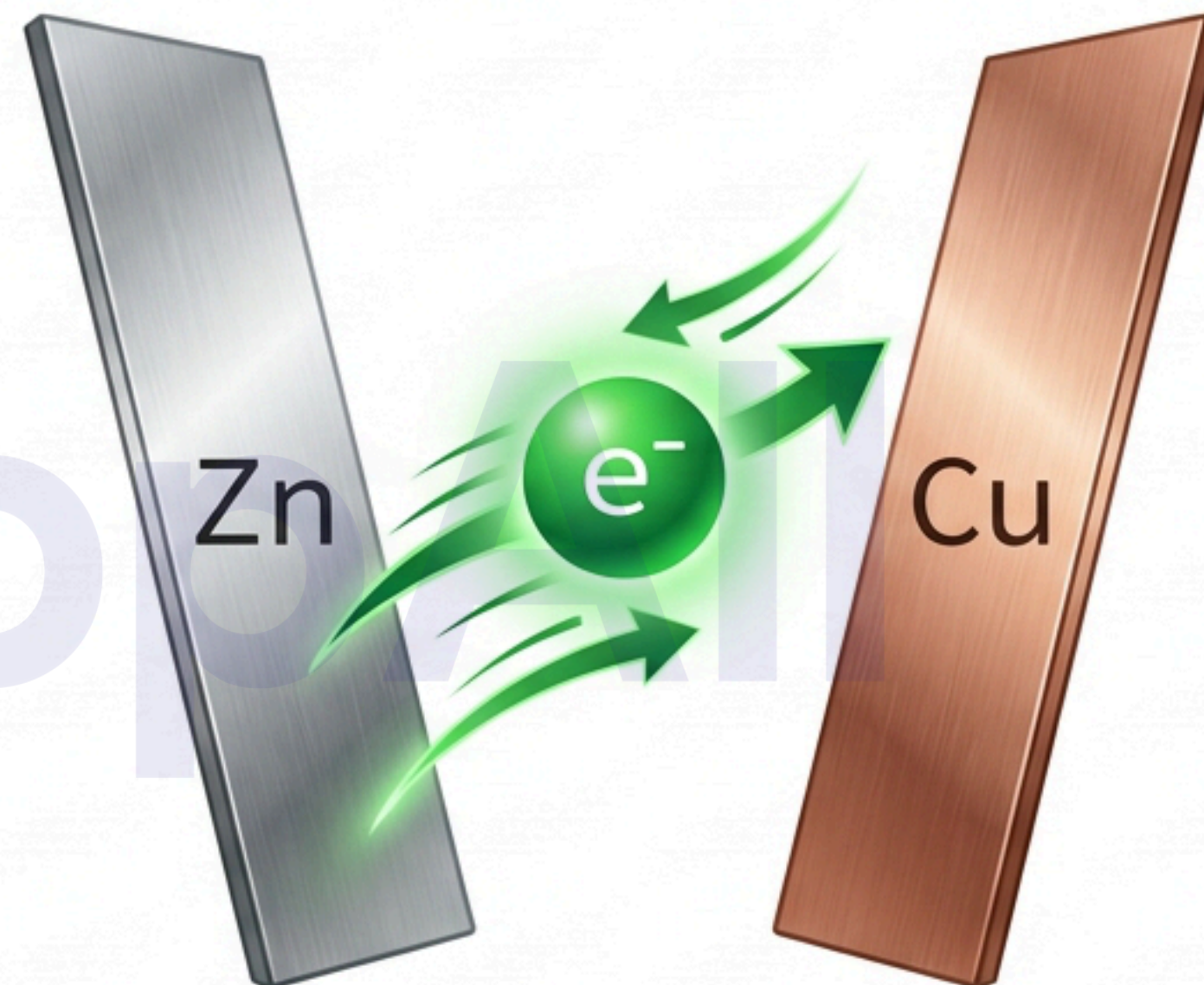


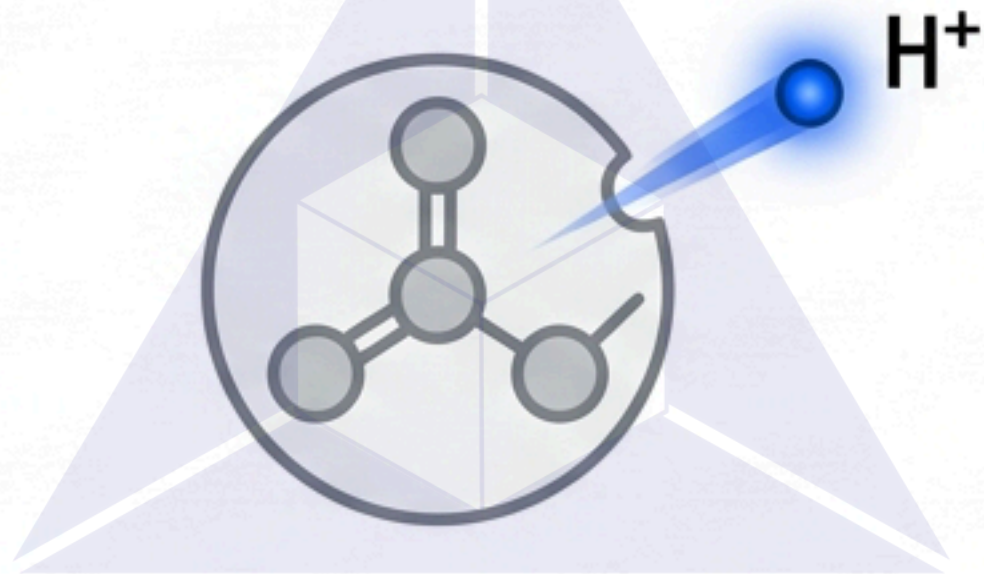
Metal Competition: Who Gives Electrons First?

Understanding Competitive
Electron Transfer Reactions

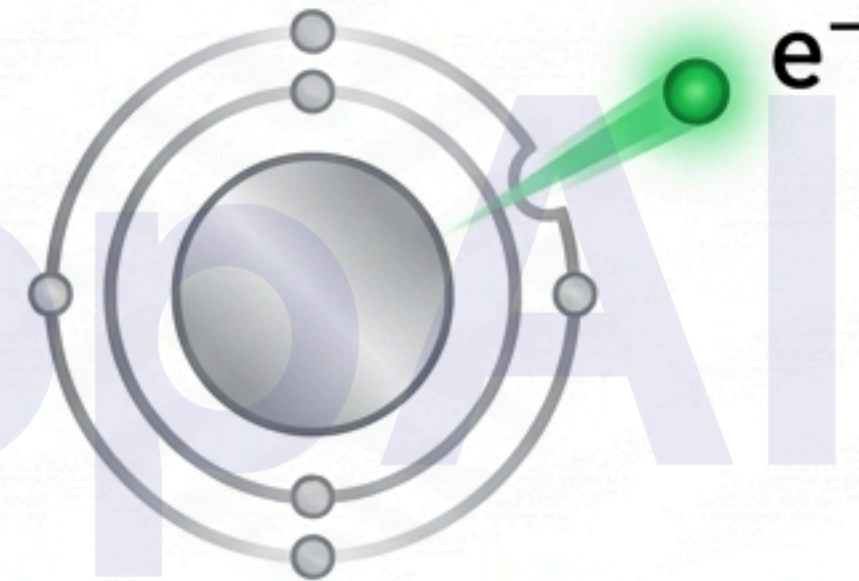


The Battle for Electrons

Just as acids compete to release protons (H^+), metals compete to release electrons (e^-).



Acid = Proton Donor



Metal = Electron Donor

Key Insight: When a metal strip is placed in a salt solution of another metal, the metal with the stronger tendency to lose electrons will oxidize and dissolve, forcing the other metal's ions to reduce and deposit.

Match 1: Zinc vs. Copper Ions



Panel 1 (Left)
Initial: Deep blue Cu^{2+} solution.



Panel 2 (Center)
During: Zinc strip starts to dissolve.



Panel 3 (Right)
Final: Blue color disappears. Reddish metallic copper coats the strip.

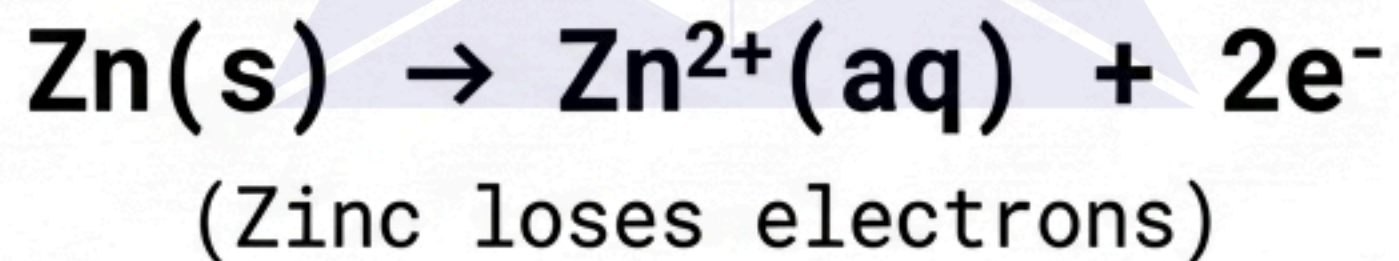
Reaction Breakdown: $\text{Zn} + \text{Cu}^{2+}$

Anatomy of an Equation

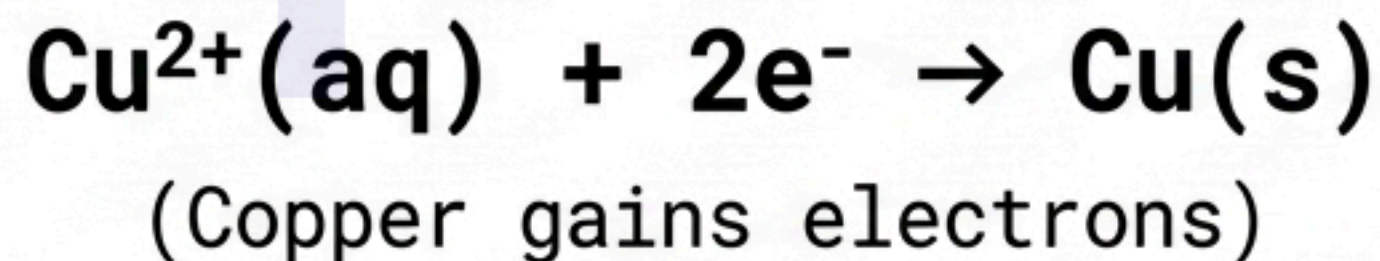
$2e^-$ transfer



Oxidation



Reduction



NO REACTION occurs if a Cu strip is placed in ZnSO_4 . Zinc strictly wins this competition. The equilibrium heavily favors the products.



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$$E=mc^2$$



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Match 2: Copper vs. Silver Ions



Initial: Colorless Ag^+ solution.



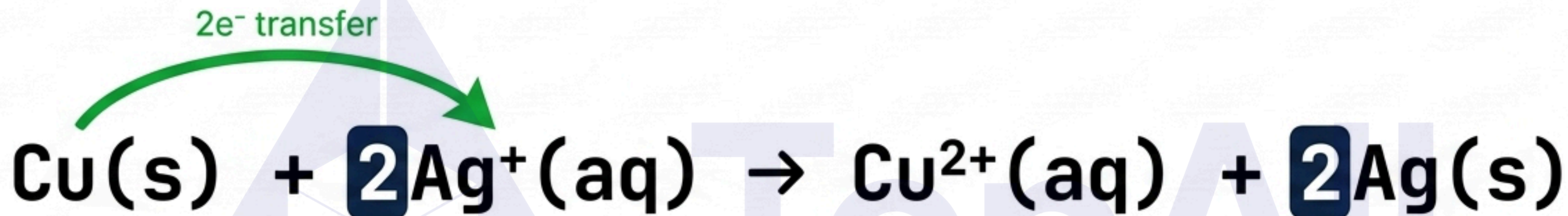
During: Copper strip dissolves.



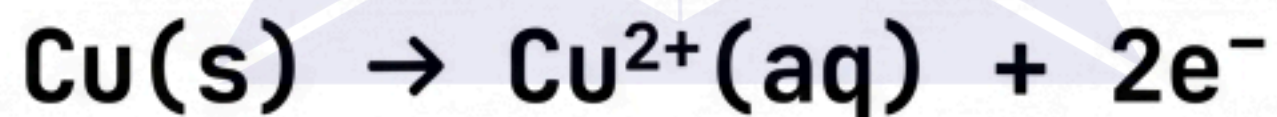
Final: Solution turns blue (Cu^{2+}).
Shiny silver deposits.

Reaction Breakdown: $\text{Cu} + \text{Ag}^+$

Anatomy of an Equation



Oxidation



Reduction

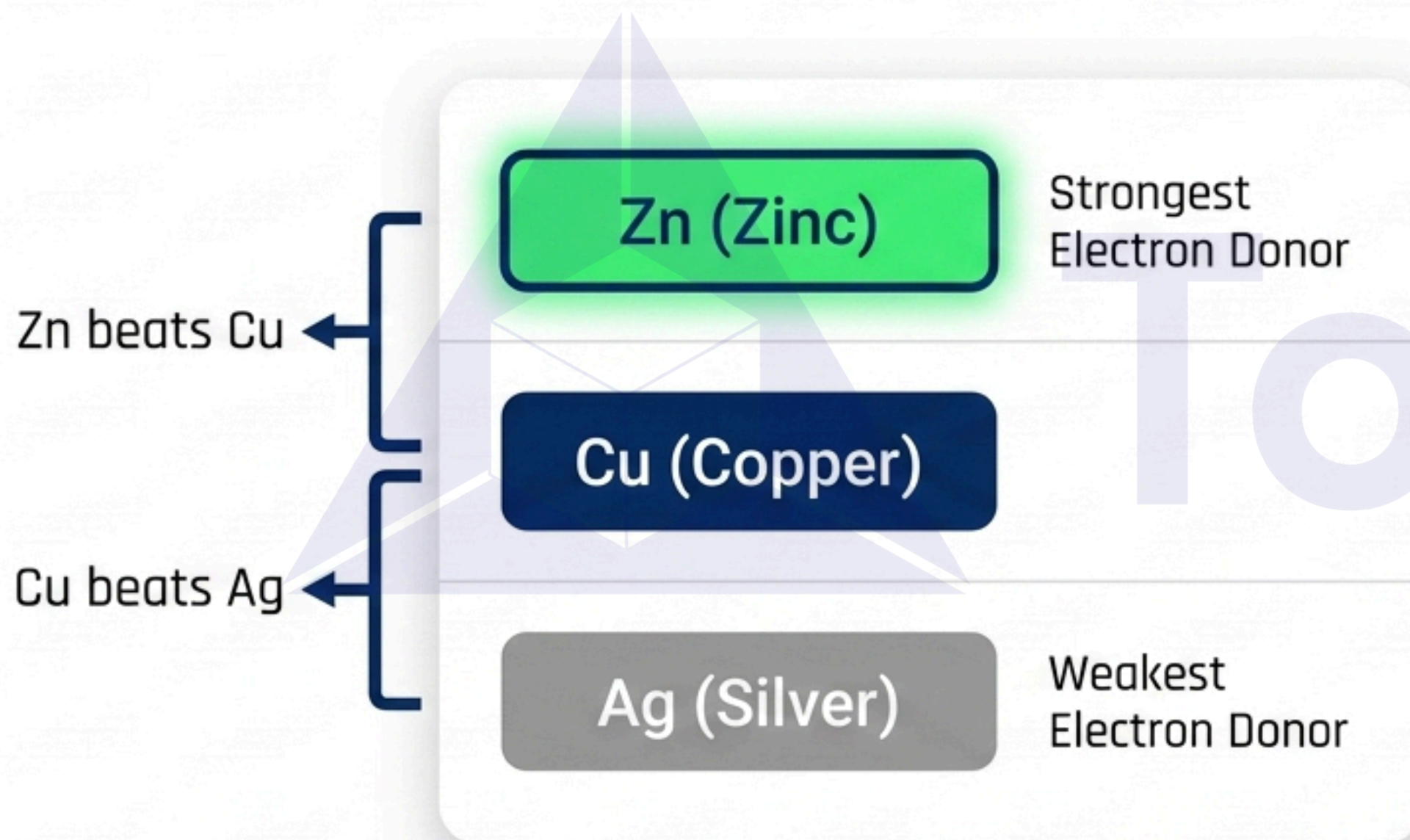


Key Insight: Copper, the 'loser' in the previous experiment, now acts as the electron donor (**reducing agent**) when paired with Silver. One Cu atom yields enough electrons to **reduce two Ag^+** ions.

The Electron Releasing Hierarchy



By observing these competitive reactions, we can rank metals by their inherent tendency to release electrons (oxidation potential).



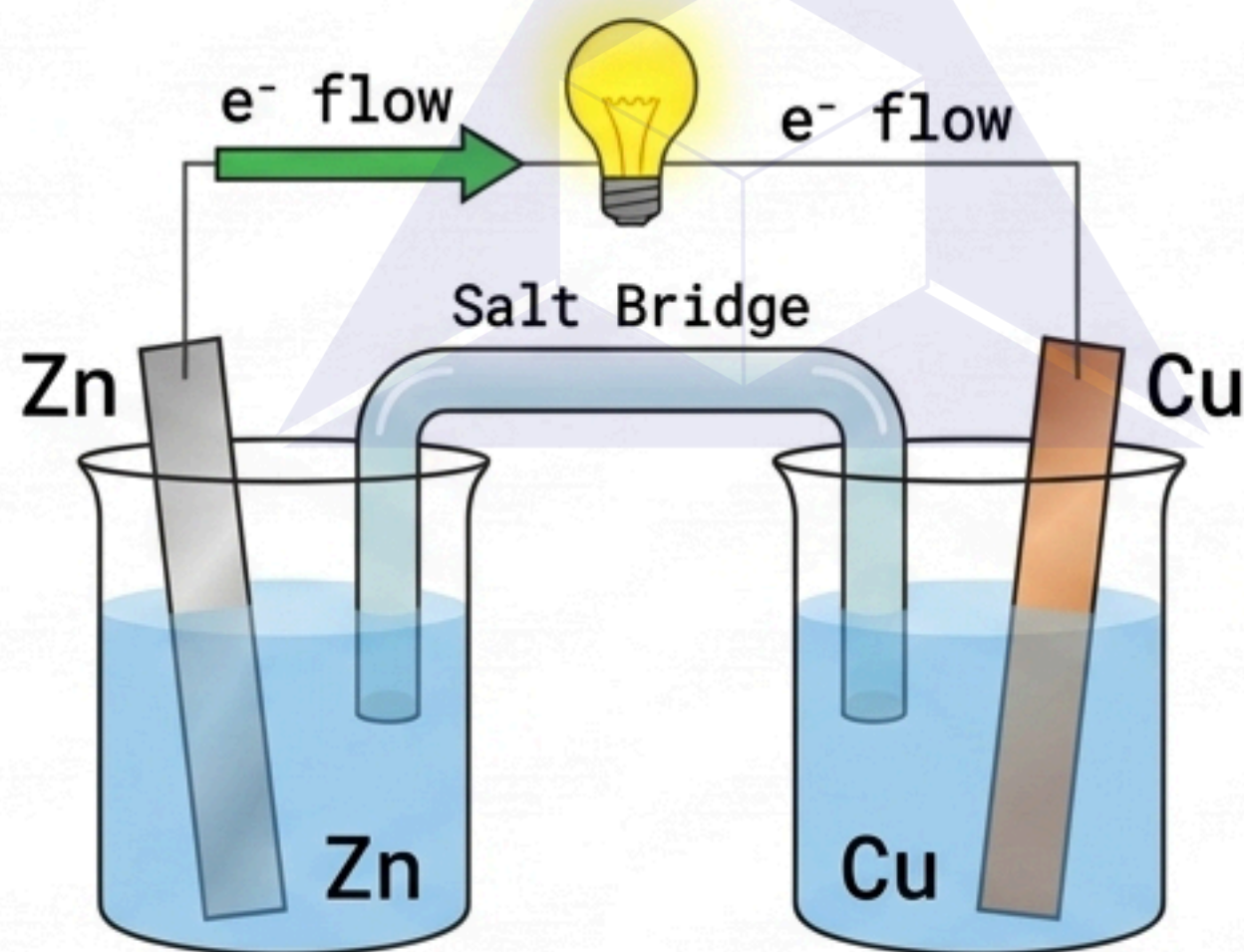
Zn > Cu > Ag

Summary: Zinc is the strongest reducing agent of the three, releasing electrons to both Copper and Silver.

Why This Matters: Batteries & The Activity Series

1. Galvanic Cells

If we separate the competing metals into two different beakers and connect them with a wire, the transferred electrons flow through the wire—creating electricity!



2. The Metal Activity Series

This exact competition allows chemists to build a universal ranking of all metals. This table (The Electrochemical Series) predicts whether any two substances will react.

Metal	Reactivity
Li	
K	
Na	
Zn	
Cu	
Ag	
Au	
Pt	



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