Coordination compounds

Addition Comp. When solutions containing two or more salts in stoichiometric (i.e. simple molar) proportions are allowed to evaporate, crystals of new compounds seperate out. These may be.

Double Salts

→ Those compounds which exist only in crystal lattices but break down into their constituent compounds when dissolved in water or any other solvent.

→ Their physical and chemical properties remain essentially the same as those of the individual compounds

e.g. Mohr's salt $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$
Potash alum $Al_2(SO_4)_3 \cdot K_2SO_4 \cdot 24H_2O$
Carnallite $KCl \cdot MgCl_2 \cdot 6H_2O$

complex or Coordination Compounds

→ Those which retain their identity in solutions.

e.g. $[Ni(NH_3)_6]Cl_2$

Definitions and Terminology :

Coordination Complex : A compound that results from the combination of two or more stable chemical species and retains its identity in the solid as well as dissolved state.

Complex Ion : An electrically charged ion which consists of a central metal atom or ion surrounded by a group of ions or neutral molecules.

e.g $[Ni(NH_3)_6]^{2+}$

→ A complex ion may be { +vely charged, -vely charged, Neutral }

Central Ion and Ligands :- The cation to which one or more neutral molecules or ions are coordinated is called the central ion while the molecules or ions so attached are called ligands.

e.g. $[Ni(H_2O)_6]^{2+}$

↓ central ion — → Ligand

Donor atom or Coordinating atom :- The atom in the ligand which can donated the electron pair.

Coordination Number :- The total no. of ligands attached to a central ion.

C.N.

- Common: 2, 4 & 6
- Not Common: 3, 5, 7, 8, 9, & 12.

Coordination Sphere :- The central ion together with molecules ~~of~~ or ions coordinated to it constitute what is termed as coordination sphere.

It is denoted by [ ], e.g. $[Ag(CN)_2]^-$

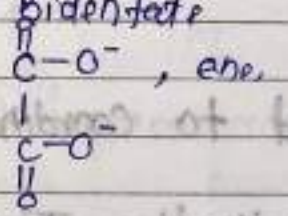
Charge on a Complex Ion :- The charge carried by a complex ion is the algebric sum of charges carried by the central ion and the ligands coordinated to it.

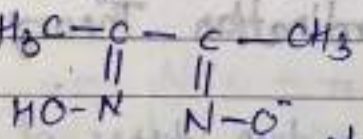
e.g $[Cu(NH_3)_4]^{2+}$ Cu^{2+}, NH_3 neutral

$[Fe(CN)_6]^{4-}$ Fe^{2+}, CN^-,

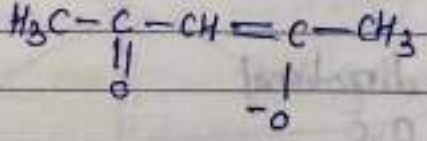
Types of ligands.

Unidentate.
e.g. NH_3, H_2O, Cl^-, Br^- etc.

Bidentate

, ene.

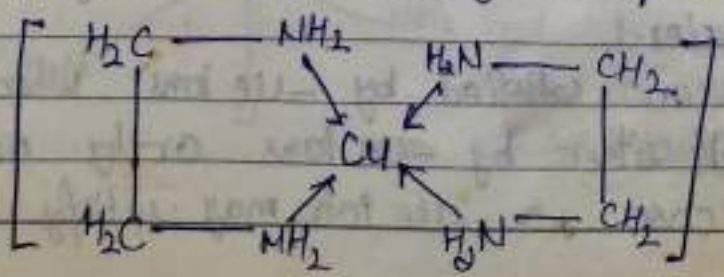

etc.

DMG.

acac 

Polydentate
EDTA, diene.
etc.

Chelating ligands and Chelates :- When a bidentate or a polydentate ligand is surrounded or attached through two or more donor atoms to the same central metal ion forming a ring structure, the ligand is called chelating ligand. The resulting complex is called a chelate.



Chelate cation.