



25050791

QP CODE: 25050791

Reg No :

Name :

MSc DEGREE (CSS) EXAMINATION, DECEMBER 2025**First Semester**

M Sc Industrial Chemistry

Core Courses - CH060101 - INORGANIC CHEMISTRY - I

2020 Admission Onwards

B3940417

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)*Answer any **eight** questions.**Weight 1 each.*

1. What is nephelauxetic series? How is it constructed?
2. Find the ground state term symbol of $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$
3. Define Rache parameters. What is the significance of Rache parameters?
4. What is magnetic moment? How is it expressed?
5. What is spin crossover?
6. Differentiate between labile and inert complexes? Give examples.
7. $[\text{Co}(\text{en})_3]^{3+}$ is more stable than $[\text{Co}(\text{NH}_3)_6]^{3+}$. Give reason.
8. Describe the associative mechanism of substitution reactions in octahedral complexes.
9. Write down Marcus equation and explain the terms.
10. Comment on the electronic configuration of actinides.

(8×1=8 weightage)

Part B (Short Essay/Problems)*Answer any **six** questions.**Weight 2 each.*

11. What are symmetrical and unsymmetrical bidentate ligands? Draw the structures of any two complexes having such ligands.
12. Sketch all of the geometrical isomers possible for square planar complex having the formulas $[\text{MX}_2\text{Y}_2]$, $[\text{MX}_3\text{Y}]$, $[\text{MX}_2\text{YZ}]$, $[\text{MX}_4]$
13. What is linkage isomerism? What are the factors affecting it?





14. What is CFSE? Calculate CFSE value for each of the following tetrahedral complexes.
- $[CoCl_4]^{2-}$
 - $[MnBr_4]^{2-}$
 - $[Zn(OH)_4]^{2-}$
15. Which of the following should have comparatively more intense d-d-transition? Explain.
(a) $trans-[CrCl_2(H_2O)_4]^+$ or $cis-[CrCl_2(H_2O)_4]^+$ (b) $Ni(CO)_4$ or $Fe(CO)_5$
16. Derive the relationship between step-wise formation constants and over-all formation constant of a complex.
17. How are cis- and trans- $[Pt(NH_3)(NO_2)Cl_2]^-$ synthesized from $[PtCl_4]^{2-}$?
18. Comment on the oxidation states and electronic configuration of lanthanides.

(6×2=12 weightage)

Part C (Essay Type Questions)

Answer any **two** questions.

Weight 5 each.

19. Give an account of crystal field theory. Discuss splitting of d orbitals in octahedral, tetrahedral and square planar complexes. List the drawbacks of crystal field theory.
- 20.
- The absorption spectrum of Ti^{3+} (aq) shows a single electronic transition. Explain the transition, position, intensity, and broad nature of this band.
 - Draw Orgel energy diagrams in the octahedral field for d^1 and d^2 electronic systems and suggest all possible electronic transitions.
 - Describe the selection rules for electronic spectra.
21. a. Calculate the spin only magnetic moment value for the following complexes :
- $$[Mn(H_2O)_6]^{2+}, [Fe(H_2O)_6]^{3+}, [FeCl_4]^{2-}$$
- b. What is the similarity in magnetic moment of these complexes? What does this tell you about the geometry of these complexes?
22. (i) Describe the electronic spectra of lanthanide complexes.
(ii) Give an account of the magnetic properties of lanthanide complexes and adiabatic demagnetisation.

(2×5=10 weightage)

