

M. SC. IN CHEMISTRY /
M. SC. IN ANALYTICAL CHEMISTRY
(MSCCHEM/MSCANCHEM)

Term-End Examination

December, 2025

MCH-011 : INORGANIC CHEMISTRY—I

Time : 2 Hours

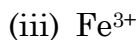
Maximum Marks : 50

Note : (i) *Attempt any five questions.*

(ii) *All questions carry equal marks.*

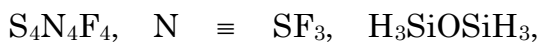
1. (a) Write the valence electron configurations for the following transition metal ions : 5

(i) Ir^{3+}



- (b) (i) Is there a possibility of $p\pi-d\pi$ bonding in the following molecules :

2



Justify your answer.

- (ii) Draw and label all the possible isomers of a square planar complex with formula $[\text{MABCD}]$.

3

2. (a) Write the method along with the reactions to prepare phosphazene polymers. Which type of polymer is used to fabricate artificial blood vessels ? Also, give the reaction to prepare poly (carbophosphazene). 5
- (b) Explain the concept of hapticity with the help of any *three* suitable examples. 5
3. (a) What are metalacycles ? Show any *two* rearrangements that they may have. Give an example of η^2 -vinyls and acyls. 5
- (b) Explain the molecular energy level scheme for carbon monoxide with a suitable diagram. 5

4. (a) With suitable diagrams, explain the *two* models of binding of dioxygen metal complexes. Also give examples where the binding of O_2 in metal complexes are with two metal atoms (any *three*). 5
- (b) Explain why the *bis* (pentahaptocyclopentadienyl) compounds of V, Cr, Co and Ni are all paramagnetic. Give the MO diagram suggested for ferrocene to explain this. 5
5. (a) With the help of Wade's rules, give the structural relationships between *closo*, *nido* and *arachno* boranes. 7
- (b) Explain dative bond in metal clusters with suitable examples. 3

6. (a) Explain with suitable diagrams the crystal field splitting of d -orbitals in a tetragonally distorted field. Explain how square planar complexes are formed. 5
- (b) What are the limitations of crystal field theory? 5
7. (a) Explain the magnetic properties of the first transition series metal ions in both octahedral and tetrahedral complexes. 7
- (b) Give the predicted magnetic exchange for $d^1 - d^1$ and $d^8 - d^8$ systems at 90° as well as 180° exchange. 3

8. (a) While determining term symbols, what are the *four* important points that you should always keep in mind ? 5
- (b) Explain the reaction profiles for intervalence for symmetrical as well as unsymmetrical complexes. 5

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