Co-ordination Compounds

Degree-II (H) , Paper-III , Group-B

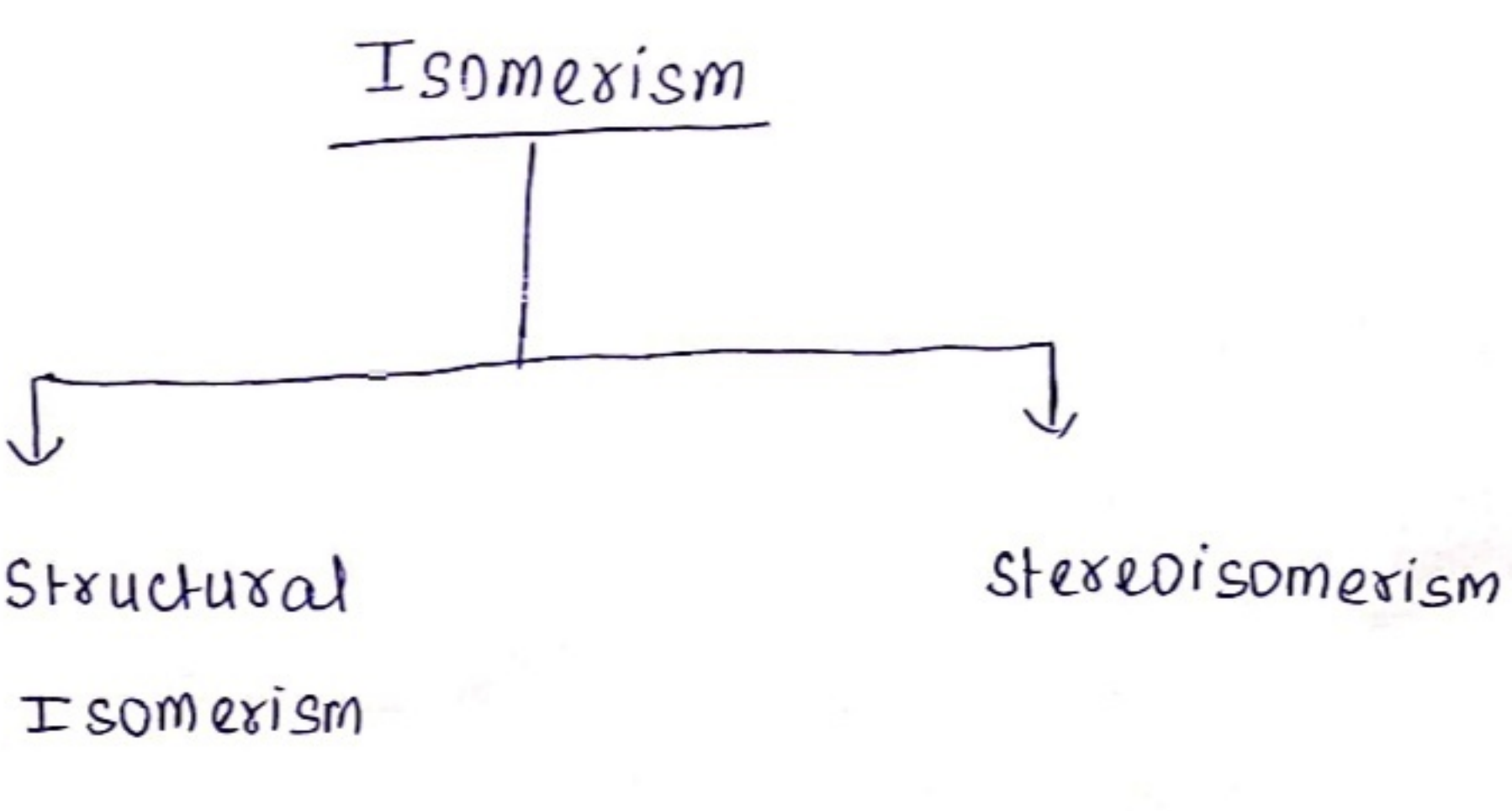
Lecture-13,By-Dr.Rinky,05/10/2020

Topic :- Isomerism in Complex Compounds

Dept.of Chemistry

* Isomers are compounds with the same chemical composition but different arrangement of their constituent atoms and the phenomenon of existence of isomers is called isomerism.

* Isomers are mainly classified into two types. Structural (or constitutional) and stereoisomerism, each of these is further sub classified as:---



Structural Isomerism

- Ionization isomerism
- Hydrate isomerism
- Linkage isomerism
- Coordination isomerism
- Coordination position isomerism
- Ligand isomerism
- Polymerization isomerism

Stereoisomerism

- Geometrical isomerism
- Optical isomerism

Structural Isomerism

* Isomers that have different atom to atom bonding are called structural isomers. In coordination

Compounds, structural isomerism arises due to different connections (or bonding) between metal and ligands.

Ionisation Isomerism

In these isomers there is exchange of ligands between co-ordination sphere and ionisation sphere (called counter ion). These isomers give different ions when dissolved in water.

for example, $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$ are ionisation isomers.

* These isomers give different ions in aqueous solution and show different properties.

[a] $[Co(NH_3)_5Br]SO_4$ is red-violet and $[Co(NH_3)_5SO_4]Br$ is red.

b) In aqueous solution, $[Co NH_3)_5Br]SO_4$ gives white ppt. of $BaSO_4$ on reaction with $BaCl_2$ whereas it

does not give any precipitate with $AgNO_3$. This indicates that SO_4^{2-} ion is present in ionisation sphere.

$$[Co(NH_3)_5Br]SO_4 \xrightarrow{Ba^{2+}} [Co(NH_3)_5Br]^{2+} + BaSO_4$$

White ppt.

$$[Co(NH_3)_5Br]SO_4 \xrightarrow{Ag^+} \text{No precipitate}$$

On the other hand, $[Co(NH_3)_5SO_4]Br$ gives cream coloured precipitate of AgBr with $AgNO_3$ and it does not give any precipitate with $BaCl_2$. This indicates that Br^- ion is present outside the coordination sphere.

$$[Co(NH_3)_5(SO_4)]Br \xrightarrow{Ag^+} [Co(NH_3)_5(SO_4)]^+ + AgBr$$

Cream coloured ppt.

$$[Co(NH_3)_5(SO_4)]Br \xrightarrow{Ba^{2+}} \text{No precipitate}$$

To be continued in next lecture..