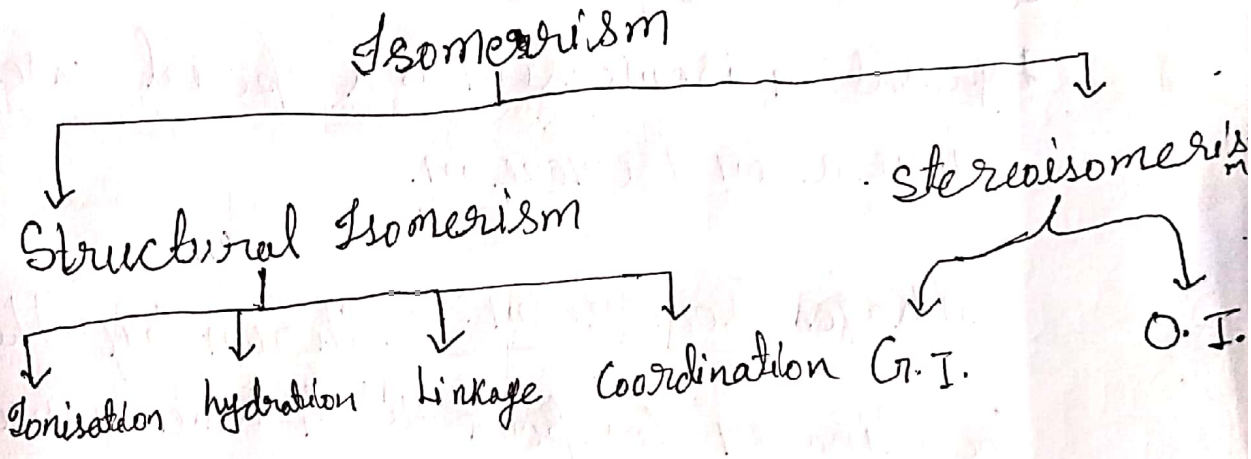
D. B. College (Jaynagar)
Akhilesh Kumar Singh
Chemistry Department
B.Sc. -II (Hons)

Co-ordination compound

Mob. - 8750390927

Isomerism :—

Compounds which have same molecular formula but different structural formula are k/n as isomers & Phenomena is k/n as isomerism.



1. Ionisation isomerism :— In these type of isomerism, interchange of ligands takes place b/w Coordination & ionisation sphere.

Eg :— $[Co(NH_3)_5Br]SO_4$ or $[Co(NH_3)_5SO_4]Br$

Pentaamminebromide Cobalt (III) Sulphate

Pentamine sulphato Cobalt III bromide.

$[Pt(NH_3)_4Cl_2]Br_2$ $[Pt(NH_3)_4Br_2]Cl_2$

$[Co(NH_3)_5NO_2]SO_4$ $[Co(NH_3)_4SO_4]NO_2$

$[Pt(NH_3)_4SO_4]Cl_2$ $[Pt(NH_3)_4Cl_2]SO_4$

trans isomer

(2) **Hydration isomerism:-** Water molecule are present in Coordination as well as ionisation sphere.

$Cr(H_2O)_6.Cl_3$ — Solvation

$[Cr(H_2O)_6]Cl_3$ — $[Cr(NH_3)_6]Cl_3$

$[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$ — $[Cr(NH_3)_5Cl]Cl_2 \cdot NH_3$

$[Cr(H_2O)_4Cl_2]Cl \cdot 2H_2O$ — $[Cr(NH_3)_4Cl_2]Cl \cdot 2NH_3$

$[Cr(H_2O)_3Cl_3] \cdot 3H_2O$X — $[Cr(NH_3)_3Cl_3] \cdot 3NH_3$X

Hydration isomerism is a special case of ionisation isomerism.

Linkage isomerism:- Shown by those Coordination compound which have ambidentate ligand.

This type of isomerism takes place due to change of donor atom due to ambidentate ligand.

e.g.:- $[Cr(NH_3)_5NO_2]Cl_2$ & $[Cr(NH_3)_5(ONO)]Cl_2$

Pentaammine nitrochromium(III) chloride — Pentaammine nitrito chromium (III)

Pentaammine nitro-N-chromium(III) chloride — Pentaammine nitro-O-chromium(III) chloride

$[Co(NH_3)_5(NCS)]Br_2$ — $[Co(NH_3)_5(SCN)]Br_2$

(3) **Coordination isomerism** :- This type of isomerism takes place in those compounds in which cation & anion both are ~~not~~ as complex.

- It takes place due to interchange of ligand b/w 2 complex.

eg: $[Cr(NH_3)_6]^{3+}[Co(CN)_6]^{3-}$ & $[Co(NH_3)_6][Cr(CN)_6]$

hexa amine chromium (III)

hexacyano cobaltate (III)

$[Pt\,Cl_4]^{2+}[Cu\,Cl_4]^{2-}$ $[Cu\,Cl_4]^{2+}[Pt\,Cl_4]^{2-}$

tetra chloride platinum (VI) tetra chloride copper

tetrachloride cuprate (VI)

$[Pt\,Cl_4][Cu(CN)_4]$ $[Cu\,Cl_4][Pt(CN)_4]$

Stereo isomerism :- ~~Cis~~ ~~Trans~~ which have same M.F or ~~Cis + Trans~~ chemical formula but special arrangement.

Geometrical isomerism :- Cis, Trans

Cis :- If same ligand occupy similar posn w.r.t. each other c/a cis isomer.

trans: If same ligand occupy opposite posn w.r.t each other. c/a trans isomer.

(4)

C.N. = 4

↓ Tetrahedral sp^3

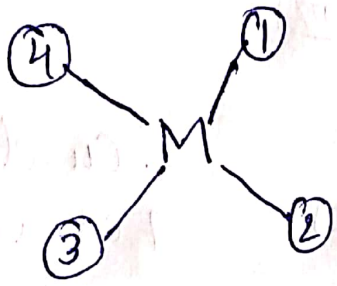
G.I.X

$[CuCl_4]^{2-}$, $Ni(CO)_4$

↓ Square Planar

$[Pt(NH_3)_2Cl_2]$

Type - I Ma_2b_2



M → C.M.A

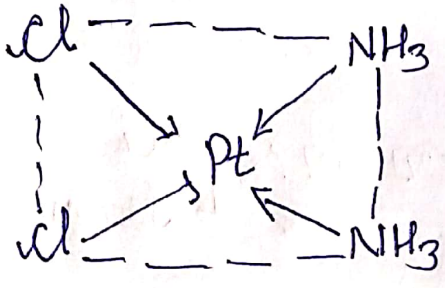
a → Monodentate

b → Monodentate

Cis 1-2, 2-3, 3-4, 4-1

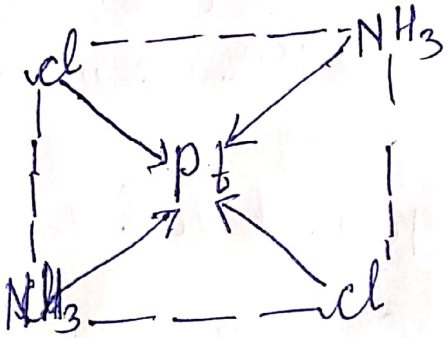
trans 1-3, 2-4

$[Pt(NH_3)_2Cl_2]$



Cis platin

Anti cancerous used in chemotherapy



trans-platin