

- Alfred Werner, one of the founders of the field of coordination chemistry, prepared a series of platinum complexes that contained ammonia and chloride ions. One of these had the empirical formula $\text{PtCl}_4 \cdot 4\text{NH}_3$ and when reacted with silver nitrate released two chloride ions per formula unit. Write the structural formula of this compound and write the name of this compound.

Marks
5

Ag^+ will react with uncoordinated Cl^- to form AgCl(s) . As it reacts with two Cl^- ions per formula unit, there must be 2Cl^- counter ions.

The remaining 2Cl^- ions and the 4NH_3 molecules are coordinated to the metal.

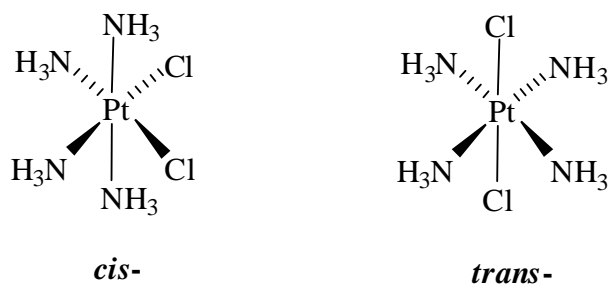
The oxidation number of the metal is +IV. The complex ion is thus $[\text{PtCl}_2(\text{NH}_3)_4]^{2+}$.

The coordination compound is $[\text{PtCl}_2(\text{NH}_3)_4]\text{Cl}_2$.

The name of this compound is tetraamminedichloridoplatinum(IV) chloride

Draw the possible structures of the metal complex.

With 2Cl^- and 4NH_3 ligands, two isomers are possible:



What types of isomers can be formed by a compound with this empirical formula?

Geometric (*cis* and *trans*) isomerism is possible (as above).

What is the *d* electron configuration of the Pt in this complex?

Platinum is in group 10 so Pt(IV) has $(10 - 4) = 6$ *d*-electrons: $5d^6$.