

CHE 509

M.Sc. (IInd SEMESTER) EXAMINATION, 2023-24

5248

(CBCS MODE)

CHEMISTRY

Transition Elements



Time : Three Hours]

[Maximum Marks

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 question : 5×3=15
- (a) Give the importance of cation-anion ratio in deciding the geometries of coordination compounds.
- (b) Explain two electron transfer reaction with suitable examples.
- (c) How will you synthesize cis-and trans – $[\text{PtCl}_2(\text{NH}_3)_2]$ starting from $[\text{PtCl}_4]^{2-}$ and $[\text{Pt}(\text{NH}_3)_4]^{2+}$?
- (d) What are step wise and overall stability constants ? Explain.
- (e) Write the use of thiourea to distinguish between cis and trans isomers of $[\text{PtA}_2\text{X}_2]^{n+}$ type complexes.

Section-B

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

2. (a) Give a brief description of stereo chemical non-rigidity exhibited by metal complexes.

Or

- (b) Distinguish between intramolecular and intramolecular mechanism of racemisation in chelate octahedral complexes with example.

3. (a) Derive the number of stereoisomer and draw the structure of each isomer of octahedral Ma_2bcde complex, where M is a metal and a,b,c,d,e are monodentate ligands.

Or

- (b) Explain the reaction mechanism of nucleophilic substitution reaction in square planar Pt(II) complexes.

4. (a) What are the factors affecting the rate of electron transfer reaction ?

Or

- (b) Define trans effect. Use it to suggest preparative routes to the three geometrical isomers of $[Pt(NH_3)(py)ClBr]$ from the reactants $PtCl_4^{2-}$, NH_3 , pyridine and Br. (trans effect : $Br^- > Cl^- > py > NH_3$)

5. (a) Describe the spectrophotometric method of determining the stability constant of metal complexes in solutions.

Or

- (b) "The substitution reactions of octahedral Co(III) complexes appear to occur predominantly by bond breaking reactions". Justify the statement.

Section-C

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

6. Give one example of the complex with following geometrics along with the type of hybridization of metal orbitals and structures involved there in.

- (a) Trigonal pyramidal
- (b) Trigonal prism
- (c) Capped octahedral
- (d) Square planar

7. Write fundamental properties of metal and ligands, which influence the stability of metal complexes ? Describe the pH-metric method of determining the stability constants of metal complexes in solution.

8. What is the symmetry criteria for optical activity ?
What are the method of resolution of optical isomers of anionic, cationic and electrically neutral complexes ?
9. Distinguish between acid hydrolysis and base hydrolysis reactions in octahedral complexes. What are the characteristics of the complexes, which affect the rate of acid hydrolysis reactions ? Explain the mechanism of base hydrolysis of Co(III) complexes.

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