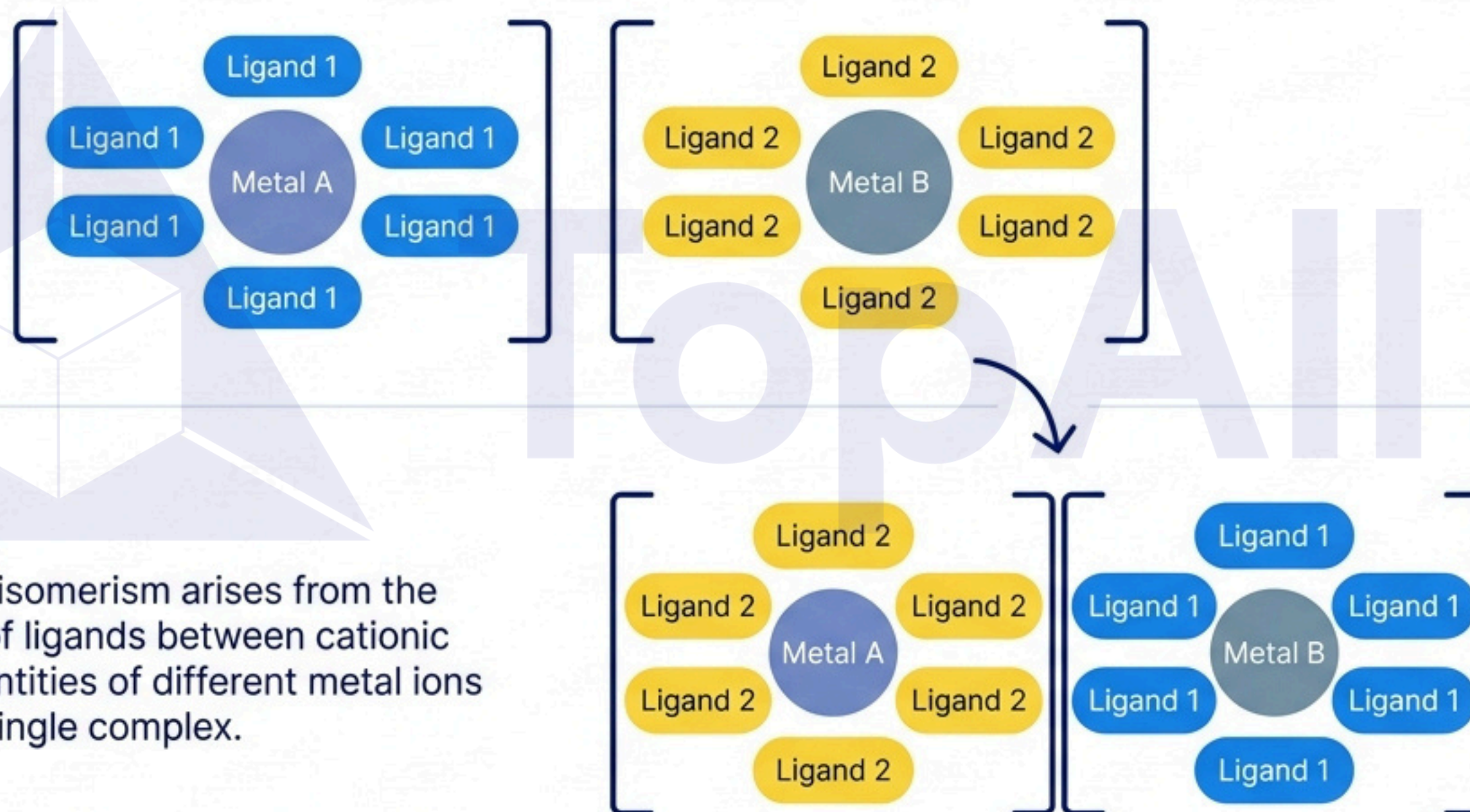


# Coordination Isomerism

The Exchange of Ligands Between Complex Ions

## DEFINITION

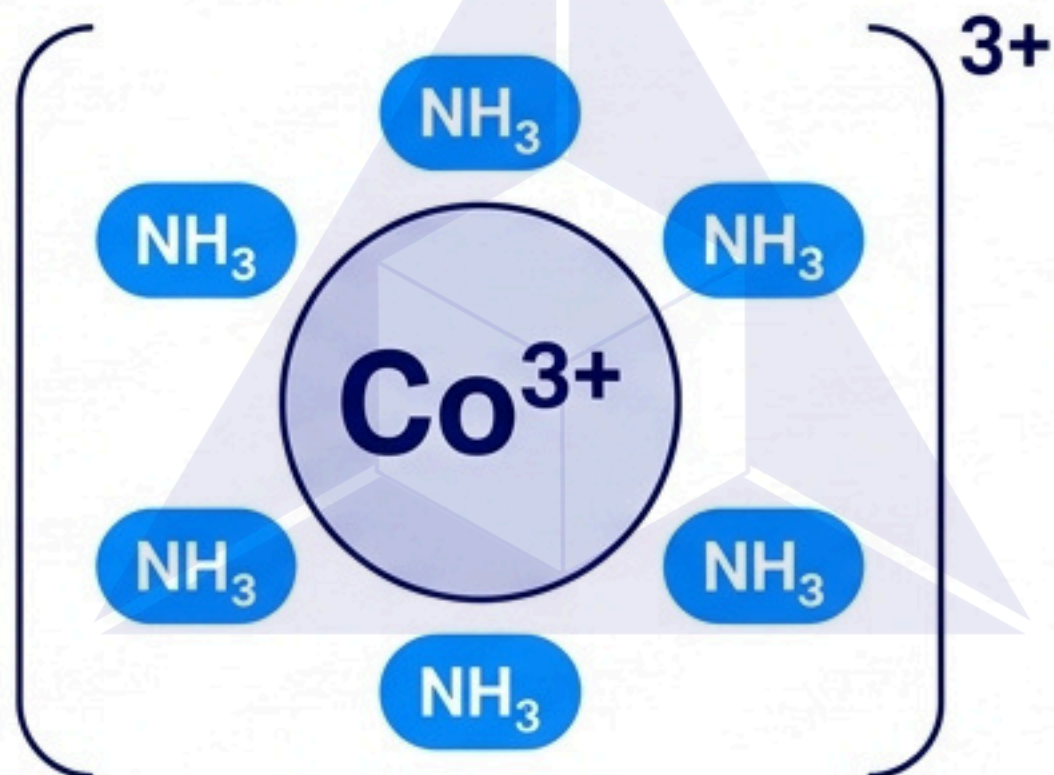
Coordination isomerism arises from the interchange of ligands between cationic and anionic entities of different metal ions present in a single complex.



# The Starting Complex

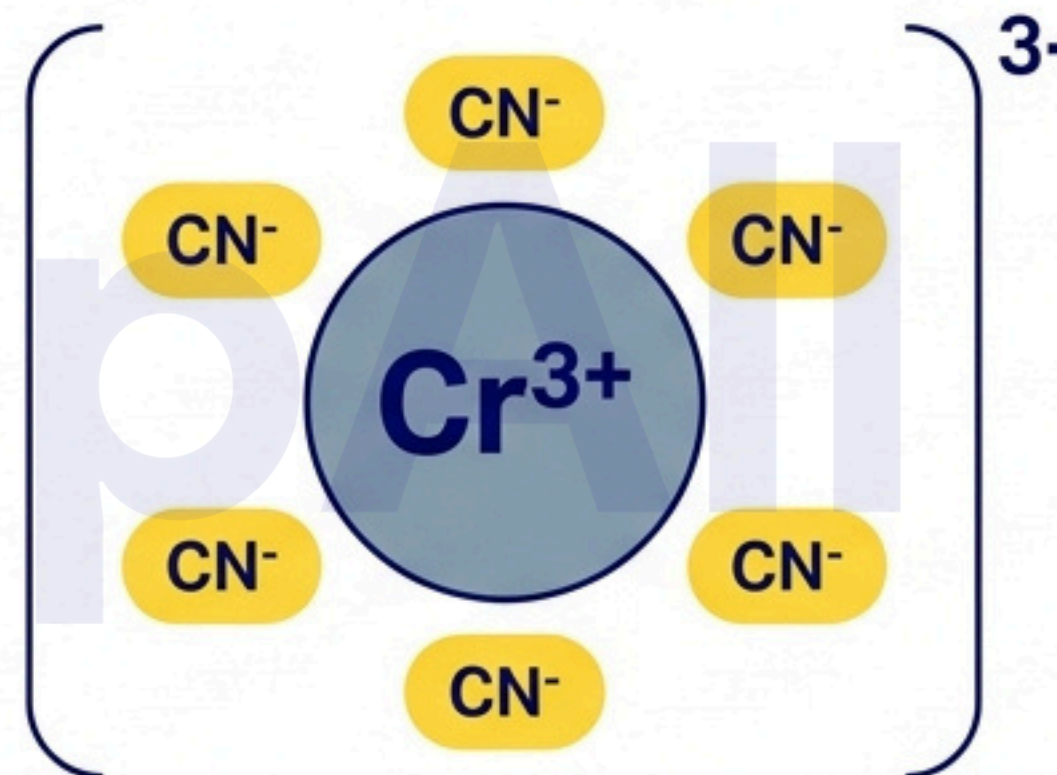
## Establishing the Cationic and Anionic Entities

### CATIONIC ENTITY



Ammine ligands are exclusively bound to the Cobalt center.

### ANIONIC ENTITY



Cyano ligands are exclusively bound to the Chromium center.

Full Empirical Formula:  $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$



# You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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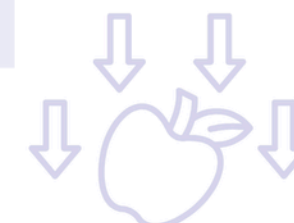
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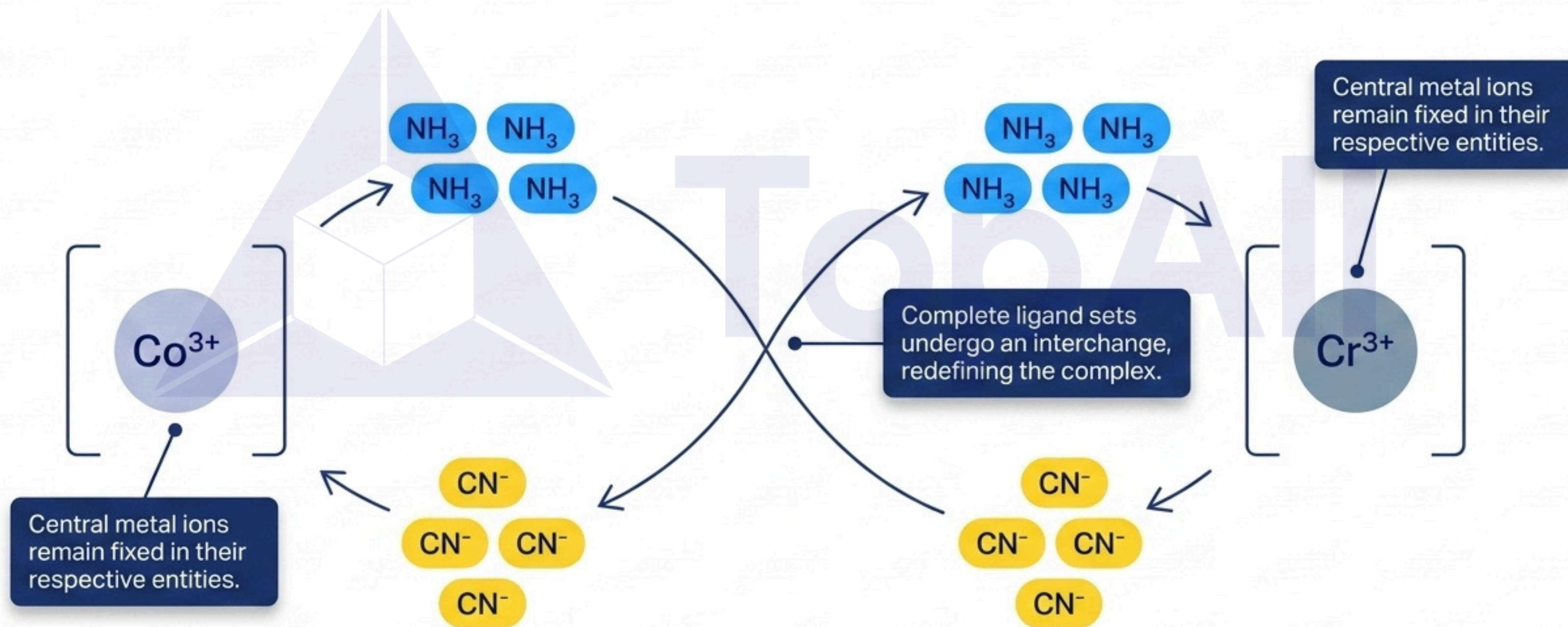
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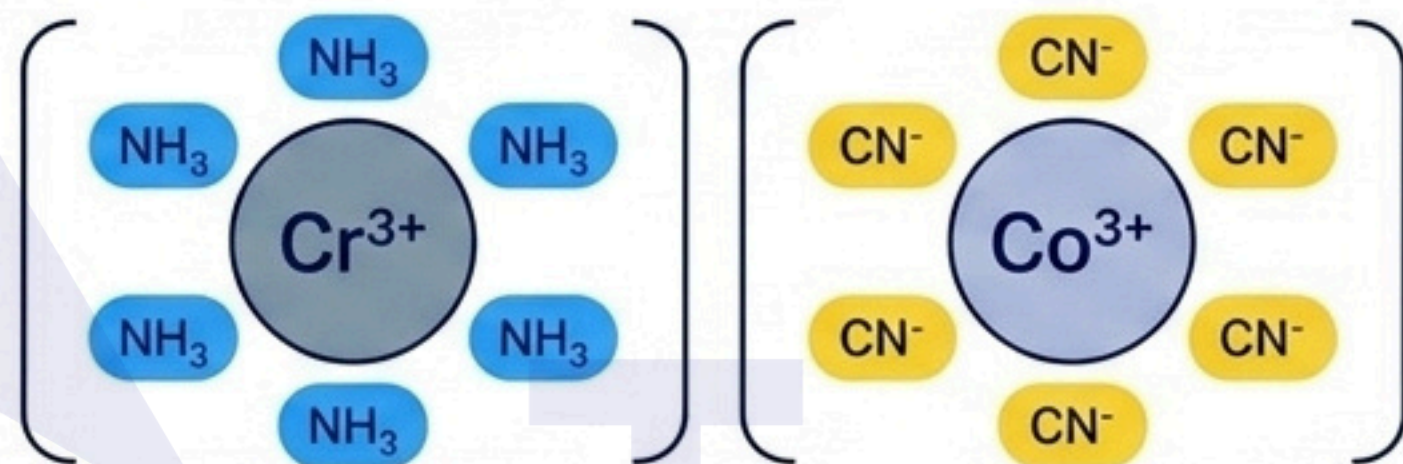
# The Ligand Interchange

## Mapping the Cation-Anion Swap



# The Resulting Isomer

Comparing the Swapped Entities



| Dimensions                | Original Complex                                     | Coordination Isomer                                  |
|---------------------------|------------------------------------------------------|------------------------------------------------------|
| [Formula]                 | $[\text{Co}(\text{NH}_3)_6][\text{Cr}(\text{CN})_6]$ | $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$ |
| [Cationic Metal]          | Cobalt ( $\text{Co}^{3+}$ )                          | Chromium ( $\text{Cr}^{3+}$ )                        |
| [Anionic Metal]           | Chromium ( $\text{Cr}^{3+}$ )                        | Cobalt ( $\text{Co}^{3+}$ )                          |
| [Bound to $\text{NH}_3$ ] | Cobalt                                               | Chromium                                             |
| [Bound to $\text{CN}$ ]   | Chromium                                             | Cobalt                                               |

# Key Takeaways

## Summary of Coordination Isomerism



### Dual Complex Requirement

This isomerism exclusively requires a complex salt where both the cationic and anionic entities are complex ions.



### The Interchange Mechanism

The structural variation occurs through the total or partial interchange of ligands between the two metal centers.



### The Archetype

The exact interchange between Co/Cr centers and  $\text{NH}_3/\text{CN}$  ligands serves as the definitive baseline example of this phenomenon.



# You've Learned the Theory.

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