

LAKSHYA JEE

LAKSHYA KO HAR HAAL ME PAANA HAI



Electric Potential & Capacitance

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Today's GOALS!

- Properties of conductors in electrostatics.



Revision

1. Net E inside a conductor = 0

2. Q_{excess} inside a conductor = 0

3. E & L are \perp to conductor

4. Conductor is equipotential

5. $\nabla R = \text{Constant}$

6. E near surface of conductor = $\frac{\sigma}{\epsilon_0}$

6.a E infinite conducting sheet = $\left(\frac{\sigma}{\epsilon_0}\right)$

due to all the charges present in the universe

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.

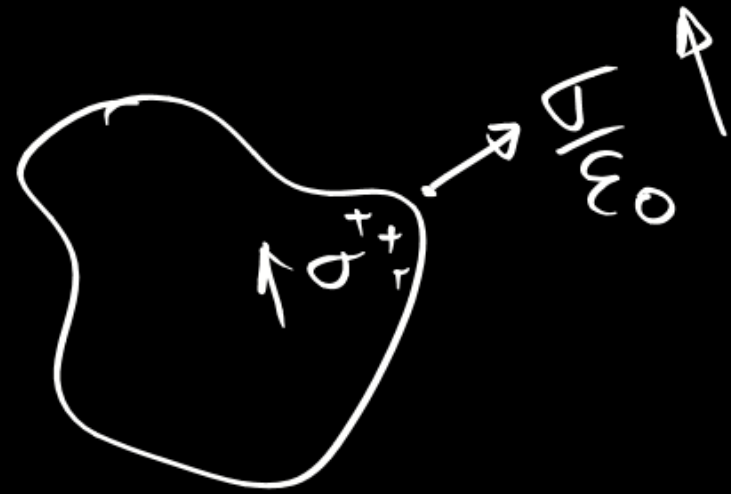
7.b E outside the conductor is due to charges placed outside and charges on the outer surface of the conductor.

8. Earthing \Rightarrow $V = 0$

Properties of conductors in Electrostatics



9 Corona Discharge



$\sigma R = \text{Const.}$



At corners, R is very small
& σ is very high.
 $\Rightarrow E$ is very high

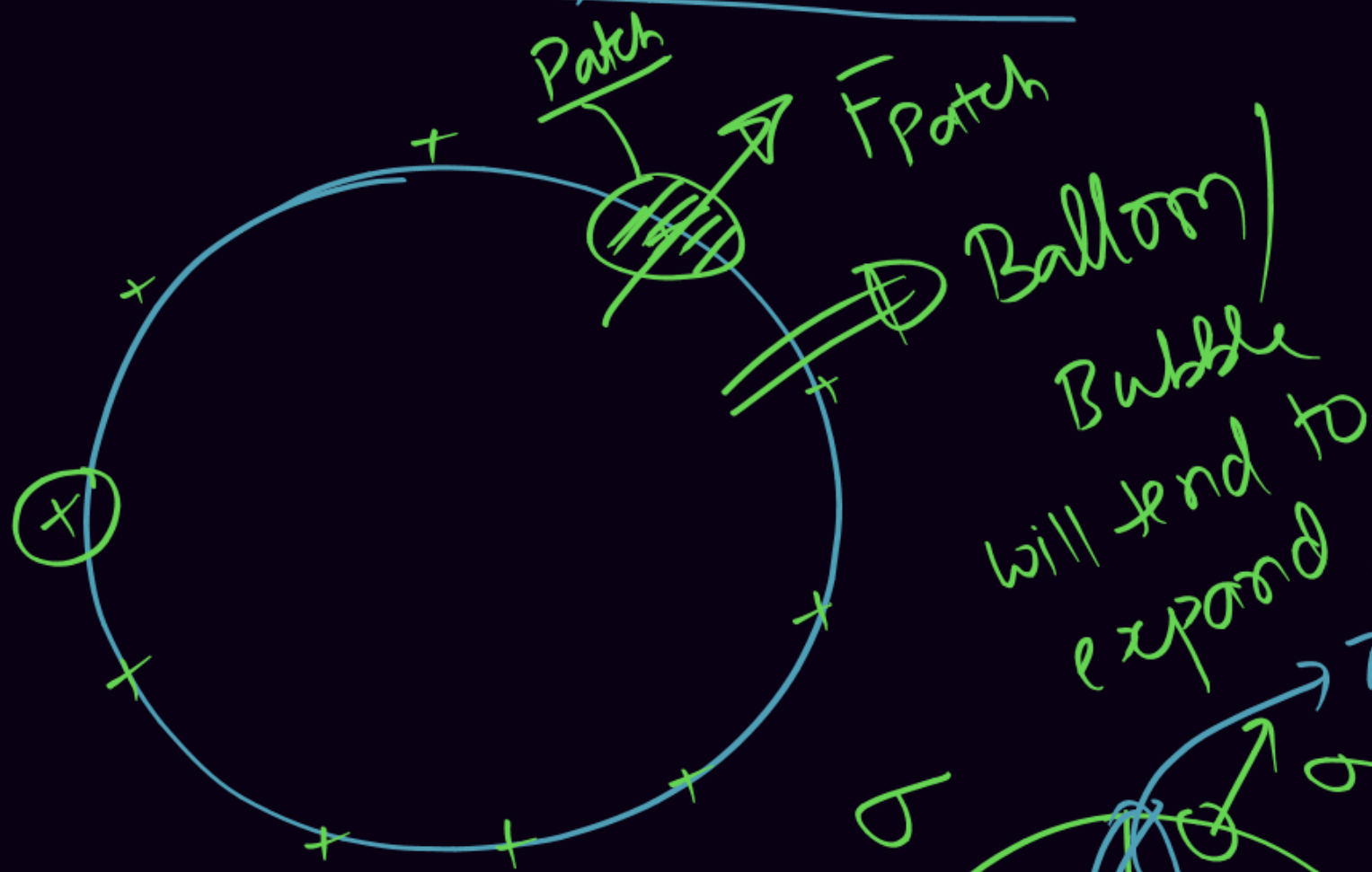
Dielectric strength

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



1(a)

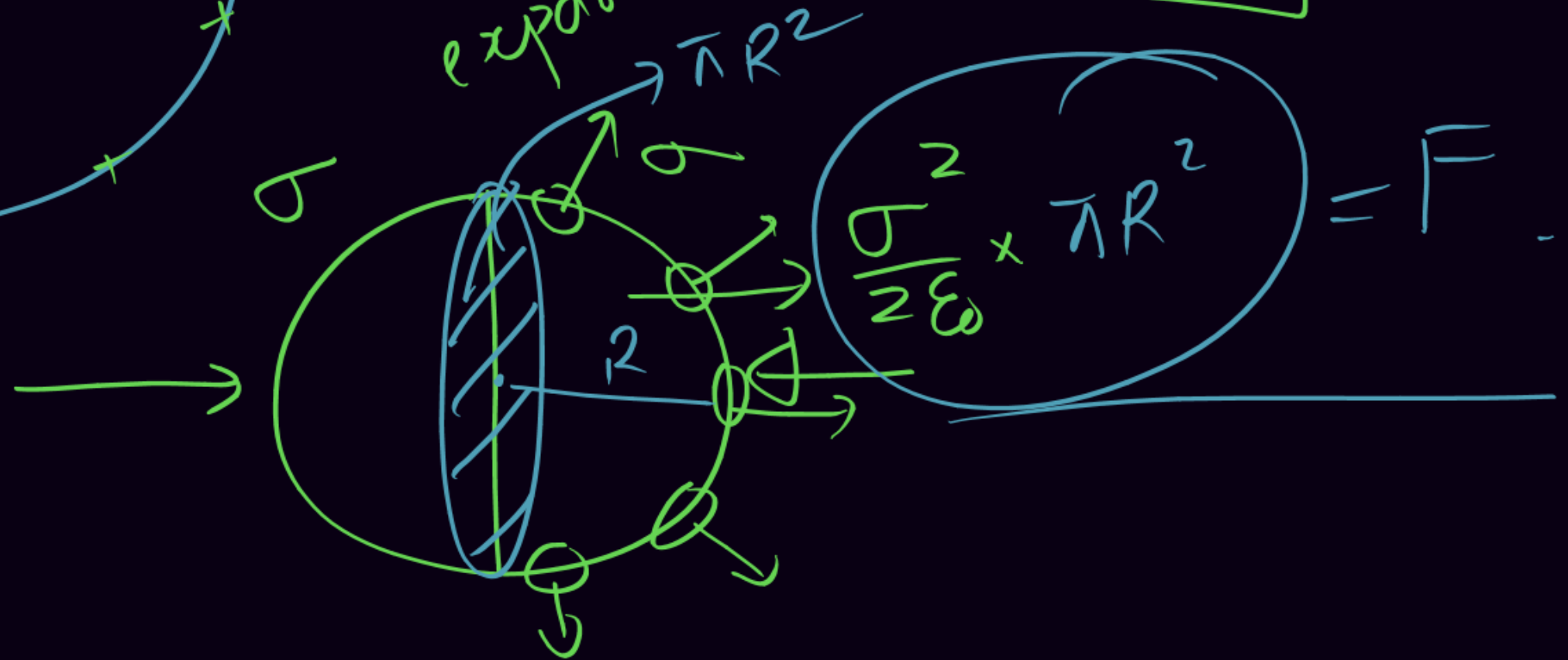
Electrostatic pressure



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

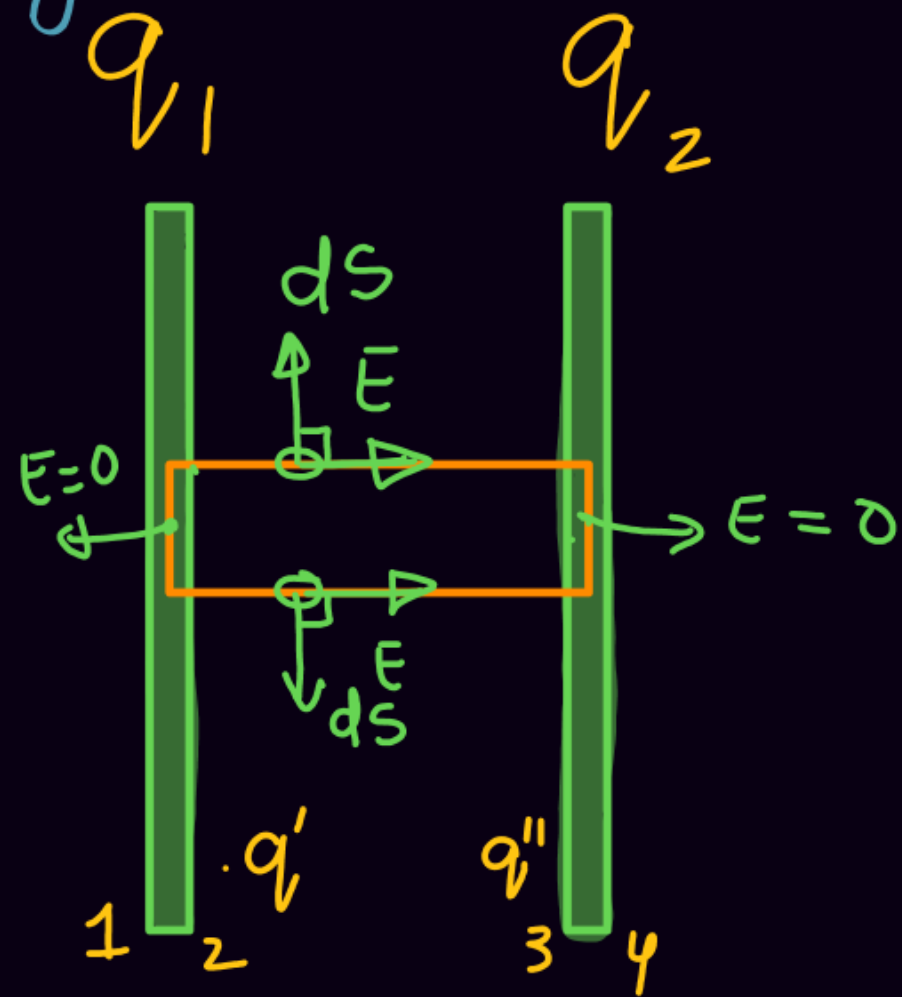
$$\text{Pressure} = \frac{\sigma^2}{2\epsilon_0}$$

A rectangular box containing the equation $\text{Pressure} = \frac{\sigma^2}{2\epsilon_0}$. To the right of the box, a force vector F is shown acting on the right side of the box.



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Charge distribution in parallel plates



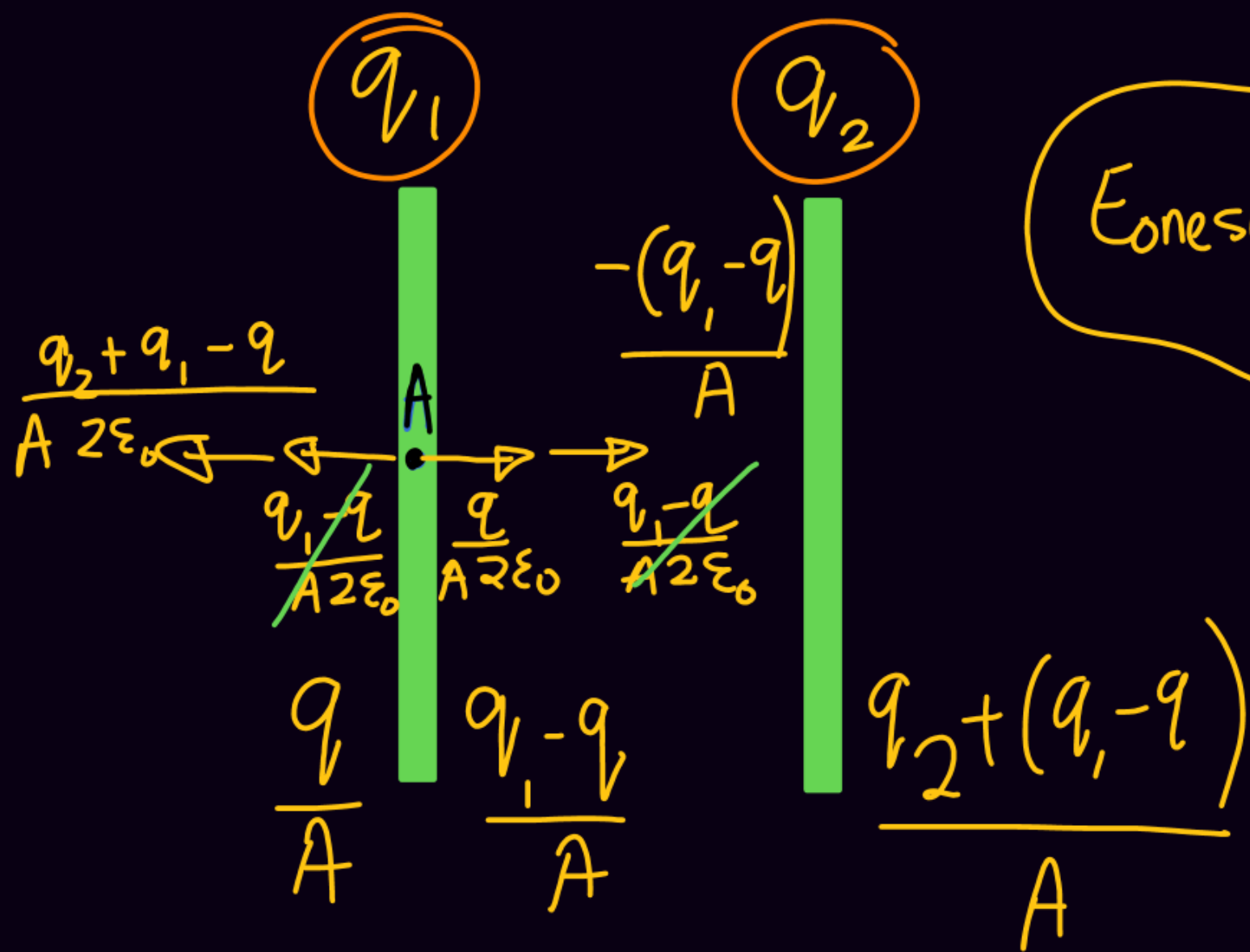
$$\oint \vec{E} \cdot d\vec{S} = \frac{q_{in}}{\epsilon_0}$$

$$0 = \frac{q_{in}}{\epsilon_0}$$

$$q_{in} = 0$$

Siddhi

Same same
charge equal
and opposite
honge.



$$E_{\text{onesurface}} = \frac{\sigma}{2\epsilon_0}$$

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

$$\frac{q_2 + q_1 - q}{2\epsilon_0 A} - \frac{q}{2A\epsilon_0} = 0$$

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

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

The diagram shows two vertical bars, one on the left and one on the right, both colored green. Above the left bar is the label q_1 , and above the right bar is the label q_2 . Between the bars, there are three lines of handwritten mathematical expressions:

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

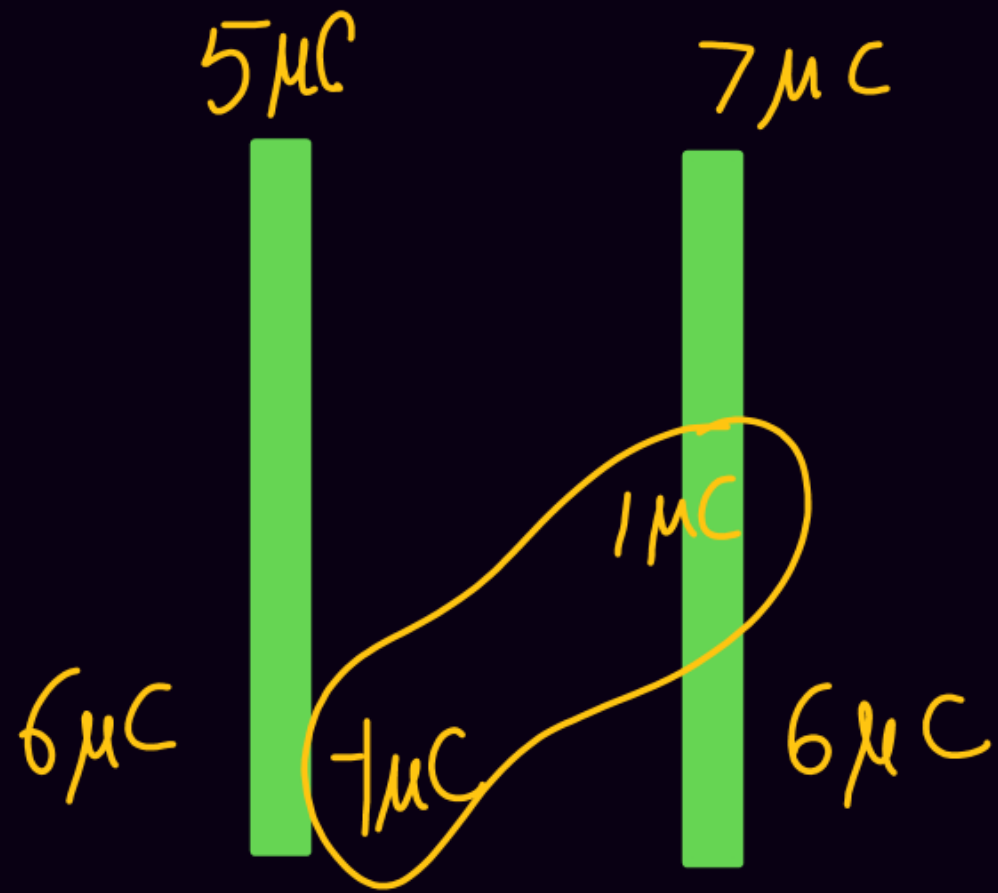
Below the bars, there are three more expressions:

Below the left bar: $\frac{q_1 + q_2}{2}$

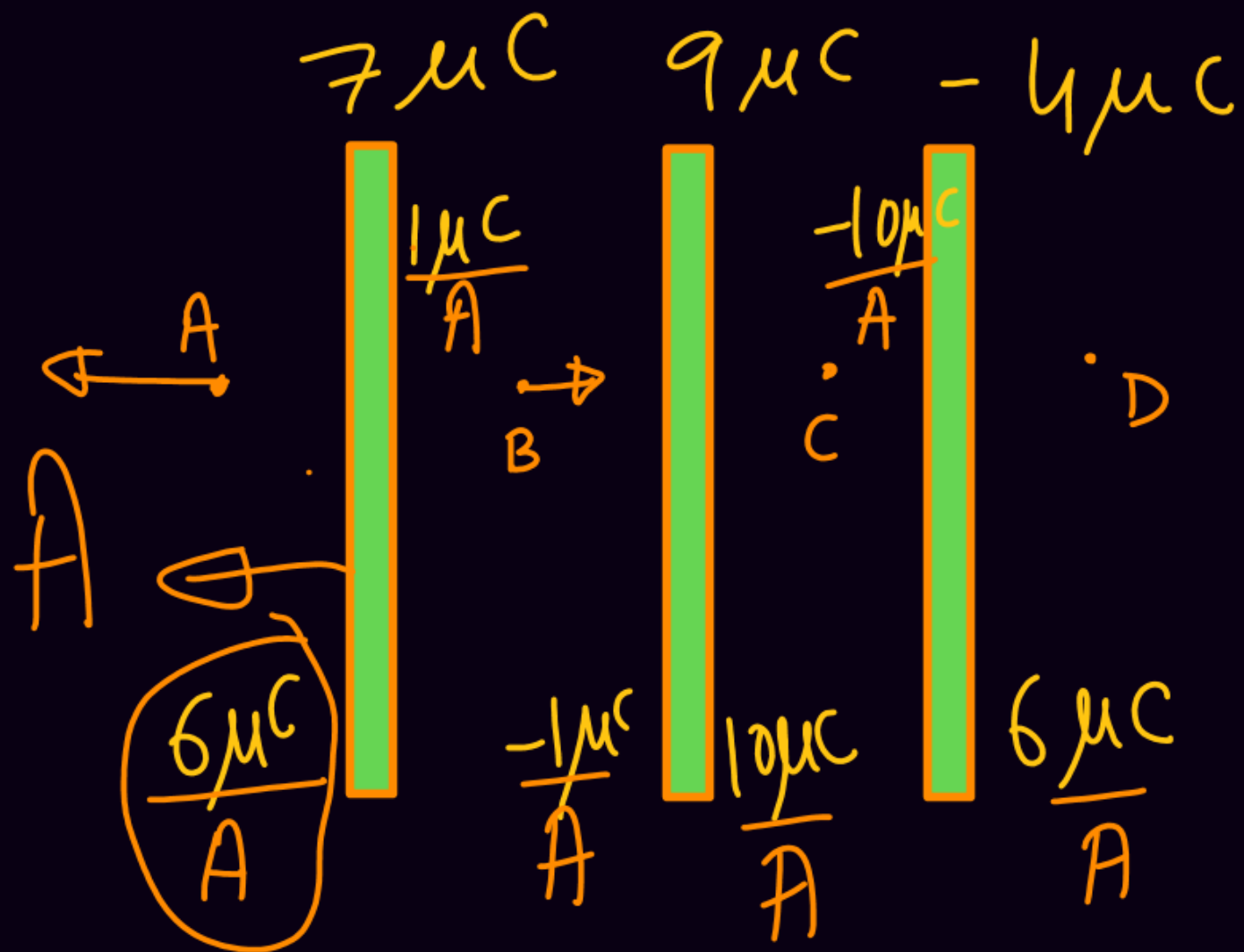
Between the bars: $q_1 - \frac{q_1 + q_2}{2}$

$$= \frac{q_1 - q_2}{2}$$

Below the right bar: $\frac{q_1 + q_2}{2}$



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



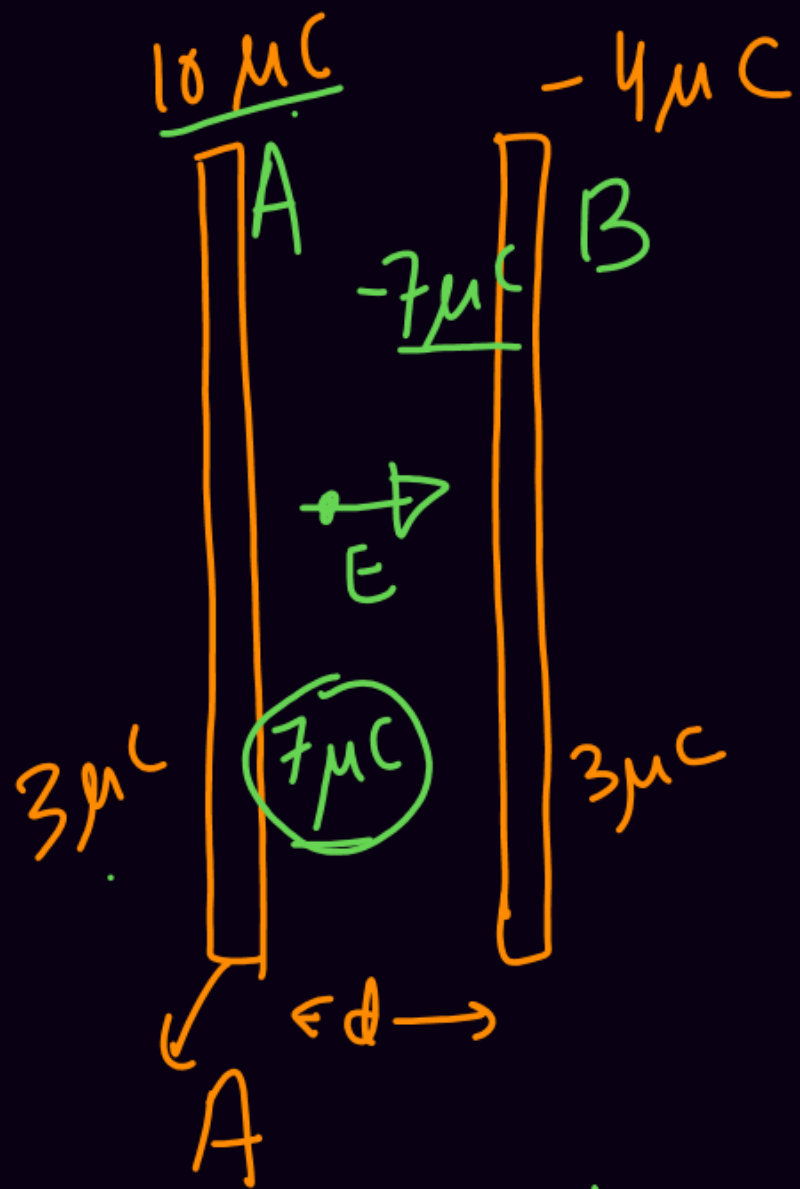
$$q_{\text{total}} = \frac{7 + 9 - 4}{2} = \frac{12 \mu\text{C}}{2} = \underline{\underline{6 \mu\text{C}}}$$

$$E_A = \frac{6 \times 10^{-6}}{A \epsilon_0} \text{ N/C}$$

$$E_B = \frac{1 \times 10^{-6}}{A \epsilon_0} \text{ N/C}$$

$$E_C = \frac{10 \times 10^{-6}}{A \epsilon_0} \text{ N/C}$$

$$E_D = \frac{6 \times 10^{-6}}{A \epsilon_0} \text{ N/C}$$



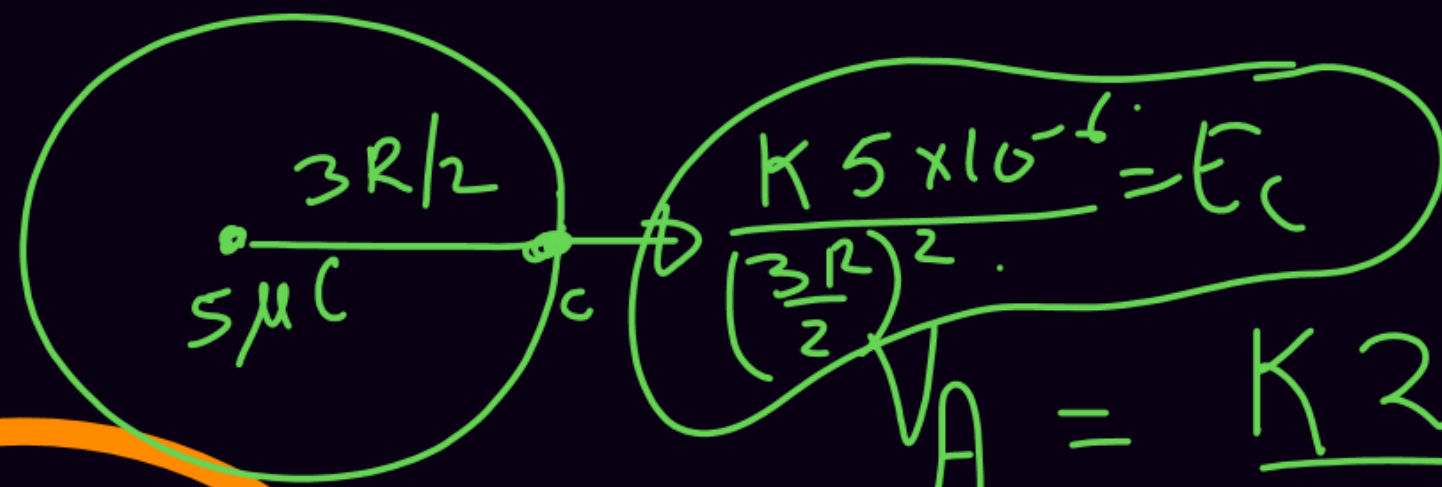
$$\frac{10}{2} - \frac{4}{2} = \boxed{6 \mu\text{C}} = 3 \mu\text{C}$$

$$E = \frac{7 \mu\text{C}}{A \epsilon_0} \quad (\text{Uniform})$$

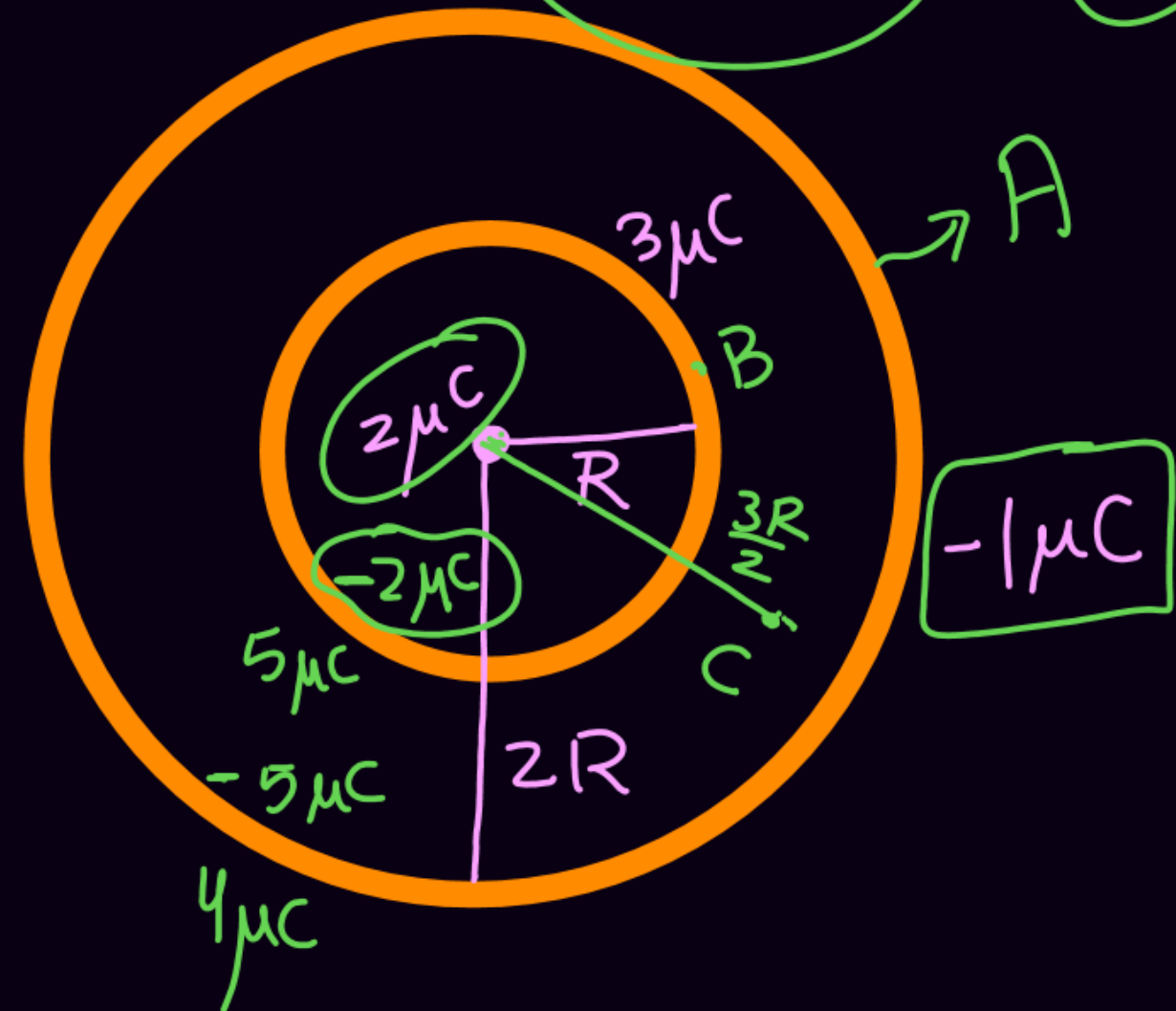
$$\boxed{\Delta V = E d}$$

$$V_A - V_B = \Delta V = \frac{7 \times 10^{-6}}{A \epsilon_0} \times d \quad V$$

$E_c = ?$

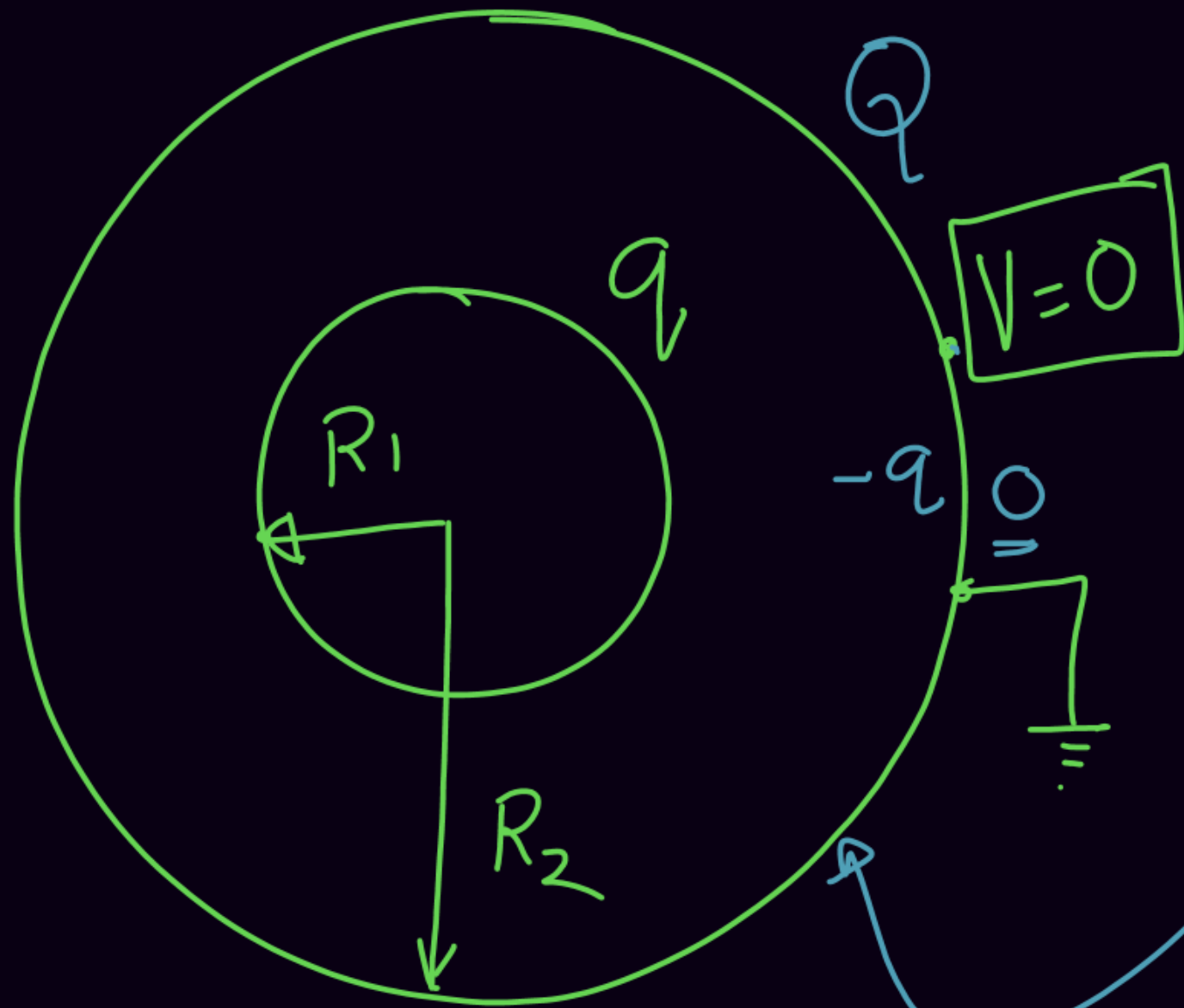


$$V_A = \frac{K 2 \times 10^{-6}}{2R} + \frac{K 3 \times 10^{-6}}{2R}$$



$$- \frac{K 1 \times 10^{-6}}{2R}$$

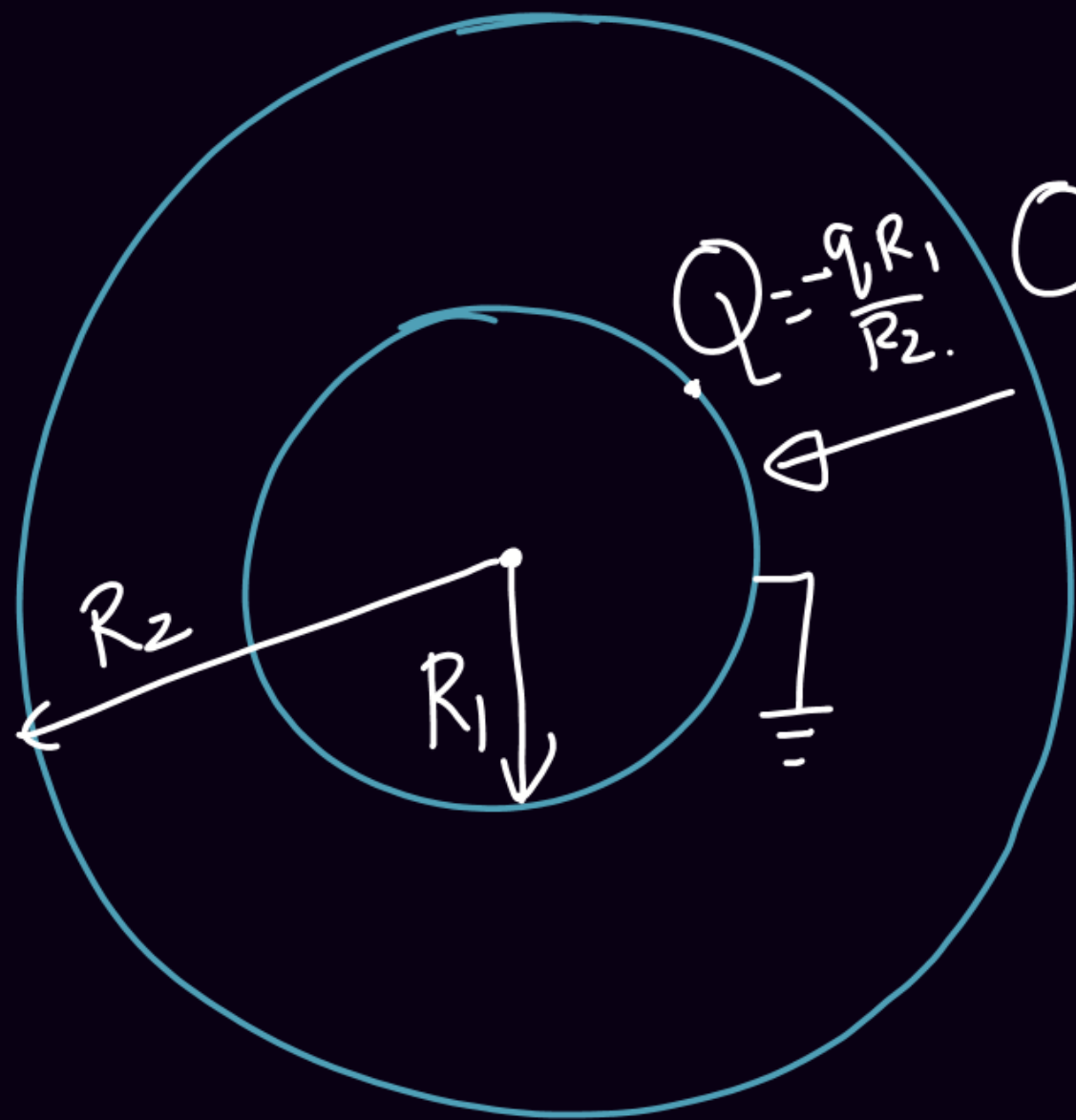
$$V_B = \frac{K 2 \times 10^{-6}}{R} + \frac{K 3 \times 10^{-6}}{R} - \frac{K 1 \times 10^{-6}}{2R}$$



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

$$Q = -q$$

$$E = 0$$



$$Q \rightarrow \frac{kQ}{R_1} + \frac{kq}{R_2} = 0$$

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

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

Thank You Lakshyians