

## IUPAC nomenclature of co-ordination compound:

Co-ordination compounds are named according to the rule suggested by International Union of Pure and Applied Chemistry (IUPAC). These rules are given below.

### (1) Order of naming cations and anions of an ionic complex compound

If a complex compound is ionic i.e.; if a complex compound is composed of cations and anions, the name of the cation is mentioned 1st and then the name of the anion is written.

e.g.; in naming  $K_2[PtCl_6]$ , the name of the cation ( $K^+$ ) is written first and then the anion name of  $[PtCl_6]^{2-}$  is mentioned.

⊗ If the complex compound is non-ionic, the name of the complex compound is written as one word.

### (2) Naming of the species present in co-ordination sphere

In naming the species present in co-ordination sphere, the ligands are named first and then the central metal atom is mentioned.

### (3) Naming of the ligands:

The ligands are named according to the following rules:-

(a) Neutral ligands are called by special names like  $H_2O$  (aqua),  $NH_3$  (amine),  $CO$  (carbonyl),  $NO$  (nitrosyl) etc. The ligands  $N_2$  and  $O_2$  are called dinitrogen and di-oxygen.

(b) Naming of the negative ligands:

The names of negative ligands end in 'o'.  
e.g;  $O^{2-}$  (oxo),  $O_2^{2-}$  (peroxo),  $N_3^-$  (nitrido),  $OH^-$  (hydroxo),  
 $CN^-$  (cyano),  $NO_2^-$  (nitro),  $F^-$  (fluoro),  $Cl^-$  (chloro),  
 $Br^-$  (bromo),  $I^-$  (iodo),  $SO_4^{2-}$  (sulphato),  $S^{2-}$  (sulphido),  
 $H^-$  (hydrido),  $NH_2^-$  (amido),  $N_3^-$  (azido) etc.

(c) Naming of the positive ligands:

For cationic ligands, the names end in 'ium'.  
e.g;  $NO^+$  (nitrosylium),  $N_2H_5^+$  (hydrazinium),  $H_3O^+$  (hydronium),  $NO_2^+$  (nitronium) etc.

(d) Naming of the organic ligands:

Organic ligands are given their common names.  
e.g; phenyl ( $-C_6H_5$ ), methyl ( $-CH_3$ ), ethylenediamine (en), pyridine ( $-C_5H_5N$ ), triphenyl phosphine ( $Ph_3P$ ), hydrazine ( $HO_2-NH_2$ ) etc.

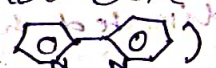
(e) Indication of no. of ligands:

If a complex contains two or more simple ligands of the same type, their no. is indicated by putting prefixes di (for two), tri (for three), tetra (for four), penta (for five), hexa (for six) before their name.

This term (for two) bis, tris (for three), tetrakis (for four), pentakis (for five), hexakis (for six) are used for organic ligands where the prefixes di, tri etc are already used in naming the ligands or where use of prefixes di, tri etc may change of the name of the ligand.

The name of the ligand is written in bracket

- e.g;
- |                      |                            |
|----------------------|----------------------------|
| complex              | Name of the organic ligand |
| (1) $[Pt(en)_2]Cl_2$ | (1) bis (ethylenediamine)  |
| (2) $[Cu(py)_2]Cl_2$ | (2) bis (pyridine)         |

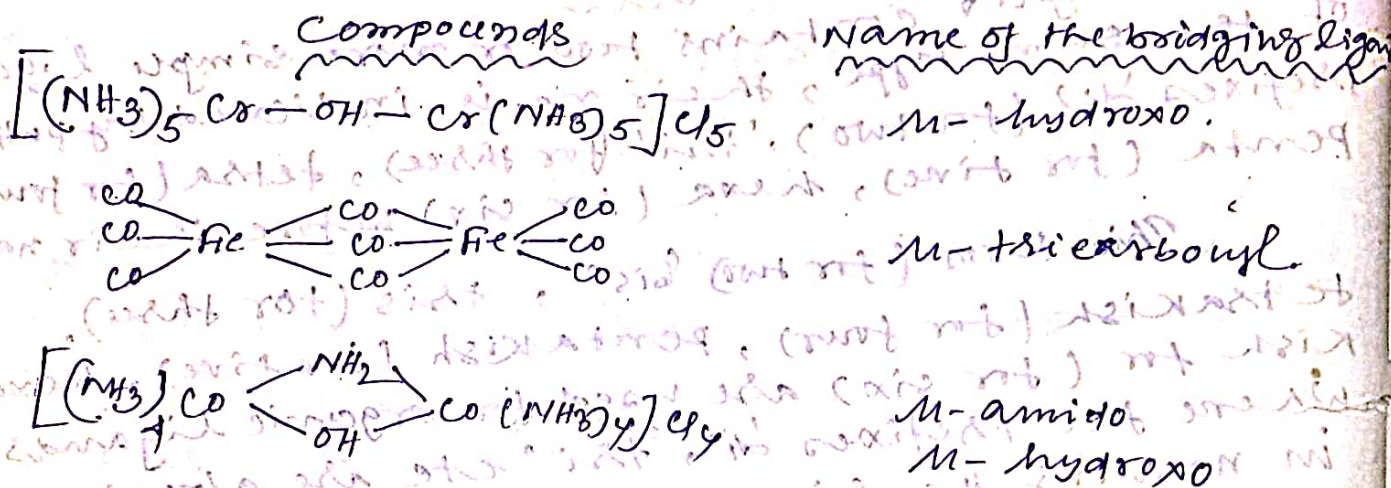
⊗ Use of di-pyridine may indicate the bidentate ligand 'di-pyridine' ()

### (4) Order of naming ligands:

When writing the name of a complex, the ligands are named in alphabetical order regardless of their charge. The prefixes di, tri, ... etc are not considered while determining this alphabetical order.

### (5) Naming of the bridging ligands:

The ligands which bridged more than one central metal atom are called bridging ligands. The prefix  $\mu$  is used to designate such a ligand. For more than one bridging ligands of the same kind,  $\mu$ -di,  $\mu$ -tri, ... etc are used. If a bridging group bridges more than two metal atoms it is written as  $\mu_3$ ,  $\mu_4$ ,  $\mu_5$  or  $\mu_6$  to indicate how many atoms it is bonded to. When the same ligand is present as a bridging ligand and as non-bridging ligand, the bridging ligand is named first.



### (6) Naming of the ambidentate ligands:

Such ligands are either named by special names such as:

(a) Thiocyanato for 'S' (S-donor) and

isothiocyanato for 'N' (N-donor)

(b) nitro for  $\text{NO}_2$  (N-donor) and

nitrito for  $\text{ONO}$  (O-donor). or the symbol of the

element co-ordinated with the metal ion is written after the name of the ligand.

e.g; thiocyanato - S ('s' donor) and thiocyanato - N ('N' donor) for  $SCN^-$  ligand.

④ Naming of the central metal ion;

Different rules are used for naming different complexes.

(i) Cationic and neutral complexes;

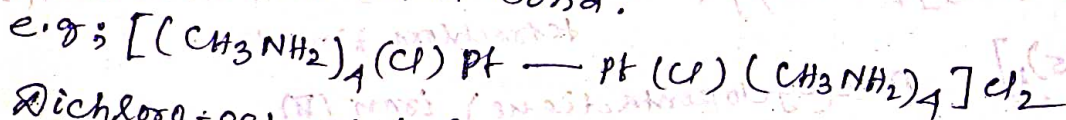
Name of the metal is used followed by the oxidation no. of the metal in Roman numerals (0, I, II, III, IV, -I, -II, -III, -IV) in parenthesis ( ). e.g; Nickel (II), Cobalt (III) etc.

(ii) Anionic complexes;

So name of the central metal ion the suffix 'ate' is attached to its name and the oxidation no. as before e.g; Cr  $\rightarrow$  Chromate, Co  $\rightarrow$  Cobaltate, Cu  $\rightarrow$  Cuprate, Ni  $\rightarrow$  Nickelate, Fe  $\rightarrow$  Ferrate, Pd  $\rightarrow$  paladate, Os  $\rightarrow$  osmate, Zn  $\rightarrow$  zincate, Pt  $\rightarrow$  platinumate, Ag  $\rightarrow$  Argentate, Au  $\rightarrow$  Aurate.

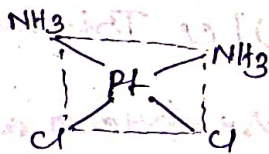
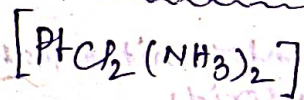
(5) Metal to Metal bonding;

In complexes containing metal to metal bonds, the prefix 'bi' is used before the name of the metals forming a metal to metal bond.

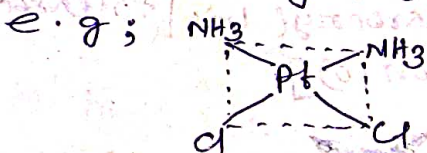


Dichloro-octakis (methyl amine) bi-platinum (II) chloride

(6) Geometrical isomer;



Geometrical isomers are named either by using the prefixes 'cis' for adjacent position and trans for opposite positions before the name of the ligands or by numbering system followed by a hyphen (-).



Cis-diamine dichloro platinum (II)

(1, 2) diamine-(3, 4) dichloro platinum (II)



Trans-diamine dichloro platinum (II)