

Ionisation Isomerism

When counter ions and coordinated ligands swap roles.



Counter Ion

An ion outside the coordination sphere that is itself a potential ligand. In ionisation isomerism, it displaces a coordinated ligand, taking its place inside the bracket.





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$$E=mc^2$$



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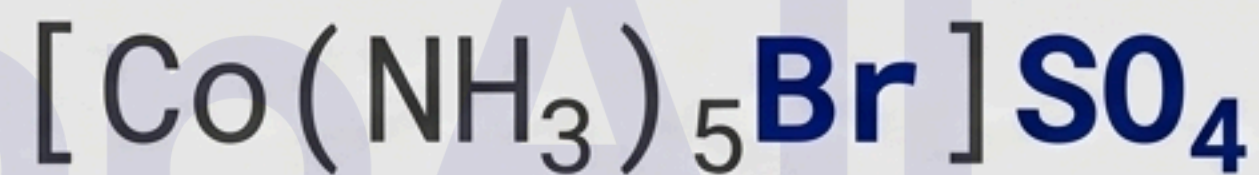


Isomer A



SO_4^{2-} is locked in the vault.
 Br^- is the free agent.

Isomer B



Br^- is locked in the vault.
 SO_4^{2-} is the free agent.



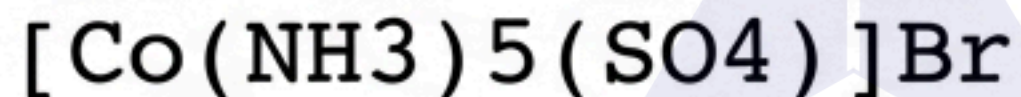
Confirming Reaction Grid

	+ $\text{Ba}^{2+}(\text{aq})$	+ $\text{Ag}^{+}(\text{aq})$
$[\text{Co}(\text{NH}_3)_5(\text{SO}_4)]\text{Br}$	No reaction	AgBr (s)
$[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$	$\text{BaSO}_4 (\text{s})$	No reaction

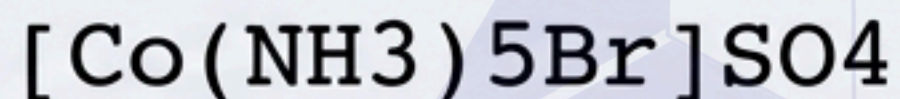
Precipitates only form when the target ion is outside the brackets.

A red-violet cobalt complex has the empirical formula $\text{Co}(\text{NH}_3)_5\text{BrSO}_4$. It produces a white precipitate with BaCl_2 , but no precipitate with AgNO_3 . Identify the complex.

Option A



Option B

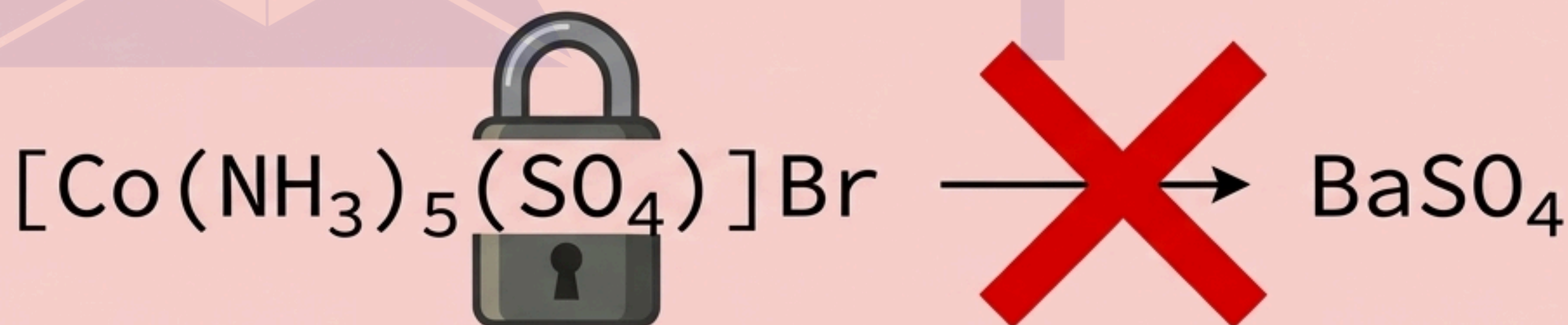


The precipitation of BaSO_4 means SO_4^{2-} must be the free counter ion outside the bracket. Therefore, the structure is $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$.

Watch for this!

Only the free agent outside the brackets reacts.

Remember that ligands locked inside the coordination sphere [...] cannot act as precipitating ions.



Key Takeaways

- Ionisation isomers share the same empirical formula but swap a coordinated ligand with an external counter ion.
- Their true structure is confirmed by testing for the free counter ion in solution using specific precipitation reagents (like Ag^+ or Ba^{2+}).



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