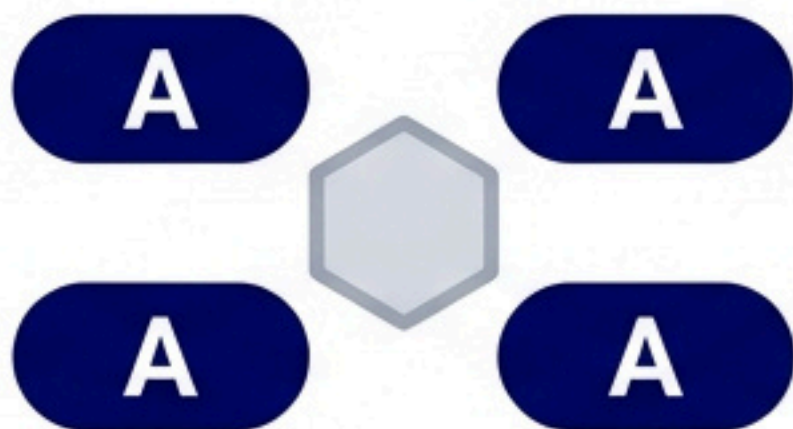


Decoding Coordination Complexes

Homoleptic

“Homo” (same) + “leptikos” (taking/binding)

A complex where the central metal is bound to only one kind of donor group.



Heteroleptic

“Hetero” (different) + “leptikos” (taking/binding)

A complex where the central metal is bound to **more than one kind** of donor group.



Homoleptic Complexes: Uniform Ligands



The Core

Cobalt (Co^{3+}) – The central metal ion.

The Donor Groups

Hexaammine ($6 \times \text{NH}_3$).

Visual Evidence (The Badge Array)



Conclusion: 100% Uniform Ligands = Homoleptic



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Heteroleptic Complexes: Mixed Ligands



The Core

Cobalt (Co^{3+}) – The central metal ion.

The Donor Groups

Tetraammine ($4 \times \text{NH}_3$) + Dichlorido ($2 \times \text{Cl}^-$).

Visual Evidence (The Badge Array)



Conclusion: Mixed Ligand Types = Heteroleptic

The Distinction Matrix

	Homoleptic	Heteroleptic
Donor Variety	Strictly one type of ligand	Two or more different types of ligands
Visual Badge Pattern		
Isomerism Potential	Typically lower structural variance	Can exhibit geometrical isomerism (e.g., cis and trans forms)
Classic Example	$[\text{Co}(\text{NH}_3)_6]^{3+}$	$[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$

Key Takeaways

- **Scan the Brackets:** Instantly identify the complex type by counting the distinct chemical species inside the square coordination sphere [].
- **Charge is Irrelevant:** The overall charge of the complex (e.g., 3+ vs +) does not determine whether it is homoleptic or heteroleptic; only the ligand variety matters.

Rapid Revision: Knowledge Check

Identify whether the following coordination entities are homoleptic or heteroleptic based on Section 5.2(h):



Heteroleptic.

It contains two distinct donor groups: chlorido (Cl) and ammine (NH_3).



Homoleptic.

It contains only one type of donor group: cyanido (CN).

✓ Mastery achieved. You can now classify coordination complexes purely through visual pattern recognition of their chemical formulas.



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