

Roll No.

Total Pages : 04

GSQ/D-20

1062

CHEMISTRY

Paper XV-CH-301

Inorganic Chemistry

Time : Three Hours]

[Maximum Marks : 32

Note : Attempt *Five* questions in all, selecting *two* questions from each Section. Q. No. **1** is compulsory.

Compulsory Question

1. Fill in the blanks :

- (i) $[\text{FeF}_6]^{-3}$ is colourless whereas $[\text{CoF}_6]^{-3}$ is.....
- (ii) CFSE of $[\text{TiF}_6]^{-3}$ is.....
- (iii) In $[\text{Ni}(\text{NH}_3)_6]^{+2}$, Ni is.....hybridised.
- (iv) Configuration of low spin Fe(II) is.....
- (v) Higher the value of β_n ,is the complex.
- (vi) Greater the multiplicity.....is the energy.
- (vii) The term $\log I_0/I$ is known as.....
- (viii) Pt-halogen bond is.....labile than Pt-N bond.

1×8=8

Section A

2. (a) $[\text{Cr}(\text{NH}_3)_6]^{+3}$ is paramagnetic while $[\text{Ni}(\text{CN})_4]^{-2}$ is diamagnetic. Explain, why ? **2**

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- (b) On the basis of 'Crystal field theory', explain why $[\text{Ti}(\text{H}_2\text{O})_6]^{+3}$ is coloured ? 2
- (c) Calculate CFSF for the following ions in coloured complexes : 2
- (i) d^4 strong field
- (ii) d^6 weak field.
3. (a) Predict the number of unpaired electrons in $[\text{Fe}(\text{H}_2\text{O})_6]^{+2}$ and $[\text{Fe}(\text{CN})_6]^{-4}$ and calculate the CFSE for the same. 3
- (b) Which of the following complexes has longer Δ value and why ? 3
- $[\text{Co}(\text{CN})_6]^{-3}$ or $[\text{Co}(\text{NH}_3)_6]^{+3}$.
4. (a) Arrange the following ligands in the decreasing order of trans effect : 1½
- Br^- , NH_3 , Cl^- , H_2O , OH^- .
- (b) Which is more stable complex and why ? 2
- $[\text{Cu}(\text{en})_2]^{+2}$ or $[\text{Cu}(\text{trien})]^{+2}$.
- (c) What is the relation between overall stability constant and stepwise stability constant ? 2½
5. (a) How will you synthesize three isomers of $[\text{Pt}(\text{NH}_3)(\text{Py})(\text{Br})\text{I}]$ starting from $[\text{PtCl}_4]^{-2}$? 3
- (b) What is the basic difference between the terms thermodynamic stability and kinetic stability ? 2
- (c) What are labile complexes ? 1

Section B

6. (a) What is spin magnetic moment ? How does it differ from orbital magnetic moment ? 2
- (b) Calculate in Bohr Magnetron the magnetic moment expected from spin only for the ions : 2
 Cr^{+3} and Fe^{+3}
- (c) Derive the relationship between magnetic susceptibility and magnetic moment. 2
7. (a) What do you understand by the term 'diamagnetic correction' ? 2
- (b) Why does Mn(II) show maximum paramagnetic character amongst the bivalent ions of first transition series ? 2
- (c) Predict which of the following configurations are expected to have orbital contribution in high spin octahedral field ? 2
- (i) d^1 (ii) d^3
(iii) d^6 (iv) d^8
8. (a) Identify the ground state terms for each set of terms :
(i) $^1\text{S}, ^3\text{P}, ^1\text{D}, ^3\text{F}, ^1\text{G}$
(ii) $^1\text{S}, ^3\text{P}, ^1\text{D}$ 2
- (b) Why do tetrahedral complexes of an element give much more intense $d-d$ spectra than its octahedral complexes ? 2

- (c) Draw Orgel diagram for d^1 and d^9 octahedral complexes. 2
9. (a) Write a brief note on L-S coupling. 2
- (b) $[\text{Ti}(\text{H}_2\text{O})_6]^{+3}$ ion is purple in colour as shown by absorption spectrum. Explain the transition, position, intensity and nature of bond. 2
- (c) Calculate number of microstates for p^3 configuration. 2