Werner's coordination theory

Postulates

(1.) In coordination compounds, the metal atoms exhibit two types of valency; the primary valency and the secondary valency. The primary valency is ionizable and is non-directional whereas the secondary valency is non-ionizable and is directional. In modern terminology, the primary valency corresponds to oxidation state and the secondary valency corresponds to the coordination number.

(2.) Every metal atom has a fixed number of secondary valencies i.e it has a fixed coordination number.

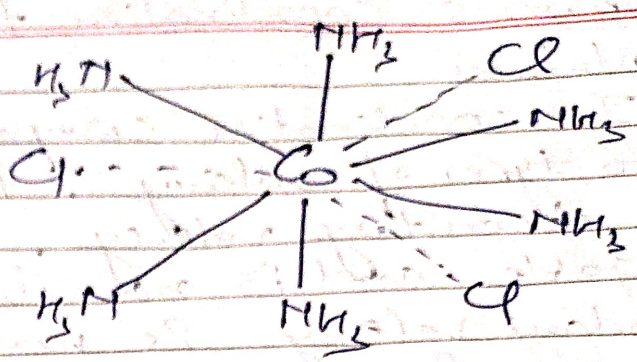
(3.) The metal atom tends to satisfy both its primary as well as secondary valencies. Primary valencies are satisfied by negative ions whereas secondary valencies are satisfied either by negative ions or by neutral molecules. In certain cases, a negative ion may satisfy both types of valencies.

(4.) The secondary valencies are always directed towards fixed positions in space and this leads to definite geometry of the coordination compound. For example, if a metal ion has six secondary valencies, these are arranged octahedrally around the central metal ion. The secondary valencies thus determine the stereochemistry of the complex. On the other hand, the primary valency is non-directional.

$CoCl_3 \cdot 6NH_3$ Complex:

Number of Cl^- ions precipitated = 3

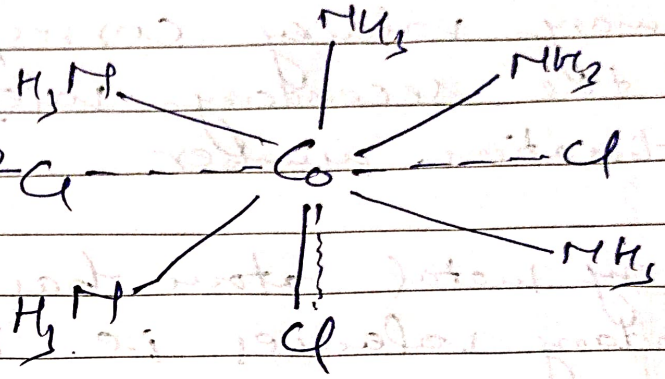
Total ions = 4



$CoCl_3 \cdot 5NH_3$ Complex.

No. of Cl^- ions precipitated = 2

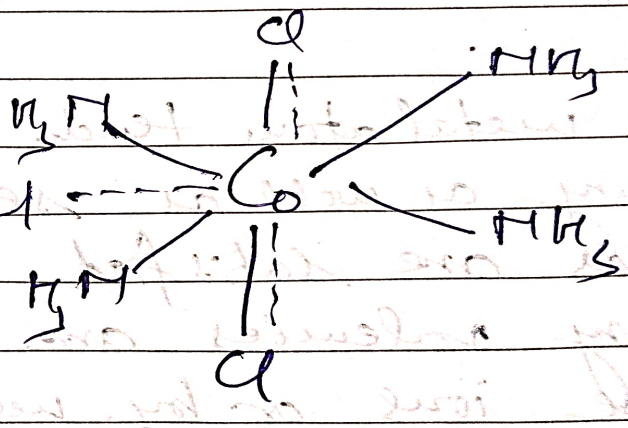
Total no. of ions = 3



$CoCl_3 \cdot 4NH_3$ Complex.

No. of Cl^- ions precipitated = 1

Total no. of ions = 2



$CoCl_3 \cdot 3NH_3$ Complex.

No. of Cl^- precipitated = 0

Neutral molecule.