DPP-04

SOLUTIONS

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1. Different complex ions have the same molecular formula. Ligands are interchanged between the complex cation and complex anion. These types of complexes are called coordination isomers.

In $[Pt(NH_3)_4][CuCl_4]$, ammonia ligands are attached to Pt metal and chloride ligands are attached to Cu metal.

In $[Cu(NH_3)_4][PtCl_4]$, ammonia ligands are attached to Cu metal and chloride ligands are attached to Pt metal.

2. The correct option is D No isomerism

Pentaamminesulphatocobalt (III) bromide is $[Co(SO_4)(NH_3)_5]Br$ and

Pentaamminesulphatocobalt (III) chloride is $[Co(SO_4)(NH_3)_5]Cl$.

The two compounds have different counter ion attached to it so its molecular mass will be different. Hence, they doesnot show any isomerism relationship.

3. Coordination isomerism occurs in compounds containing complex anionic and cationic parts and can be viewed as the interchange of one or more ligands between the cationic complex ion and the anionic complex ion. For example, $[Co(NH_3)_6][Cr(CN)_6]$ is a coordination isomer with $[Cr(NH_3)_6][Co(CN)_6]$.

4. $[Cr(NH_3)_2(H_2O)_2Cl_2]+$ can exhibit geometrical isomerism and because it's not symmetric it will also exhibit optical isomerism.

5. The complex $[Co(en)_3][Cr(C_2O_4)_3]$ has four possible coordination isomers. They are

$[Co(en)_3][Cr(C_2O_4)_3]$, $[Co(C_2O_4)(en)_2][Cr(C_2O_4)_2(en)]$,

$[Cr(C_2O_4)(en)_2][Co(C_2O_4)2(en)]$, $[Cr(en)_3][Co(C_2O_4)_3]$.

The complex $[Cu(NH_3)_4][CuCl_4]$ has two possible coordination isomers. They are

$[Cu(NH_3)_4][CuCl_4]$,

$[CuCl(NH_3)_3][CuCl_3(NH_3)]$.

The complex $[Fe(en)_3][Co(NO_2)_6]$ has four possible coordination isomers

$[Fe(en)_3][Co(NO_2)_6]$

$[Fe(en_2)_2(NO_2)_2]^{+1}[Co\ en(NO_2)_4]^{-1}$

$[Fe\ en(NO_2)_4]^{-1}[Co\ en_2(NO_2)_2]^{+1}$

$[Fe(NO_2)_6]^{-3}[Co(en)_3]^{+3}$

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6. Exhibits linkage isomerism as it has ambidentate ligand, NO_2

7. Correct option is B

$[Cr(NH_3)_5Br]Cl$ and $[Cr(NH_3)_5Cl]Br$ can be distinguished by $AgNO_3$ and isomerism shown is ionisation isomerism.

$AgNO_3$ reacts with Cl - atom in the outer coordination sphere to form white precipitate of AgCl. When Br - is in the outer coordination sphere, a pale-yellow precipitate of AgBr forms.

8. Pentaamminenitrito-N-chromium (III) tetrachlorozincate(II) is the IUPAC name for the compound Cr(NO) (II). N denotes that the nitro group is connected to the metal atom via the N atom.

Because nitro ligand is an ambidentate ligand with two donor atoms, linkage isomerism is possible.

It possesses coordination isomers. The coordination isomers are as follows:

$[CrCl(NH_3)_5][ZnCl_3(NO_2)]$, $[CrCl_2(NH_3)_4][ZnCl_2(NO_2)NH_3]$ and $[Zn(NO_2)(NH_3)_3][CrCl_4(NH_3)_2]$.

So, option B is correct answer.

9. (a) $Fe_2(NO_2)_6(NH_3)_6$

$\rightarrow Fe(NO_2)_3(NH_3)_3$

(b) $Fe_3(NO_2)_9(NH_3)_9$

$Fe(NO_2)_3(NH_3)_3$

(c) $Fe_3(NO_2)_9(NH_3)_9$

$Fe(NO_2)_3(NH_3)_3$

(d) $Fe_2(NO_2)_6(NH_3)_6$

$\rightarrow Fe(NO_2)_3(NH_3)_3$

10. **(i)** $[Pt\ Cl_2(NH_3)_4][Pt(SCN)_4]$

(ii) $[Pt\ Cl(NH_3)_4SCN][Pt(SCN)_3Cl]$

(iii) $[Pt(NH_3)_4(SCN)_2][Pt(SCN)_2Cl_2]$

(iv) $[Pt\ SCN(NH_3)_3Cl_2][Pt(SCN)_3NH_3]$

(v) $[Pt(SCN)_2(NH_3)_2Cl_2][Pt(SCN)_2(NH_3)_2]$

(vi) $[Pt\ Cl(NH_3)_3(SCN)_2][Pt(SCN)_2Cl\ NH_3]$

(vii) $[Pt\ Cl(NH_3)_2(SCN)_3][Pt(NH_3)_2Cl\ SCN]$

(viii) $[Pt\ Cl\ NH_3\ (SCN)_4][Pt\ (NH_3)_3Cl]$