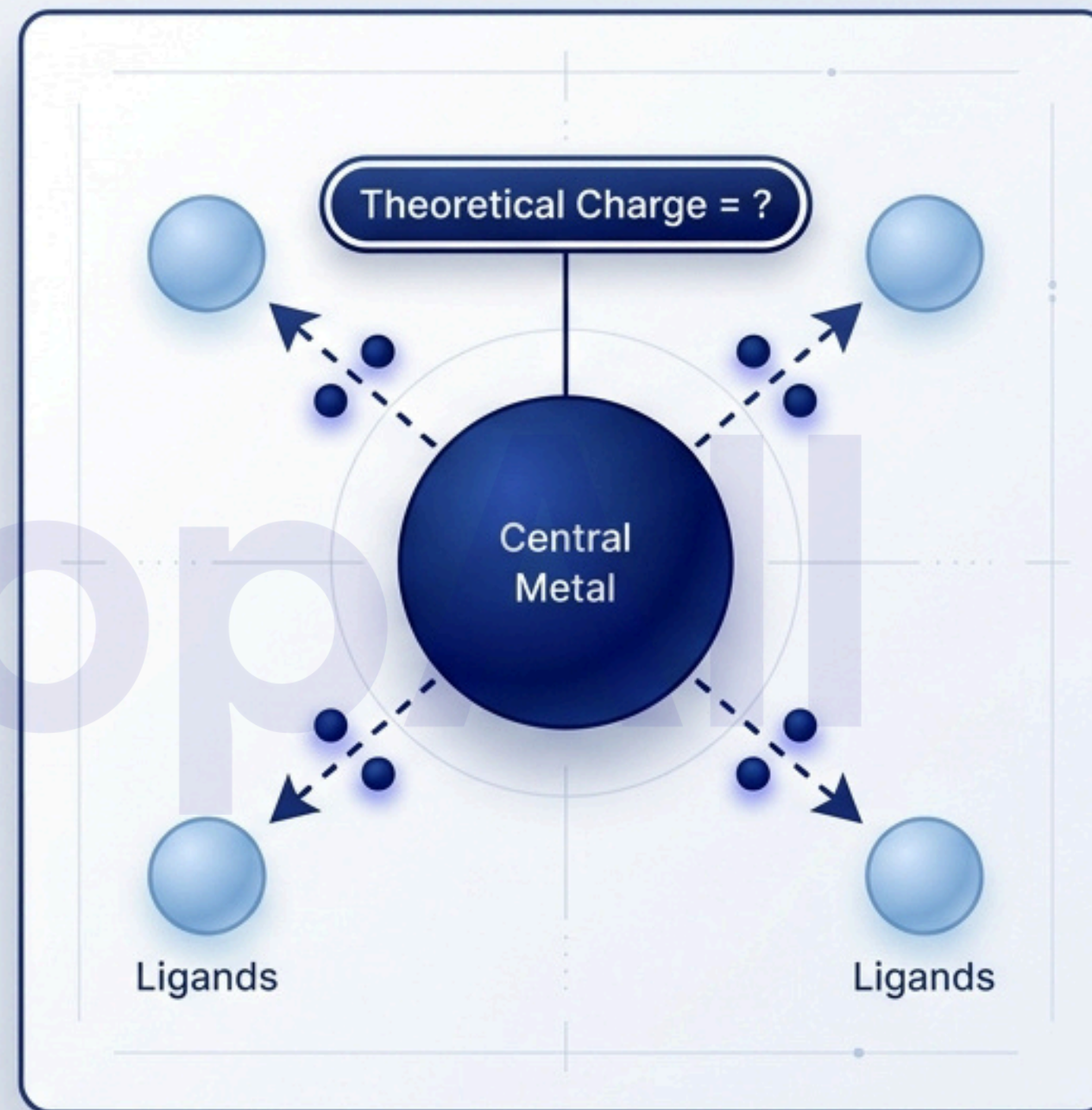


SECTION 5.2(G) • DEFINITIONS

Oxidation Number of the Central Atom

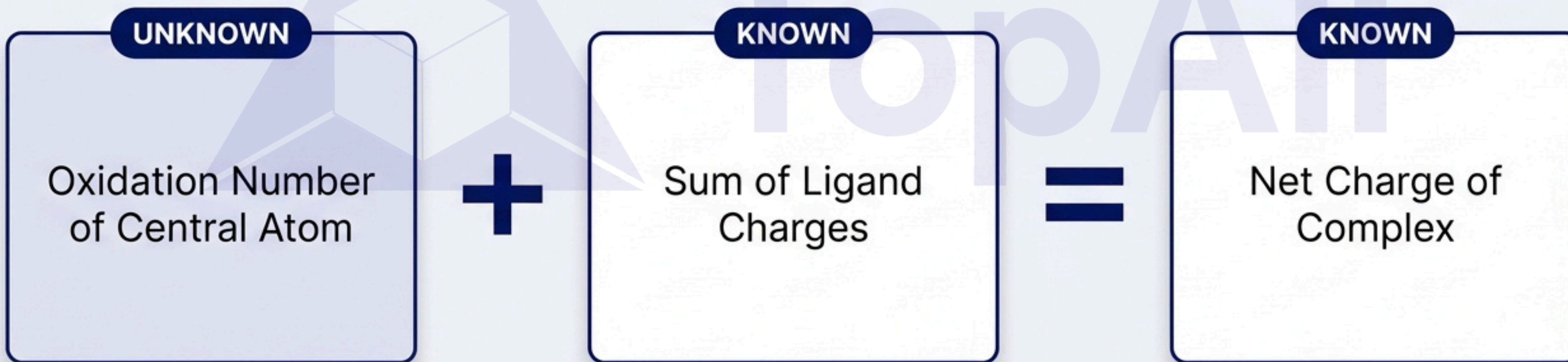
The oxidation number of the central atom in a complex is defined as the theoretical charge it would carry if **all the ligands are removed** along with the electron pairs that are shared with the central atom.



THE CORE PRINCIPLE

Balancing the Complex

A coordination entity is a balanced system. The sum of the oxidation state of the central atom and the charges of all attached ligands must perfectly equal the net charge of the entire complex.



We solve for the Central Atom by isolating the unknown variable.



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$$E=mc^2$$



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Solving for Copper in $[\text{Cu}(\text{CN})_4]^{3-}$

Step 1: Identify Variables

Central Atom:

Cu

Let this be x

Ligands:

4 x Cyanide (CN^-) ions

Since the whole complex is -3 , each CN contributes a -1 charge.

Total = -4

Net Charge:

The total charge of the complex is

-3

Step 2: Set up the Equation

$$x + (-4) = -3$$

Step 3: Solve

$$x - 4 = -3 \longrightarrow x = +1$$

Oxidation State = $+1$

Writing the Oxidation State

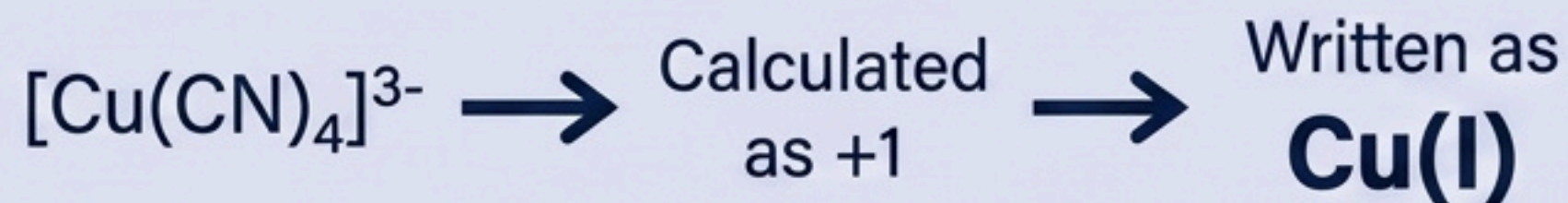
The oxidation number is represented by a Roman numeral in parenthesis immediately following the name of the coordination entity's central metal.

Calculated Charge -> Notation

+1	→	(I)
+2	→	(II)
+3	→	(III)

Because Copper's theoretical charge is +1, its oxidation state is written as

Cu(I).



Key Takeaways

- ✓ The oxidation number is the central atom's theoretical charge if all ligands were removed.
- ✓ It is found by balancing the equation: [Central Atom] + [Ligands] = [Net Charge].
- ✓ It is always formatted as a Roman numeral in parentheses (e.g., Cu(I)).

Quick Knowledge Check

Using the logic that a Cyanide (CN) ligand carries a -1 charge, calculate the oxidation number of a hypothetical Metal (M) in the complex **[M(CN)6]4-**. How would you write it?

Reveal Answer

Answer: Set up the ledger: $x + (-6) = -4$. Solving for x gives +2. Following the naming convention, it is written as **M(II)**.



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