended from. **2**

(C) What is electron diffraction ? Derive the equation $\lambda = \sqrt{\left(\frac{150}{V}\right)} \times 10^{-8}$ cm

(word limit 200-250) **4**

OR

What is Miller Indices. Calculate Miller indices of crystal planes which cut through the crystal axes at.

(i) $2a$, $3b$, c,

(ii) $2a$, $-3b$, $-3c$.

(D) Describe the Rotating and oscillating crystal method to investigate the interal structure of crystals.

(word limit 400-450) **12**

OR

Explain the principle and instrumentation of Davison and Germer electron diffraction. How is it advantageous over X-ray diffraction.

UNIT-IV

4. (A) Name the factors causing neutron diffraction. What its main disadvantage ? **2**

(B) Write the name and molecular formula for Penta and Deca metal carbonyls. **2**

(C) Explain the structure and bonding of Pentaborane-9 and Pentaborane-II.

(word limit 200-250) **4**

OR

What are Dinuclear clusters ? Give the structure and bonding of $[Re_2Cl_8]^{-2}$ and $Mo_2(CH_3COO)_4$.

(D) What are carboranes, metalloboranes and metallocarboranes with suitable examples mention the structure of $[C_2B_9H_{11}]^{-2}$ anion.

(word limit 400-450) **12**

OR

Describe the preparation, properties and structure of heteropoly acids of Molybdenum. Tungsten.

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