

IUPAC Nomenclature of Coordination Compounds

Rules for Systematic Nomenclature:

1. The name of the cationic part is written first followed by the anionic part.
e.g. $K_4[Fe(CN)_6]$ The cation K^+ is named first followed by anion $[Fe(CN)_6]^{4-}$
 $[Co(NH_3)_6]Cl_3$ The cation $[Co(NH_3)_6]^{3+}$ is named first followed by anion chloride.
2. The name of the ligand is listed before the name(s) of the central atom(s).
3. No space is left between the names that refers to the same coordination entity.
4. Ligand names are listed in the alphabetical order.
5. (a) When there are several ligands of the same kind prefixes like di, tri, tetra, penta, hexa, etc. are used before the name of the ligand to indicate their number.
(b) When the name of the ligand terms like di, tri, tetra etc. then prefixes like bis, tris, tetrakis, pentakis etc. are written before the name of the ligand & the ligand name is kept within brackets to avoid ambiguity. e.g.
 $(NH_3)_2$ - diammine
 Me_2NH dimethylamine
 $(en)_2$ - bis(ethylenediamine)
 $(MeNH_2)_2$ - bis(methylamine) To make it distinct from dimethylamine
(c) There is no deletion of vowels or use a hyphen.
e.g. $(NH_3)_4$: tetraammine
6. The name of the cationic ligands are ended with 'ium', e.g. NO^+ nitrosylium
 $NH_2^+-NH_3^+$ hydrazinium
7. The neutral ligand names have no special ending.
e.g.

H_2O : aqua

NH_3 : ammine

CO : Carbonyl

NO : nitrosyl

$MeCONH_2$ acetamide

Me_2O dimethyl ether

Me_2S dimethyl thioether

C_6H_6 Benzene

O^{2-} oxo

O_2^{2-} Peroxo

O_2^- superoxo

8. The names of anionic ligands are ended with 'o'.
e.g.

(a). Ligand names ending with 'ate' are changed to 'ato'.

NO_3^- nitrate

CO_3^{2-} carbonate

$acac^-$ acetylacetonato

(b). Ligand names ending with 'ite' are changed to 'ito'.

SO_3^{2-} sulphito

ClO_2^- Chlorito

NO_2^- nitrito

(c). Ligand names ending with 'ide' are changed to 'ido'.

e.g. F^- fluorido

Cl^- chlorido

Br^- Bromido

I^- Iodido

CN^- cyanido

H^- hydrido

OH^- hydroxido

NH_2^- amido

D^- Deuterido or $[^2H]$ hydrido

(d). The anionic organic ligands where C atom is the donor atom are not ended with 'o'. e.g.

CH_3^- methyl

$^-\text{CH}_2-\text{CH}=\text{CH}_2$ allyl
 Ph^- phenyl

$\text{CH}_2=\text{CH}^-$ vinyl

Δ cyclopropyl

- e. For the π -donors, the prefix like η^x is to be used where η indicates π electron donation and x is known as the hapticity of the ligand. eg.
- $\text{C}_5\text{H}_5^- \eta^5$ cyclopentadienyl or pentahaptocyclopentadienyl
 $\text{C}_6\text{H}_6^- \eta^6$ Benzene or hexahaptobenzene
 $\text{C}_3\text{H}_5^- \eta^3$ allyl or trihaptobenzene

- f. Ambidentate ligands are named as follows:

$\leftarrow \text{CN}^-$ cyanido or cyanido-C
 $\leftarrow \text{:NC}^-$ isocyanido or cyanido-N

$\leftarrow \text{:NO}_2^-$ nitrito-N

$\leftarrow \text{ONO}^-$ nitrito-O

$\leftarrow \text{SCN}^-$ thiocyanato-S

$\leftarrow \text{:NCS}^-$ isothiocyanato-N

- g. For anionic complexes metal names are ended with 'ate'.

Aluminium $\rightarrow$ Aluminate

Platinum $\rightarrow$ Platinate

Molybdenum $\rightarrow$ Molybdate

Zinc $\rightarrow$ Zincate

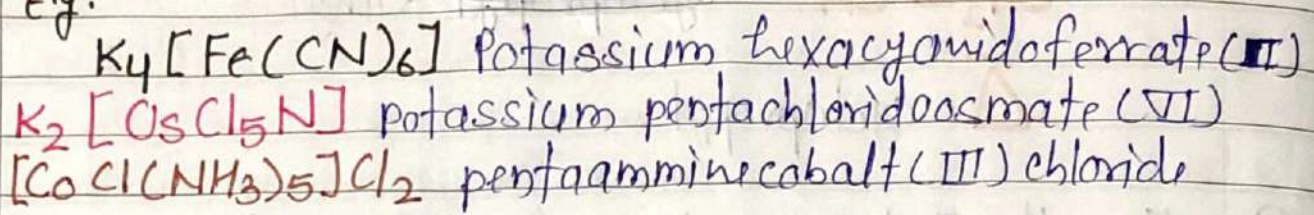
Nickel $\rightarrow$ Nickelate

Cobalt $\rightarrow$ Cobaltate

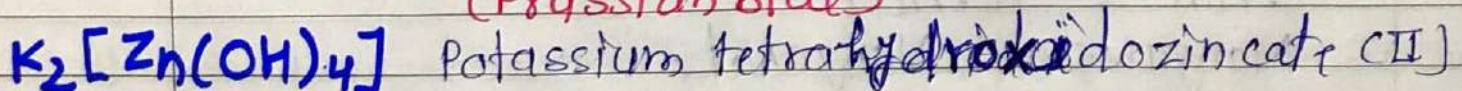
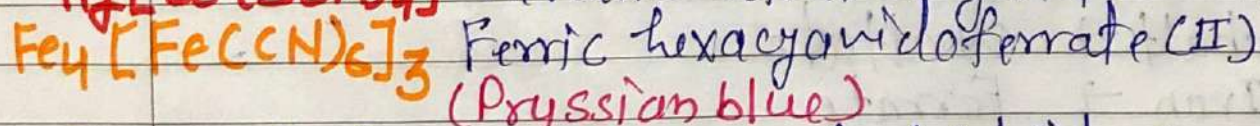
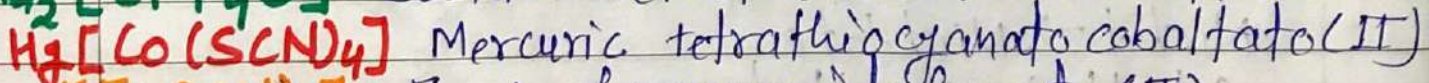
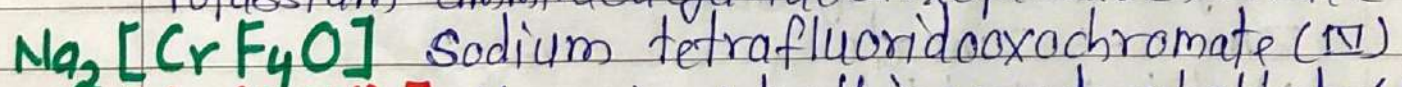
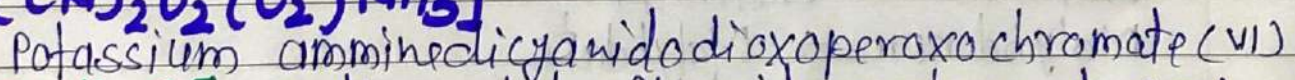
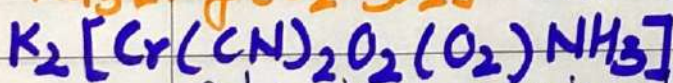
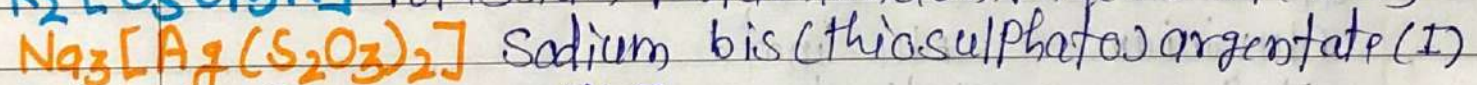
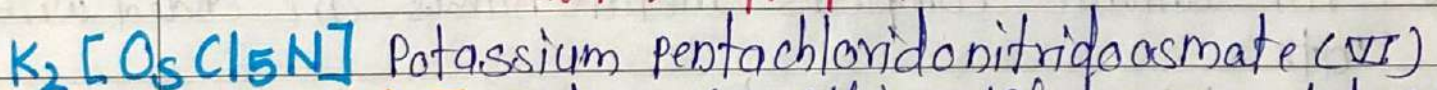
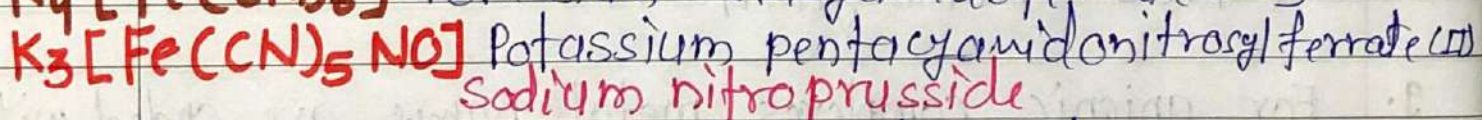
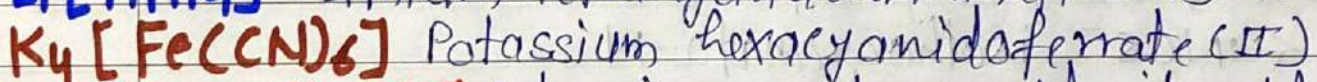
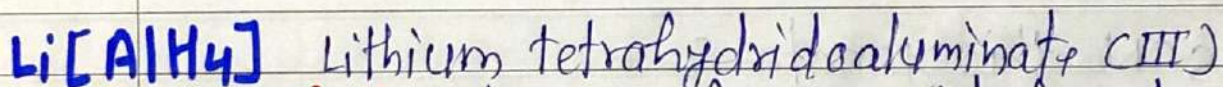
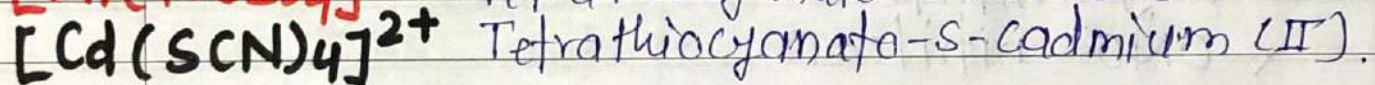
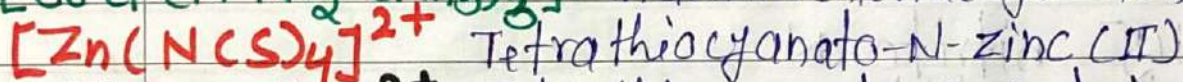
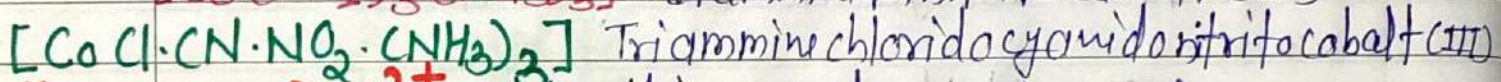
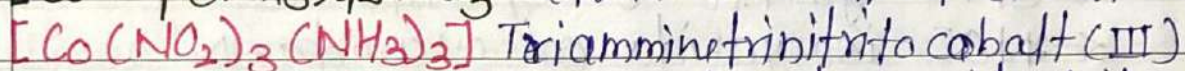
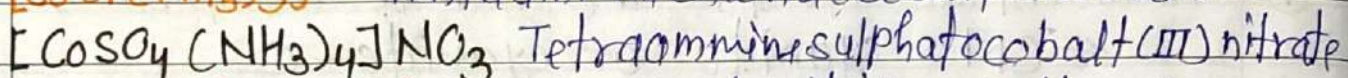
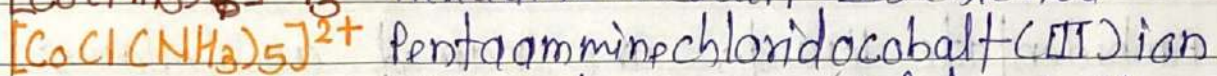
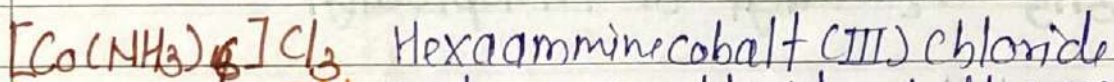
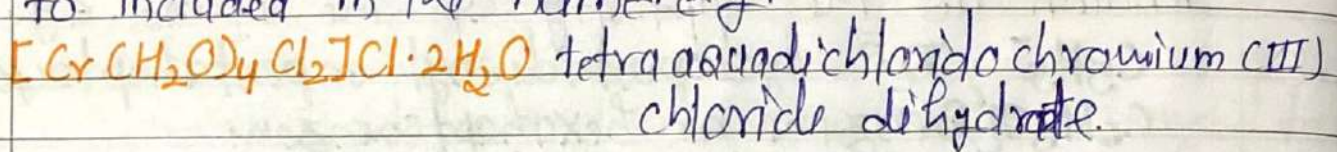
Iron $\rightarrow$ Ferrate

Manganese $\rightarrow$ Manganate

10. The oxidation number of the central atom is written in Roman numbers within brackets, after the name of the central atom. e.g.



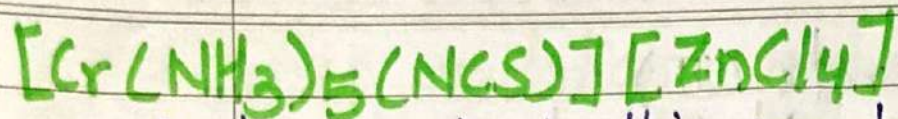
11. If there is any water of crystallization, it is to be included in the name. e.g.



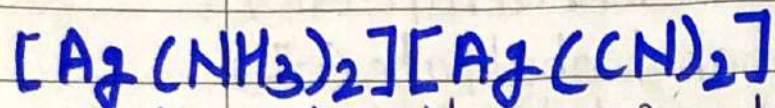
- $[HgI_3]^-$ Triiodidomercurate (II)
 $Cu_2[Fe(CN)_6]$ Copper hexacyanidoferrate (II)
 $K_2[HgI_4]$ Potassium tetraiodidomercurate (II)
 $Na[Co(CO)_4]$ Sodium tetracarbonylcobaltate (-I)
 $Na_2[Ni(EDTA)]$ Sodium ethylenediaminetetraacetatonickelate (II)
 $[Fe(C_5H_5)_2]$ bis(cyclopentadienyl)iron (II)
 $[Cr(en)_3]Cl_3$ Tris(ethylenediamine)chromium (III) chloride
 $[CuCl_2(CH_3NH_2)_2]$ Dichlorido bis(methylamine)copper (II)
 $[Cr(C_6H_6)_2]$ bis(benzene)chromium (0)
 $[CuCl_2(NH_2CONH_2)_2]$ Dichloridobis(urea)copper (II)
 $[Ag(NH_3)_2]OH$ Diammine silver (I) hydroxide
Tollen's Reagent
 $[Cr(PPh_3)(CO)_5]$ Pentacarbonyltriphenylphosphinechromium (0)
 $[Pt(PPh_3)_3]$ Tris(triphenylphosphine)platinum (0)
 $[Ni(CO)_4]$ Tetracarbonylnickel (0)
 $[Ni(dmg)_2]$ bis(dimethylglyoximate)nickel (II)
 $(NH_4)_2[Pt(NCS)_4]$ Ammonium tetra isothiocyanatoplatinate (II)

IUPAC Names of Complexes Containing Complex cation and complex anion:

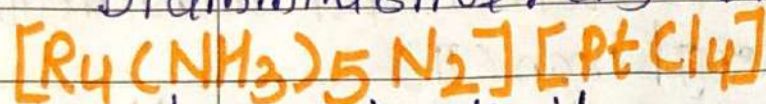
- $[Pt(NH_3)_4][PtCl_4]$ Tetraammineplatinum (II) tetrachloridoplatinate (II)
 $[Pt(NH_3)_4Cl_2][PtCl_4]$ Tetraammine dichloridoplatinum (IV) tetrachloridoplatinate (II)
 $[Cr(NH_3)_6][CoF_6]$ Hexaamminechromium (III) hexafluoridocobaltate (III)
 $[Co(en)_3][Cr(CN)_6]$ tris(ethylenediamine)cobalt (III) hexacyanidochromate (III)
 $[Pt(Py)_4][PtCl_4]$ Tetrapyridylplatinum (II) tetrachloridoplatinate (II)
 $[Co(NH_3)_6][Cr(NH_3)_2Cl_4]$ Hexaamminecobalt (III) diamminetetrachloridochromate (III)



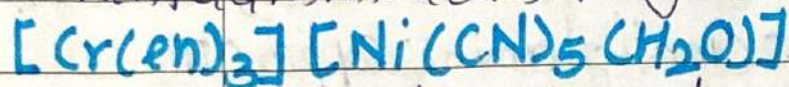
Pentammine isothiocyanatochromium(III) tetrachloridozincate(II)



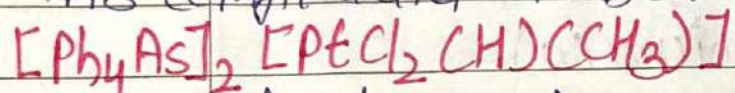
Diamminesilver(I) dicyanidoargentate(I)



Pentammine dinitrogenruthenium(II) tetrachloridoplatinate(II)



Tris(ethylenediamine)chromium(III) aquapentacyanonickelate(II)



Tetraphenylarsonium dichloridohydridomethylplatinate(II)

Give the IUPAC Names of the following complex

Species.

