This question paper contains **3** printed pages]

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 $[Cr(NH_3)_6]^{3-}$.

(*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 $[Fe(CN)_6]^{4-}$ to $[Fe(CN)_6]^{3-}$ 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.

5. Write notes on (any *three*) : 15

(*a*) *j-j* coupling

(*b*) LMCT

(*c*) Anation reaction

(*d*) Nanomaterial

(*e*) Mixed valence complexes.