LAKSHYA JEE

LAKSHYA KO HAR HAAL ME PAANA HAI

Electric Potential & Capacitance

-Er. Rohit Gupta

Today's GOALS!

- Properties of conductors in electrostatics.

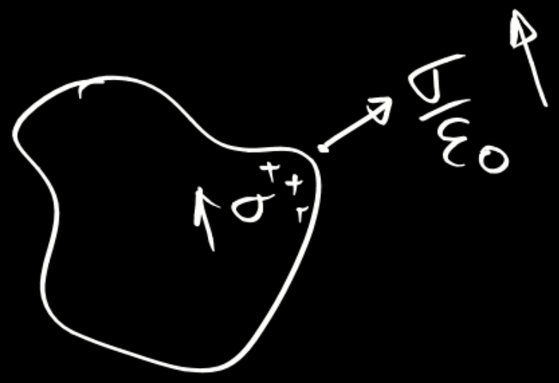
Revision

1. Net E inside a conductor $= 0$
2. Q_{excess} inside a conductor $= 0$
3. EFL are $\perp$ to conductor
4. Conductor is equipotential
5. ∇R = Constant.
6. E near surface of conductor $= \frac{\sigma}{\varepsilon_0}$ (due to all the charges present in the universe)
   - 6.a E infinite conducting sheet $= \left(\frac{\sigma}{\varepsilon_0}\right)$
7. Cavity is shielded from outside world & vice-versa.
   - 7.a E inside cavity is due to charges inside the cavity & charges on the inner surface of cavity.
   - 7.b E outside the conductor is due to charges placed outside And charges on the outer surface of the conductor.

8 Earthing $\Rightarrow V = 0$

Properties of conductors in Electrostatics

9 Corona Discharge



$\sigma \uparrow$ R = Const.
$\downarrow$

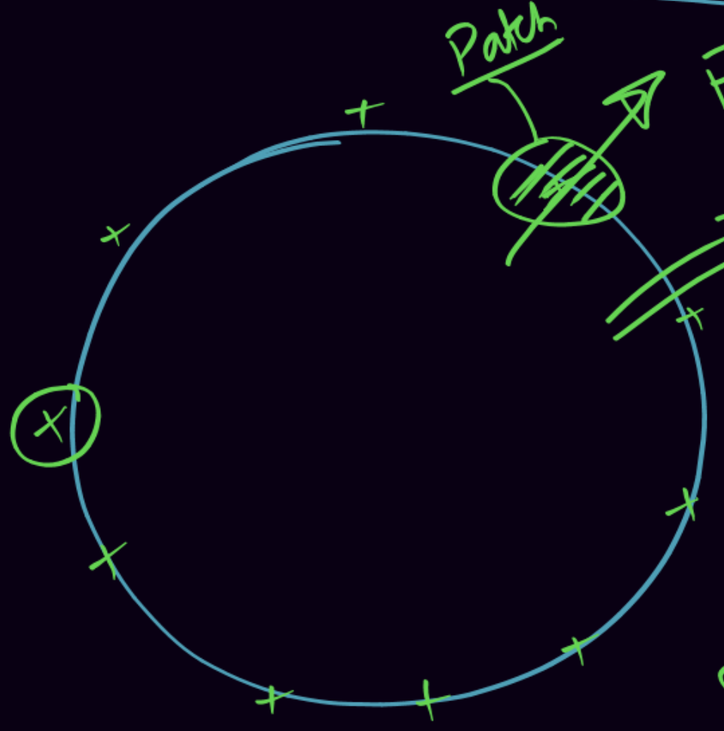
At corners, R is very small & σ is very high.

$\Rightarrow$ E is very high

Dielectric strength

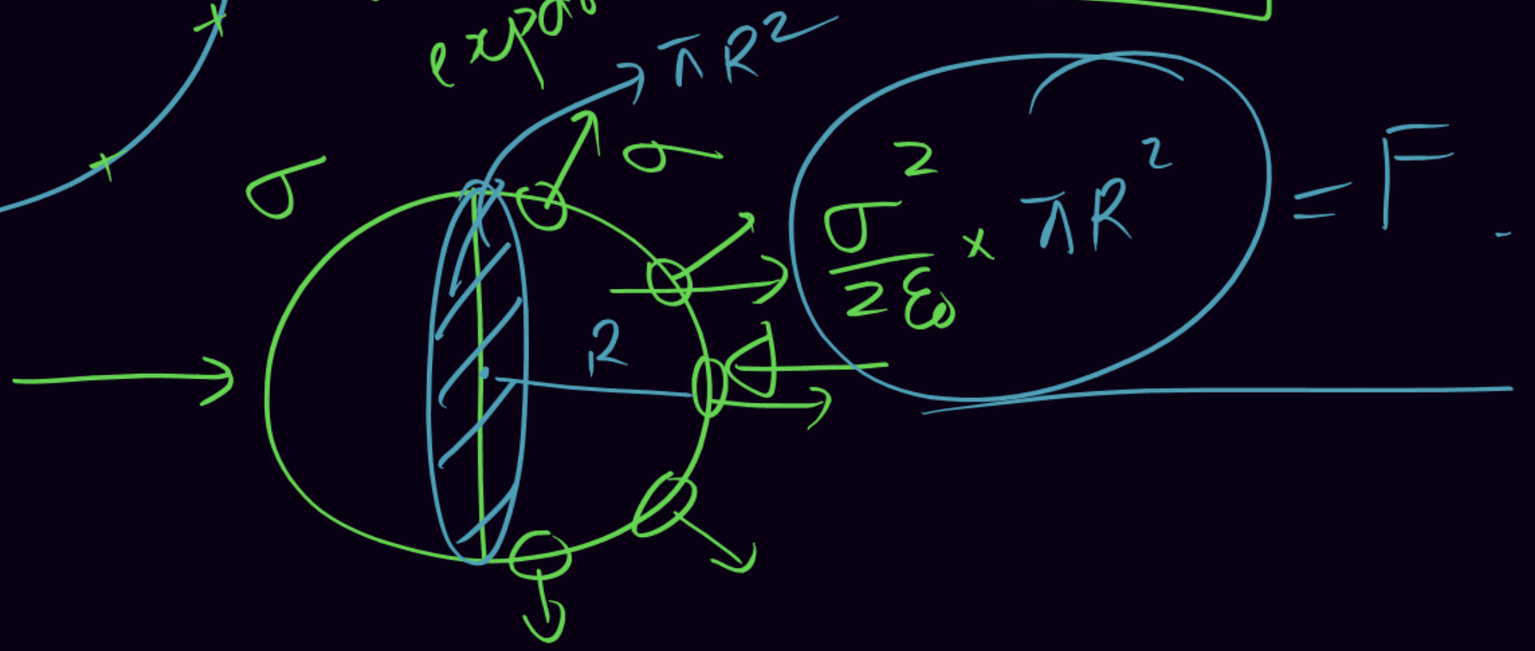
It is the maximum electric field that the medium can bear before breaking down.

10) Electrostatic pressure



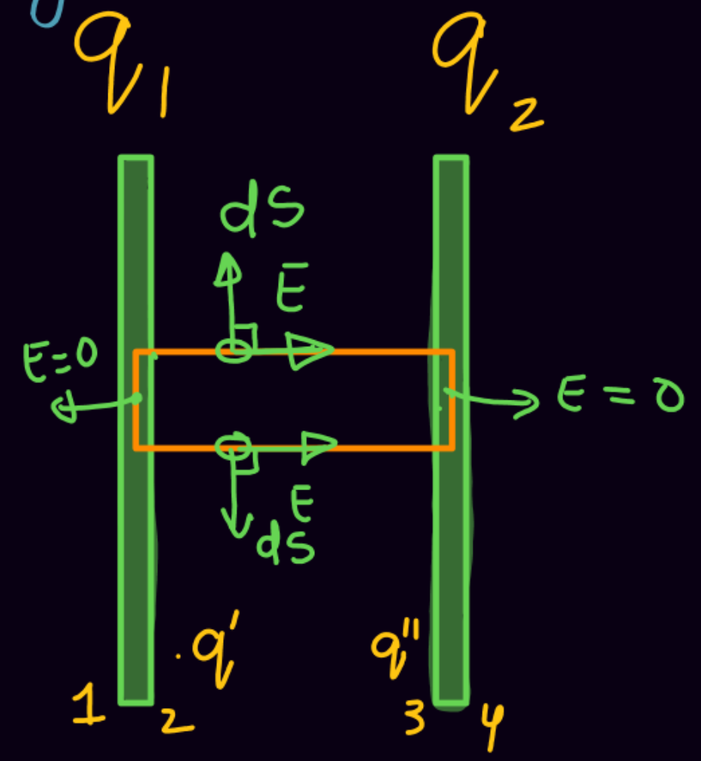
$$\text{Pressure} = \frac{F_{patch}}{A_{patch}}$$

$$\text{Pressure} = \frac{\sigma^2}{2\varepsilon_0}$$



$$\frac{\sigma^2}{2\varepsilon_0} \times \pi R^2 = F$$

II Charge distribution in parallel plates



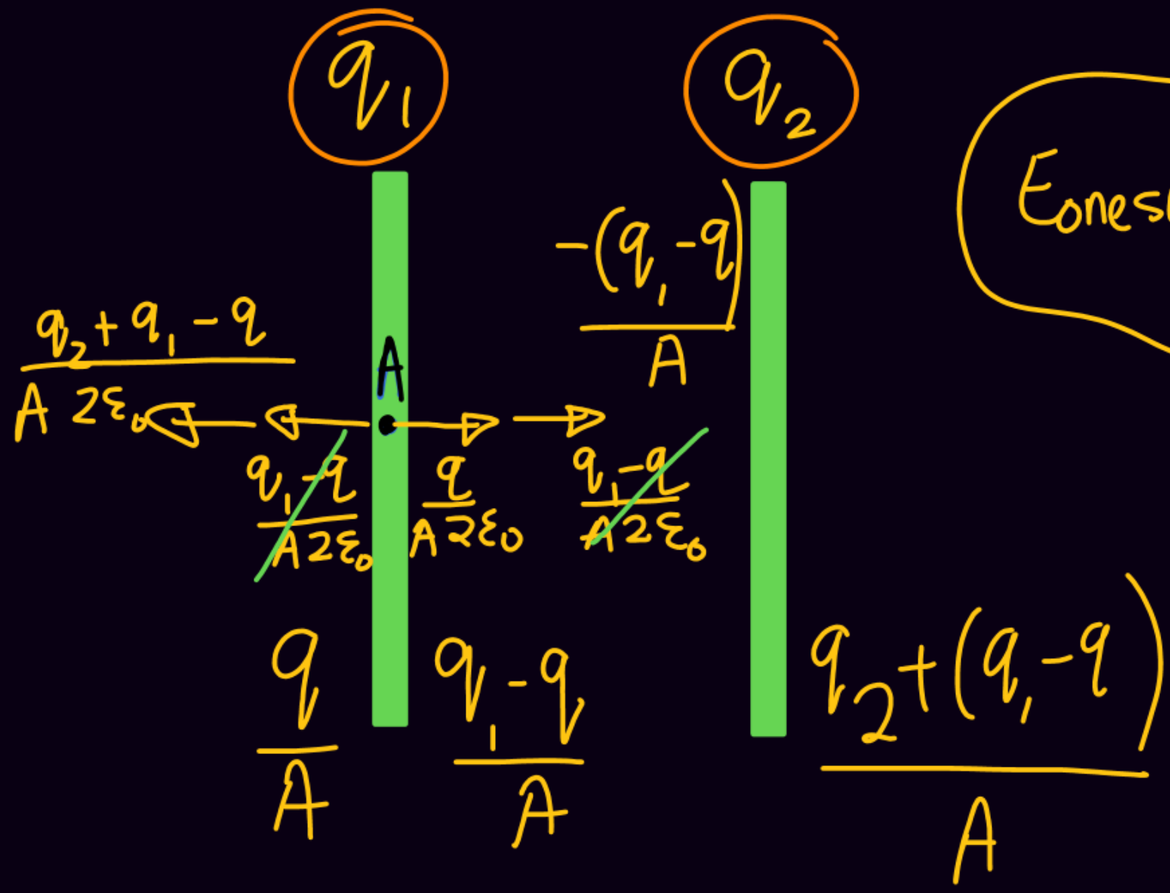
$$\oint \vec{E} \cdot d\vec{s} = \frac{q_{in}}{\varepsilon_0}$$

$$0 = \frac{q_{in}}{\varepsilon_0}$$

$$q_{in} = 0$$

Siddhi

aamne samne charge equal and opposite honge.



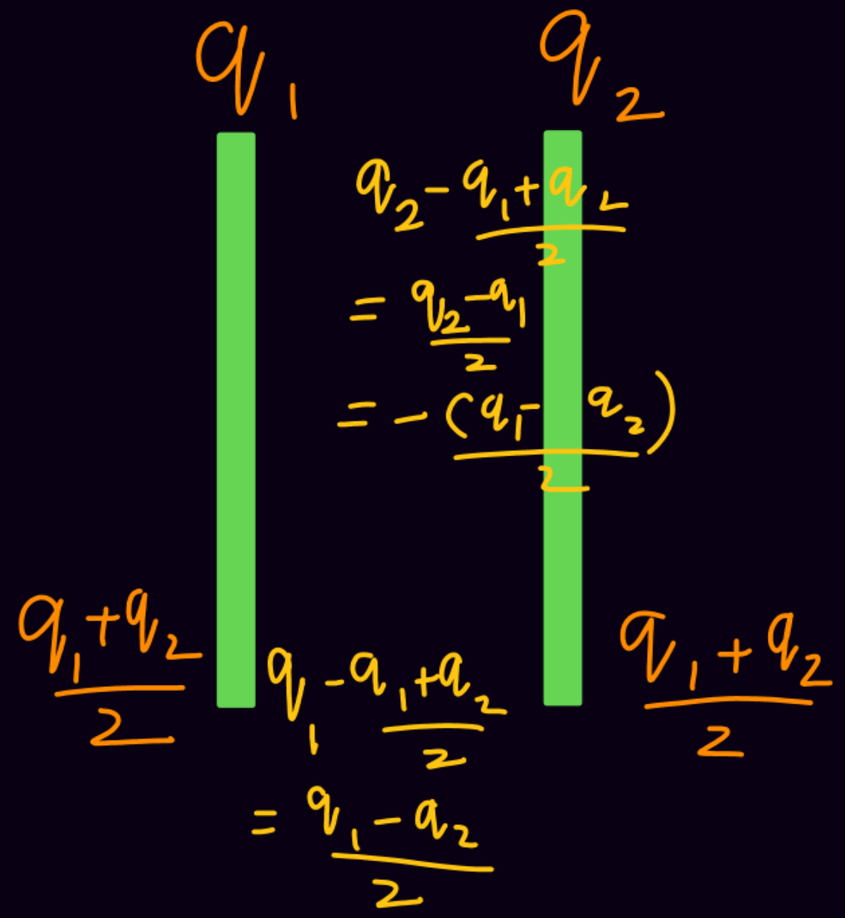
$$E_{one\,surface} = \frac{\sigma}{2\varepsilon_0}$$

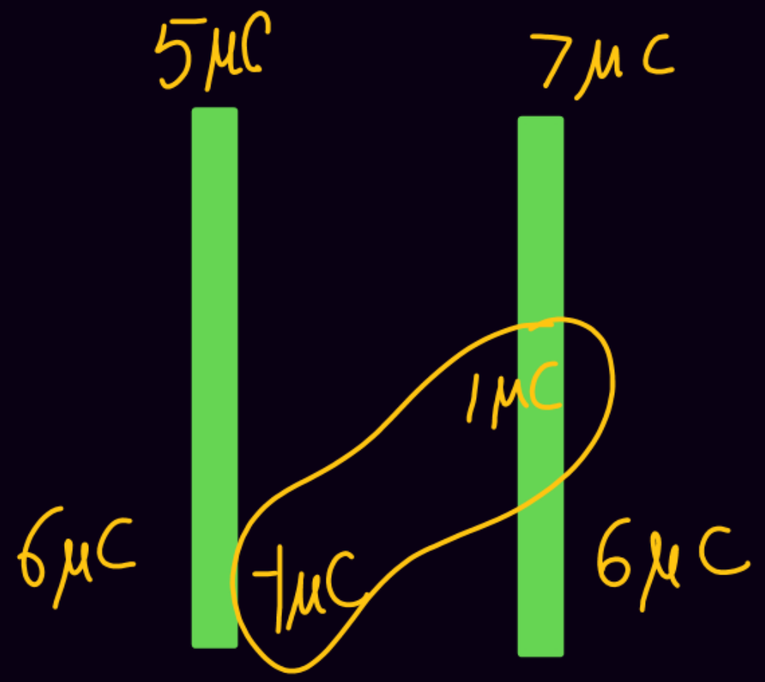
Because pt. A is inside the conductor $E_A = 0$.

$$\frac{q_2+q_1-q}{2\varepsilon_0 A} - \frac{q}{2A\varepsilon_0} = 0$$

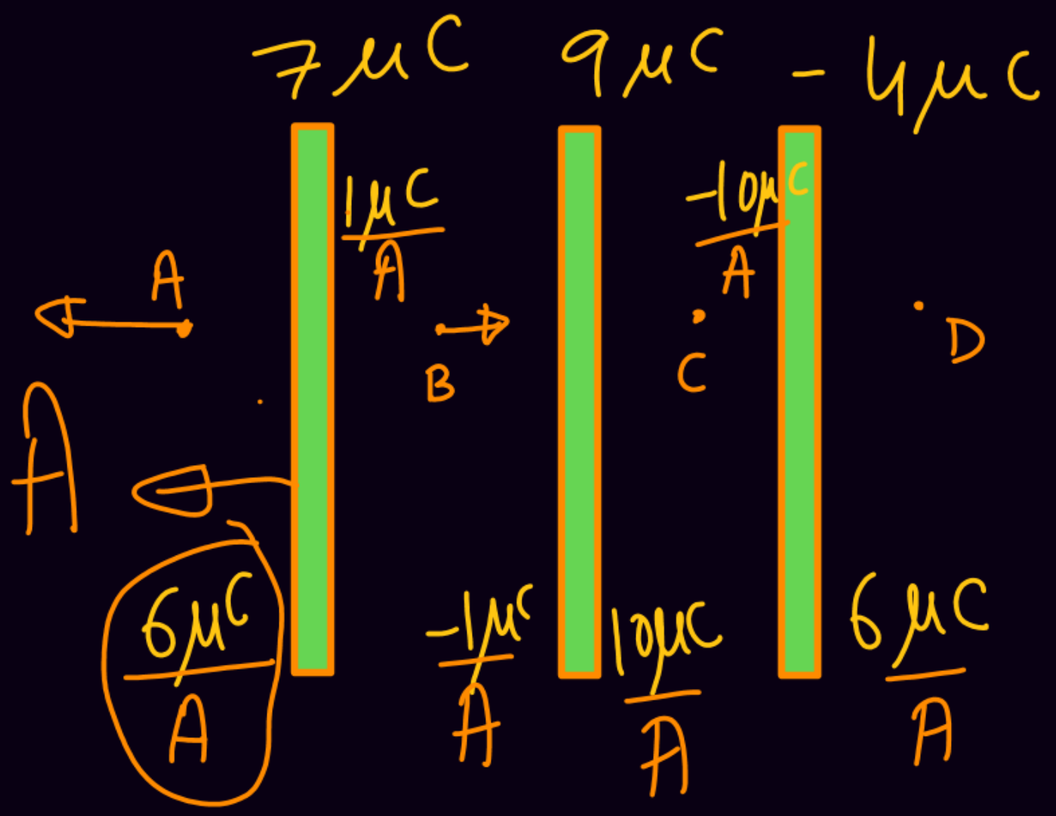
$$q_2+q_1-2q=0$$

$$\boxed{q = \frac{q_1+q_2}{2}} = \frac{\text{total charge}}{2}$$


q_1
q_2
$q_2 - \frac{q_1 + q_2}{2}$
$= \frac{q_2 - q_1}{2}$
$= -\frac{(q_1 - q_2)}{2}$
$\frac{q_1 + q_2}{2}$
$q_1 - \frac{q_1 + q_2}{2}$
$= \frac{q_1 - q_2}{2}$
$\frac{q_1 + q_2}{2}$



$$\frac{q_{total}}{2} = \frac{5+7}{2} = \frac{12\mu C}{2} = 6\mu C$$



$$\frac{q_{total}}{2} = \frac{7+9-4}{2} = \frac{12\mu C}{2}$$

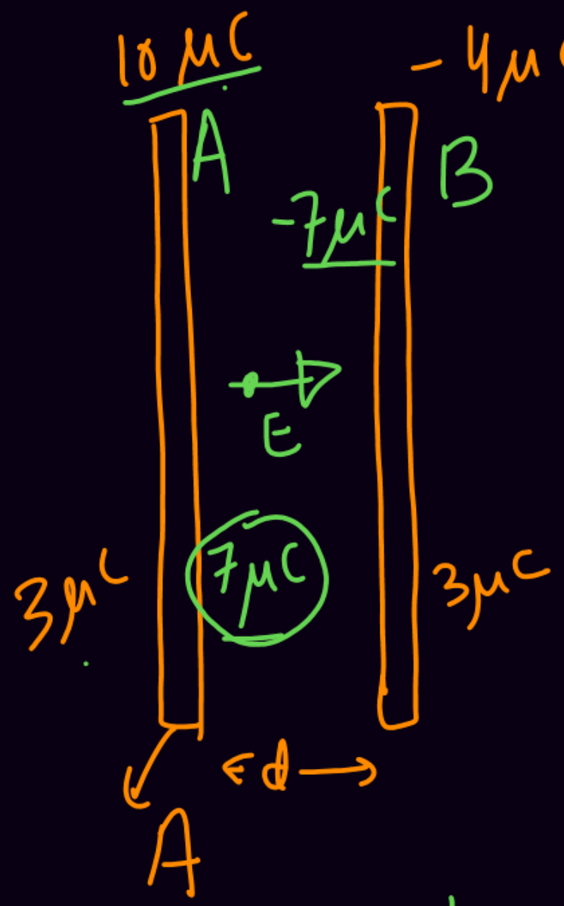
$$= 6\mu C$$

$$E_A = \frac{6\times10^{-6}}{A\varepsilon_0}\ N/C$$

$$E_B = \frac{1\times10^{-6}}{A\varepsilon_0}\ N/C$$

$$E_D = \frac{6\times10^{-6}}{A\varepsilon_0}\ N/C$$

$$E_C = \frac{10\times10^{-6}}{A\varepsilon_0}\ N/C.$$



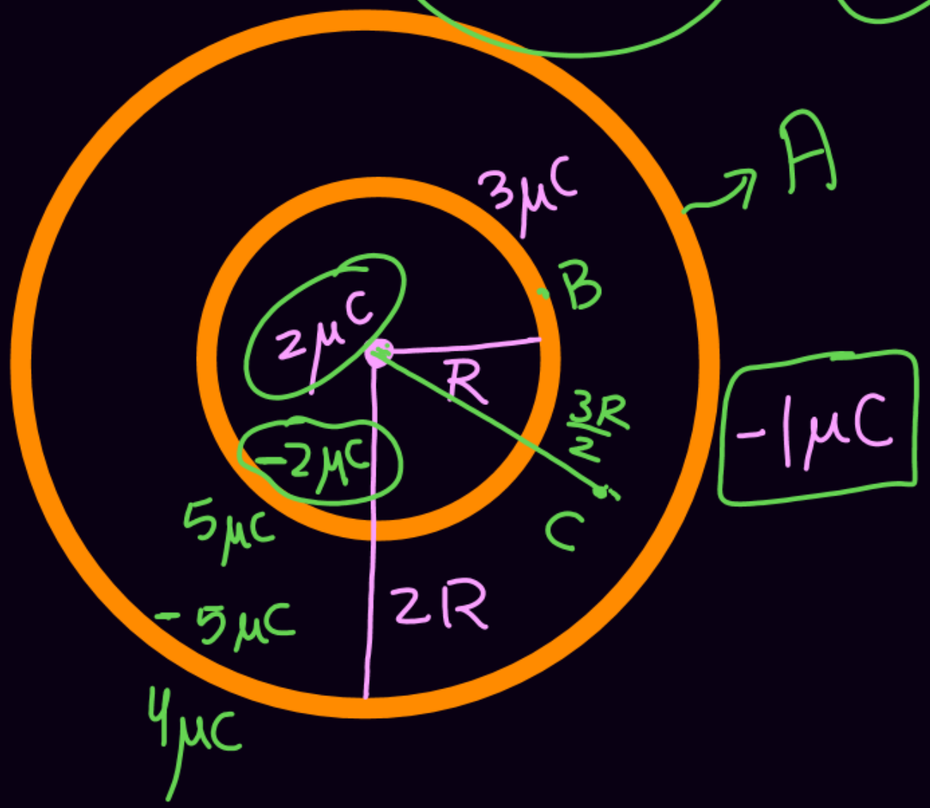
$$\frac{10 - 4}{2} = \frac{6\,\mu C}{2} = 3\,\mu C$$

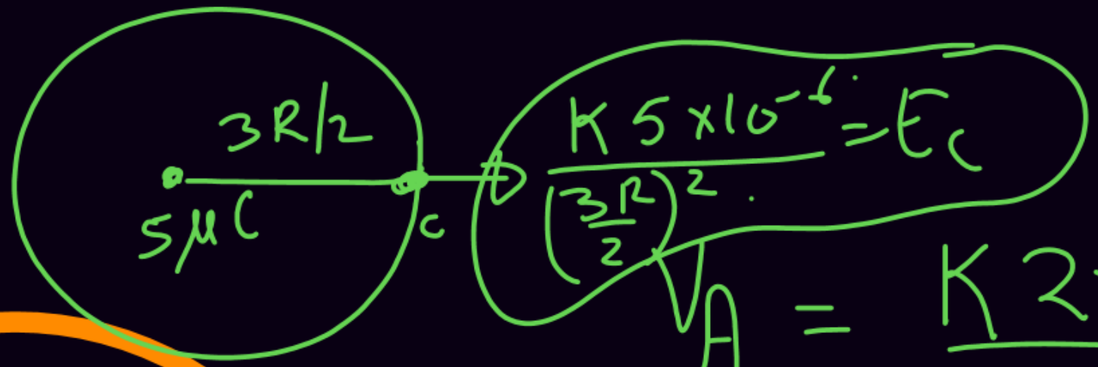
$$E = \frac{7\,\mu C}{A\,\varepsilon_0} \quad \text{(Uniform)}$$

$$\boxed{\Delta V = E\,d}$$

$$V_A - V_B = \Delta V = \frac{7 \times 10^{6}}{A\,\varepsilon_0} \times d \ V$$

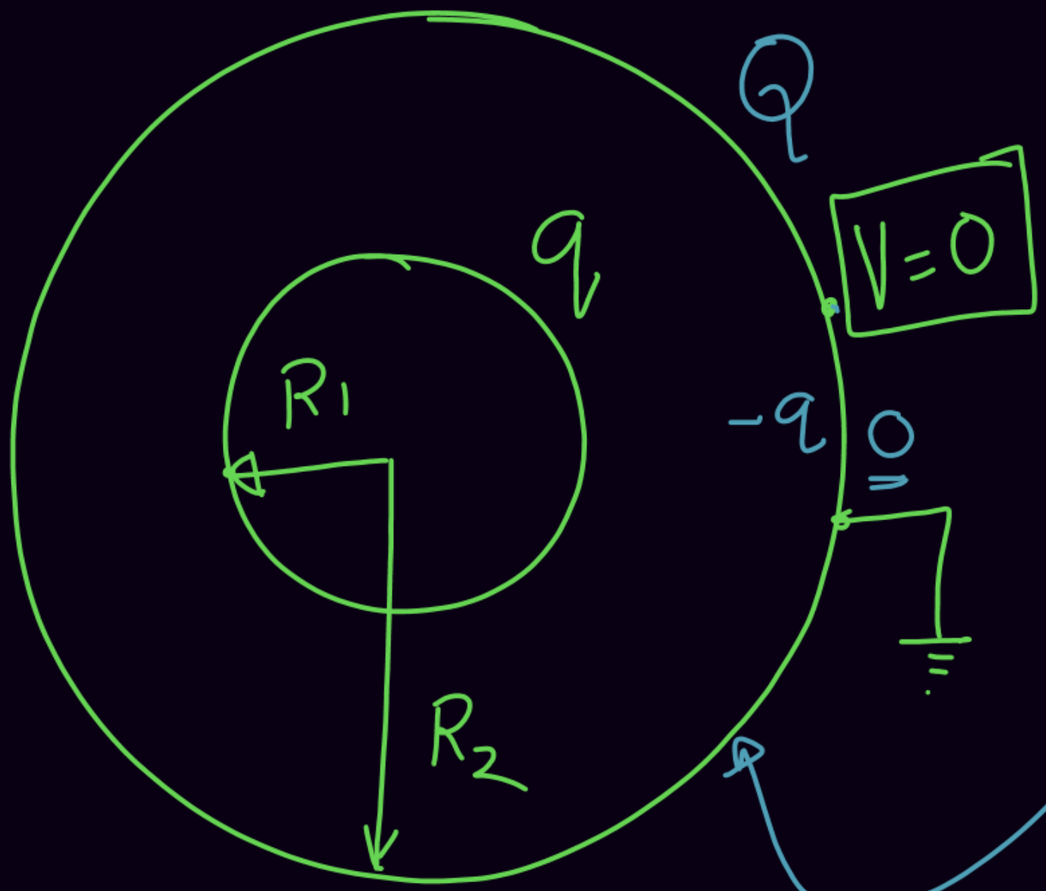
$E_C = ?$





$$V_A = \frac{K\,2\times10^{-6}}{2R} + \frac{K\,3\times10^{-6}}{2R} - \frac{K\,1\times10^{-6}}{2R}$$

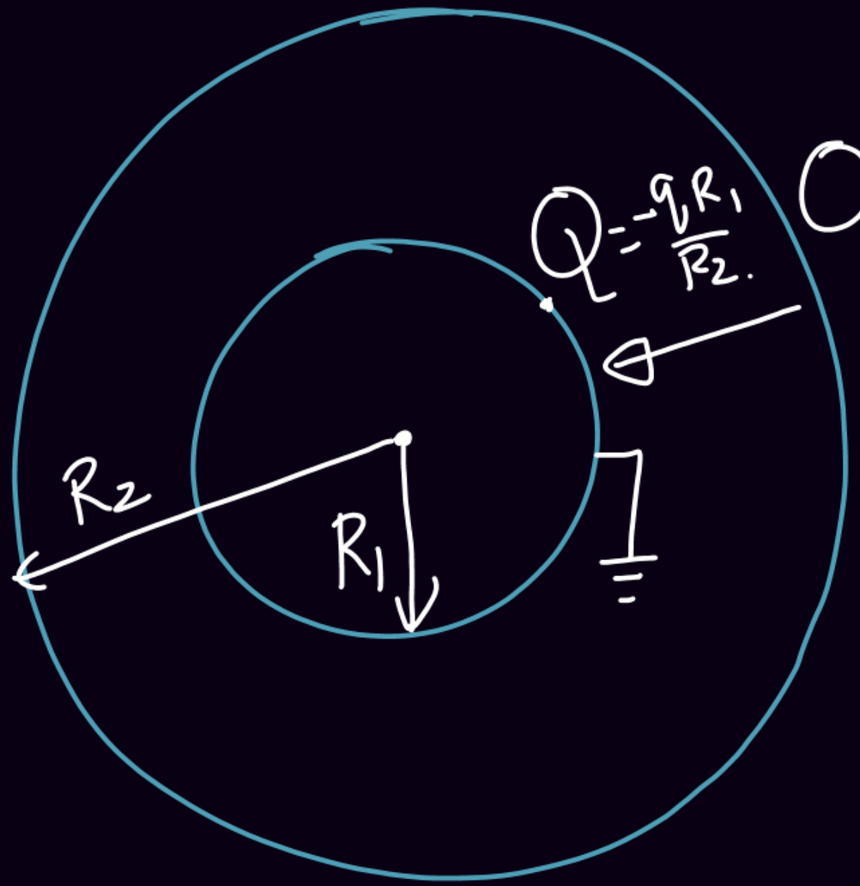
$$V_B = \frac{K\,2\times10^{-6}}{R} + \frac{K\,3\times10^{-6}}{R} - \frac{K\,1\times10^{-6}}{2R}$$



$$V_{R_2} = \frac{Kq}{R_2} + \frac{KQ}{R_2} = 0$$

$$\boxed{Q = -q}$$

$E = 0$



$$\frac{KQ}{R_1} + \frac{Kq}{R_2} = 0$$

$$q = -Q\frac{R_2}{R_1}$$

$$Q = -q\frac{R_1}{R_2}$$

Thank You Lakshyians