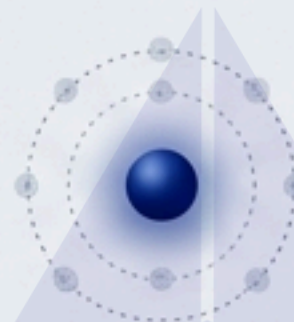


UNIT 5 • COORDINATION COMPOUNDS

Formulas of Mononuclear Coordination Entities

The 7 IUPAC Rules for Building
Complex Formulas

The Building Blocks



Mononuclear Coordination Entity

A coordination complex containing exactly **one** central metal atom or ion bonded to a fixed number of surrounding ligands.



Alphabetical Ligand Ordering

The strict IUPAC protocol dictating that ligands are listed A-Z based on their chemical symbol or abbreviation, ignoring their electrical charge, for example, listing Cl^- before H_2O and NH_3 .

The 7-Step Formula Blueprint

- 01 **Central Atom First:** Always starts the formula.
- 02 **Alphabetical Ligands:** Sorted A-Z regardless of charge.
- 03 **Polydentate Abbreviations:** Sorted by the first letter of their abbreviation.
- 04 **Enclose in Brackets:** **[]** for the whole entity, **>()** for polyatomic ligands & abbreviations.
- 05 **Zero Spaces:** No spaces between metal and ligands inside the sphere.
- 06 **Charge Placement:** Indicated outside brackets as a right superscript (e.g., **3-**).
- 07 **Balance Charges:** Cation charges must balance anion charges.



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Assembling a Formula: Step-by-Step

1. Central Metal

Co

2. Add Ligands

Co(CN)₆

3. Enclose Sphere

[Co(CN)₆]

4. Add Net Charge

[Co(CN)₆]³⁻

Formula Structure: Old Habit vs. IUPAC Rule

~~Charge-Based Ordering~~

Anions first, neutrals second.



Alphabetical Ordering

Purely A-Z based on symbol/name, ignoring charge.



Watch for this



The Charge-Placement Trap

A common misconception is that a ligand's charge dictates its order within the brackets (e.g., placing negative ions before neutral molecules). **IUPAC explicitly removed this.**

**Ligand placement never depends on charge.
Always sort strictly by the alphabet.**

Core Concept Summary

- ✓ Writing a mononuclear formula requires strict syntax: Metal first → Alphabetized ligands → Brackets [] → Net charge as superscript.
- ✓ Alphabetical ordering is absolute. Polyatomic ligands use their formulas, and abbreviated polydentate ligands use their abbreviations to determine their precise A-Z placement. Ignore electrical charges entirely when ordering.



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