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NY—09—2023

FACULTY OF SCIENCE

M.Sc. (First Year) (First Semester) EXAMINATION

NOVEMBER/DECEMBER, 2023

(New/CBCS Pattern)

CHEMISTRY

Paper-I (CH-411)

(Inorganic Chemistry)

(Tuesday, 5-12-2023)

Time : 10.00 a.m. to 1.00 p.m.

Time—3 Hours

Maximum Marks—75

N.B. :— (1) *All questions are compulsory.*

(2) *Use of log table and calculator is allowed.*

1. Solve any *three* of the following : 15

- (a) What are labile and inert complexes ? Explain it by using Taube's approach.
- (b) Give the characteristics of substitution, nucleophilic, bimolecular mechanism in ligand substitution reaction.
- (c) How is scanning probe microscopy method used for the characterisation of nanomaterials ?
- (d) Calculate the number of microstates for p^2 and d^2 arrangements.
- (e) Explain spin selection rule for electronic transition in complexes.

2. Solve any *three* of the following : 15

- (a) Write essential requisite for electron transfer reaction.

P.T.O.

- (b) Taube's reaction is the inner-sphere redox reaction. Explain it with suitable example.
- (c) Explain solution based synthesis of nanoparticles.
- (d) Describe Tanabe-Sugano diagram for d^3 complex $[\text{Cr}(\text{NH}_3)_6]^{3-}$.
- (e) Give an account on $d-d$ transition.

3. Solve the following :

- (a) Explain substitution nucleophilic unimolecular conjugate base mechanism. 8

Or

Find out ground state term symbol for d^2 configuration.

- (b) Explain the influence of the bridging ligand on inner sphere electron transfer. 7

Or

Carbon nanotubes dimensionality play a crucial role in determining the properties of materials.

4. Solve the following :

- (a) The electron transfer from $[\text{Fe}(\text{CN})_6]^{4-}$ to $[\text{Fe}(\text{CN})_6]^{3-}$ is very rapid. Explain. 8

Or

Explain Orgel combined energy level diagram for d^1 octahedral and tetrahedral complexes.

- (b) Give an account on DNA and nanomaterials. 7

Or

Give the comparison between charge transition and $d-d$ transition.

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5. Write notes on (any *three*) :

15

- (a) *j-j* coupling
- (b) LMCT
- (c) Anation reaction
- (d) Nanomaterial
- (e) Mixed valence complexes.

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