Q1 - 24 June - Shift 1

Match List – I with List - II

Space for your notes:

List – I		List – II	
(A)	$[PtCl_4]^{2-}$	**(I)**	sp^3d
(B)	BrF_5	**(II)**	d^2sp^3
(C)	PCl_5	**(III)**	dsp^2
(D)	$[Co(NH_3)_6]^{3+}$	**(IV)**	sp^3d^2

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

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

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

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

Q2 - 24 June - Shift 1

In the cobalt-carbonyl complex: $[Co_2(CO)_8]$, number of Co-Co bonds is "X" and terminal CO ligands is "Y". X + Y = ____

Space for your notes:

Q3 - 24 June - Shift 2

Transition metal complex with highest value of crystal field splitting (Δ_0) will be

(A) $\left[Cr(H_2O)_6\right]^{3+}$ (B) $\left[Mo(H_2O)_6\right]^{3+}$

(C) $\left[Fe(H_2O)_6\right]^{3+}$ (D) $\left[Os(H_2O)_6\right]^{3+}$

Space for your notes:

Q4 - 25 June - Shift 1

White precipitate of AgCl dissolves in aqueous ammonia solution due to formation of :

(A) $[Ag(NH_3)_4]Cl_2$ (B) $[Ag(Cl)_2(NH_3)_2]$

(C) $[Ag(NH_3)_2]Cl$ (D) $[Ag(NH_3)Cl]Cl$

Space for your notes:

Q5 - 25 June - Shift 1

If $[Cu(H_2O)_4]^{2+}$ absorbs a light of wavelength 600 nm for d–d transition, then the value of octahedral crystal field splitting energy for $[Cu(H_2O)_6]^{2+}$ will be _____ $\times 10^{-21}$ J. (Nearest Integer)

(Given : $h = 6.63 \times 10^{-34}$ Js

and $c = 3.08 \times 10^{8}$ ms^{-1})

Space for your notes:

Q6 - 25 June - Shift 2

Amongst $FeCl_3.3H_2O$, $K_3[Fe(CN)_6]$ and $[Co(NH_3)_6]Cl_3$, the spin-only magnetic moment value of the inner-orbital complex that absorbs light at shortest wavelength is _____ B.M. [nearest integer]

Space for your notes:

Q7 - 26 June - Shift 1

Which statement is **not** true with respect to nitrate ion test ?

(A) A dark brown ring is formed at the junction of two solutions.

(B) Ring is formed due to nitroferrous sulphate complex.

(C) The brown complex is $[Fe(H_2O)_5\ (NO)]SO_4$.

(D) Heating the nitrate salt with conc. H_2SO_4, light brown fumes are evolved.

Space for your notes:

Q8 - 26 June - Shift 1

The spin–only magnetic moment value of an octahedral complex among $CoCl_3.4NH_3$, $NiCl_2.6H_2O$ and $PtCl_4.2HCl$, which upon reaction with excess of $AgNO_3$ gives 2 moles of AgCl is _____ B.M. (Nearest Integer)

Space for your notes:

Q9 - 26 June - Shift 2

Reaction of $[Co(H_2O)_6]^{2+}$ with excess ammonia and in the presence of oxygen results into a diamagnetic product. Number of electrons present in t_{2g}–orbitals of the product is _____.

Space for your notes:

Q10 - 27 June - Shift 1

Which of the following will have maximum stabilization due to crystal fild?

(A) $[Ti(H_2O)_6]^{3+}$ (B) $[Co(H_2O)_6]^{2+}$

(C) $[Co(CN)_6]^{3-}$ (D) $[Cu(NH_3)_4]^{2+}$

Space for your notes:

Q11 - 27 June - Shift 2

Arrange the following coordination compounds in the increasing order of magnetic moments. (Atomic numbers: Mn = 25; Fe = 26)

(A) $[FeF_6]^{3-}$

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

(C) $[MnCl_6]^{3-}$ (high spin)

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

(A) A < B < D < C (B) B < D < C < A

(C) A < C < D < B (D) B < D < A < C

Space for your notes:

Q12 - 28 June - Shift 1

Given below are two statements :

Statement I : $[Ni(CN)4]^{2-}$ is square planar and diamagnetic complex. with dsp^2 hybridization for Ni but $[Ni(CO)_4]$ is tetrahedral. paramagnetic and with sp^3-hybridication for Ni.

Statement II: $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$ both have same d-electron configuration have same geometry and are paramagnetic.

In light the above statements. choose the correct answer form the options given below:

(A) Both Statement I and Statement II are true.

(B) Both Statement I and Statement II are false.

(C) Statement I is correct but statement II is false.

(D) Statement I is incorrect but statement II is true.

Space for your notes:

Q13 - 28 June - Shift 1

Number of complexes which will exhibit synergic bonding amongst, $[Cr(CO)_6]$, $[Mn(CO)_5]$ and $[Mn_2(CO)_{10}]$ is _____.

Space for your notes:

Q14 - 28 June - Shift 2

$[Fe(CN)_6]^{4-}$

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

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

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

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

Among the given complexes, number of paramagnetic complexes is _____.

Space for your notes:

Q15 - 28 June - Shift 2

(a) $CoCl_3 \cdot 4\ NH_3$

(b) $CoCl_3 \cdot 5NH_3$

(c) $CoCl_3 \cdot .6NH_3$ and

(d) $CoCl(NO_3)_2 \cdot 5NH_3$

Number of complex(es) which will exist in cis-trans is/are

Space for your notes:

Q16 - 29 June - Shift 2

Given below are two statements .

Statement I : In $CuSO_4.5H_2O$, Cu–O bonds are present.

Statement II : In $CuSO_4.5H_2O$, ligands coordinating with Cu(II) ion are O-and S-based ligands.

In the light of the above statements, choose the correct answer from the options given below

(A) Both Statement I and Statement II are correct

(B) Both Statement I and Statement II are incorrect

(C) Statement I is correct but Statement II is incorrect

(D) Statement I is incorrect but Statement II is correct

Space for your notes:

Q17 - 29 June - Shift 2

Spin only magnetic moment of $[MnBr_6]^{4-}$ is____ B.M. (round off to the closest integer)

Space for your notes:

Answer Key

Q1 (B) **Q2** (7) **Q3** (D) **Q4** (C)

Q5 (745) **Q6** (2) **Q7** (B) **Q8** (3)

Q9 (6) **Q10** (C) **Q11** (B) **Q12** (B)

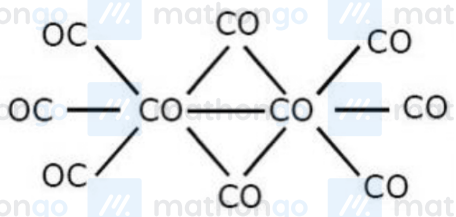
Q13 (3) **Q14** (2) **Q15** (1) **Q16** (C)

Q17 (6)

Q1 (B)

List – I		List – II	
(A)	$[PtCl_4]^{2-}$	(III)	dsp^2
(B)	BrF_5	(IV)	sp^3d^2
(C)	PCl_5	(I)	sp^3d
(D)	$[Co(NH_3)_6]^{3+}$	(II)	d^2sp^3

Q2 (7)



$X = 1$

$Y = 6$

Q3 (D)

CFSE of octahedral complexes with water is greater for 5d series metal centre ion as compared to 3d and 4d series metal centre.

Q4 (C)

$$AgCl + 2NH_3 \rightarrow \underset{\text{soluble}}{[Ag(NH_3)_2]^+Cl^-}$$

Q5 (745)

$$\Delta_t = \frac{hc}{\lambda} = \frac{6.63\times10^{-34}\times3.08\times10^{8}}{600\times10^{-9}}$$

$$= \frac{6.63\times3.08\times10^{-17}}{600}$$

$$= 0.034034\times10^{-17}$$

$$= 340.34\times10^{-21}\,\text{J}$$

$$\Delta_0 = \frac{9}{4}\Delta_t$$

$$= \frac{9}{4}\times340.34\times10^{-21}$$

$$= 765.765\times10^{-21}\,\text{J}$$

$$\approx 766\times10^{-21}\,\text{J}$$

Answer = 766

Q6 (2)

$[Fe(H_2O)_3Cl_3]$, $\underbrace{K_3[Fe(CN)_6], [Co(NH_3)_6]Cl_3}_{\text{inner orbital complexes}}$

$K_3[Fe(CN)_6]$ has more value of Δ_0 than that of $[Co(NH_3)_6]Cl_3$; as $\bar{C}N$ is stronger ligand.

More $\Delta_0 \Rightarrow$ smaller value of absorbed λ

$K_3[Fe(CN)_6]$: Fe^{3+} : $3d^5$ $4s^0$ $4p^0$

1 unpaired e^- d^2sp^3

Spin only magnetic moment (μ) = $\sqrt{3}$ BM

= 1.732 BM

Rounding off $\Rightarrow$ 2

Q7 (B)

Ring is formed due to formation of nitrosoferrous sulphate

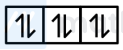
Q8 (3)

$CoCl_3.4NH_3 \rightarrow [Co(NH_3)_4Cl_2]Cl$

$NiCl_2.6H_2O \rightarrow [Ni(H_2O)_6]Cl_2$

$PtCl_4 . 2HCl \rightarrow H_2[PtCl_6]$

$[Ni(H_2O)_6]Cl_2 \xrightarrow{2AgNO_3} 2AgCl\downarrow + [Ni(H_2O)_6](NO_3)_2$



$\mu = \sqrt{2(2+2)}$ B.M = 2.84 BM ≈ 3

Q9 (6)

$[Co(H_2O)_6]^{2+} + NH_3(excess) \rightarrow [Co(NH_3)_6]^{3+} + 6H_2O$

Diamagnetic

↓

Low spin complex

$Co^{3+} \Rightarrow 3d^6\ 4s^0$

$\Rightarrow t_{2g}^6\ e_g^0$

Total number electrons = 6

Q10 (C)

Co^{3+} has maximum effective nuclear charge and CN^- is the strongest ligand in the given options

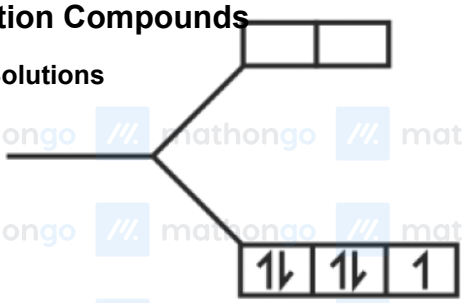
Q11 (B)

(A) $[FeF_6]^{3-}$

$Fe^{+3} \rightarrow 3d^5\ 4s^0$

$n = 5$

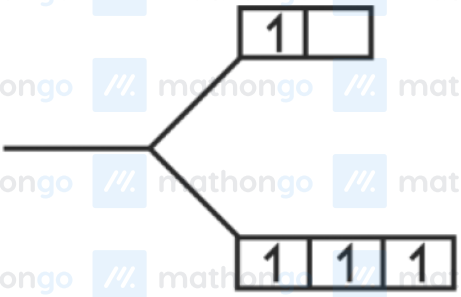
(B) $[Fe(CN)_6]^{3-}$



$Fe^{+3} \rightarrow 3d^5\ 4s^0$

$n = 1$

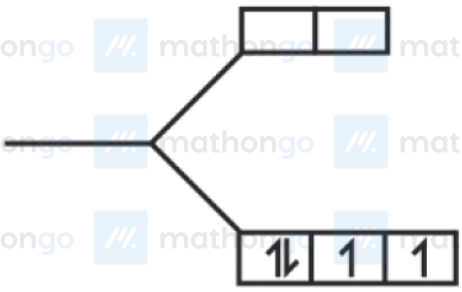
(C) $[MnCl_6]^{3-}$



$Mn^{+3} \rightarrow 3d^4\ 4s^0$

$n = 4$

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



$Mn^{+3} \rightarrow 3d^4\ 4s^0$

$n = 2$

$\mu \Rightarrow A > C > D > B$

Q12 (B)

$[Ni(CN)_4]^{2-}$: d^8 configuration, SFL, sq. planar splitting (dsp^2), diamagnetic.

$[Ni(CO)_4]$: d^{10} config (after excitation), SFL, tetrahedral splitting (sp^3), diamagnetic.

$[NiCl_4]^{2-}$: d^8 config, WFL, tetrahedral splitting (sp^3), paramagnetic(2 unpaired e^-).

Q13 (3)

Carbonyl complex compounds have tendency to show synergic bonding.

Q14 (2)

Sol. $[Fe(CN)_6]^{4-}$ Diamagnetic

$[Fe(CN)_6]^{3-}$ Paramagnetic (1 unpaired electron)

$[Ti(CN)_6]^{3-}$ Paramagnetic (1 unpaired electron)

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

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

Ans. 2

Q15 (1)

(a) $CoCl_3 \cdot 4\ NH_3 = [Co(NH_3)_4\ Cl_2]Cl$

Can exhibit G.I.

(b) $CoCl_3 \cdot 5NH_3 = [Co(NH_3)_5\ Cl]Cl_2$

Can't exhibit G.I.

(c) $CoCl_3 \cdot .6NH_3 = [Co(NH_3)_6]Cl_3$

Can't exhibit G.I.

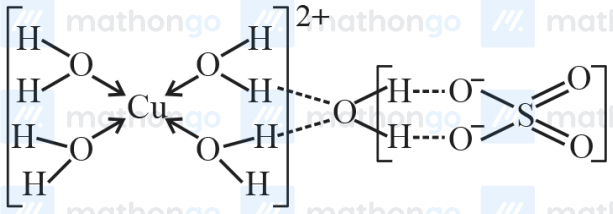
(d) $CoCl(NO_3)_2 \cdot 5NH_3 = [Co(NH_3)_5\ Cl](NO_3)_2$

OR

$= [Co(NH_3)_5\ (NO_3)]Cl(NO_3)$

Both can't exhibit G.I.

Q16 (C)



Q17 (6)

$$Mn^{2+} \rightarrow t_{2g^{111}} e_{g^{11}}$$

$$\mu_s = \sqrt{35}$$

$$= 5.91$$

$$= 6$$