

Why Doesn't A Dielectric Behave Like A Conductor?

Conductor

Has free electrons. In an external field, charges drift until the internal electric field is exactly zero.

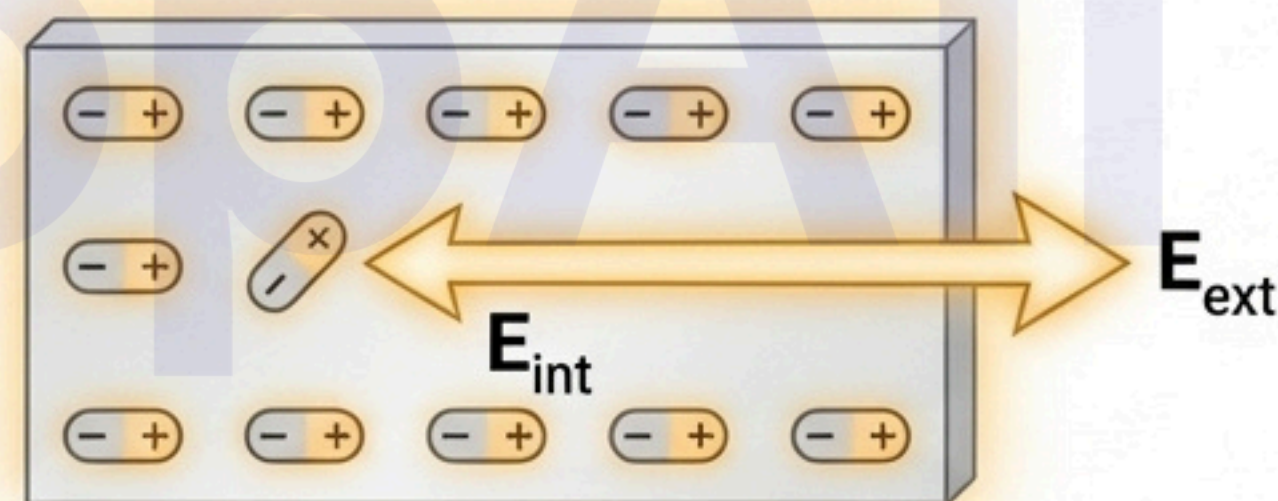
$$E_{in} = 0$$



Internal field $E_{int} = -E_{ext}$, Resultant $E_{in} = 0$

Dielectric

Non-conducting substances. Negligible charge carriers. Free movement of charges is impossible.



Internal field $E_{int} < E_{ext}$, Resultant $E_{in} \neq 0$

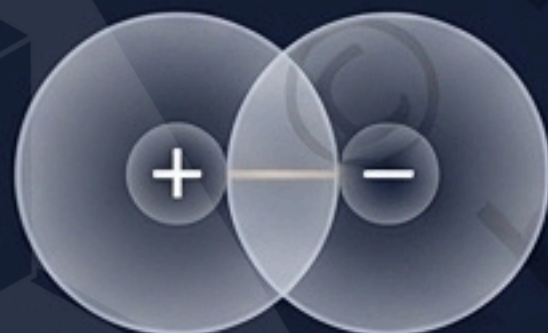
The Anatomy Of A Dielectric

Dielectrics are insulators. They lack the free charge carriers found in metals.

Type 1: Non-Polar Molecules

Centers of positive and negative charge coincide. Zero permanent dipole moment.

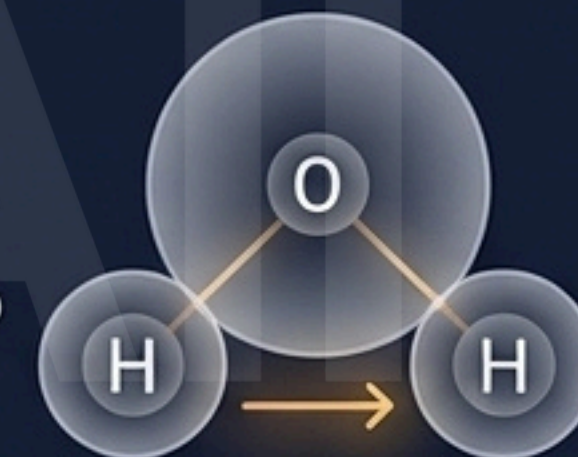
(e.g., H_2 , O_2)



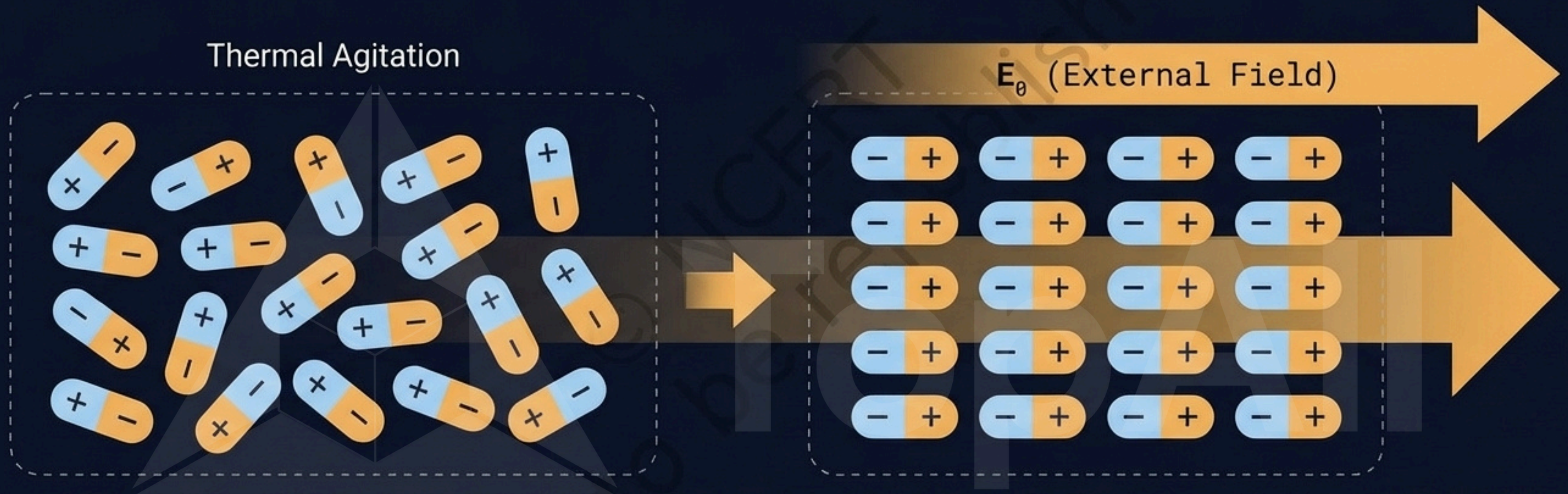
Type 2: Polar Molecules

Centers of charge are separated. Have a permanent dipole moment, but randomly oriented due to thermal agitation.

(e.g., HCl , H_2O)



Polarisation: When Molecules Fall In Line



The Result: A net dipole moment develops in the direction of the external field.

$$P = \chi_e \epsilon_0 E$$



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

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Practice Now

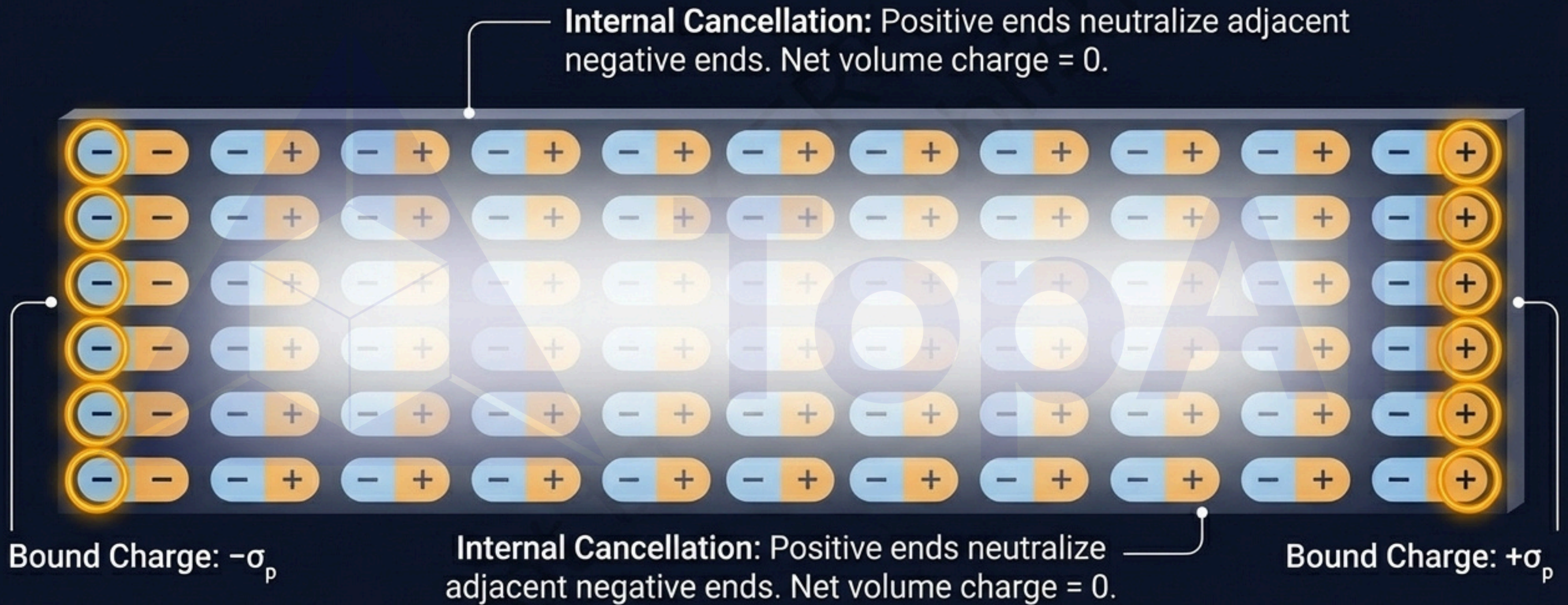


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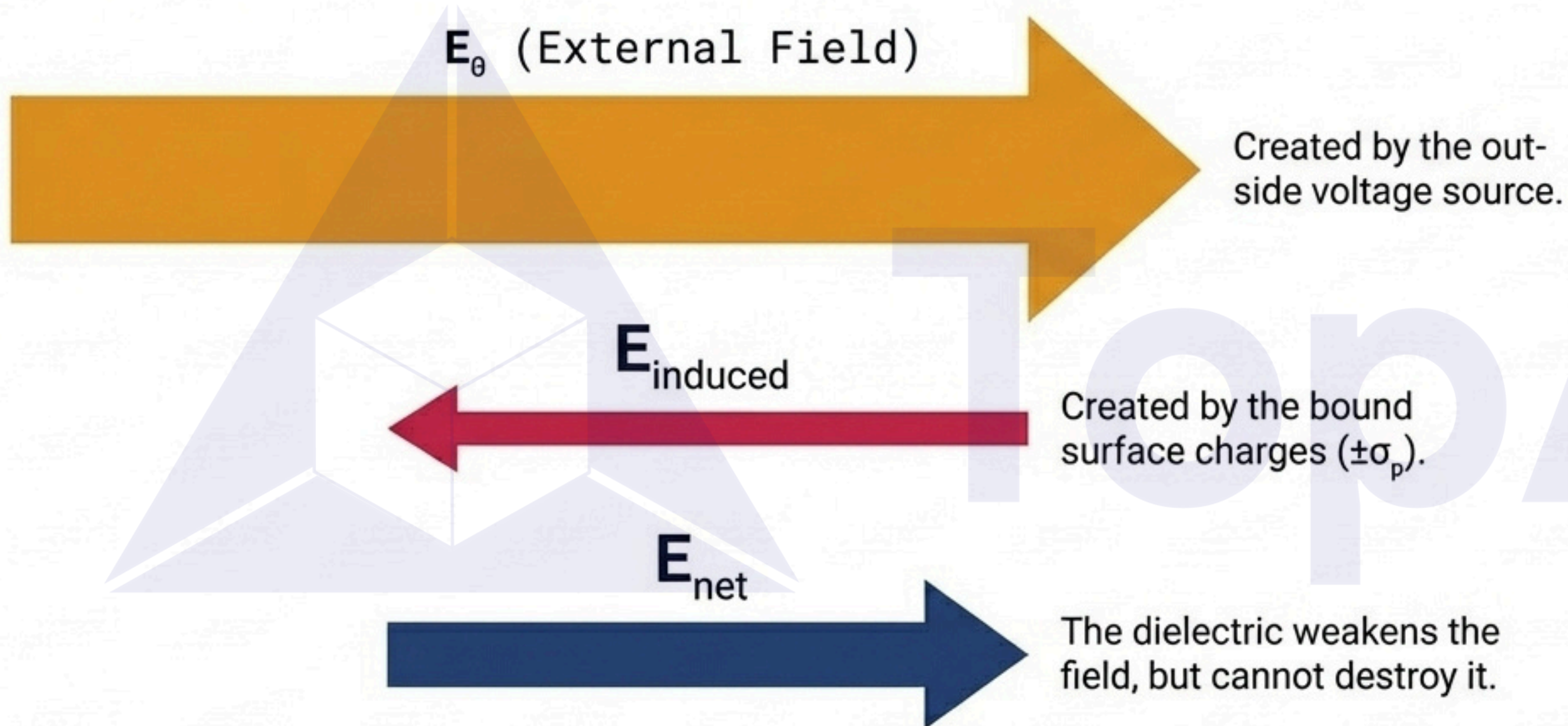
Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter

The Illusion Of Charge: Bound Surface Charges



The Pushback: Opposing Internal Field



Dielectric Constant

$$K = \frac{E_0}{E_{\text{net}}}$$

(where $K > 1$)

The Capacitor Cheat Code: Dielectrics

E field reduces



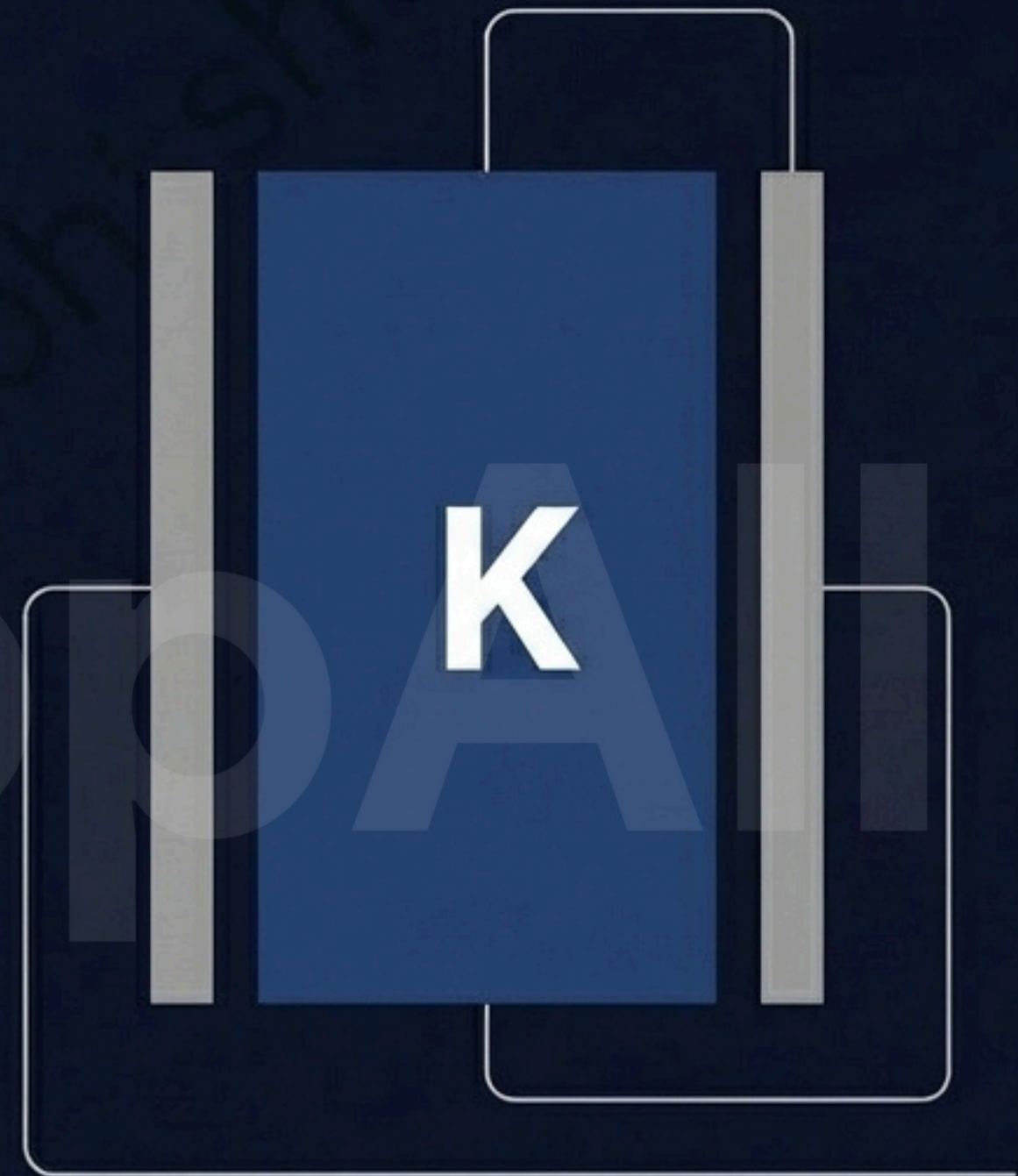
Voltage (V) drops



Capacitance (C) rises!

$$C = K C_0$$

where C_0 is vacuum capacitance



Practice more, score more

Key Takeaways: Dielectrics & Polarisation

- **LACK** free charges; cannot perfectly cancel external electric fields like conductors do.
- **DEVELOP** a net dipole moment (Polarisation, P) when exposed to an external field by stretching or re-orienting molecules.
- **PRODUCE** bound surface charge densities ($\pm\sigma_p$) while the interior volume remains neutral.
- **CREATE** an opposing internal field that reduces (but does not eliminate) the net electric field.
- **INCREASE** the overall capacitance of a system by a factor of K ($C = K C_0$).



You've Learned the Theory.

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