

PRAYAS

JEE 2025



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Lecture - 01 Physics

Capacitor



By- Saleem Ahmed Sir



Topics *to be covered*

- 1 Capacitor
- 2 Law of Capacitance
- 3
- 4

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Capacitor

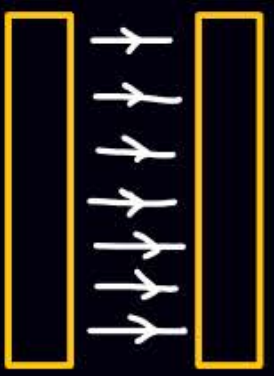
- It is a device which store energy between two boundaries in the form of electric field.
- It consist of two conducting boundary having equal & opposite charge.

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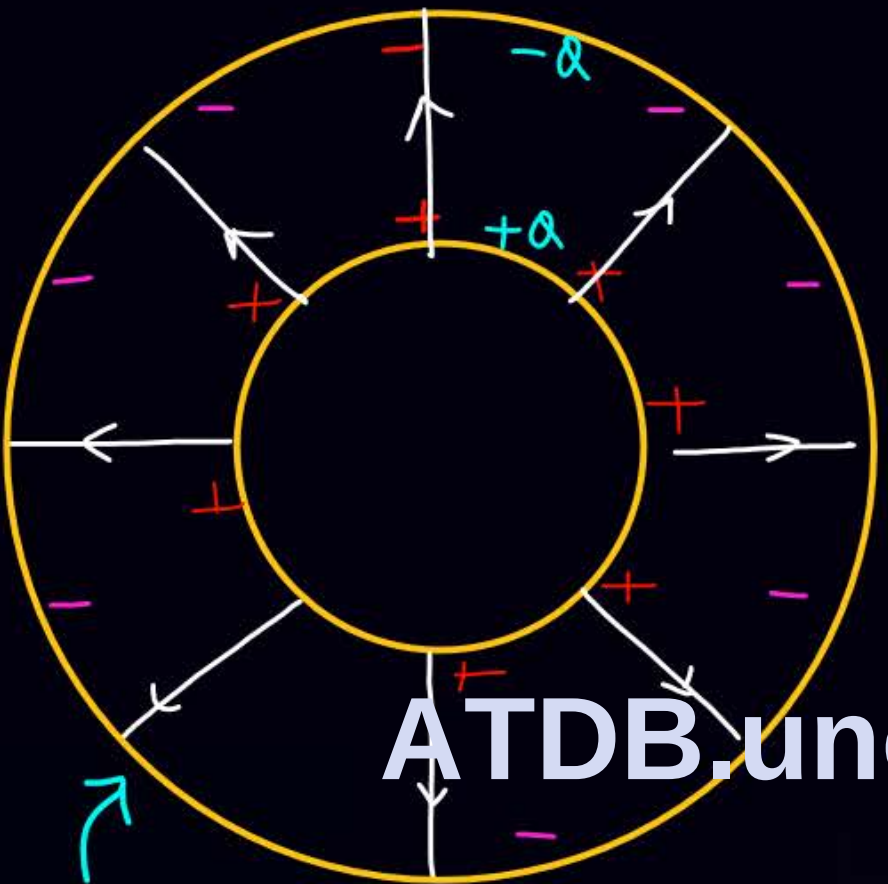


parallel plate
Capacitor

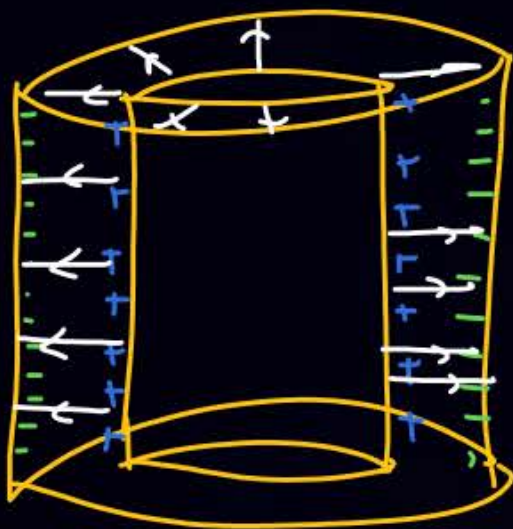




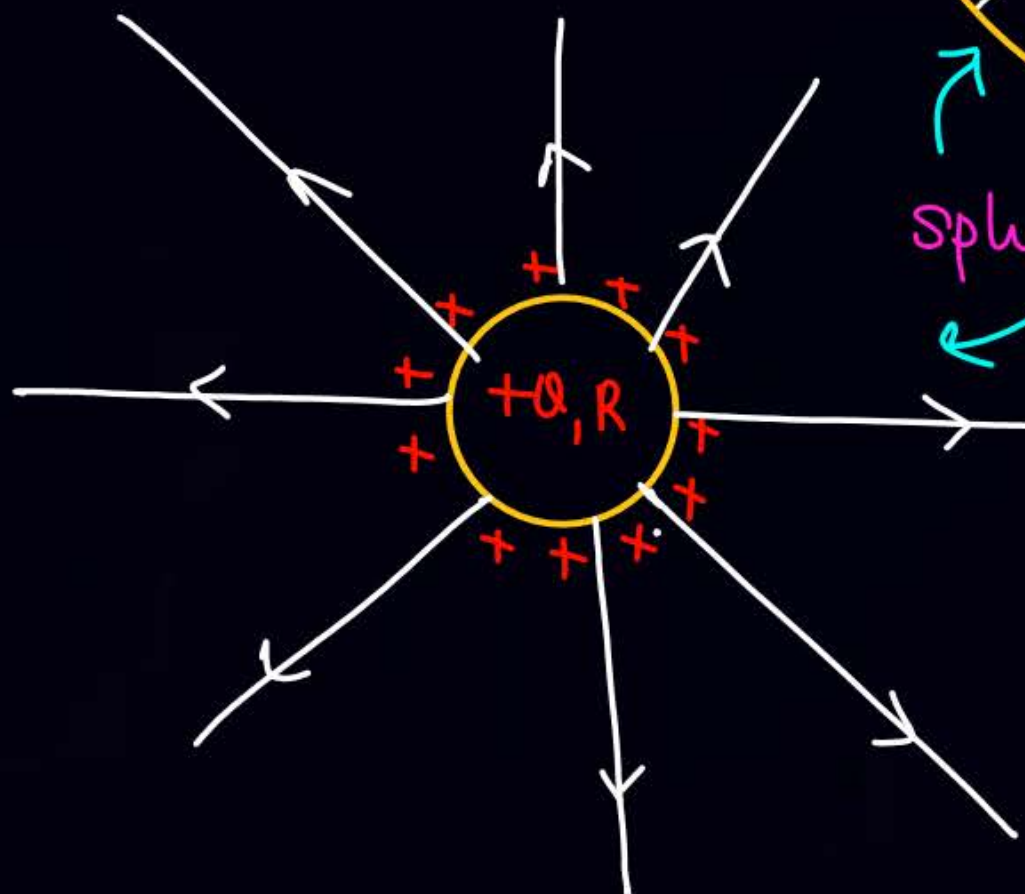
parallel plate
Capacitor



spherical capacitor.



cylindrical capaci



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दिल वाला Cap.



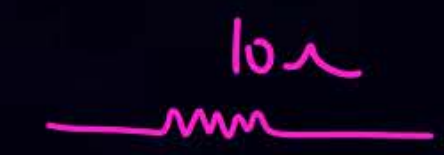
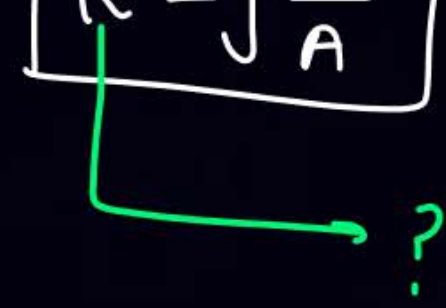
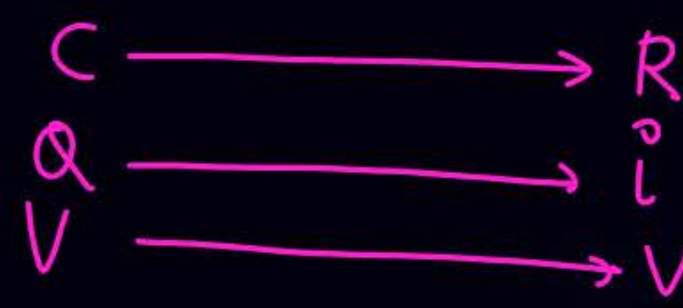
Law of capacitance

$\Delta V \propto Q$ charge on the positive plate

$\Delta V = \frac{Q}{C}$ Capacitance (unit farad)

$V = \frac{Q}{C} \implies V = IR$

$R = \rho \frac{l}{A}$



pot. diff. blw two boundary

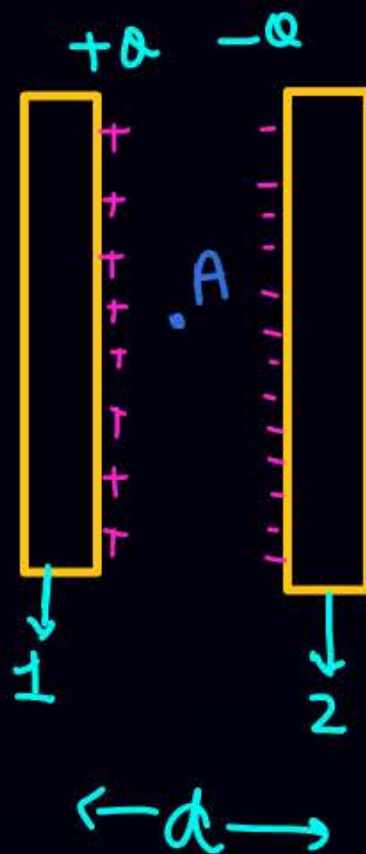
$\Delta V = \frac{Q}{C} \quad , \quad Q = C \Delta V$
 $V = \frac{Q}{C} \quad , \quad Q = CV$

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(very close to each other)

① parallel plate capacitor C'



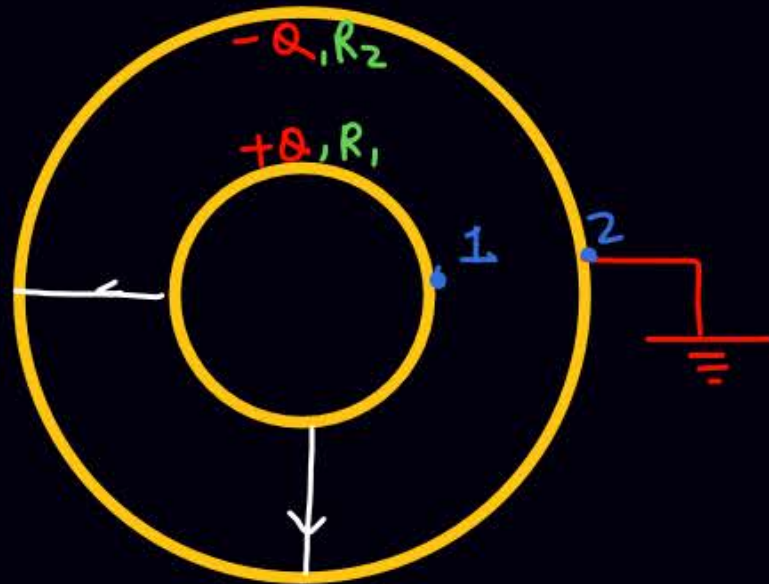
$$E_A = \frac{Q/A}{2\epsilon_0} + \frac{Q/A}{2\epsilon_0} = \frac{Q}{A\epsilon_0}$$

$$\Delta V = V_1 - V_2 = E \cdot d = \frac{Q}{A\epsilon_0} \cdot d$$

$$\Delta V = \frac{Q}{\left(\frac{A\epsilon_0}{d}\right)} = \frac{Q}{C}$$

$$C = \frac{A\epsilon_0}{d} \equiv \text{Independent on charge}$$

② spherical conductor



$$V_1 = \frac{kQ}{R_1} + \frac{k(-Q)}{R_2}$$

$$V_2 = 0$$

$$\Delta V = V_1 - V_2$$

$$\Delta V = \frac{kQ}{R_1} - \frac{kQ}{R_2}$$

$$\Delta V = Q \left(\frac{k}{R_1} - \frac{k}{R_2} \right) = \frac{Q}{C}$$

$$\frac{1}{C} = \frac{k(R_2 - R_1)}{R_1 R_2}$$

$$C = \frac{R_1 R_2 4\pi\epsilon_0}{(R_2 - R_1)}$$

If $R_2 \rightarrow \infty$, $C = \frac{R_1}{k}$

$$C = 4\pi\epsilon_0 R_1$$

Q



$$\Delta V = V_1 - V_2 = \frac{kQ}{R} - 0$$

$$\Delta V = \frac{kQ}{R} = \frac{Q}{C}$$

$$C = \frac{R}{k} = 4\pi\epsilon_0 R$$





To be Continue Tommorrow - - -

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THANK YOU

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