(ii) $[Fe(CN)_6]^{3-}$ or $[Ru(CN)_6]^{3-}$

(b) Give reasons for the following:

(i) Square planar complexes with coordination number 4 exhibit geometrical isomerism, whereas tetrahedral complexes do not.

(ii) $[Co(NH_3)_5Br]^{2+}$ is optically inactive.

(c) How do charge and size of metal ion affect thermodynamic stability of complexes? (5,5,5)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1455 **I**

Unique Paper Code : 2172523501

Name of the Paper : Coordination Chemistry and its Application in Biological Systems

Name of the Course : **B.Sc. (Prog.) Life Science**

Semester : V

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. Attempt any four questions.
3. All questions carry equal marks

1 (a) Give reasons for the following:

(i) The crystal field splitting in tetrahedral complexes is smaller than that in octahedral complexes.

(ii) 4d and 5d transition metals form low spin complexes.

(b) Give the IUPAC names of the following complexes (any five) :

(i) $K_4[Fe(CN)_6]$

(ii) $[Cr(ONO)(NH_3)_2Br_2H_2O]$

(iii) $[Co(NH_3)_5Cl]Cl_2$

(iv) $Na_2[ZnCl_4]$

(v) $[Pt(py)_4]$ $[PtCl_4]$

(vi) $K_2[OsNCl_5]$

(c) Discuss the mechanism of substitution reactions in square planar complexes. (5,5,5)

(c) Draw the possible isomers for the following complexes :

(i) $[Cr(ox)_3]^{3-}$

(ii) $[CoCl_2(NH_3)_2Br_2]$ (5,5,5)

5. Write short notes on (any three):

(a) Jahn Teller distortion

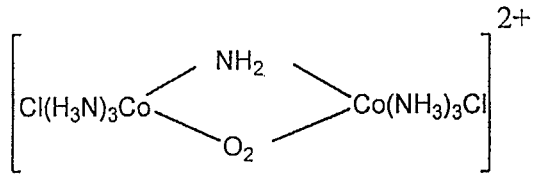
(b) Outer orbital complexes

(c) Bohr's effect in hemoglobin

(d) Limitations of valence bond theory (5,5,5)

6 (a) Which complex in each of the following pairs will have greater crystal field splitting and why?

(i) $[Cr(CN)_6]^{3-}$ or $[Cr(NH_3)_6]^{3+}$



(v) $[Pd(PPh_3)_2(SCN)_2]$ and $[Pd(PPh_3)_2(NCS)_2]$

(5,5,5)

4 (a) Calculate crystal field stabilization energy (CFSE) values for :

(i) d^5 high spin octahedral system and

(ii) d^7 tetrahedral ion in strong field

(b) What is trans effect? Explain the polarization theory of trans effect.

2 (a) On the basis of valence bond theory, answer the following questions for the six-coordinated complex ion : $[Fe(CN)_6]^{3-}$

(i) What is the oxidation state of Fe?

(ii) What type of hybridization is involved?

(iii) Whether the given complex is inner orbital or outer orbital complex?

(iv) What is the magnetic behaviour of the complex ion?

(v) Calculate the value of magnetic moment (spin only).

(b) Write chemical formulae for the following compounds :

(i) Potassium tetrafluroargentate(I)

(ii) Octacarbonyl-u-dicarbonyl diiron(0)

(iii) Sodium dithiosulphatoargentate(I)

(iv) Pentammineazidocobalt(III)sulphate

(v) Dichlorotetraaquachromium(III)nitrate

(c) What are the similarities and differences between hemoglobin and myoglobin? (5,5,5)

3 (a) $[Co(CN)_6]^{4-}$ ion is paramagnetic, while $[Co(CN)_6]^{3-}$ ion is diamagnetic, although both the ions have strong ligands. Explain on the basis of crystal field theory.

(b) The formation of $[Cd(Br)_4]^{2-}$ from $[Cd(H_2O)_6]^{2+}$ exhibit the successive equilibrium constants K_1,

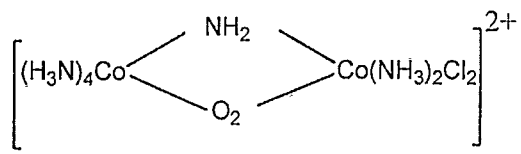
K_2, K_3 and K_4 as 1.56, 0.54, 0.06 and 0.37, respectively. Explain why K_4 is larger than K_3.

(c) Name the type of isomerism exhibited by the following complexes:

(i) $[Co(en)_3][Cr(CN)_6]$ and $[Cr(en)_3][Co(CN)_6]$

(ii) $[Pt(NH_3)_4Br_2]Cl_2$ and $[Pt(NH_3)_4\ Cl_2]\ Br_2$

(iii) $[Co(H_2O)_5Cl]Cl_2.H_2O$ and $[Co(H_2O)_4C1_2]$ $C1.2H_2O$

(iv) 

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