Stereoisomerism → Same chemical formula & same chemical bonds but different spatial arrangements.

① Geometrical Isomerism

- Arises in heteroleptic complexes.
- Cis – two ligands adjacent to each other (90°)
- Trans – " " opposite " " (180°)

② Optical Isomerism :- Optical isomers are mirror images that cannot be superimposed one one another. These are called as enantiomers (optically active pairs).

* Square planer complex (CN=4)

↓

Optical ✗
POS ✓
G.I ✓

Comp	G.I
Ma_4	0
Ma_3b	0
Ma_2b_2	2
Ma_2bc	2
Nabcd	3

[g.i]

-a|b|c|d|e|f Monodentate ligands

-(AA) → Symmetrical bidentate (donor atom same [en, ox])

-(AB) → unsymmetrical bidentate (dibb)

* By using Bidentate ligands

$M(AA)_2$, $M(AA)b_2$, $M(AA)bc$] G.I = 0

Jugaad

Symmetrical bidentate

(AA) ↓ G.I = 0 (always)

(AB) for unsymmetrical bidentate

$M(AB)_2$ = 2 G.I

$M(AB)b_2$ = 0

$M(AB)bc$ = 2 G.I

* Tetrahedral complex (C.N=4)

↓

G.I ✗ ↳ optically active if – (i) Mabcd (ii) $M(AB)_2$

Jugaad → (C.N=4)

① Zn, Cd, Hg → always tetrahedral

② Pt, Pd → always sq. planar

* Octahedral complex (CN=6)

↳ Can give both G.I & O.I

Jugaad → for optically active / Inactive

① If two same ligands present at any one trans position → POS ≠, O.I

② If any two trans position are mutually same → POS ≠, O.I

③ If Non co-planer rings are present → O.A

Type	No. of G.I	S.I
Ma_6	0	0
Ma_5b	0	0
Ma_4b_2	2	2
Ma_4bc	2	2
Ma_3b_3	2	2

* using Bidentate ligands

① $M(AA)_3$ → $[Co(en)_3]^{3+}$

G.I (✗) O.I (✓) S.I = 2

② $M(AA)_2b_2$

G.I = 2 cis & trans

S.I = 3 "cis is active"

③ $M(AA)_2bc$

G.I = 2 cis & trans

S.I = 3 "cis is active"

Importance & Applications of coordination compounds

① Hardness of water is estimated by simple titration with Na_2EDTA.

② In extraction & purification of Metals.

③ Rhodium complex. $[RhCl(PPh_3)_3]$, a Wilkinson catalyst, is used for the hydrogenation of Alkenes.

④ In black & white photography, the developed film is fixed by washing with hypo solution which dissolves the undecomposed AgBr to form a complex ion, $[Ag(S_2O_3)_2]^{3-}$.

⑤ EDTA is used in the treatment of lead poisoning.

⑥ Cis-platin is used as anticancer.

⑦ Chlorophyll (pigment responsible for photosynthesis) → (Mg)

⑧ Haemoglobin → Fe

⑨ Cyanocobalamine vitamin B_{12} → Co

⑩ Articles can be electroplated with silver & gold much more smoothly & evenly from solutions of the complexes, $[Ag(CN)_2]^-$ & $[Au(CN)_2]^-$ than from a soln of simple metal ions.