Q1 - 25 July - Shift 1

Consider the following metal complexes :

$[Co(NH_3)]^{3+}$

$[CoCl(NH_3)_5]^{2+}$

$[Co(CN)_6]^{3-}$

$[Co(NH_3)_5(H_2O)]^{3+}$

The spin-only magnetic moment value of the complex that absorbs light with shortest wavelength is B.M. (Nearest integer)

Space for your notes:

Q2 - 25 July - Shift 2

The correct order of energy of absorption for the following metal complexes is

A: $[Ni(en)_3]^{2+}$, B: $[Ni(NH_3)_6]^{2+}$, C: $[Ni(H_2O)_6]^{2+}$

(A) C < B < A

(B) B < C < A

(C) C < A < B

(D) A < C < B

Space for your notes:

Q3 - 26 July - Shift 1

The difference between spin only magnetic moment values of $[Co(H_2O)_6]Cl_2$ and $[Cr(H_2O)_6]Cl_3$ is_____.

Space for your notes:

Q4 - 26 July - Shift 2

The metal complex that is diamagnetic is (Atomic number : Fe, 26; Cu, 29)

(A) $K_3[Cu(CN)_4]$

(B) $K_2[Cu(CN)_4]$

(C) $K_3[Fe(CN)_4]$

(D) $K_4[FeCl_6]$

Space for your notes:

Q5 - 27 July - Shift 1

The conductivity of a solution of complex with formula $CoCl_3(NH_3)_4$ corresponds to 1 : 1 electrolyte, then the primary valency of central metal ion is_____

Space for your notes:

Q6 - 27 July - Shift 2

Low oxidation state of metals in their complexes are common when ligands:

(A) have good π -accepting character

(B) have good σ -donor character

(C) are havind good π -donating ability

(D) are havind poor σ -donating ability

Space for your notes:

Q7 - 27 July - Shift 2

Fe^{3+} cation gives a prussian blue precipitate on addition of potassium ferrocyanide solution due to the formation of:

(A) $[Fe(H_2O)_6]_2[Fe(CN)_6]$

(B) $Fe_2[Fe(CN)_6]_2$

(C) $Fe_3[Fe(OH)_2(CN)_4]_2$

(D) $Fe_4[Fe(CN)_6]_3$

Space for your notes:

Q8 - 27 July - Shift 2

The spin only magnetic moment of the complex present in Fehling's reagent is_____ B.M. (Nearest integer).

Space for your notes:

Q9 - 28 July - Shift 1

Total number of relatively more stable isomer(s) possible for octahedral complex $[Cu(en)_2(SCN)_2]$ will be _____.

Space for your notes:

Q10 - 28 July - Shift 2

Match **List I** with **List II**

	List I (Complex)		**List II (Hybridization)**
A	$Ni(CO)_4$	I	sp^3
B	$[Ni\ (CN)_4]^{2-}$	II	sp^3d^2
C	$[Co\ (CN)_6]^{3-}$	III	d^2sp^3
D	$[CoF_6]^{3-}$	IV	dsp^2

Choose the correct answer from the options given below:

(A) A-IV, B-I, C-III, D-II

(B) A-I. B-IV, C-III, D-II

(C) A-I. B-IV, C-II, D-III

(D) A-IV, B-I, C-II. D-III

Space for your notes:

Q11 - 29 July - Shift 1

$[Fe(CN)_6]^{3-}$ should be an inner orbital complex. Ignoring the pairing energy, the value of crystal field stabilization energy for this complex is (–) _____ Δ_o. (Nearest integer)

Space for your notes:

Q12 - 29 July - Shift 2

Octahedral complexes of copper (II) undergo structural distortion (Jahn-Teller). Which one of the given copper (II) complexes will show the maximum structural distortion ?

(en–ethylenediamine; $H_2N\text{-}CH_2\text{-}CH_2\text{-}NH_2$)

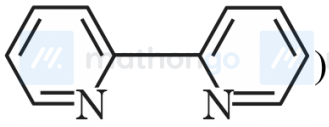
(A) $[Cu(H_2O)_6]SO_4$ (B) $[Cu(en)(H_2O)_4]SO_4$

(C) cis-$[Cu(en)_2Cl_2]$ (D) trans-$[Cu(en)_2Cl_2]$

Space for your notes:

Q13 - 29 July - Shift 2

Sum of oxidation state (magnitude) and coordination number of cobalt in $Na[Co(bpy)Cl_4]$ is__.

(Given bpy = )

Space for your notes:

Answer Key

Q1 (0) **Q2** (A) **Q3** (0) **Q4** (A)

Q5 (3) **Q6** (A) **Q7** (D) **Q8** (2)

Q9 (3) **Q10** (B) **Q11** (2) **Q12** (A)

Q13 (9)

Q1 (0)

$\Delta_0 \propto \frac{1}{\lambda}$

Here, CN^- being SFL will have maximum CFSE

So, $[Co(CN)_6]^{3-}$ will be d^2sp^3, $\mu = 0$

Q2 (A)

Stronger the ligand, larger the splitting & higher the energy of absorption.

$$\underset{(A)}{[Ni(en)_3]^{+2}} > \underset{(B)}{[Ni(NH_3)_6]^{+2}} > \underset{(C)}{[Ni(H_2O)_6]^{+2}}$$

Q3 (0)

$[Co(H_2O)_6]^{2+}$

Co^{+2} :

number of unpaired $e^- = 3$

$\mu = \sqrt{15}BM$

$[Cr(H_2O)_6]^{3+}$

Cr^{+3} :

number of unpaired $e^- = 3$

$\mu = \sqrt{15}BM$

Difference in spin only magnetic moment = 0

Q4 (A)

$K_3[Cu(CN)_4]$

O.N. of copper is Cu^{+1}

$Cu^{+1} = [Ar]3d^{10} \Rightarrow$ Diamagnetic

Q5 (3)

$[Co(NH_3)_4\,Cl_2]Cl$

Primary valency = oxidation no. = +3

Q6 (A)

When metal is in low oxidation state then it forms complexes when ligands have good π -accepting character.

Q7 (D)

$$4Fe^{3+} + 3[Fe(CN)_6]^{-4} \longrightarrow \underset{\text{Prussian Blue}}{Fe_4[Fe(CN)_6]_3}$$

Q8 (2)

Fehling solution is a complex of Cu^{++}

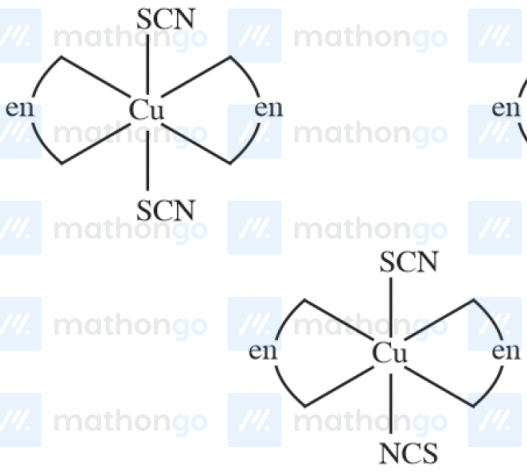
$Cu^{++} = 3d^9$

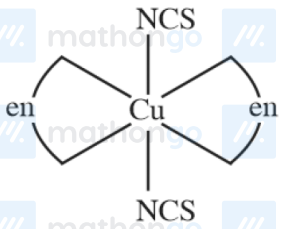
No. of unpaired $e^- = 1$

$M.M = \sqrt{1(1+2)} = \sqrt{3} = 1.73$ BM

Q9 (3)

$[Cu(en)_2(SCN)_2]$





Q10 (B)

$Ni(CO)_4$ Hybridisation sp^3

$[Ni(CN)_4]^{2-}$ Hybridisation dsp^2

$[Co(CN)_6]^{3-}$ Hybridisation d^2sp^3

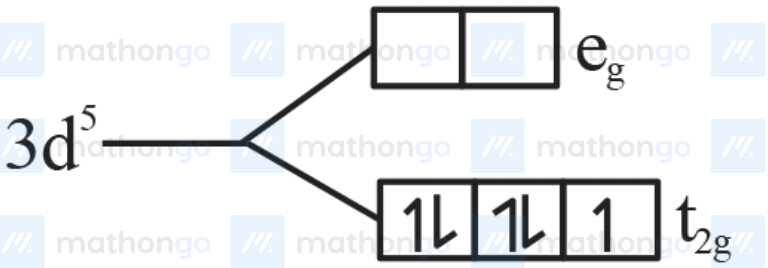
$[Co(F)_6]^{3-}$ Hybridisation sp^3d^2

Q11 (2)

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

CN^- is strong field ligand

Fe^{+3} $3d^5$ $(t_{2g}^5 \quad e_g^0)$



$CFSE = 5\ (-0.4\ \Delta_0) = -2.0\ \Delta_0$

Ans. (2)

Q12 (A)

There is unsymmetric filling of e_g subset of Cu^{+2} ion, while there is symmetrical distribution in t_{2g} set, if the complex has same ligand there will be equal repulsion which leads to symmetrical bond length along t_{2g} , but due to uneven filling of electron in e_g subset, either octahedral will be elongated or compressed.

Q13 (9)

$$\text{Coordination no.} = 6$$

$$\text{Oxidation state} = 3$$

$$6 + 3 = 9$$