Coordination Compounds

Question1

Which of the following exhibit ionisation isomerism?

I. $[Cr(NH_3)_4Cl_2]Cl$

II. $[Ti(H_2O)_5Cl](NO_3)_2$

III. $[Pt(en)\,(NH_3)Cl]NO_3$

IV. $[Co(NH_3)_4(NO_3)_2]NO_3$

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Options:

A.

II and III only

B.

I and II only

C.

II and IV only

D.

III and IV only

Answer: A

Solution:

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II and III i.e. $[Ti(H_2O)_5Cl](NO_3)_2$ and $[Pt(en)(NH_3)Cl]NO_3$ shows ionisation isomerism.

Ionisation isomerism occur when coordination compound with same empirical formula but different ions in solution are produced.

Question2

The IUPAC name of the complex shown below is $K_3[Co(ox)_3]$

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Options:

A.

tripotassium trioxalatocobaltate (III)

B.

potassium trioxalatecobaltate (III)

C.

potassium trioxalatecobalt (III)

D.

potassium trioxalatocobaltate (III)

Answer: D

Solution:

The correct IUPAC name of the complex $K_3[Co(ox)_3]$ is, potassium trioxalatocobaltate (III)

Question3

The coordination number of chromium in $K[Cr(H_2O)_2(C_2O_4)_2]$ is

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Options:

A.

5

B.

4

C.

6

D.

3

Answer: C

Solution:

To determine the coordination number of chromium (Cr) in the complex $K[Cr(H_2O)_2(C_2O_4)_2]$, we need to identify the ligands and their denticity.

1. **Identify the central metal atom:** The central metal atom is Chromium (Cr).
2. **Identify the ligands:**
   - H_2O (aqua)
   - C_2O_4 (oxalato, derived from oxalic acid, $C_2O_4^{2-}$)
3. **Determine the denticity of each ligand:**
   - H_2O **(water):** This is a monodentate ligand, meaning each water molecule forms one coordinate bond with the central metal atom.
   - $C_2O_4^{2-}$ **(oxalate):** This is a bidentate ligand, meaning each oxalate ion forms two coordinate bonds with the central metal atom, typically through its two oxygen atoms.
4. **Calculate the total number of coordinate bonds:**
   - There are two H_2O ligands. Since each is monodentate, they contribute $2 \times 1 = 2$ coordinate bonds.
   - There are two $C_2O_4^{2-}$ ligands. Since each is bidentate, they contribute $2 \times 2 = 4$ coordinate bonds.
5. **Sum the coordinate bonds to find the coordination number:**

   Coordination number = (bonds from H_2O) + (bonds from $C_2O_4^{2-}$)

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Coordination number = $2 + 4 = 6$

Therefore, the coordination number of chromium in the given complex is 6.

The final answer is $\boxed{6}$.

Question4

Identify the complex ion with spin only magnetic moment of 4.90 BM .

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Options:

A.

$[CO(NH_3)_6]^{3+}$

B.

$[Cr(NH_3)_6]^{3+}$

C.

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

D.

$[MnCl_6]^{3-}$

Answer: D

Solution:

The complex ion $[Mn(Cl)_6]^{3-}$ has a spin-only magnetic moment of 4.90 B.M.

Oxidation State and Electron Configuration:

For Mn in this ion, the oxidation state is +3. This means manganese has lost three electrons.

The electron configuration for Mn^{3+} is $[Ar]\ 3d^4$. This tells us the ion has 4 electrons in the 3d orbitals.

Finding the Magnetic Moment:

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The formula for the spin-only magnetic moment is:

$\mu = \sqrt{n(n+2)}$ B.M.

Here, n is the number of unpaired electrons. For Mn^{3+}, $n = 4$ because there are 4 unpaired electrons in the $3d$ orbitals.

Plug in the value of n:

$\mu = \sqrt{4(4+2)} = \sqrt{24} = 4.90$ B.M.

Question5

In which one of the following complexes the metal ion has $t_{2g}^3 e_g^2$ configuration?

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Options:

A.

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

B.

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

C.

$[Co(NH_3)_6]^{3+}$

D.

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

Answer: A

Solution:

$[Mn(H_2O)_6]^{2+}$ has $t_{2g}^3 e_9^2$ configuration

H_2O is a weak field ligand, means it does not cause pairing of e^-.

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The $3d$ electron will occupy the d-orbital with 5 -single electrons is each orbital. d splits into t_{2g} has 3 electrons and e_g has 2 electrons.

Question6

In $\mathrm{Fe}_x[\mathrm{Fe}_y(\mathrm{CN})_6]_3, x, y$ respectively, are

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Options:

A.

3, 2

B.

4, 1

C.

2, 3

D.

1, 4

Answer: B

Solution:

We are given the compound:

$\mathrm{Fe}_x[\mathrm{Fe}_y(\mathrm{CN})_6]_3$

and asked to find the values of x and y.

Step 1. Identify familiar Prussian blue–type compounds

Prussian blue and related compounds have the general formula:

$\mathrm{Fe}_4[\mathrm{Fe}(\mathrm{CN})_6]_3$

This often corresponds to a mixed-valence compound containing both Fe^{2+} and Fe^{3+} ions.

Step 2. Match with the given general form

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Given formula: $Fe_x[Fe_y(CN)_6]_3$

If we compare:

$Fe_4[Fe(CN)_6]_3$

we identify:

$x = 4, \quad y = 1$

✅ **Answer: Option B (4,1)**

Question7

In which of the following, complex ions are not in correct order with respect to their magnitude of crystal field splitting?

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Options:

A.

$[Fe(H_2O)_6]^{3+} > [FeF_6]^{3-}$

B.

$[Fe(en)_3]^{3+} > [Fe(NCS)_6]^{3-}$

C.

$[Fe(CN)_6]^{4-} > [Fe(H_2O)_6]^{2+}$

D.

$[Fe(H_2O)_6]^{2+} > [Fe(NH_3)_6]^{2+}$

Answer: D

Solution:

Option (d) is incorrect regarding magnitude of crystal field splitting $Fe(NH_3)_6]^{2+} > [Fe(H_2O)_6]^{2+}$

This is because NH_3 is strong ligand than H_2O and strong ligand causes larger splitting of *d*-orbitals.

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Question8

Which of the following complexes exhibit geometrical isomerism?

I. $[Co(en)(NH_3)_2Cl_2]Cl$

II. $[Co(NH_3)_4Cl_2]Cl$

III. $[Co(en)_3, Cl_3$

IV. $[Co(en)_2Cl_2]Br$

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Options:

A.

I, II and III only

B.

II, III and IV only

C.

I, II and IV only

D.

II and III only

Answer: C

Solution:

Complexes given in

I, II and IV exhibit geometrical isomerism

Geometrical isomerism, also called cis-trans isomerism, occurs in coordination complexes when ligands can occupy different position around the central metal ions.

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This is found in square planar and octahedral complex.

Question9

Arrange the following in the increasing order of their magnetic moments

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

II. $[MnCl_6]^{3-}$

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

IV. $[FeF_6]^{3-}$

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Options:

A. III $<$ I $<$ IV $<$ II

B. III $<$ IV $<$ II $<$ I

C. IV $<$ II $<$ I $<$ III

D. III $<$ I $<$ II $<$ IV

Answer: D

Solution:

The increasing order of magnetic moments is:

III $<$ I $<$ II $<$ IV

The magnetic moment is calculated using the formula $\mu = \sqrt{n(n+2)}$ BM, where n is the number of unpaired electrons. The magnetic moment μ is directly proportional to n.

I. $[Mn(CN)_6]^{3-}$:

Oxidation state of Mn: $+3$

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Electron configuration: $[\mathrm{Ar}]3d^4$

CN^- is a strong ligand causing electron pairing.

Mn^{3+} has 2 unpaired electrons, $n = 2$.

$\mu = \sqrt{2(2+2)} = \sqrt{8}\,\mathrm{BM}$

II. $[\mathrm{MnCl_6}]^{3-}$:

Oxidation state of Mn: $+3$

Cl^- is a weak ligand, leading to 4 unpaired electrons.

$n = 4$

$\mu = \sqrt{4(4+2)} = \sqrt{24}\,\mathrm{BM}$

III. $[\mathrm{Fe(CN)_6}]^{3-}$:

Oxidation state of Fe: $+3$

CN^- is a strong ligand causing electron pairing.

Fe^{3+} has 1 unpaired electron, $n = 1$.

$\mu = \sqrt{1(1+2)} = \sqrt{3}\,\mathrm{BM}$

IV. $[\mathrm{FeF_6}]^{3-}$:

Oxidation state of Fe: $+3$

F^- is a weak ligand, so no electron pairing happens.

Fe^{3+} has 5 unpaired electrons, $n = 5$.

$\mu = \sqrt{5(5+2)} = \sqrt{35}\,\mathrm{BM}$

Thus, the correct order based on increasing magnetic moments is III $<$ I $<$ II $<$ IV.

Question10

Which complex among the follwing is most paramagnetic?

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Options:

A. $[\mathrm{Co(NH_3)_6}]^{2+}$

B. $[\mathrm{Co(NH_3)_6}]^{3+}$

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

D. $[Co(H_2O)_6]^{3+}$

Answer: D

Solution:

Paramagnetism is influenced by the magnetic moment, which can be calculated using the formula:

$\mu = \sqrt{n(n+2)}\,\text{BM}$

Here, n represents the number of unpaired electrons in the complex. The larger the value of n, the greater the magnetic moment, and therefore, the stronger the paramagnetic behavior.

Let's evaluate each complex:

$[Co(NH_3)_6]^{2+}$:

Cobalt is in the +2 oxidation state. With NH_3 as a strong ligand, it leaves one unpaired electron.

$[Co(NH_3)_6]^{3+}$:

Cobalt is in the +3 oxidation state. Since NH_3 is a strong ligand, all electrons are paired, making it diamagnetic.

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

Cobalt is in the +2 oxidation state. With H_2O as a weak ligand, electron pairing does not occur, resulting in 3 unpaired electrons.

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

Cobalt is in the +3 oxidation state. It has 4 unpaired electrons.

Thus, $[Co(H_2O)_6]^{3+}$ exhibits the highest degree of paramagnetism due to having the most unpaired electrons.

Question11

Match the complexes in List-I with their hybridisation in list-II.

List-I (Complex)		List-II (Hybridisation)	
I	$Ni(CO)_4$	A	sp^3d^2
II	$[Ni(CN)_4]^{2-}$	B	d^2sp^3

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List-I (Complex)		List-II (Hybridisation)	
III	$[Co(NH_3)_6]^{3+}$	C	dsp^2
IV	$[CoF_6]^{3-}$	D	sp^3

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Options:

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

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

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

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

Answer: C

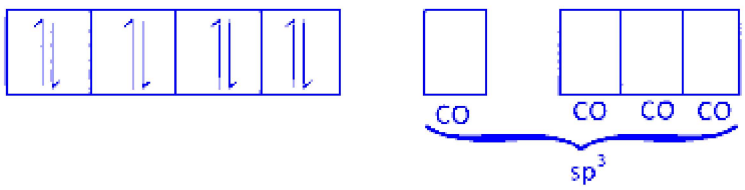
Solution:

The correct match is I-D, II-C, III-B, IV-A.

I. $[Ni(CO)_4] \rightarrow$ Oxidation state of Ni $= 0$

Electronic configuration $= [Ar]3d^8 4s^2$

As CO is strong ligand, pairing wiII occur



$II. [Ni(CN)_4]^{2-} \longrightarrow$ Oxidation state of Ni $= +2$
$Ni^{2+} = [Ar]3d^8 4s^0$

As CN is strong ligand, pairing will occur, leaving one d-orbital empty Hvbridisation $= dsp^2$

$III. [Co(NH_3)_6]^{3+} \longrightarrow$ Oxidation state of Co $= +3$
$Co^{3+} = [Ar]3d^6$

As NH_3 is a strong ligand, $3d$ electron pair up leaving $2d$-orbital empty.

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Hybridisation $= d^2sp^3$

IV. $[COF_6]^{3-} \longrightarrow$ Oxidation state of Co $= +3$

As F is weak ligand, thus pairing of d-orbital electron is not happened.

$Co^{3+} = [Ar]3d^6$

Hybridisation $= sp^3d^2$

Question12

Cobalt (III) chloride forms a green coloured complex ' X ' with NH_3 . Number of moles of AgCl formed when excess of $AgNO_3$ solution is added to 100 mL of 1 M solution of ' X ' is

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Options:

A. 0.3

B. 0.2

C. 0.1

D. 1

Answer: C

Solution:

The coordination compound with the empirical formula $CoCl_3 \cdot 4NH_3$ forms a green isomeric complex with cobalt (III) chloride and ammonia, in a 1:1 ratio (acting as an electrolyte). The molecular formula of this complex is $[CoCl_2(NH_3)_4]^+Cl^-$, denoted as $[X]$.

When this complex reacts with silver nitrate ($AgNO_3$), the following equation represents the reaction:

$$[CoCl_2(NH_3)_4]^+Cl^-(aq) + Ag^+NO_3^-(aq) \rightarrow AgCl(s) + [CoCl_2(NH_3)_4]NO_3(aq)$$

Initially, 0.1 moles of the complex $[X]$ are present in a 100 mL solution, calculated as follows:

Given: $\frac{100 \times 1}{1000}$ mol $= 0.1$ mol

Therefore, for the reaction:

0.1 mol of $[X]$ is consumed,

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0.1 mol of $AgNO_3$ is used,

0.1 mol of AgCl is formed.

This reflects a stoichiometric conversion of reactants to products, where 0.1 mol of AgCl is precipitated as solid.

Question13

Improve silver ore $+CN^- + H_2O \xrightarrow{O_2} [X]^- + OH^-$

$[X]^- + Zn \longrightarrow [Y]^{2-} + Ag$ (pure)

The co-ordination numbers of the metals in $[X]$. [Y] are respectively

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Options:

A. 3,4

B. 1,4

C. 4,2

D. 2,4

Answer: D

Solution:

The complete reaction is a follows

$$2Ag + 4CN^- + H_2O \xrightarrow{[O_2]} \underset{\text{Product X}}{[Ag(CN)_2]^-} + 2OH^-$$

$$[Ag(CN)_2]^- + Zn \longrightarrow \underset{\text{Product Y}}{[Zn(CN)_4]^{2-}} + Ag$$

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Coordination number
$[Ag(CN)_2]^- = 2$
$[Zn(CN)_4]^{2-} = 4$

Question14

How many of the following ligands are stronger than

H_2O ?
$S^{2-}, Br^-, C_2O_4^{2-}, CN^-$, en, NH_3, CO, OH^-

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Options:

A. 5

B. 3

C. 4

D. 6

Answer: C

Solution:

Strong ligands are those ligands that produce large spliting between the *d*-orbitals and form low spin complex. Order of ligands is,

$Br^- < S^{2-} < OH^- < C_2O_4^- < H_2O < NH_3$
$< en < CN^- < CO.$

Hence, total of 4 ligands are stronger than H_2O.

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Question15

Arrange the following in the increasing order of number of unpaired electrons present in the central metal ion

I. $[MnCl_6]^{3-}$

II. $[FeF_6]^{3-}$

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

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

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Options:

A. IV < I < III < II

B. I < III < II < IV

C. IV < III < I < II

D. I < II < III < IV

Answer: C

Solution:

The correct order of number of unpaired electron is

$[Fe(CN)_6]^{3-} < [Mn(CN)_6]^{3-} < [MnCl_6]^{3-} < [FeF_6]^{3-}$

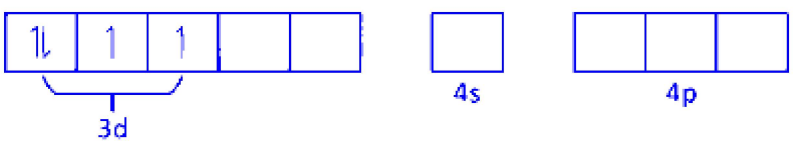
i.e., IV < III < I < II

IV. $[Fe(CN)_6]^{3-} \rightarrow$ The central atom has +3 oxidation state. $Fe^{3+} = [Ar]3d^5$

As CN^- is strong ligand, pairing of electron will occur it has only 1 unpaired electron. $\left(t_{2g}^{221} e_g^0\right)$

III. $[Mn(CN)_6]^{3-} \rightarrow$ The central atom has 3 oxidation state.

$Mn^{3+} = [Ar]3d^4$



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2 unpaired electrons are present.

I. $[MnCl_6]^{3-} \rightarrow$ Oxidation state of central atom is +3 .

$Mn^{3+} = [Ar]3d^4$

As Cl^- is weak ligand, pairing of electron will not happen and therefore number of unpaired electrons $= 4$

II. $[FeF_6]^{3-} \rightarrow$ Central atom has +3 oxidation state.

F^- is a weak ligand, hence no pairing of electron happens. Hence, number of unpaired electron is 5 .

Question16

The paramagnetic complex ion, which has no unpaired electrons in t_{2g} orbitals is

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Options:

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

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

C. $[Zn(NH_3)_6]^{2+}$

D. $[Ni(NH_3)_6]^{2+}$

Answer: D

Solution:

In the complex ion $[Ni(NH_3)_6]^{2+}$, the central nickel atom is in the +2 oxidation state, giving it an electronic configuration of $3d^8$. Ammonia, being a strong ligand, causes the electrons to pair up in the t_{2g} orbitals rather than occupying the e_g level.

Therefore, the outer electronic configuration becomes $t_{2g}^6 e_g^2$. Since all electrons in the t_{2g} orbitals are paired, there are no unpaired electrons in these orbitals.

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Question17

The spin only magnetic moments of the complexes $[\mathrm{Mn(CN)_6}]^{3-}$ and $[\mathrm{Co(C_2O_4)_3}]^{3-}$ are respectively.

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Options:

A. $2.84\mathrm{BM}, 0\mathrm{BM}$

B. $0\mathrm{BM}, 2.84\mathrm{BM}$

C. $0\mathrm{BM}, 3.87\mathrm{BM}$

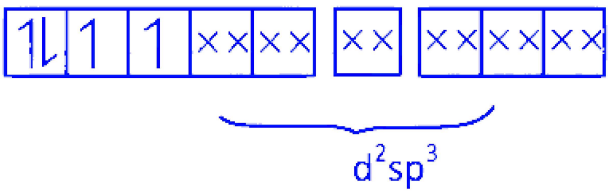
D. $5.92\mathrm{BM}, 2.84\mathrm{BM}$

Answer: A

Solution:

Complex $[\mathrm{Mn(CN)_6}]^{3-}$, oxidation state of $\mathrm{Mn} = +3$

Mn^{3+} : $[\mathrm{Ar}]3d^4 4s^0$



It has 2 unpaired electrons.

Spin only magnetic moment is given by

$$\mu_s = \sqrt{n(n+2)}$$

$$\Rightarrow \mu_s = \sqrt{2(2+2)} = \sqrt{8} \text{ or } \mu_s = 2.84\mathrm{BM}$$

For complex, $[\mathrm{Co(C_2O_4)_3}]^{3-}$, oxidation state of $\mathrm{Co} = +3$

$\mathrm{Co}^{3+} = 1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$

Since oxalate is a strong field ligand, pairing will occur. There is no unpaired electrons ($n = 0$).

Hence, $\mu_s = 0$

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Question18

An element 'X' with the atomic number 13 forms a complex of the type $[\mathrm{XCl}(\mathrm{H_2O})_5]^{2+}$. The covalency and oxidation state of X in it are respectively

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Options:

A. $5, +2$

B. $6, +2$

C. $5, +3$

D. $6, +3$

Answer: D

Solution:

Element 'X' is forming a complex of the type $[X\mathrm{Cl}(\mathrm{H_2O})_5]^{2+}$.

Total number of ligands attached to X is 6 (one Cl and five $\mathrm{H_2O}$).

$\therefore$ Covalency of X is 6.

Cl is a unidentate ligand with charge -1.

$\mathrm{H_2O}$ is a unidentate ligand with charge 0.

$$\begin{aligned} x + (-1) + 0 &= +2 \\ x - 1 &= +2 \\ x = +2 + 1 &= +3 \end{aligned}$$

$\therefore$ Oxidation state of x is +3.

Question19

Identify the species, which does not exist?

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Options:

A. $[SiF_6]^{2-}$

B. $[SiCl_6]^{2-}$

C. $[GeCl_6]^{2-}$

D. $[Sn(OH)_6]^{2-}$

Answer: B

Solution:

Presence of vacant *d*-orbitals in Si, Ge and Sn , makes the existence of species $[SiF_6]^{2-}$, $[GeCl_6]^{2-}$ and $[Sn(OH)_6]^{2-}$ feasible. But $[SiCl_6]^{2-}$ cannot exist as six large Cl^- cannot be accommodated around Si^{4+} ion due to smaller size of cation.

Question20

The homoleptic complex in the following is

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Options:

A. $[Co(NH_3)_4Br_2]^{\oplus}$

B. $[Co\,(C_2O_4)(NH_3)_4]^{\oplus}$

C. $[CO(NH_3)_6]^{3\oplus}$

D. $[Co(CN)_4Cl_2]^{\ominus}$

Answer: C

Solution:

Homoleptic complexes are the complexes in which all the ligands attached to central metal atom/ion are same or identical.

$\therefore$ $Co(NH_3)_6]^{3+}$ is a homoleptic complex whereas other complexes are not.

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Question21

The crystal field theory is successful in explaining which of the following?

I. Ligands as point charges.

II. Formation and structures of complexes.

III. Colour.

IV. Magnetic properties.

V. Covalent character of metal-ligand bonding.

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Options:

A. I, II, III only

B. II, III, IV only

C. III, IV, V only

D. II, IV, V only

Answer: B

Solution:

Crystal field theory considered ligands as point charges but does not explain it. But, it explain the formation and structure of the complexes, colour and their magnetic properties. Covalent character of metal-ligand bonding was not explained. It considered them as point charges. Thus, explaining ionic character only.Thus, CFFT explained II, III and IV statements only.

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Question22

Which of the following is correct related to the colours of $TiCl_3(X)$ and $[Ti(H_2O)_6]Cl_3(Y)$?

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Options:

A. $X =$ colourless $Y =$ coloured

B. $X =$ colouored $Y =$ coloured

C. $X =$ colourless $Y =$ colourless

D. $X =$ coloured $Y =$ colourless

Answer: A

Solution:

Oxidation state of Ti in $TiCl_3$ is +3. Electronic configuration is [Ar] $3d^1 4s^\circ$. In absence of ligands, no splitting occurs, in *d*-orbitals of Ti^{3+} ions. So, no transitions are possible. Hence, $TiCl_3$ is colourless.Oxidation state of Ti in $[Ti(H_2O)_6]Cl_3$ is + 3. In presence of a ligand, splitting in *d*-orbitals occur. Hence, $[Ti(H_2O)_6]Cl_3$ is coloured.

$TiCl_3(X) \longrightarrow$ colourless

$[Ti(H_2O)_6]Cl_3(Y) \longrightarrow$ coloured

Question23

AlF_3 is soluble in HF only in the presence of KF due to formation of

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Options:

A. AlH_3

B. $[AlH_6]^{3-}$

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C. $[AlF_6]^{3-}$

D. $K[AlF_3H]$

Answer: C

Solution:

$$\underset{\text{Aluminium trifluoride}}{AlF_3(s)} \xrightarrow{HF} AlF_3(HF) \xrightarrow{KF} \underset{\text{Potassium hexafluorido aluminate (III)}}{K_3(AlF_6)}$$

AlF_3 is soluble in HF only in presence of KF. It is due to formation of $K_3[AlF_6]$.

AlF_3 is insoluble in anhydrous HF because F^- ion is not available for H-bonding.

Question24

Potassium cyanide is made alkaline withNaOH and boiled with thiosulphate ions.The solution is cooled and acidified with HCland this solution with iron (III) chlorideproduces

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Options:

A. prussian blue colour solution

B. blood red colour solution

C. dark brown colour solution

D. green colour solution

Answer: B

Solution:

$$KCN \xrightarrow[S_2O_3^{2-}]{NaOH} \underset{\text{Potassium thiocyanate}}{KSCN}$$

$$FeCl_3 + 3KSCN \rightarrow \underset{\text{Blood red colour}}{Fe(SCN)_3} + 3KCl$$

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Reaction of $FeCl_3$ with KSCN gives a blood red solution.

Question25

Which of the following complexes formed by nickel is tetrahedral and paramagnetic?

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Options:

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

B. $[Ni(CO)_4]$

C. $[Ni(Cl)_4]^{2-}$

D. $[Ni(NH_3)_6]^{2+}$

Answer: C

Solution:

(a)

$[Ni(CN)_4]^{2-}$
$Ni^{+2} = 3d^8$
2 unpaired electrons are present. So,
$\therefore$ Nature = paramagnetic
Shape $=$ square planar

(b)

$[Ni(CO)_4]$
$Ni = 3d^8 4s^2$
Shape $=$ tetrahedral

As CO is strong ligand, it causes pairing of electrons, therefore nature is diamagnetic.

(c)

$[Ni(Cl)_4]^{2-}$
$Ni^{2+} = 3d^8$
Shape $=$ tetrahedral

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As Cl^- is weak ligand, no pairing occurs therefore, nature is paramagnetic.

(d)

$[Ni(NH_3)_6]^{2+}$
$Ni^{2+} = 3d^8 4s^0$

Shape = octahedral and nature is paramagnetic.

Question26

What is coordination number of the metal in $[Co(en)_2Cl_2]^{2+}$?

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Options:

A. 3

B. 4

C. 5

D. 6

Answer: D

Solution:

Coordination number is defined as number ofcoordinate bonds of central metal atom with theligand. Here, en is bidentate ligand and Cl^- ismonodentate ligand.

In the given complex, Co binds with two abidentate ligand en ($2 \times 2 = 4$) and twomonodentate ligand ($2 \times 1 = 2$).

$\therefore$ Its coordination number is, $4 + 2 = 6$.

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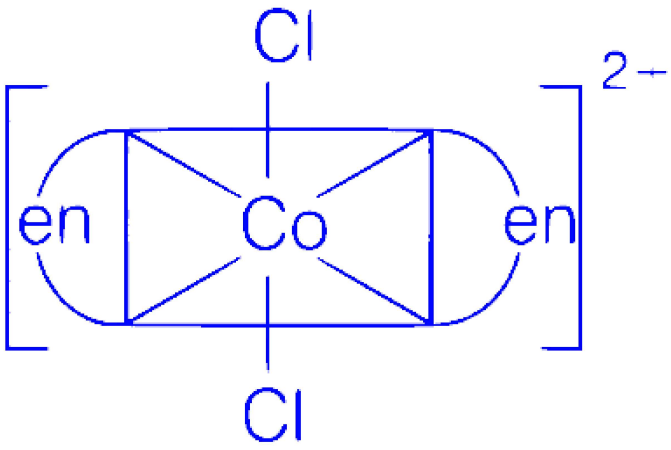

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