

Nomenclature of complex compounds:

- The naming of complex compounds is done according to the guidelines given by IUPAC. In this system the complexes are divided into 2 types.
 - Neutral or molecular complexes.
Ex. $\text{CoCl}_3 \cdot 3\text{NH}_3$; $\text{Ni}(\text{CO})_4$; $\text{PtCl}_4 \cdot 2\text{NH}_3$
 - Ionic complexes. These ionic complexes may be cationic or anionic depending on whether the cation constitutes the complex group or the anion is the complex group in the compound.

Ex: $\text{CuSO}_4 \cdot 4\text{NH}_3$; $\text{TiCl}_3 \cdot 6\text{H}_2\text{O}$ are cationic complexes. Potassium ferrocyanide, cryolite, sodium argento thiosulphate are anionic complexes.

IUPAC rules: The main principles to be followed are as follows:

- Complex part of the compound is written in square brackets.
Ex: $[\text{Co}(\text{NH}_3)_3 \text{Cl}_3]$; $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$; $\text{K}_4[\text{Fe}(\text{CN})_6]$
 - The names of the ligands H_2O , and ammonia are written as 'aquo' (or aqua) and 'ammine' respectively. Other neutral ligands are named as they are CO (carbonyl) ; $\text{H}_2\text{N} - \text{NH}_2$ (hydrazine) ; $\text{H}_2\text{NCH}_2 - \text{CH}_2\text{NH}_2$ (ethylene diamine) etc.
 - The names of negative ligands terminate in -O
Ex: Cl^- (chloro); CN^- (cyano); SO_4^{2-} (sulphato) ; $\text{S}_2\text{O}_3^{2-}$ (thiosulphato) etc.
 - In case a large number of simple ligands of the same type is present, the name of the ligand is prefixed with di, tri, tetra etc corresponding to the presence of two, three or four ligands in the complex.
 - The ligands are written in alphabetical order of their names irrespective of the complexity of the groups.
 - In neutral and cationic complexes, the name of the central metal will not change. But in anionic complexes the suffix -ate is added to the name of the metal.
Ex : cobalt \rightarrow cobaltate ; nickel \rightarrow nickelate
Copper changes to cuprate; Iron changes to ferrate etc.
 - The oxidation number (or the primary valency) of the metal is represented in roman numerals and is always written, immediately after the name of the metal, in parenthesis.
 - The name of the non – ionic complexes are given a one word name.
Ex: $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$. Triammine trichloro cobalt (III)
 - The sequence in writing the name of a complex part of a compound is name(s) of ligands, name of the metal in proper form and the oxidation state of the metal.
- In the case of ionic complexes, the order is name of the cation first, and then the name of the anion.

Examples:

- i) $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$: Tetrammine copper (II) sulphate.
- ii) $[\text{Ti}(\text{H}_2\text{O})_6]\text{Cl}_3$: Hexa aquo titanium (III) chloride
- iii) $\text{K}_2[\text{PtCl}_6]$: Potassium hexachloroplatinate (IV)
- iv) $\text{K}_4[\text{Fe}(\text{CN})_6]$: Potassium hexacyano ferrate (II)
- v) $\text{Na}_2[\text{Ni}(\text{CN})_4]$: Sodium tetracyano nickelate (II)
- vi) $[\text{Ag}(\text{NH}_3)_2]\text{Cl}$: Diammine argentium(I) chloride
- vii) $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$: Dichloro tetraammine chromium (III) chloride

Hume – Rothery Rules : alloys (homogenous mixtures) of the metals are formed according to the Hume-Rothery rules. They are simplified as

- i) for metals to form the alloys, they must have similar or same atomic radii values i.e. sizes. (should not differ by more than 15%)
- ii) The metals must have similar chemical properties, especially the number of valency electrons.
- iii) the metals must have same crystal structures.

When one or more of these conditions are satisfied alloys are formed.