NOMENCLATURE OF INORGANIC COMPOUND

The first Comprehensive System of nomenclature was suggested by A. Werner. Later this has been modified by the Inorganic Nomenclature Committee of the International union of Pure and applied Chemistry.

(1) ORDER OF Naming ionic Complexes :- In Inorganic Complexes or Ionic Complexes Cation is named first then the anion. (i.e Naming of Na as- Sodium Chloride), For Example:-

$[Ni(NH_3)_6]Cl_2$ → Hexa ammine Nickel II Chloride.

Here $[Ni(NH_3)_6]^{++}$ is Cation so its name has been written before the name of anion Chloride.

Non ionic Complexes i.e. Molecular Compleres However, are given a one word name.

eg. $[Pt(NH_3)_2Cl_4]$ is a non ionic Complex.

It is Named as tetra Chloro diamino Platinum (iv)

(2) Name of ligands :- (a) In naming a Complex ion ligands are named first. and the Number of ligands is indicated by writing di, tri, tetra, before the name of ligand. but the hyphen is not introduce between the name of ligand and the suffix Numb

(b) If there are two or more different kinds of ligand then liga are named in the following order: →

(1) Negative ← (2) Neutral ← (3) Positive. Without separation by hyphen. Within ligands of same Category the groups are listed in order of increasing Complexity (i.e Halo - Substi are named according to increasing electronegativity)

For examples:—

$[Pt(NH_3)_4 NO_2Cl]SO_4$, It is named as chloro nitrito tetra ammine Platinum IV Sulphate.

$NH_4[Cr(NH_3)_2(NCS)_4]$ — Ammonium tetra thiocyanato di'ammine Chromate III.

(C) Neutral Ligands are named as the molecule. If however Neutral molecule is Water molecule, then it is named as aquo, and ammonia molecule is named as ammine

(D) The names of anion which are bounded with metal ion as ligand. is given as follows.

(i) If the name of anion ends with 'ide', then ide is replaced by O i.e it becomes (i)O instead of 'ide'.

F^-	Fluoride	Fluoro
Cl^-	Chloride	Chloro
CN^-	Cyanide	Cyano
OH^-	Hydroxide	Hydroxo
Br^-	Bromide	Bromo
NH^{2-}	Imide	Imido
NH_2^-	Amide	Amido

O_2^{--}	(Peroxo)
O_2H^-	(Perhydroxo)

NH_3 — ammine

(ii) In some Cases, the anionic ligands which ends with 'ate' or 'ite' the 'e' is replaced into 'O' or, e is changed into 'O'.

SO_4^{--}	Sulphate	Sulphato
$C_2O_4^{--}$	Oxalate	Oxalato
NO_3^-	Nitrate	Nitrato
NO_2^-	Nitrite	Nitrito

CH_3COO^- → Acetate → Acetato.

(iii) The names for Cationic ligands are the same as those of the Corresponding Compound or ion. No special ending is added, but the Cation names usually end in the -ium already For example. $NH_2NH_3^+$ is Called Hydrazinium.

Note → (a) Carbonate (CO_3^{2-}) and Pyridine (C_6H_5N) is also named as usually.

(b) If the ligands have Complex name Such as ethylene-diammine, Dimethyl Glyoximato etc, then their Numbes is indicated by prefix bis, tris, tetrakis etc.

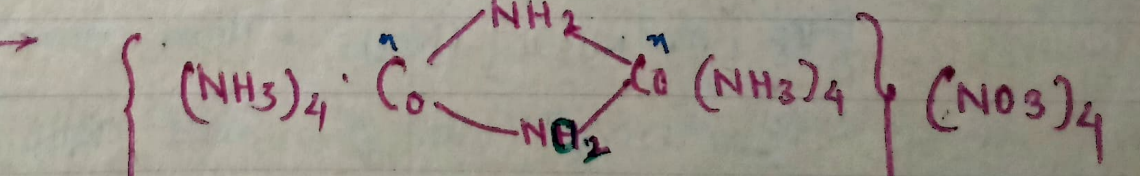
i.e. $[Co(NH_2\text{-}CH_3\text{-}CH_3NH_2)_2Cl_2]SO_4$ → Dichloro bis (ethylene diammine) Cobalt (III) Sulphate.

NAMING OF THE Bridging ligands Of the bridged Polynuclear Complexes →

The Complexes having two or more metal atoms are Called Polynuclear Complexes. In these complexes the bridging group is indicated in the formula of the Complex by separating it from the rest of the Complex by hyphen. and by adding the prefix μ before the name. This is repeated before the name of each Kind of bridging Group.

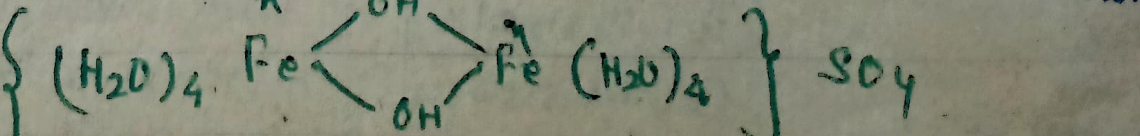
If two or more bridging groups of the Same Kind are indicated by di-μ, tri-μ ... etc.

For example: →



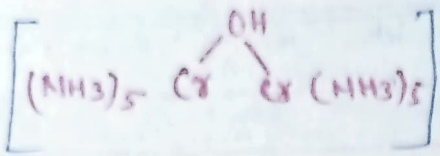
$2x - 2 = 4$
$2x = 6$
Cobalt, $x = 3$

Octa ammine → μ-amido-μ-nitro di cobalt (III) Nitrate

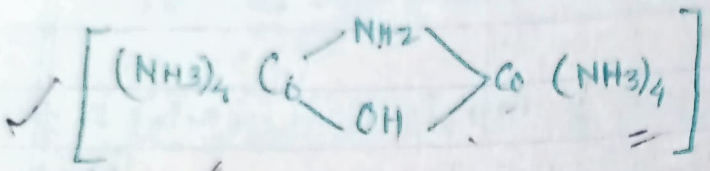


$2n - 2 = 4$
$2n = 6$
$n = 3$

Octa aquo - di hydroxo di Iron (III) Sulphate



μ-hydroxo-bis{Penta-ammine chromium (III)} chloride



μ-amido-μ-hydroxo octa-ammine dicobalt (III) ion

NAMING OF METAL ION :→ It is already mentioned in naming of ionic Complexes Cation is named first then anion. and it has been also mentioned in naming Complex ion ligand are named first then Central metal ion.

Following Rules has been Observed in naming Central metal ion.

(a) If Complex ion is Cation then Central metal ion is named as usual and No Characteristic of Suffix is given.

For example:— $[Ni(NH_3)_6]Cl_2 \rightleftharpoons [Ni(NH_3)_6]^{++} + 2Cl^-$

i.e the Central metal ion Ni is placed in the Cationic Part Hence its name is given as follows.

$[Ni(NH_3)_6]Cl_2$ → Hexa ammine Nickel II Chloride.

$[Ni(NH_3)_6]^{2+}$ → Hexa ammine Nickel II ion.

$[Cr(NH_3)_6](NO_3)_3$ → Hexa ammine Chromium (III) Nitrate.

$[Cr(H_2O)_6](ClO_4)_3$ → Hexa aquo Chromium III Perchlorate.

Non ionic Complexes: →

$[Pt(NH_3)_2Cl_4]$ → Tetra chloro diammine Platinum(IV)

$[Co(NH_3)_3(NO_3)_3]$ → Trinitro triammine Cobalt (III)

OXIDATION STATE OF CENTRAL METAL ION.

Oxidation state of central metal ion is written after the name of central ion in small bracket. in Roman numeral (II, III IV V etc)

If we have to name only a complex ion, not a complex compound. then word 'ion' is named (written) after Oxidation State.

(1) e.g. $[\overset{x}{Co}(\overset{0}{NH_3})_4\overset{-1}{Cl_2}]^{+}$ → Dichloro tetra ammine Cobalt III ion.

Here Oxidation State of Cobalt is determined as follow

$x - 2 = +1$

$\therefore x = 1 + 2 = 3$

Because one charge is present on Cobalt and it looses two Chlorine (negatively) charged. Then Cobalt has O.S. III.

(2) $[\overset{x}{Ag}(\overset{-2}{CN})_2]^{-}$ → Dicyano argentate I ion.

Expression for the Oxidation State of (Ag)

$x - 2 = -1$

$x = -1 + 2 = 1$

for zero oxidation state a letter '0' is written in braeket and for a negative Oxidation state the negative sign is used before Roman Numeral.

This has been illustrated below.

The Complex $K_4[Ni(CN)_4]$ O.S. of Ni is Zero.

So its name is Given as:- Potassium tetracyano Nickelate[0]

In complex $Na[Co(CO)_4]$ O.S. of Co is -1

So, name of Complex is Given as

Sodium tetra Carbonyl Cobaltate (-1)