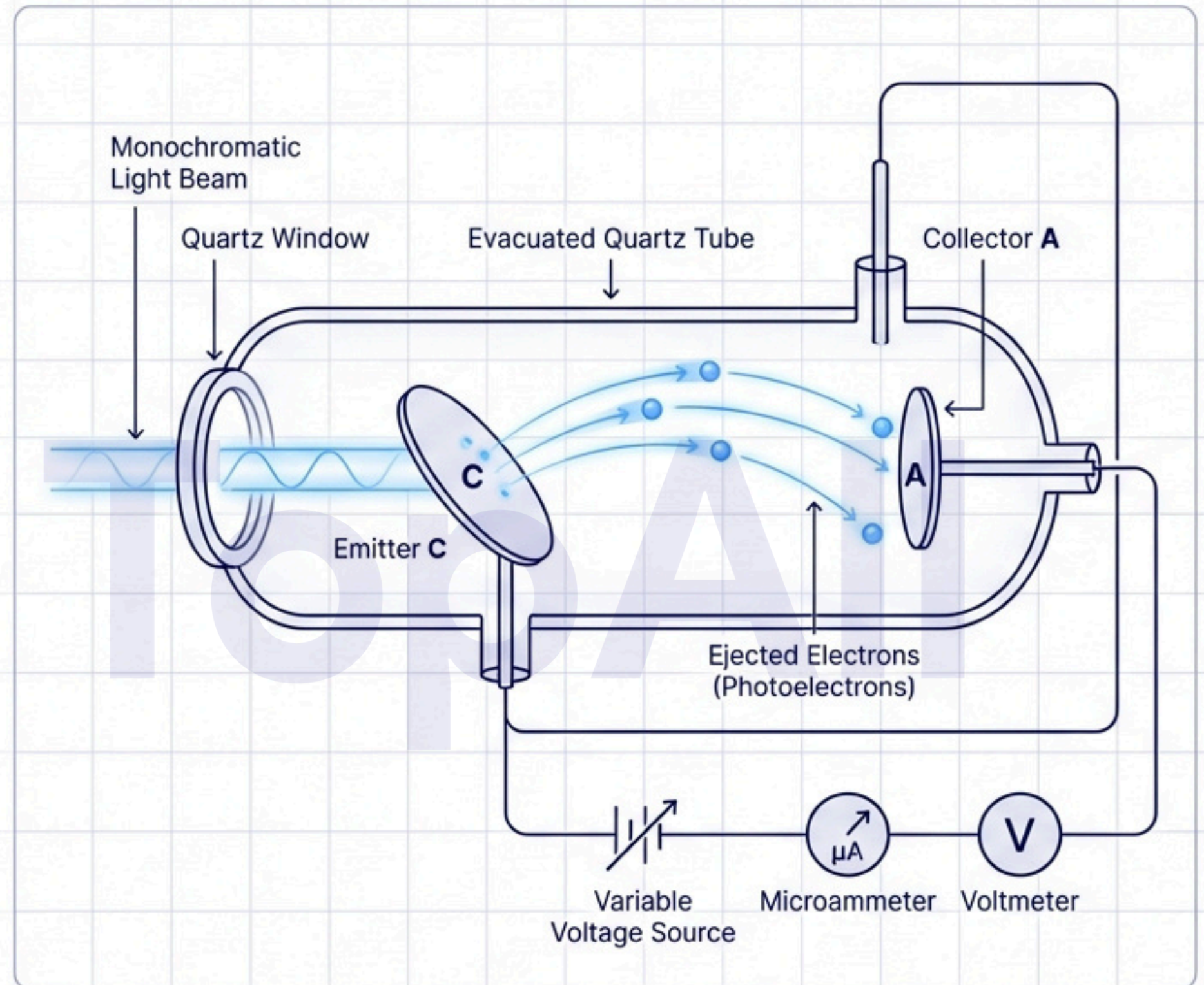
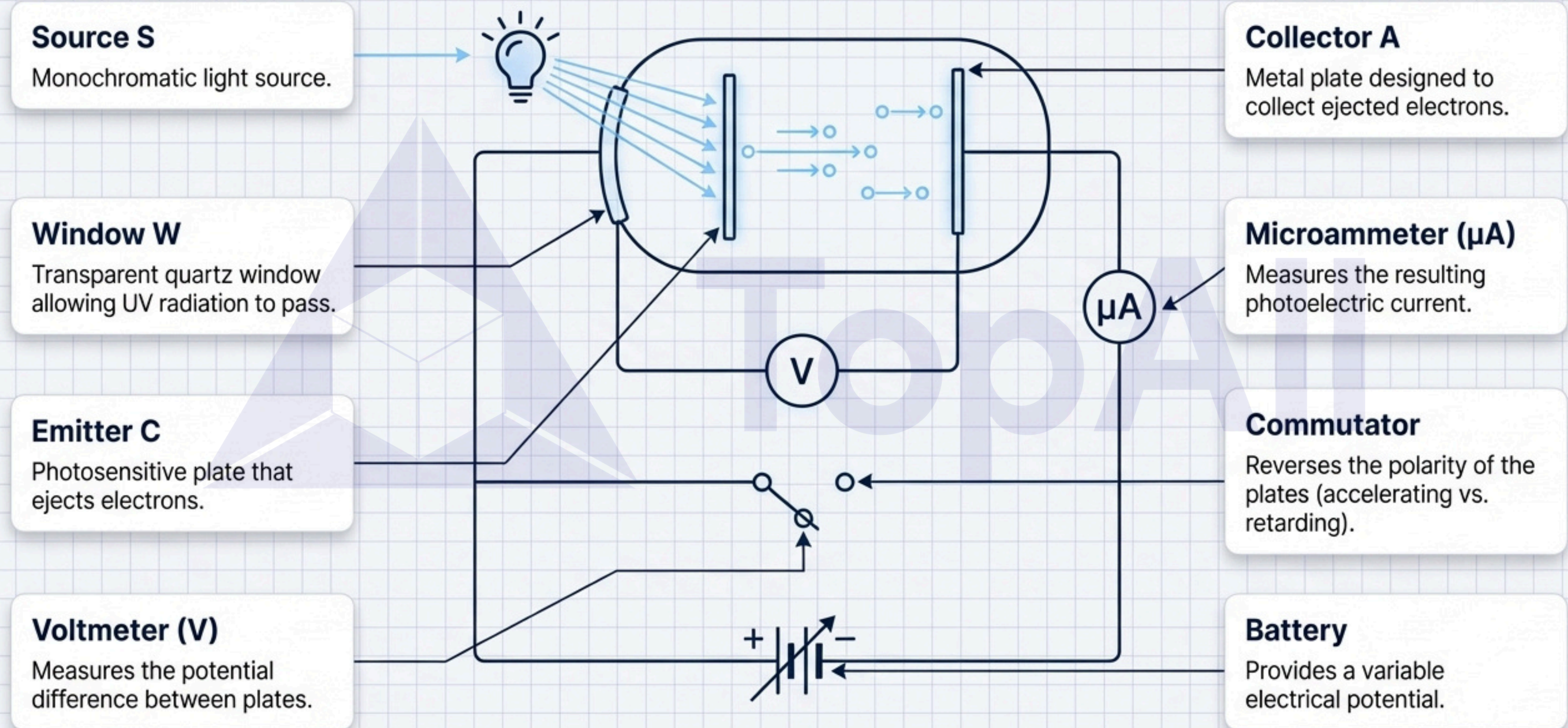


Experimental Study of Photoelectric Effect

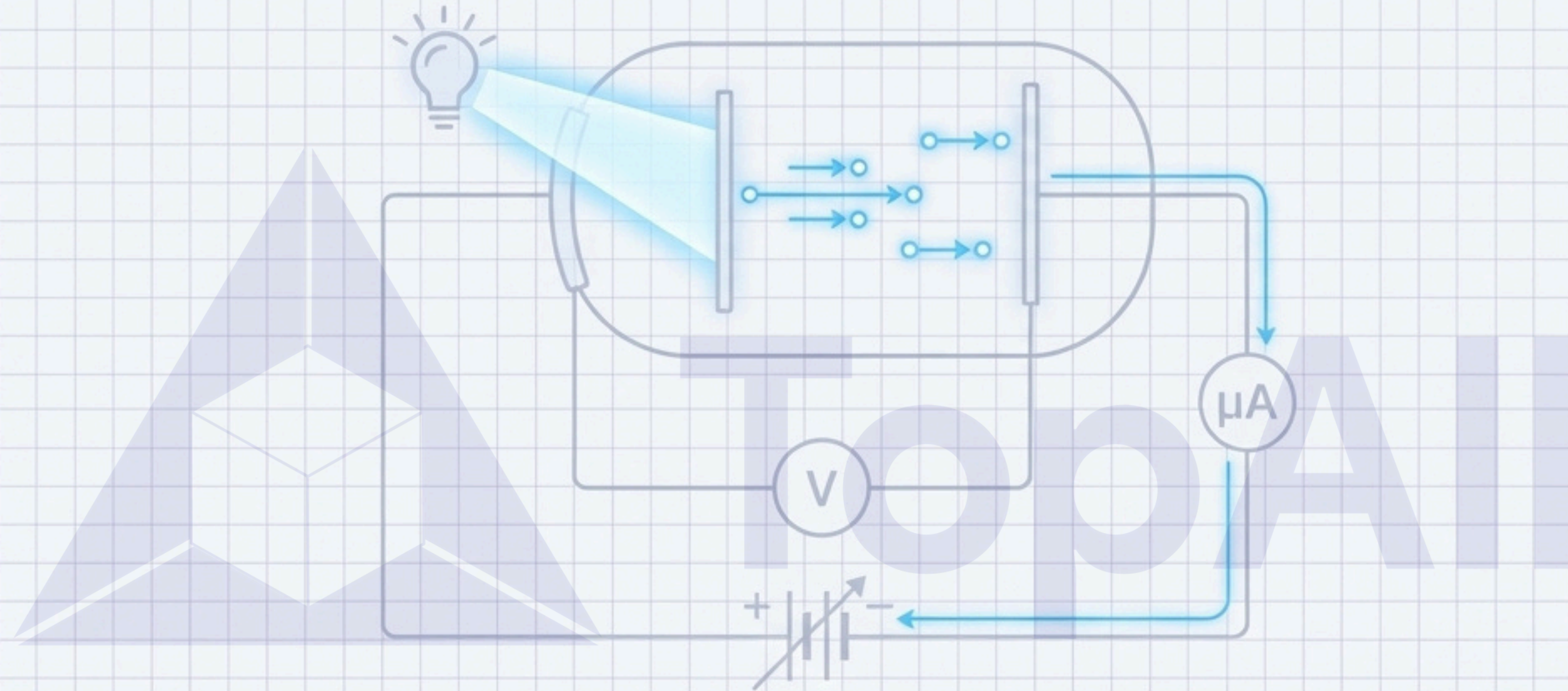
The apparatus behind the discovery



PHOTOELECTRIC EFFECT EXPERIMENTAL SETUP



The Emission Sequence



1. Monochromatic light of sufficiently short wavelength passes through the quartz window and strikes the photosensitive Emitter (C).

2. Electrons absorb photon energy, overcome the material's work function, and are ejected into the evacuated space.

3. Electrons travel across the vacuum, are collected by Plate A, and flow through the external circuit, registering on the microammeter.



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$$E=mc^2$$



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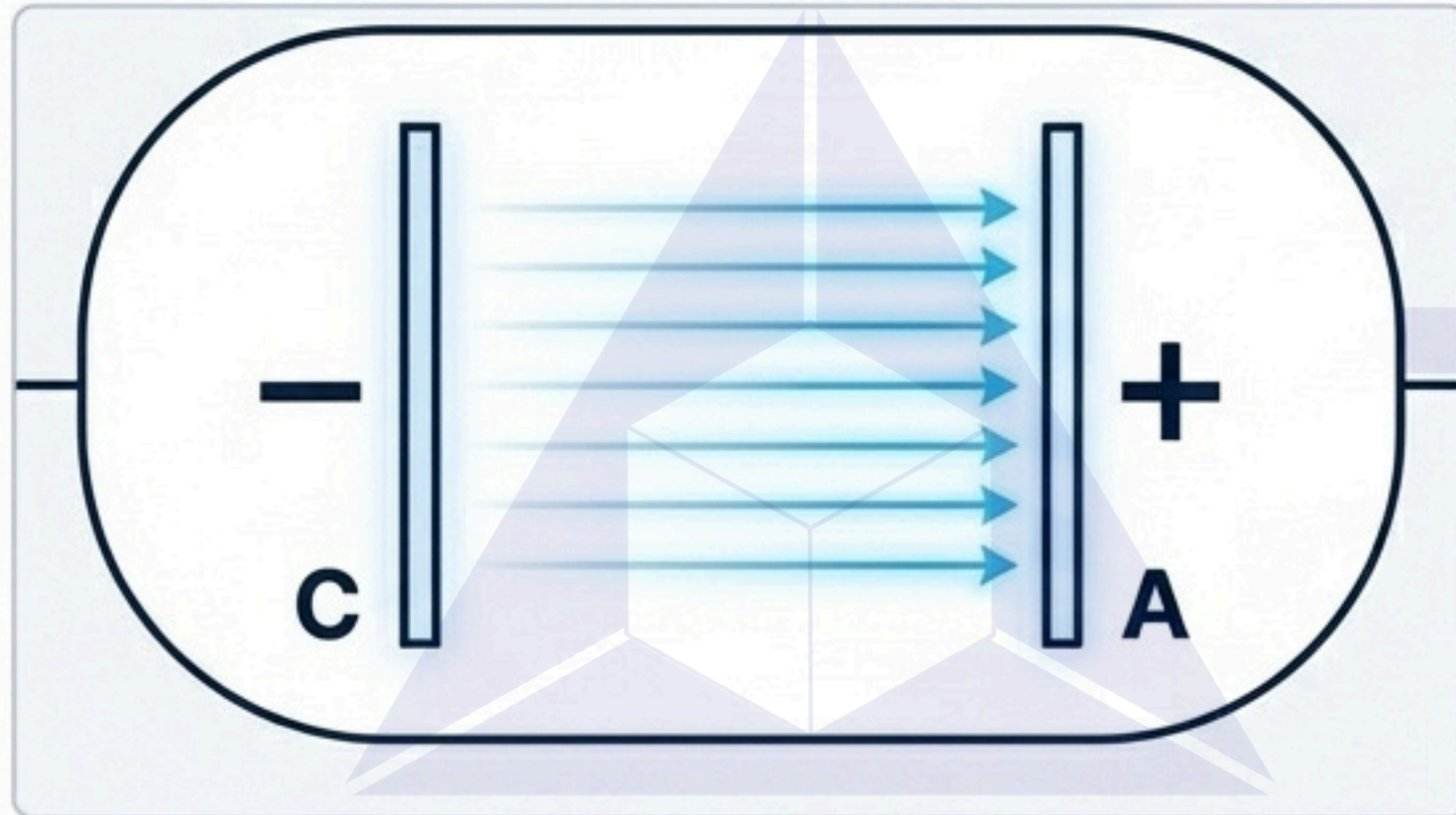
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The Role of Collector Potential

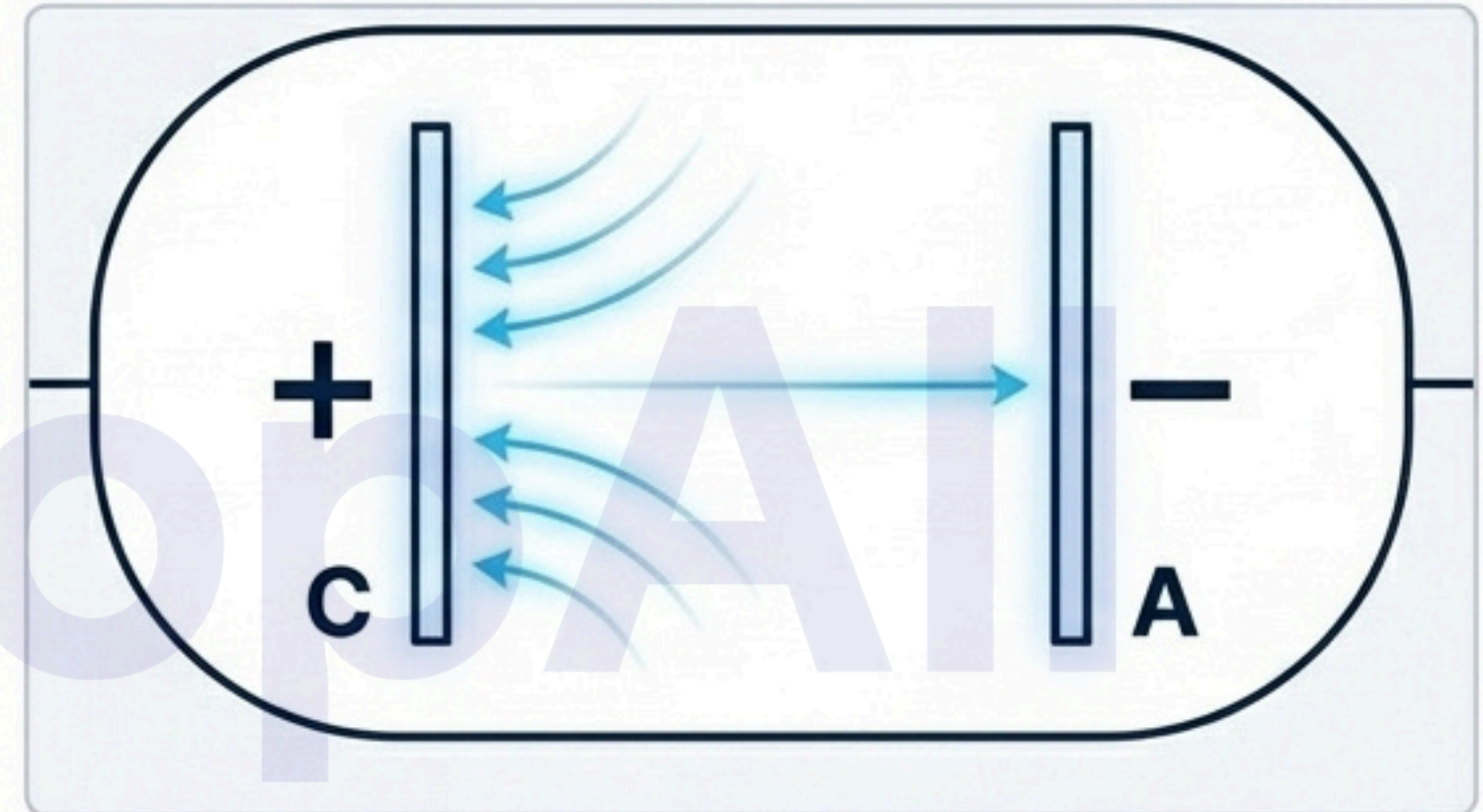
Accelerating Potential



Positive Potential

Collector A strongly attracts electrons. Photoelectric current increases as voltage rises, until all emitted electrons are successfully collected (Saturation Current).

Retarding Potential



Negative Potential

Polarity is reversed. Electrons are actively repelled. Current drops to zero at a critical negative voltage (Stopping Potential, V_0).

Experimental Inputs: What Can Be Varied?



Intensity of Light

Changed by moving the source distance. Determines the number of photoelectrons emitted per second.



Frequency of Light

Changed via different sources or optical filters. Determines the maximum kinetic energy of the emitted electrons.



Potential Difference

Changed via the battery and commutator. Used to accelerate or artificially retard the electrons.



Emitter Material

Different photosensitive metals (Nature of Plate C) have unique threshold frequencies and work functions.

Experimental Outputs: What Can Be Measured?

Photocurrent

Measured continuously by the microammeter. It is directly proportional to the intensity of the incident light.

Saturation Current

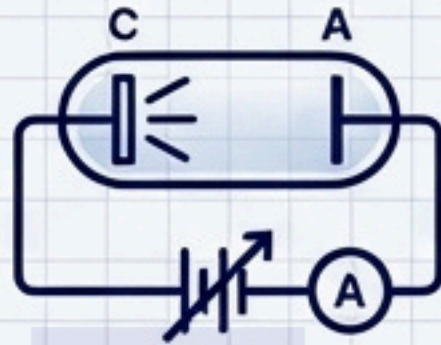
The maximum possible current value, occurring when every single emitted photoelectron successfully reaches the positive collector plate.

Stopping Potential (V_0)

The precise negative potential applied to the collector that causes photocurrent to drop to exactly zero. It directly measures maximum kinetic energy ($K_{\text{max}} = eV_0$).

The Blueprint of Quantum Evidence

How this single setup dismantles the wave theory of light:



Instantaneous Emission.

Proves energy absorption occurs in immediate, discrete collisions (quanta), not a slow, continuous wave buildup.

Intensity vs. Current.

Proves brighter light simply means more incident photons (and thus more electrons), not higher energy electrons.

Frequency vs. Energy.

Proves maximum kinetic energy is dictated solely by light frequency ($E = h\nu$), leading directly to Einstein's photoelectric equation.



You've Learned the Theory.

Now Let's Test It.

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