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Roll No. -----

MCH-501

Inorganic Chemistry-1

M.Sc. Chemistry (MSCCH-20)

1st Semester Examination June 2022

Time: 2 Hours

Max. Marks: 40

Note : This paper is of Forty (40) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

Section – A

(Long Answer – type questions)

Note: Section 'A' contains Five (05) long-answer-type questions of Ten (10) marks each. Learners are required to answer any two (02) questions only.

[2 x 10 = 20]

Q.1. What is an Orgel diagram? Explain the electronic spectra of d^1 , d^9 , d^2 and d^8 octahedral and tetrahedral complexes with the help of Orgel diagrams.

Q.2. State Hund's rule. Explain how they are useful in ordering of energy level by taking suitable example.

P.T.O.

- Q.3. What is crystal field theory? Explain the spatial orientation of metal d- orbitals and their splitting in an octahedral geometry.
- Q.4. Write down the all possible stereoisomers of $Ma_2b_2c_2$ complex and classify all these isomers for polarity and chirality.
- Q.5. Write short note on
- (a) Dihedral plane
 - (b) Molecules of high symmetry

Section – B

(Short-answer-type questions)

Note: Section 'B' contains Eight (08) short-answer-type questions of Five (05) marks each. Learners are required to answer any Four (04) questions only.

[4 x 5 = 20]

- Q.1. Define symmetry elements and symmetry operations.
- Q.2. What is character table? Draw a character table for C_{3V} point group.

P.T.O.

- Q.3. Construct the molecular orbital diagram for $[\text{CoCl}_4]^{2-}$.
- Q.4. Determine the symmetry point group of the following.
- Benzene
 - $\text{Co}(\text{NH}_3)_4\text{Cl}_2$ (trans)
 - P- Dichlorobenzene
 - BF_3
 - Diborane
- Q.5. What is crystal field stabilization energy (CFSE)? Calculate CFSE for high spin d^4 , d^5 and low spin d^7 , d^8 .
- Q.6. Write about the electronic spectra given by transition metal complexes.
- Q.7. Explain the composite ligand orbitals for σ - bonding in the case of octahedral complexes.
- Q.8. The octahedral complexes formed by Cu^{2+} are distorted. Explain.
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