Stereo Isomerism or Space isomerism.

Stereo is a Greek word taken from stereos, it means Occupying space.

Stereoisomerism is the isomerism which arises on account of the different arrangements of atoms or groups in space in a molecule. it becomes more clear from the following example.

When two compounds contain the same ligands co-ordinated to the same Central ion, but, the arrangements of ligands in space is different, then these two Compounds are said to be Stereoisomers and the Phenomenon is known as stereoisomerism.

Stereoisomerism is divided into two Category or Class.

Stereoisomerism

- Geometrical or Cis-trans isomerism
- Optical isomerism or Mirror-image isomerism.

Geometrical isomerism:→

Geometrical isomers have identical empirical formula, but differ in Chemical and Physical Properties, due to different arrangement of ligands.

eg. When two identical groups occupy adjacent positions the isomer is Called Cis and when groups arranged opposite to one another, the isomer is Called trans.

This type of isomerism i.e. Cis-trans is not possible for Complexes with Co-ordination number 2 and 3 and also for the tetrahedral Complexes with C.N.: 4.

Geometrical isomerism can't arise in tetrahedral Complexes (C.N=4) because this Geometry Contains all the ligands in Cis (i.e. adjacent) Position w.r. to each Other i.e. Each Ligand is equidistance from the other three ligands and all bond angles are the same (i.e 109°)

This type of Cis-trans isomerism is quite Common in Octahedral and Squre planer Geometry.

Co-ordination Number - 4

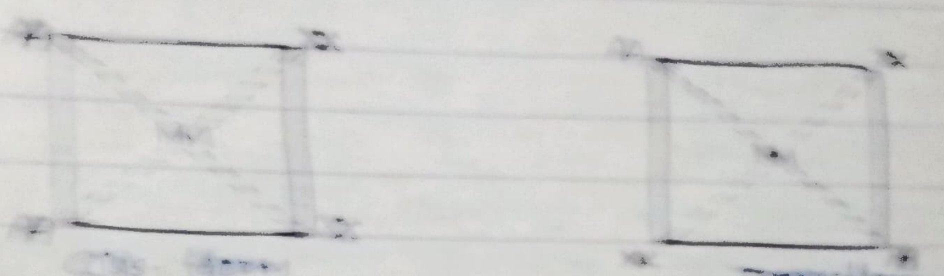
The Complexes having Co-ordination number 4 (four) shows two type of ~~Geometry~~ Structure.

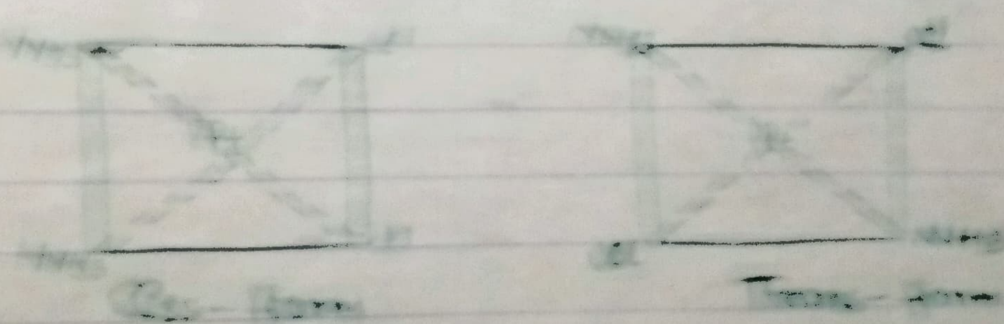
(i) Tetrahedral

(ii) Squre Planer

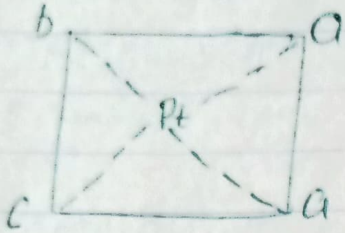
The Cis-trans isomerism is not Possible in the Case of tetrahedral Complexes, because four ligands are equidistance from One another, but it Can be easily shown by Squre Planer Complexes.

Cis-trans isomerism Generally occurs in the following type of Complexes. —

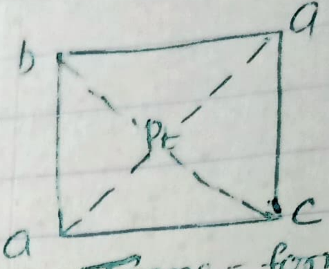




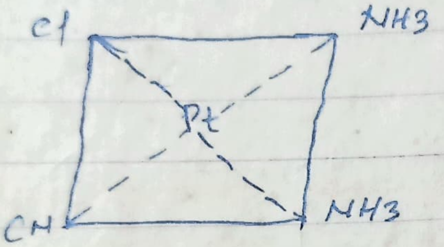
Example of this type of Complex → $(Pt^{II}(NH_3)_2(Cl)(CN))^0$

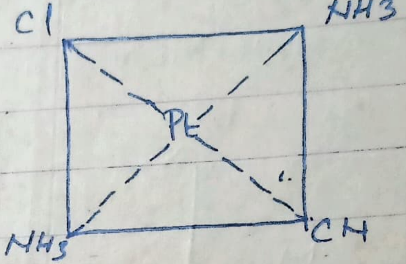


Cis form,



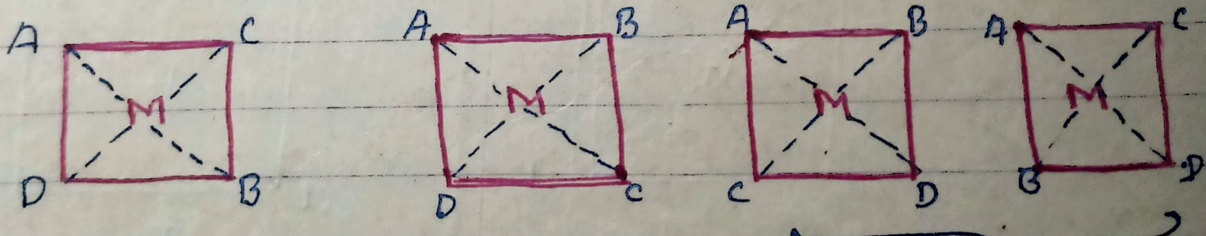
Trans - forms



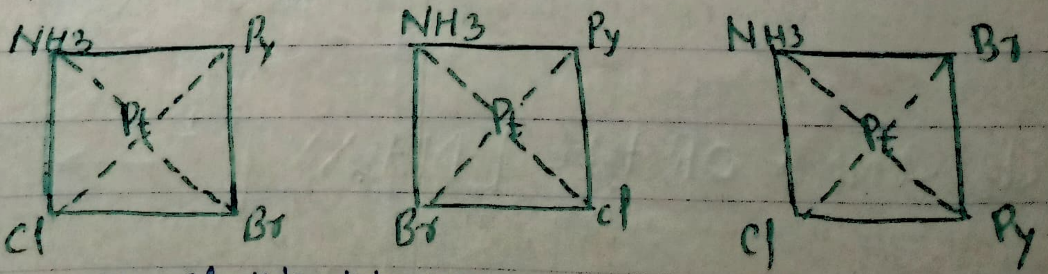


(C) $[MABCD]^{n+}$ type of Complex :→ Complex of this type exist in three isomeric forms. these isomers form

(i) the Complex. $[Pt^{II}(NH_3)(Py)Cl(Br)]^0$ has been reported Corresponding to NH_3 trans to each of remaing three ligands.



Both are identical.



ii Other example of this type —

(ii) $[Pt^{II}(NO_2)(Py)(NH_3)(NH_2OH)]^+$

(iii) $[Pt^{II}(C_2H_4)(NH_3)(Cl)(Br)]^0$

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

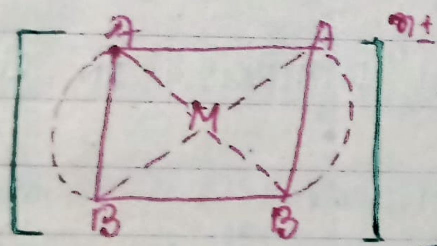
They also gives the three isomeric forms :-
The existance of three isomeric forms in case of the Complexes mentioned above indicates that these Complexes have Squre. Planar Geometry.

(d) Complexes of the type $[MA_4]^{n\pm}$ $[MA_3X]^{n\pm}$ $[MA_3X]^{n\pm}$

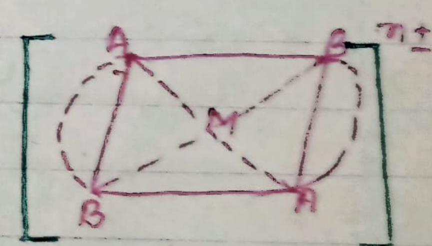
Squre Planar Complexes of such type do not show Geometrical isomerism, since, every Possible spatial arrangement of ligands round the metal ion is exactly equivalent.

Square Planar Complexes having unsymmetrical Bidentate Chelating ligand :- $[M(AB)_2]^{n\pm}$ Type Complex

Here M is the Central metal ion and (AB) represents an unsymmetrical bidentate ligand. Such type of Complexes also shows Cis and trans isomerism,

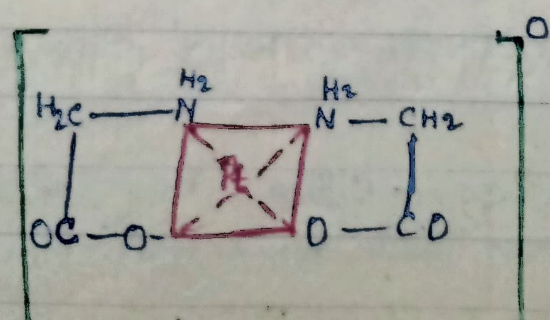


Cis - Form

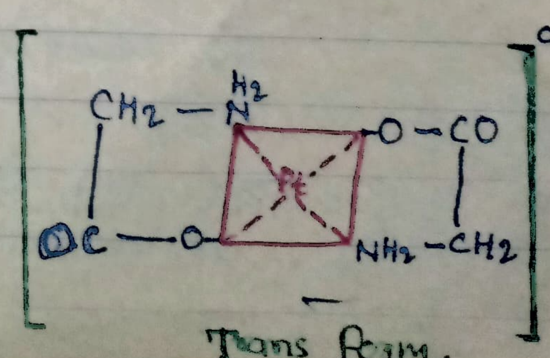


Trans - Form -

Example:- $[Pt^{II}(gly)_2]^0$ where gly stands for $NH_2-CH_2COO^-$ (Glycine ... is an important example of this type of complex. It also exist Cis- and trans isomerism, ~~Shown~~ which is shown below.



Cis- Form



Trans Form.