

CHE 509N / CHE 509

M.Sc. (IInd SEMESTER) EXAMINATION, 2024-25

(CBCS MODE)

CHEMISTRY

(Transition Elements)



5248

Time : Three Hours]

[Maximum Marks : 75

Note: There are **three** sections (A, B and C) and candidate has to attempt questions from all sections. Marks are indicated against each section.

Section-A

1. Answer **all** questions : 5×3=15
- (a) Why is geometrical isomerism not shown by tetrahedral complexes and optical isomerism by square planar complexes ?
- (b) Explain the complementary reactions with suitable examples.
- (c) Give cation-anion ratio in various polyhedr and indicate its importance in deciding the geometries of the complexes.
- (d) How chelation influences the rate of acid hydrolysis in co (III) octahedral complexes?
- (e) What happens when both cis and trans $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ are treated with thiourea ?

Section-B

Note: Answer **all** questions of the following : $4 \times 5 = 20$

2. (a) Give one example of the complex with the following geometries along with type of hybridisation of metal orbitals and structures involved there in –
- (i) Trigonal Pyramidal
 - (ii) Bicapped trigonal prism

Or

- (b) What are the stepwise and over all stability constants ? How are they related ? Describe briefly the pH metric method of determination of stability constants of metal complexes in solution.
3. (a) Distinguish between intermolecular and intramolecular rearrangements in chelate octahedral complexes. Describe one method of resolution of optically active isomers.

Or

- (b) Give a brief description of stereochemical non-rigidity exhibited by metal complexes.

4. (a) Describe briefly the spectrophotometric method for determination of metal complexes in solution.

Or

- (b) How will you determine the composition and stability of the complexes with the help of Job's method ?
5. (a) Discuss the role of metal ions in determining the stability of metal complexes.

Or

- (b) What are the factors affecting the rate of electron transfer reactions ?

Section-C

Note: Answer any **two** questions of the following : $2 \times 20 = 40$

6. What is the symmetry criterion for optical activity? For each of the octahedral complexes given below, derive the number of stereoisomers. Draw the structure of each isomer and sort out the optically active ones.



Where M stands for a metal and lower case letters for monodentate ligands.

7. Why is there no correlation between thermodynamic and kinetic stability terms ? Explain with examples of octahedral and square planar complexes.
8. Interpret that in square planar Pt (II) complexes, the preferred mechanism for substitution is SN^2 . Discuss the factors affecting the rates of reactions in these complexes.
9. With the help of suitable examples, discuss the inner and outer sphere mechanism for electron transfer reactions in coordination complexes.

