QC-5231

M. Sc. (Sem. I) Examination,
December, 2023

CHEMISTRY

PAPER - 1.1

CHEM-511

Inorganic Chemistry

Time Allowed : **Three Hours**

Maximum Marks : **70**

Minimum Marks : **28**

Note : *This question paper contains two sections as under :*

SECTION - A

10×2=20

1 (i) Define Bent rule.

(ii) Predict the geometry of moelcule or ion XeF_4, $TeCl_4$, SO_2, IF_5.

(iii) Explain splitting of *d* orbitals in octahedral field.

(iv) What is John-Teller theorem ?

(v) Write relation between stepwise and overall stability constant.

(vi) Explain chelate effect.

(vii) Describe symmetry elements.

(viii) Find out the classes of operation in the following point groups C2v, C3v, D3b, Td

(ix) What is mutual exculsion rule.

(x) What is irreducible representation of point group ?

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SECTION - B

UNIT - I

2 Write short notes on following :

(a) Energetics of hybridization

(b) $d\pi - P\pi$ Bond

5×2=10

OR

Explain the following :

(a) Walsh diagram for any triatomic molecule.

(b) Acid base behaviour of binary oxides.

5×2=10

UNIT - II

3 Explain the bonding in Octahedral complexes with the help of molecular orbital theory.

10

OR

Describe the structure and bonding in η^2 complex with the help of MOT.

10

UNIT - III

4 What are the factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand.

10

OR

Discuss various spectrophotometric methods for determination of stability constant.

10

UNIT - IV

5 Discuss the great orthogonality theorem with its importance.

10

OR

(a) Write short notes on following :

(i) Molecular point group

(ii) Group and sub groups

$$2\frac{1}{2} \times 2 = 5$$

(b) Write down the point group for given molecules with their symmetry elements.
PCl_5, BF_3, C_6H_6, HCl, H_2O_2

5

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UNIT - V

6. (i) Construct character table of C2v point group.

(ii) Relationship between reducible representation and irreducible representation by a suitable example.

5

OR

(i) Write down the symmetry aspects of molecular vibrations of H2O in IR and Raman spectroscopy.

(ii) Formation of hybrid orbital for σ bonding in tetrahedral (CH_4) molecule.

5

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