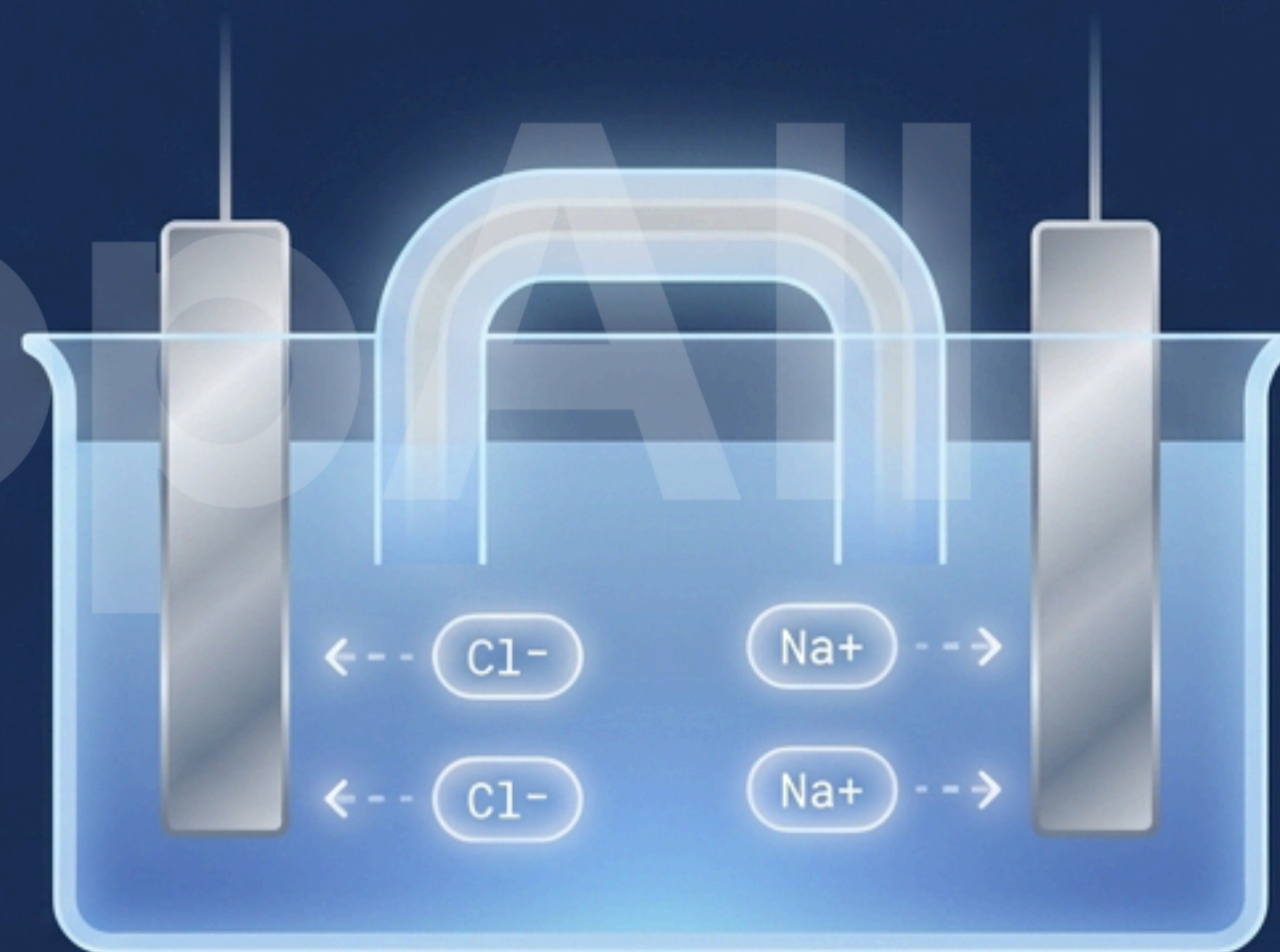


ELECTROCHEMISTRY / PART 2

Conductance of Electrolytic Solutions

Understanding how ions carry electrical current: from fundamental resistance to molar conductivity.



Resistance & Resistivity

Resistance R

The hindrance to the flow of electrical current through a specific object.

Geometry Dependency:	Directly proportional to length	l
	Inversely proportional to area	A

Unit: Ohm Ω

Resistivity ρ (rho)

The inherent resistance of a specific material, regardless of its overall shape.

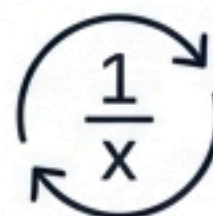
Defined as the resistance of a substance when it is exactly 1 meter long with a 1 m^2 cross-sectional area.

Unit: Ohm metre $\Omega \text{ m}$

$$R = \underbrace{\rho(l/A)}$$

Cell Constant (G^*)

Conductance & Conductivity



Conductance **G**

The ease with which electric current flows through an object. The exact inverse of Resistance.

Unit: Siemens (S) or mho **Ω^{-1}**

$$G = 1/R$$

Conductivity **κ (kappa)**

The inherent ability of a material to conduct current. The exact inverse of Resistivity. Also known as specific conductance.

Unit: Siemens per meter **$S\ m^{-1}$**

$$\kappa = 1/\rho$$



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$$E=mc^2$$



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Key Highlights

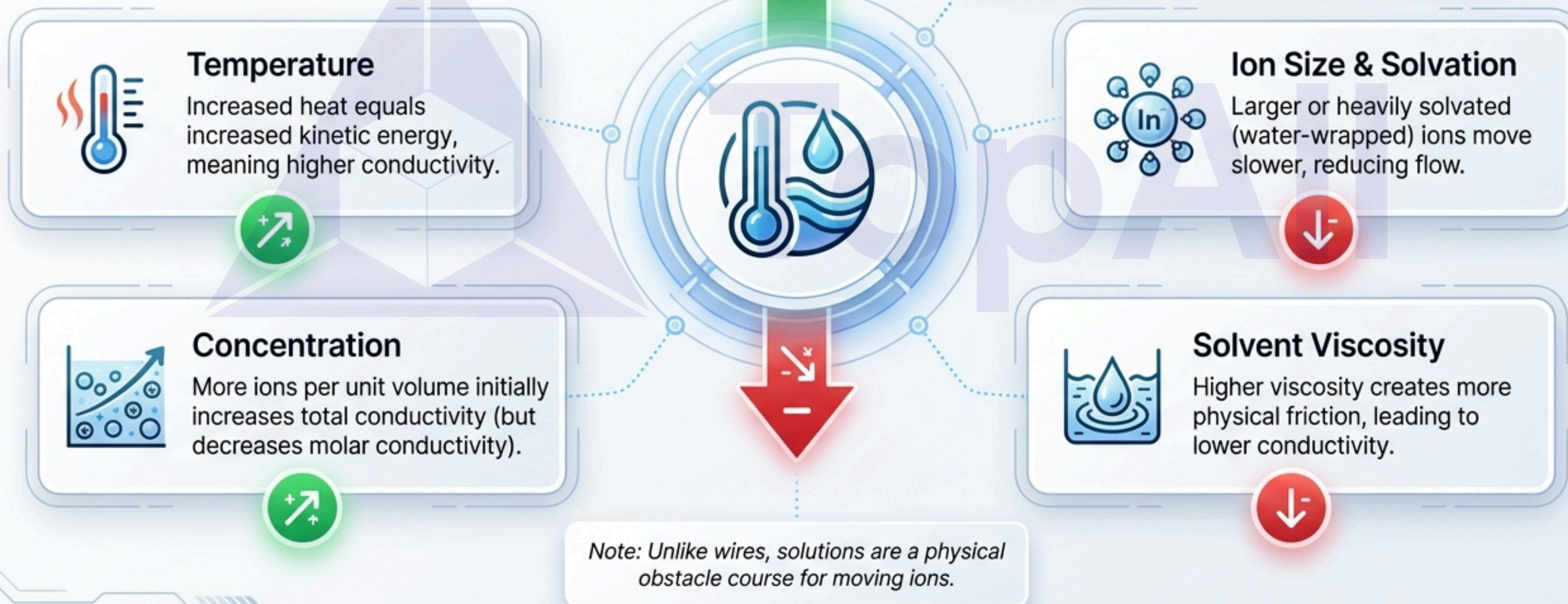
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Two Ways to Conduct

	Metallic (Electronic) Conductance	Electrolytic (Ionic) Conductance
 Charge Carriers	Movement of Electrons e^-	Movement of Ions $+$ $-$
 Chemical Change	None. Physical composition remains entirely unchanged.	Decomposition. Electrochemical reactions occur at the electrodes.
 Temperature Effect	Conductance DECREASES with heat (due to metal lattice vibration hindering flow).	Conductance INCREASES with heat (due to increased kinetic energy and lower viscosity).

Variables of Electrolytic Flow

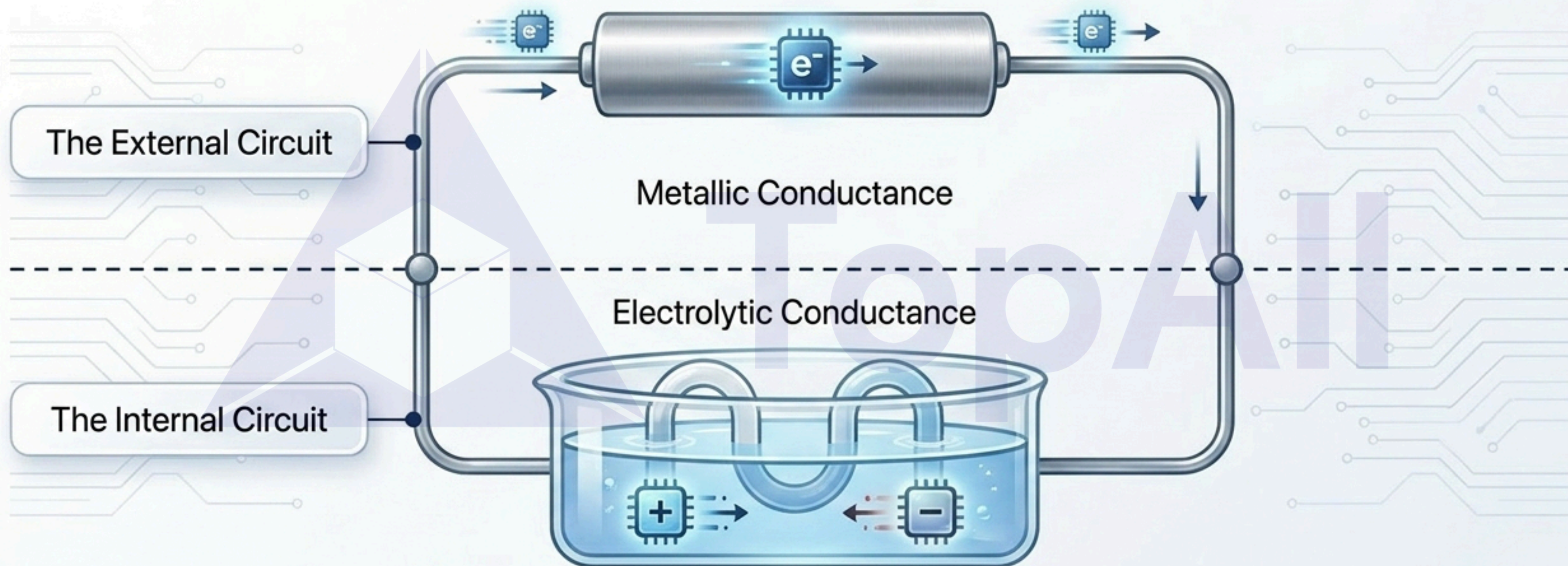


Conductivity Across Materials



Aqueous solutions are highly variable intermediate conductors—their conductivity depends entirely on the presence and concentration of dissolved ions.

Ions Carry the Current



While the Nernst Equation and Gibbs Energy dictate the potential (E_{cell}) of the battery, the conductance (κ) of the solution dictates how efficiently that potential can drive current.



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