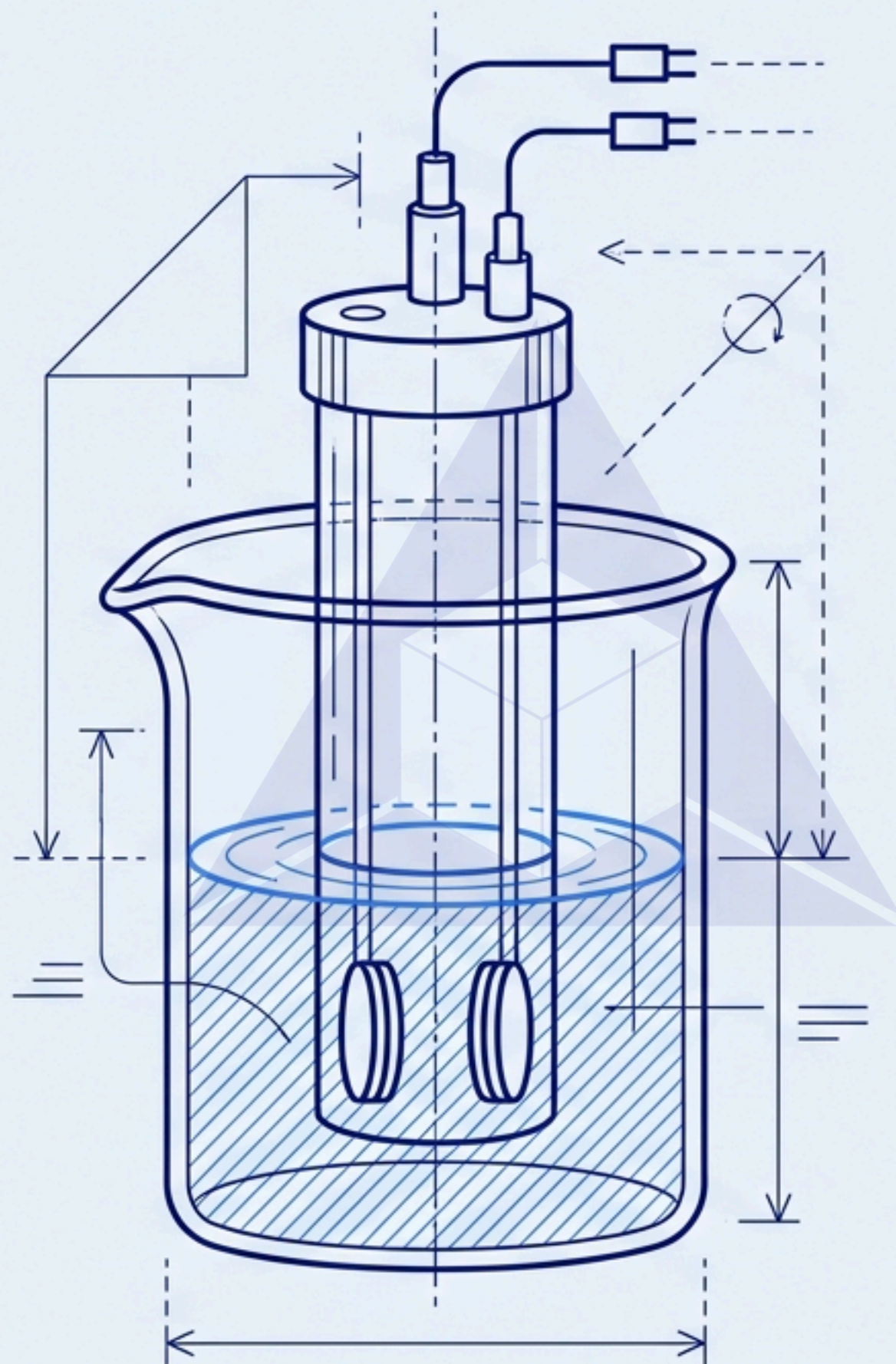




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Conductivity Cell

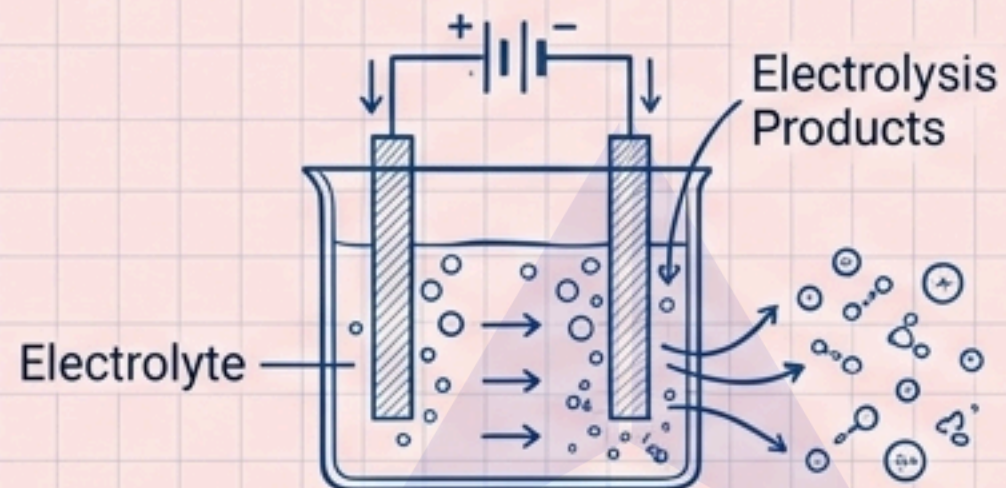
Measuring Ionic Conductivity

Weightage: High

Why Not Ordinary DC Measurement?



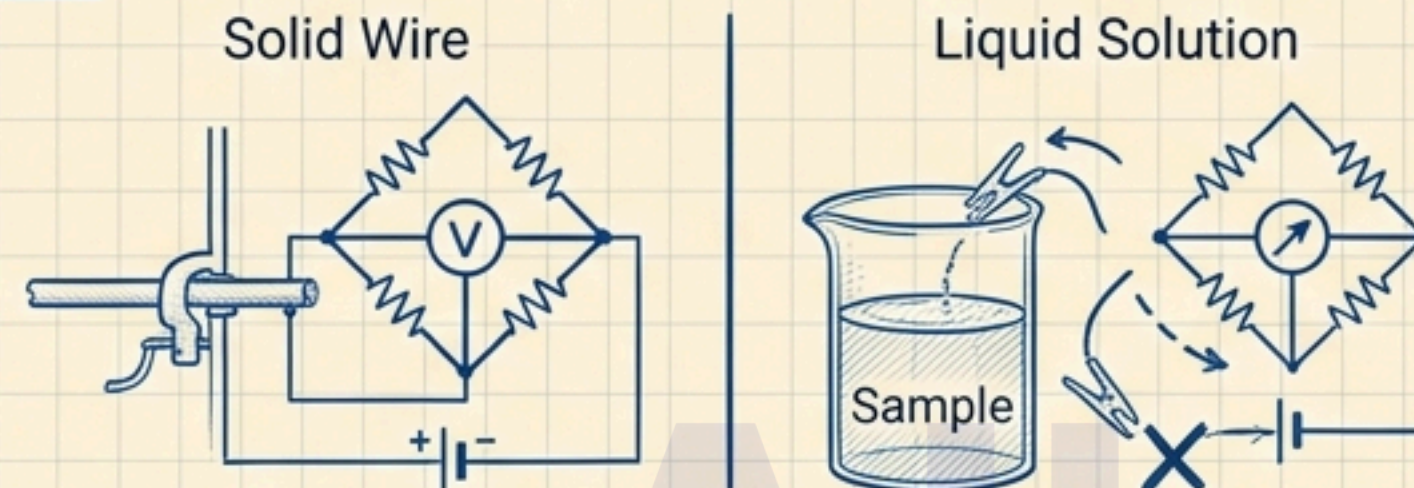
DC Changes Composition



Passing direct current (DC) causes electrochemical reactions, altering the solution's chemical makeup.

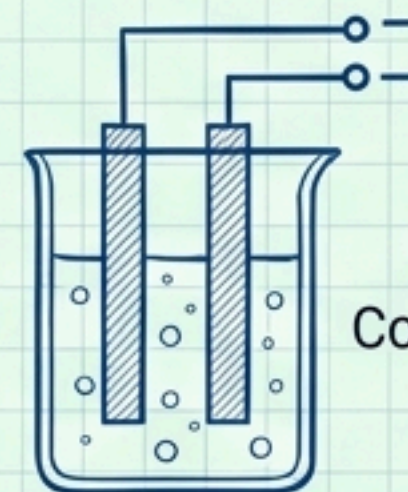
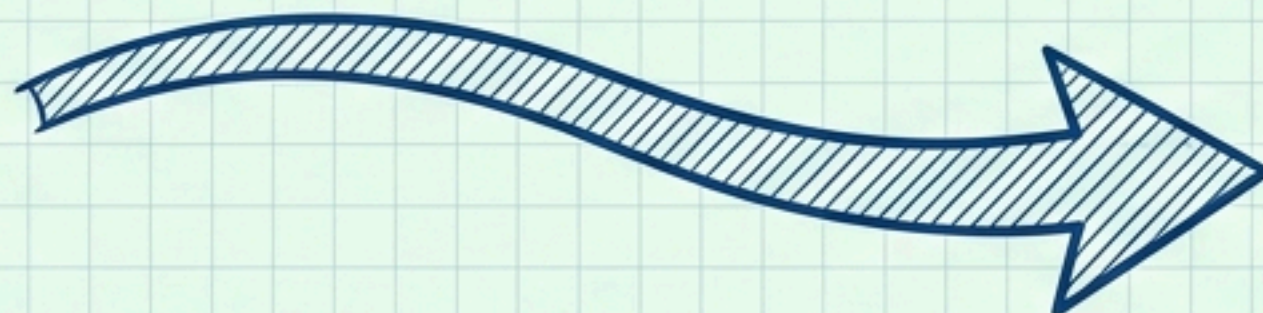


Liquid Geometry



A liquid solution cannot be firmly connected to a Wheatstone bridge circuit like a solid metallic wire.

The Workaround



Specialized Conductivity Cell

Use an Alternating Current (AC) power source paired with a specially designed Conductivity Cell.



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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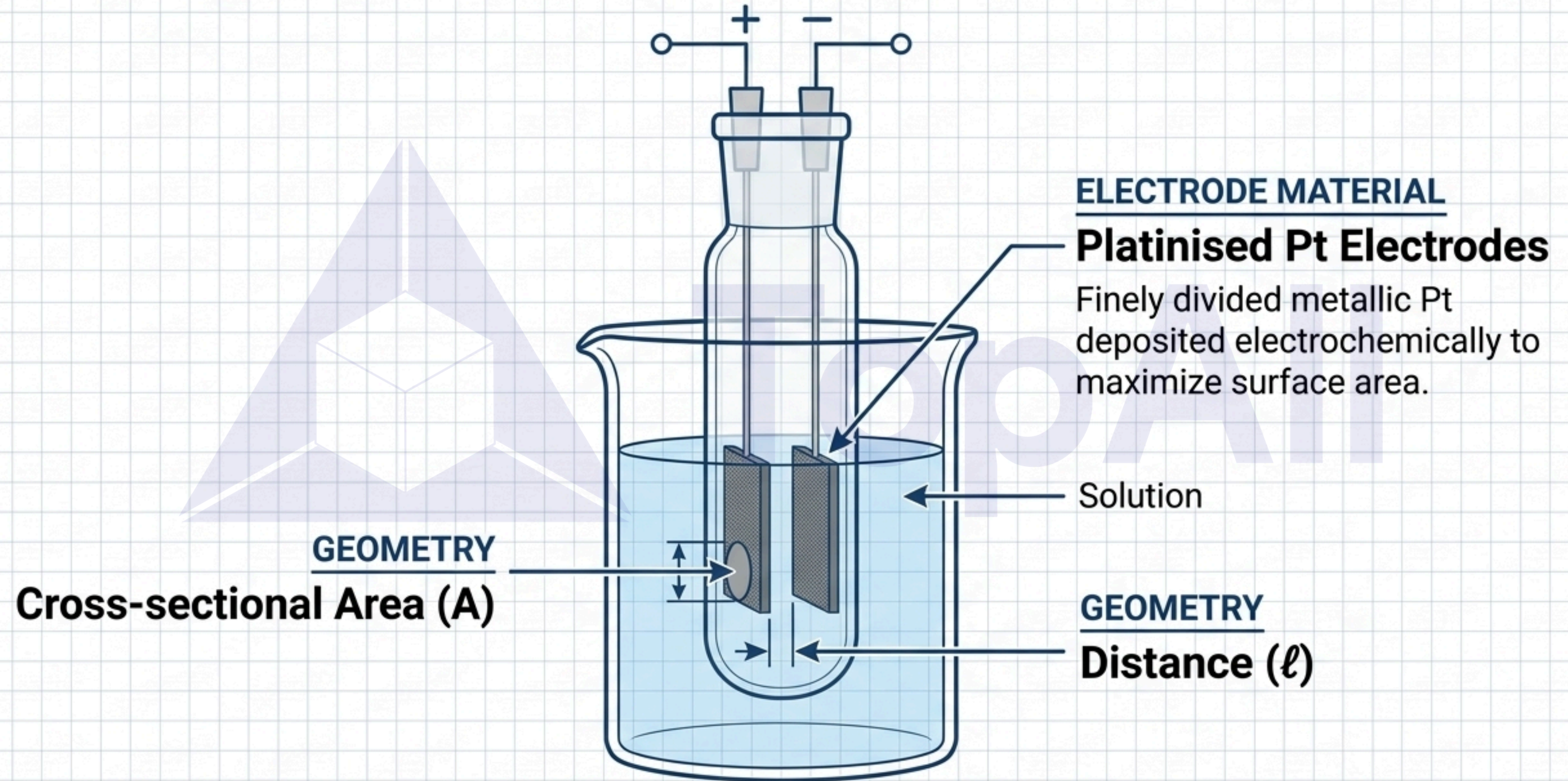
At prep.topall.app

Key Highlights

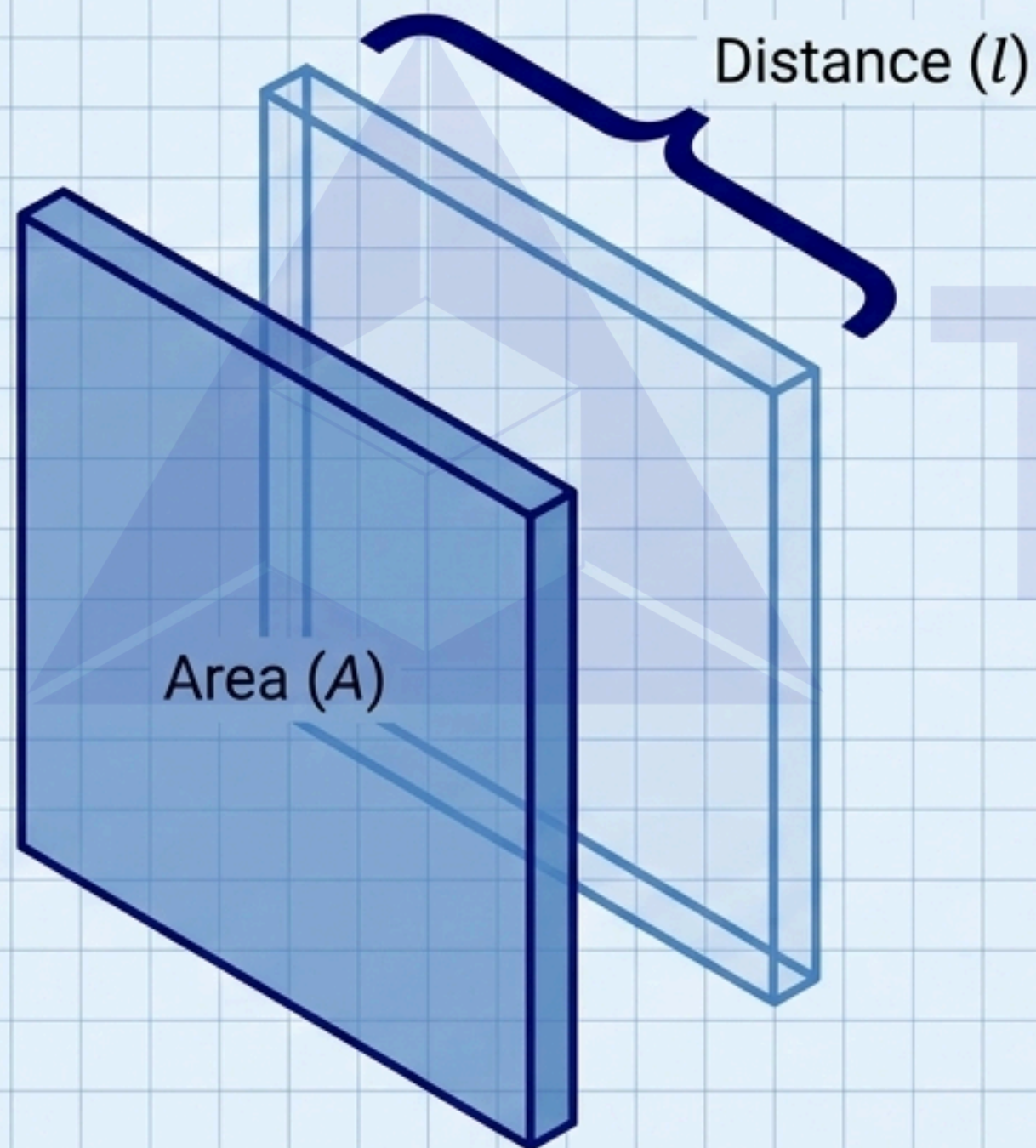
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Anatomy of a Conductivity Cell



Defining the Cell Constant (G^*)



$$G^* = \frac{l}{A}$$

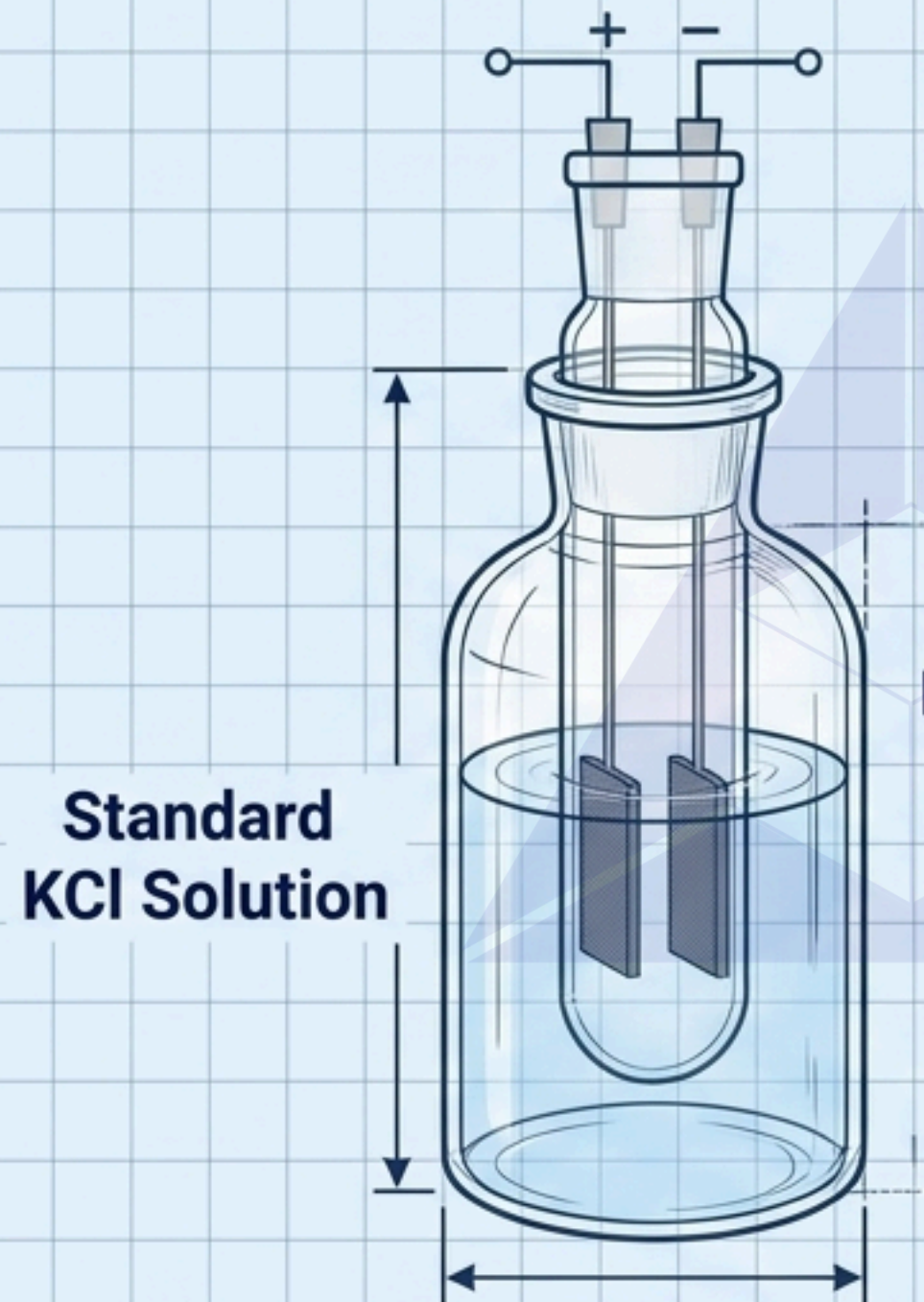
Geometric definition

$$G^* = R\kappa$$

Practical definition

Measuring l and A directly in a liquid setup is physically inconvenient and unreliable. Therefore, G^* is treated as a single unified constant that is calibrated for a specific cell.

Step 1: Calibration



Known κ

Conductivity of standard KCl is perfectly known at various temperatures.

Measure R

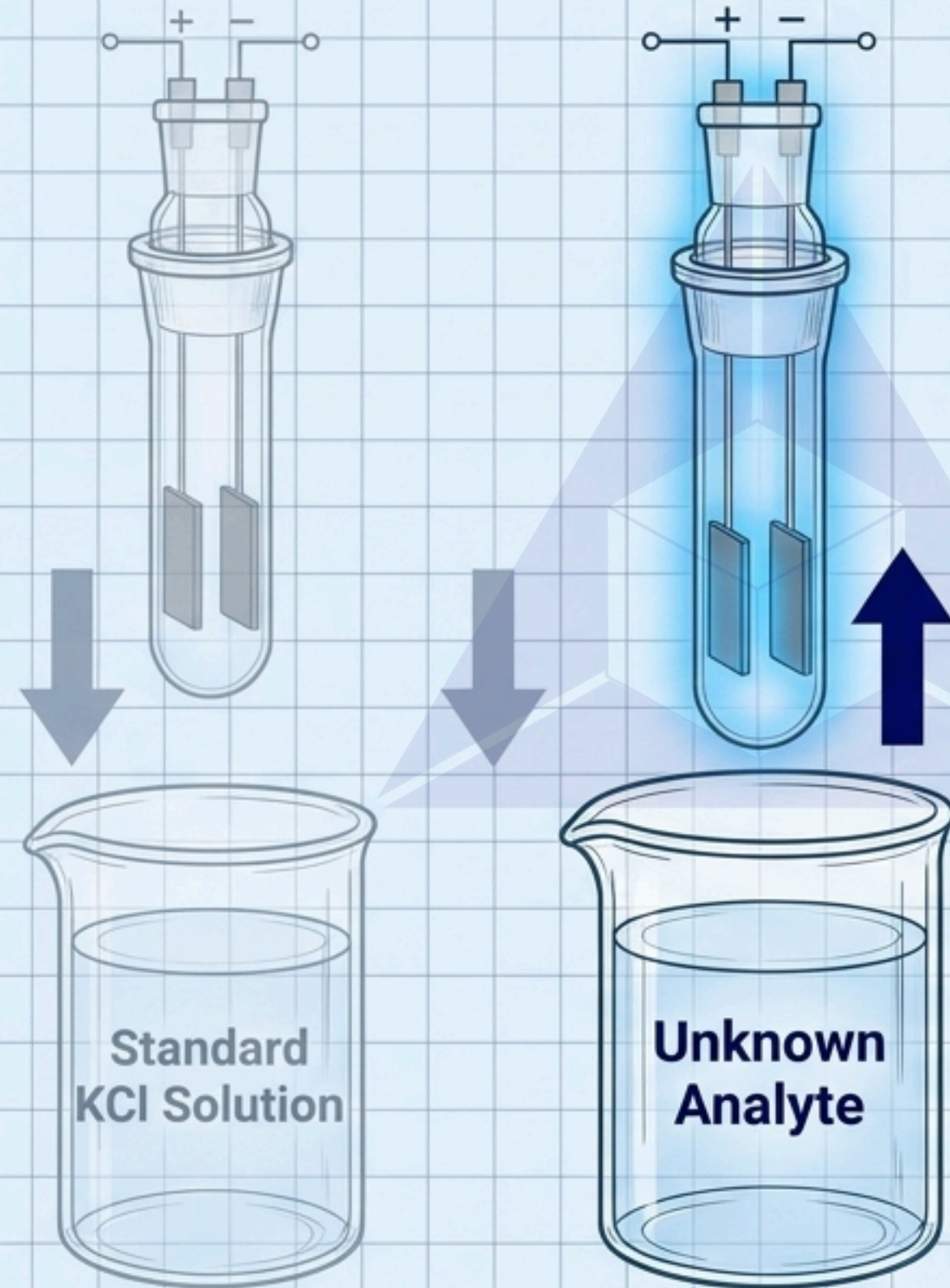
Connect cell to AC Wheatstone bridge to find resistance.

Calculate G^*

Using the formula
 $G^* = R\kappa$

Takeaway: The exact cell constant (G^*) for this specific physical instrument is now permanently locked in.

Step 2: Unknown Solution



G^* is Known

Transferred from Step 1.



Measure new R

Read the new resistance from the bridge.



Calculate κ

Find the unknown conductivity.

Formula Card

$$\kappa = \frac{G^*}{R}$$

The JEE Mental Model

CALIBRATE

Find G^*

MEASURE

Find R

CALCULATE

Find κ

JEE Trap

 **Do not invert the geometry!**

Cell Constant $G^* = l/A$ (Length / Area).
Students frequently mistake it for A/l because they incorrectly adapt the generic resistance formula $R = \rho(l/A)$ in this context.

Key Takeaways

-  AC current is strictly used to prevent electrolysis of the solution.
- G^* is constant for a specific physical cell, completely regardless of which liquid is inside it.



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