COMPLEXING IN BIOLOGICAL SYSTEMS

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Coordination compounds are the higher-order compounds which are stable in aqueous solutions or dissociate insignificantly.

$K_4[Fe(CN)_6]$

Central atom (ion) **or** ***complexing agent*** **takes central place in coordination compounds and is usually a positively charged ion**

Fe^{2+}

Ligands **are ions of opposite charge or neutral molecules that are located (coordinated) around the complexing agent.**

CN^-

$K_4[Fe(CN)_6]$

Inner sphere (coordination entity) **is formed by complexing agent and ligands.**

$$[Fe(CN)_6]^{4-}$$

Outer sphere ***is formed by*** **lons which are not included in the inner sphere.**

$$K^+$$

Classification of Coordination Compounds

- Depending on the electric charge of the inner sphere :

1. Coordination compounds containing complex cations - [Zn(NH3)4]Cl2
2. Coordination compounds containing complex anions - $K_3[Al(OH)_6]$
3. Neutral complexes - $[Pt(NH_3)_2Cl_2]$

Classification of Coordination Compounds

- Depending on the nature of ligands:

1. Acid complexes - $[Fe(CN)_6]^{4-}$
2. Aqua complexes - $[Cr(H_2O)_6]^{3+}$
3. Hydroxide complexes - $[Zn(OH)_4]^{2-}$
4. Ammonia complexes - $[Cu(NH_3)_4]^{2+}$

Classification of Coordination Compounds

- Depending on the chemical compounds class:

1. Acids - $H[AuCl_4]$
2. Bases - $[Ag(NH_3)_2]OH$
3. Salts - $K_2[HgI_4]$

Classification of Coordination Compounds

- Depending on the quantity of central atoms:

1. Mononuclear - $[Cr(NH_3)_3(H_2O)_3]Cl_3$
2. Polynuclear - [Pt4(OH)4](ClO4)4

When didentate or polydentate ligand uses its two or more donor atoms to bind a single metal ion, it is said to be

a chelate ligand

The coordination compounds in which a ligand is bound with central atom by both donor-acceptor bond and ionic bond are called

chelates

CHELATES APPLICATION IN MEDICINE

Disease	Excess metal ion	Used chelating agent
Hemochromatosis, hemosiderosis, iron intoxication	Fe	Deferoxamine, Penicillamine
Cataracts, atherosclerosis	Ca	Na_2EDTA , Penicillamine
Wilson's disease	Cu	Mixture of Penicillamine and Calcium Tetacine
Disease "itai-itai-bio"	Cd	Cryptand, Calcium Tetacine
Minimata disease	Hg	Penicillamine, Calcium Tetacine
Plutonium poisoning	Pu	Pentacine
Lead poisoning	Pb	Calcium Tetacine, Na_2EDTA
Berylliosis, beryllium rickets	Be	Aluminon