LAKSHYA JEE

LAKSHYA KO HAR HAAL ME PAANA HAI

Electric Potential & Capacitance

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Today's GOALS!

- Properties of conductors in electrostatics.

Properties of conductors in Electrostatics

① E_{net} inside conductor $= 0$

② $q_{in\ bulk} = 0$

③ EFL surface par ⊥ hoti hai

④ Conductor is equipotential.

⑤ Earthing ⏚ $V = 0$

⑥ $\sigma R = \text{Const}$

(6) $\sigma R = \text{Constant}$

σ → $\frac{\text{Charge}}{\text{Area}}$

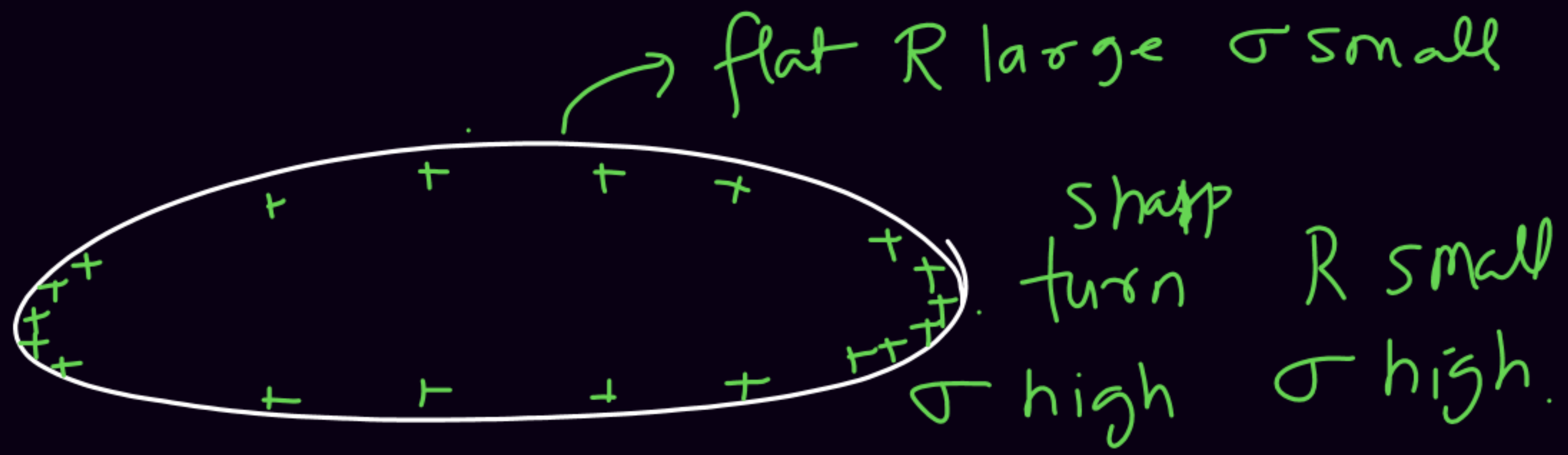
R → Radius of curvature.

Flatter the surface greater is the R.

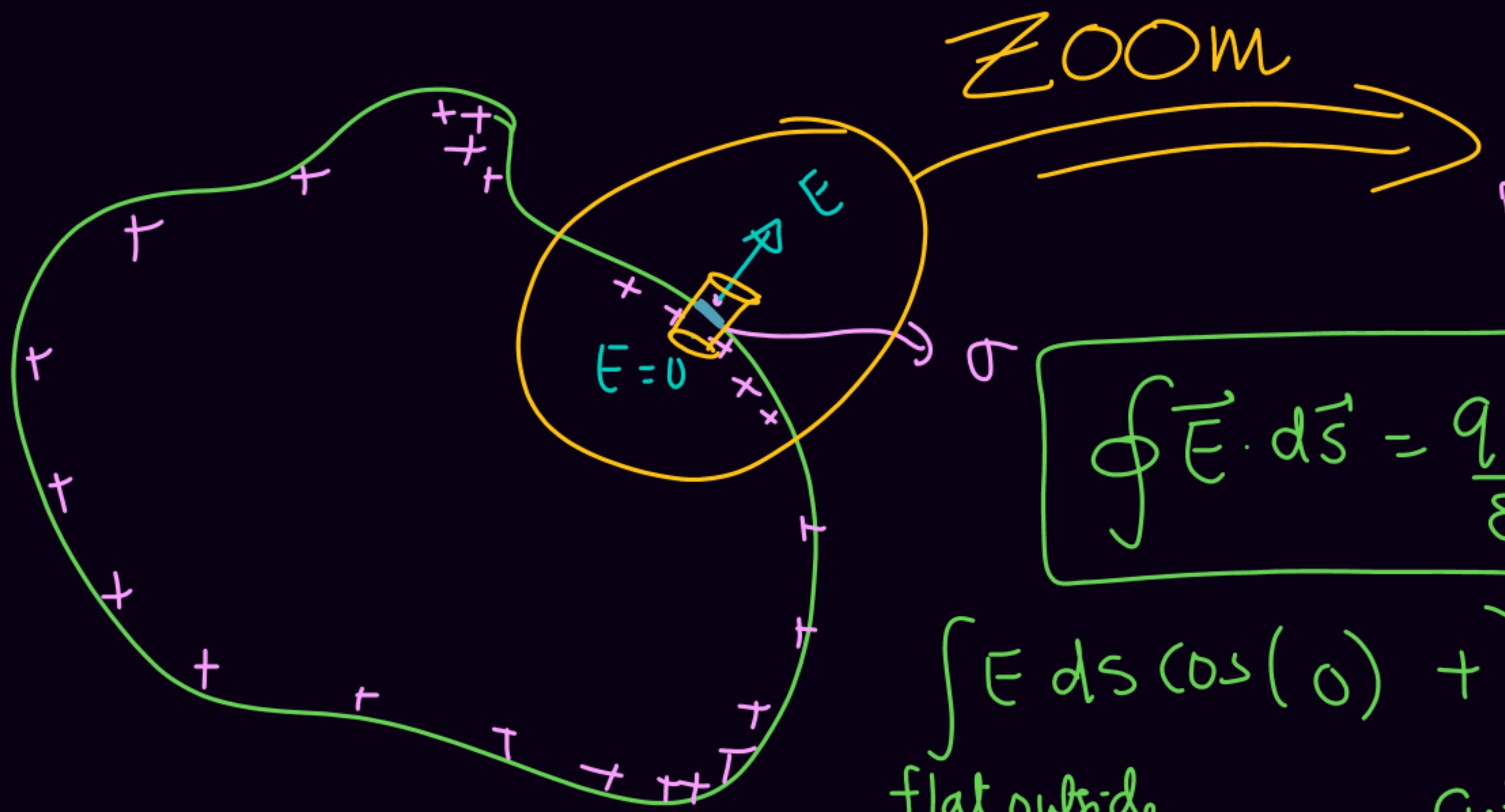
sharp turn ⇒ R small.

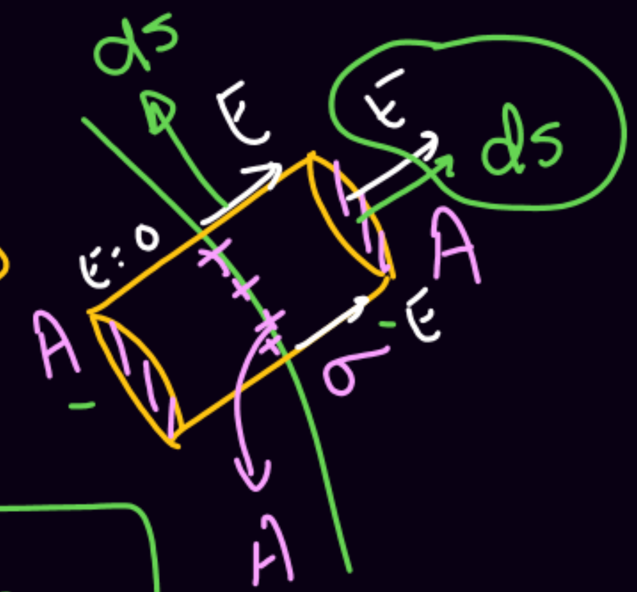
Corner ⇒ very sharp turn ⇒ R is very small.

σ is very high.


flat R large σ small
sharp turn R small
σ high σ high.

(7) Electric field near the surface of a conductor is σ/ε_0





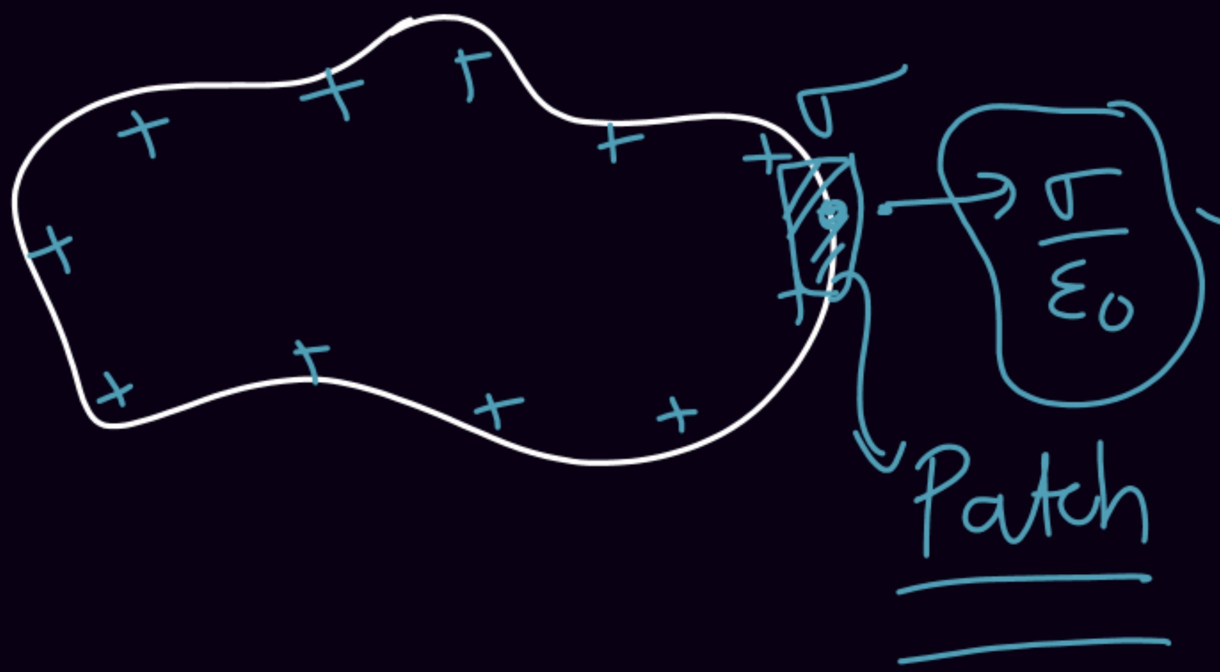
$$\oint \vec{E} \cdot d\vec{s} = \frac{q_{in}}{\varepsilon_0}$$

$$\int E\, ds \cos(0) + \cancel{\int E\, ds \cos(90)} = \frac{\sigma A}{\varepsilon_0}$$

flat outside — curved outside

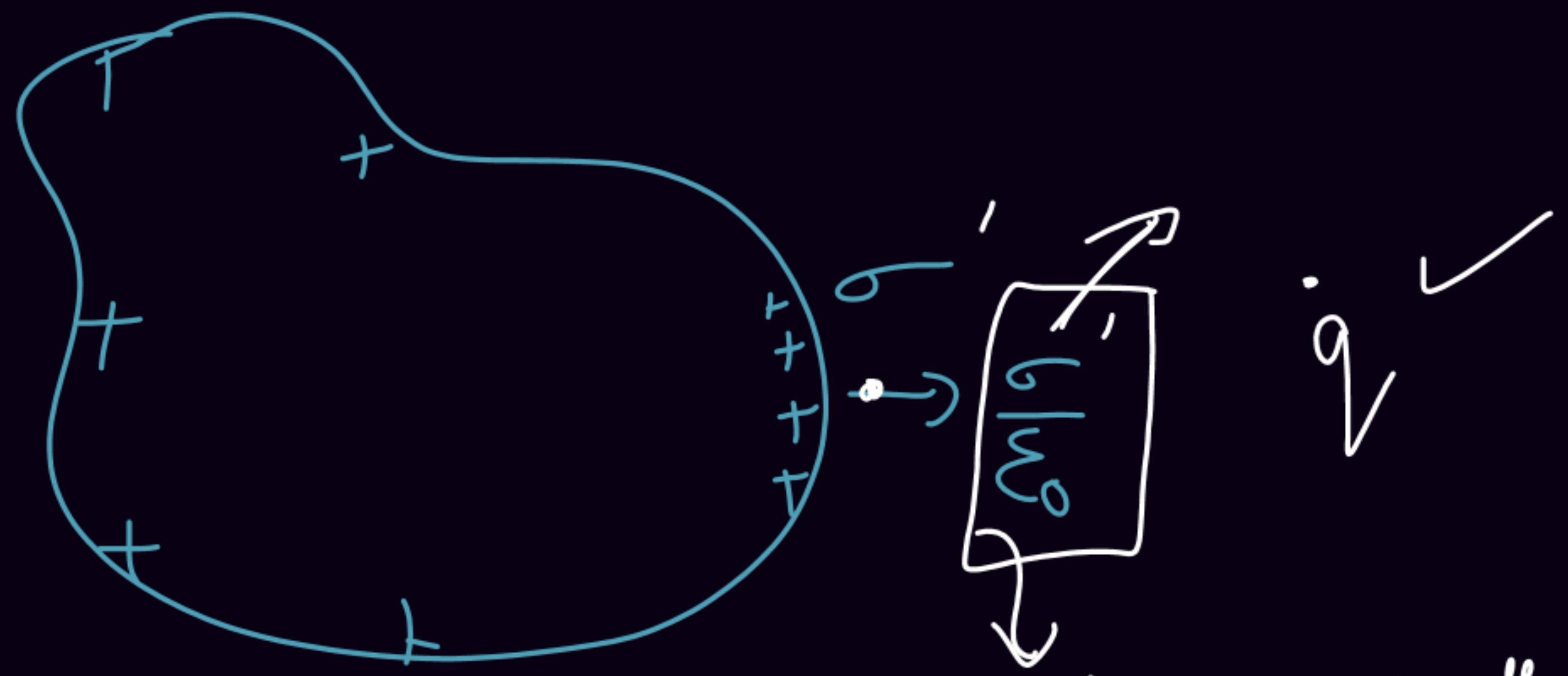
$$E \cancel{A} = \frac{\sigma \cancel{A}}{\varepsilon_0}$$

$$E = \sigma/\varepsilon_0$$



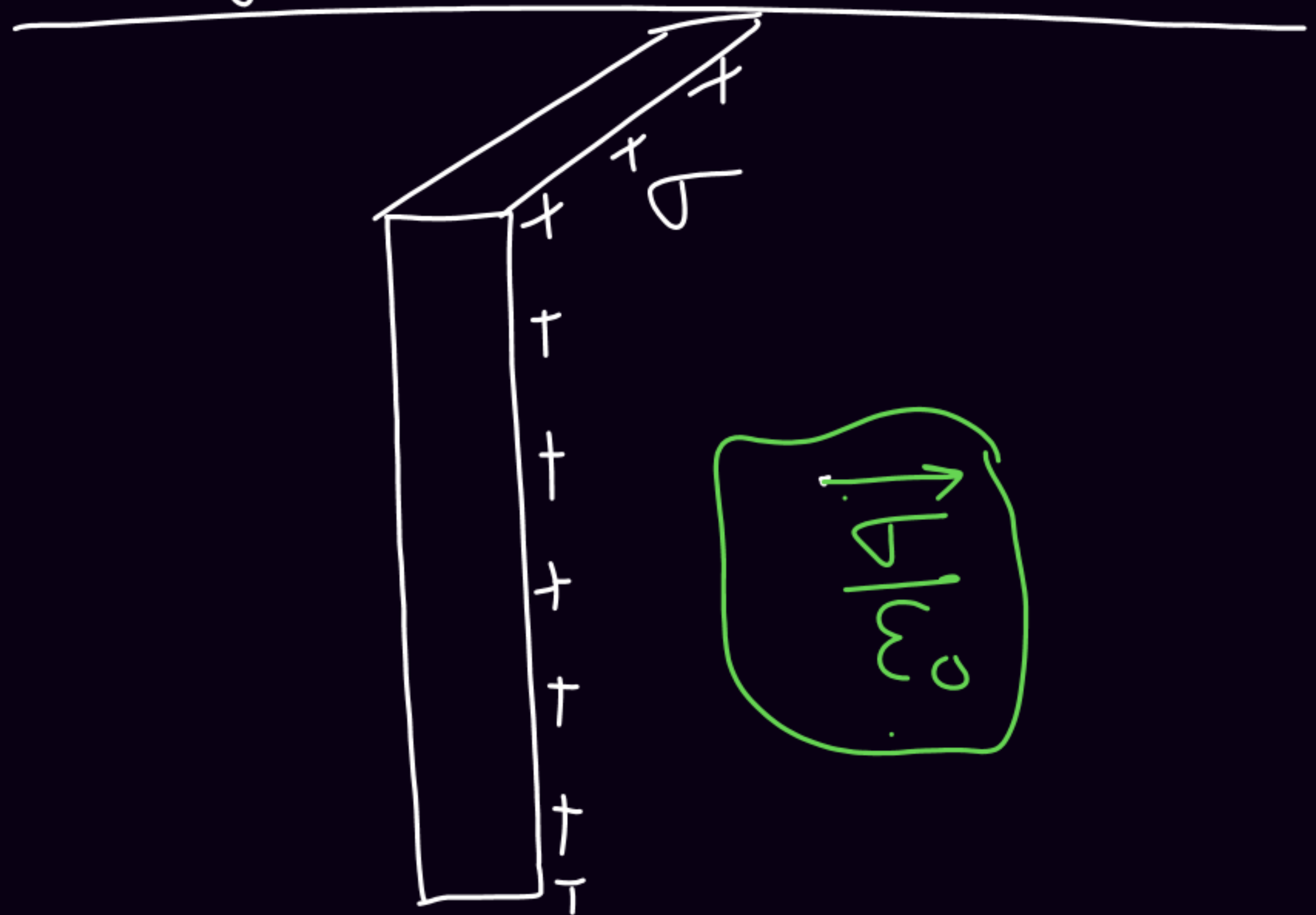
$E = \frac{\sigma}{\varepsilon_0}$ is due to

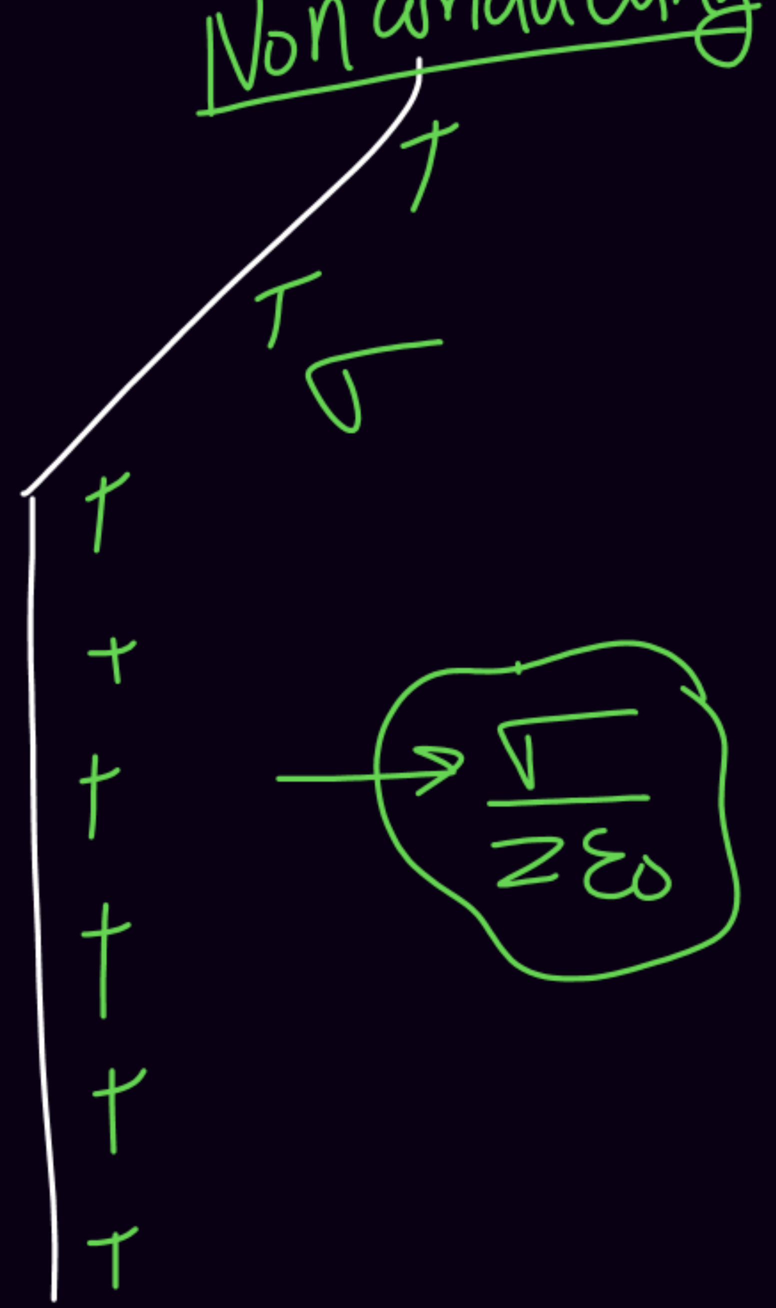
1. only due to patch.
2. due to complete conductor
3. due to all the charges in the universe.



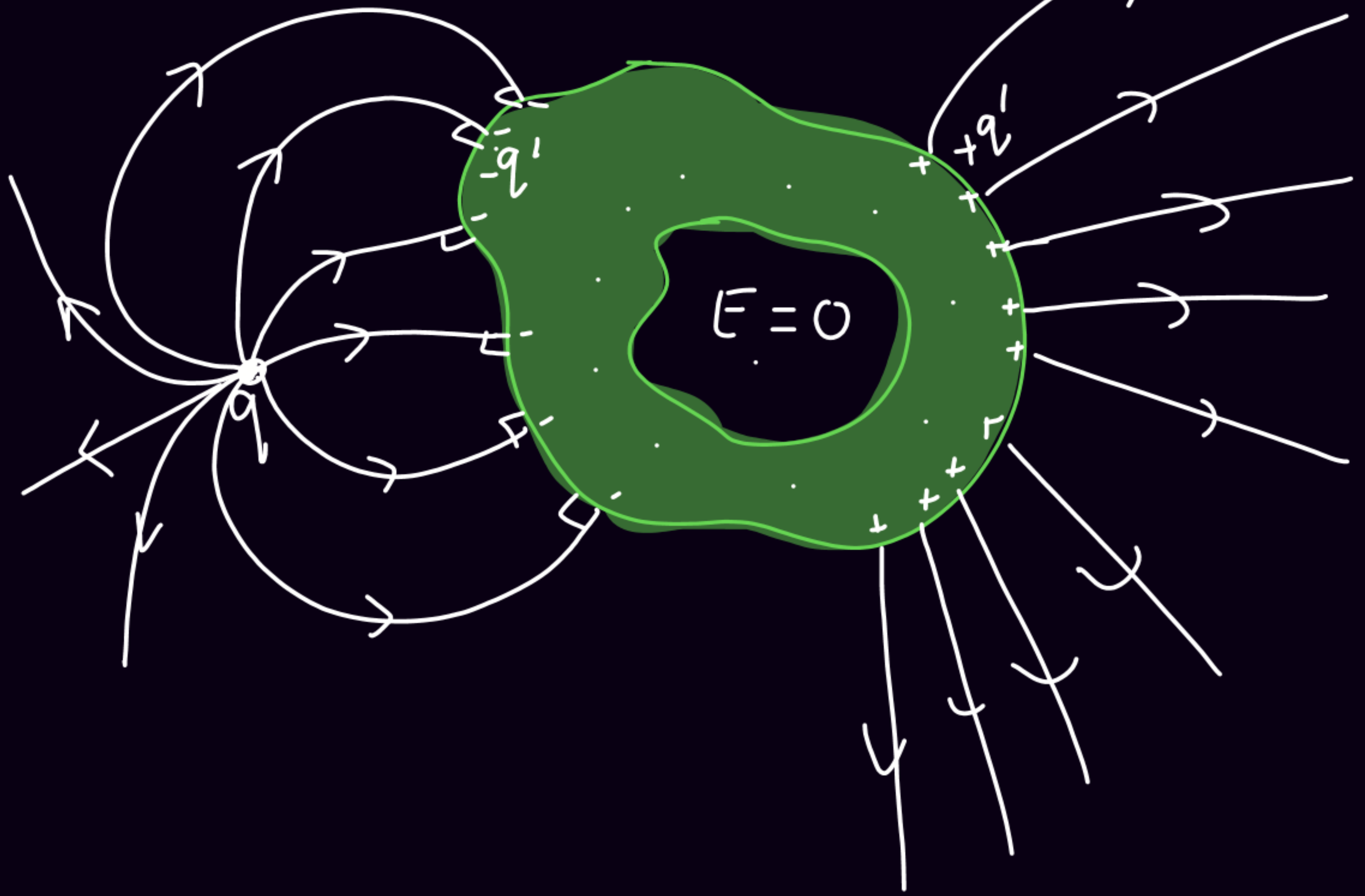
due to both conductor & the charges in the vicinity.

Infinite conducting sheet





⑧ Cavity



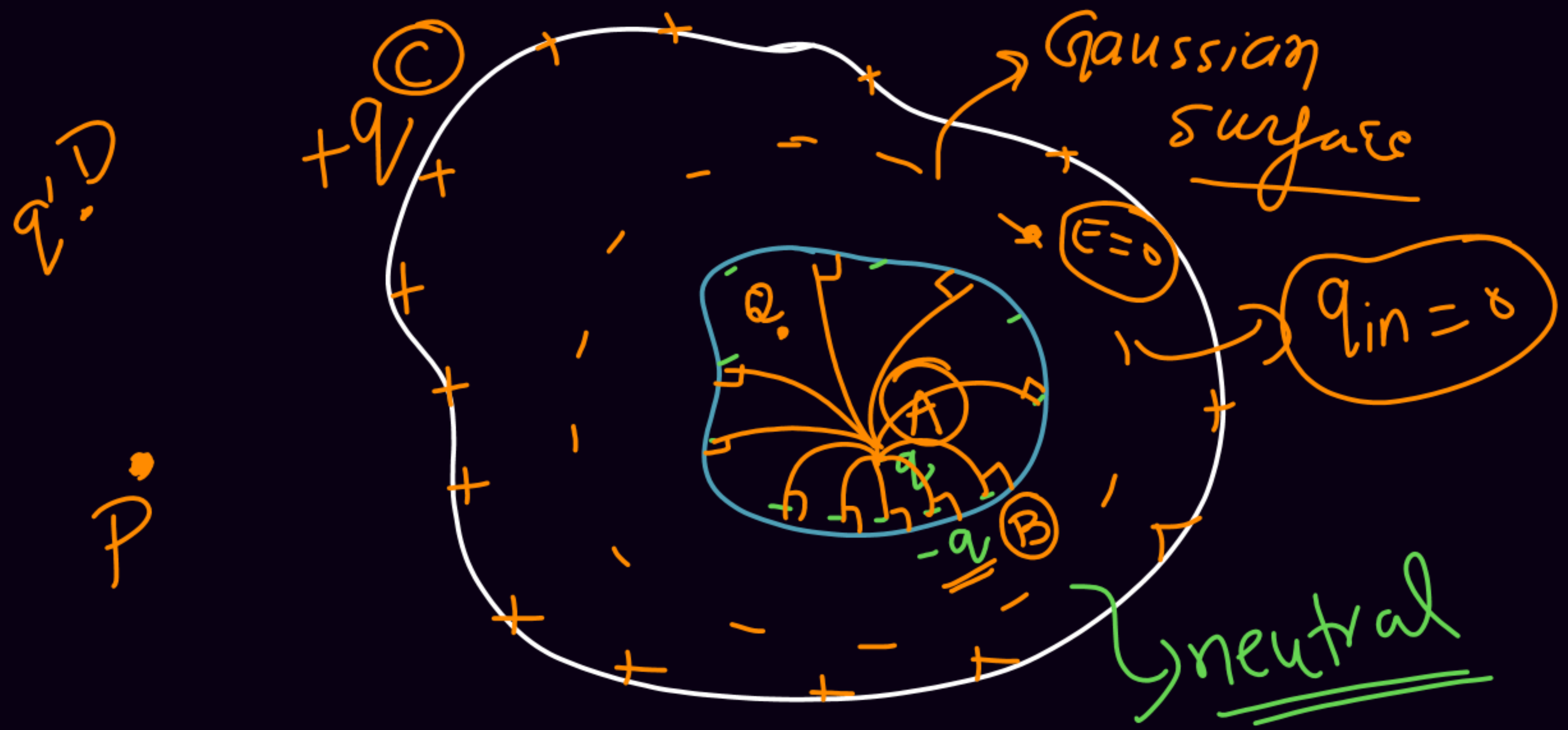
Shielding Effect of cavity!

Cavity inside a conductor is sheilded from the outside world & vice versa.

Outer world :- Outer surface of conductor + outside of conductor.

Inner world :- Inner surface of cavity + inside the cavity.

∞
E↑
q
E=0
V=?

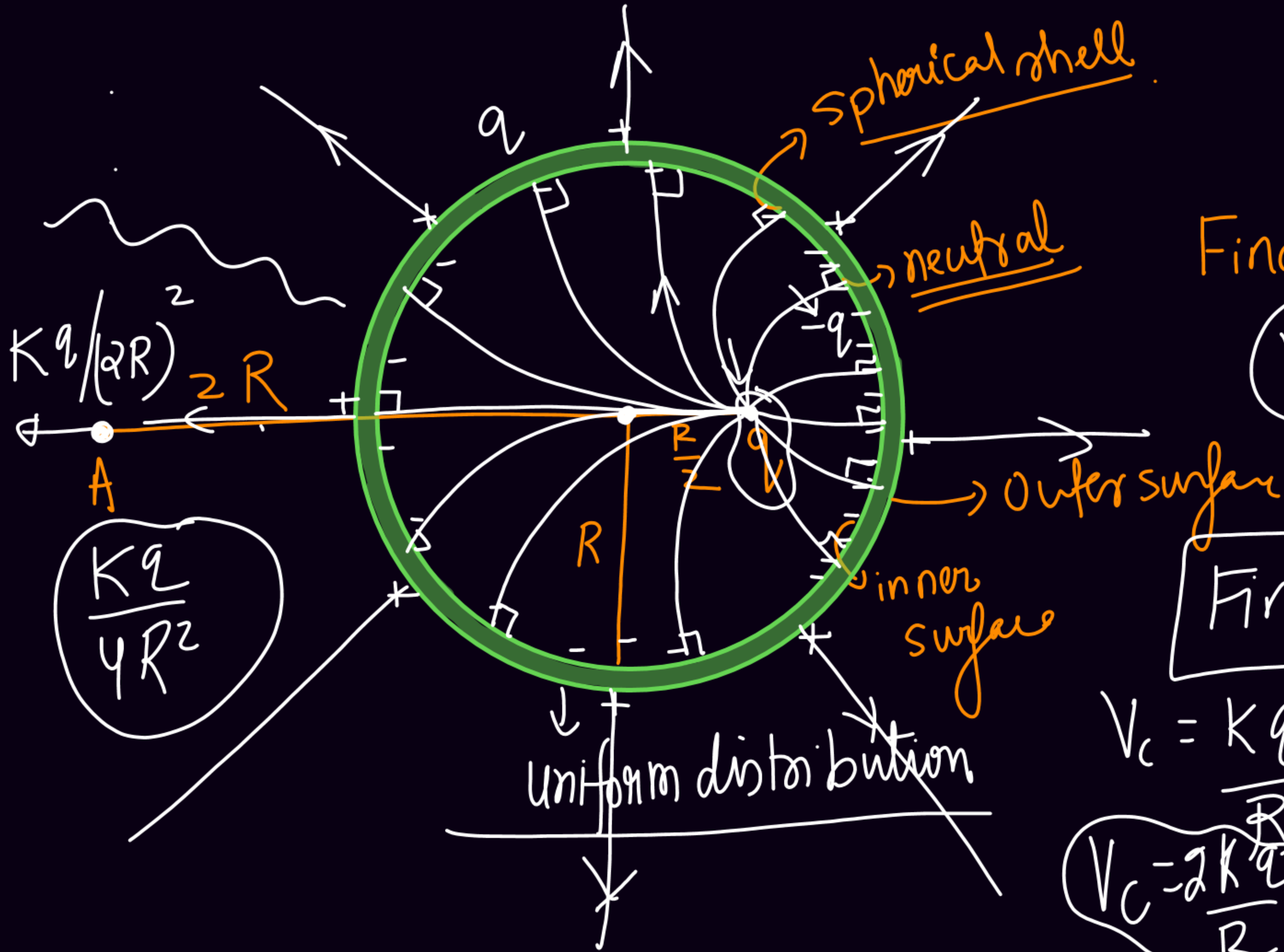


E_P will be due to charge Ⓒ & Ⓓ only

E_P due to charges at Ⓐ & Ⓑ is zero.

$E_Q|_{C,D} = 0$

$E_Q|_{A,B} \neq 0.$



Find V_A ; E_A ?

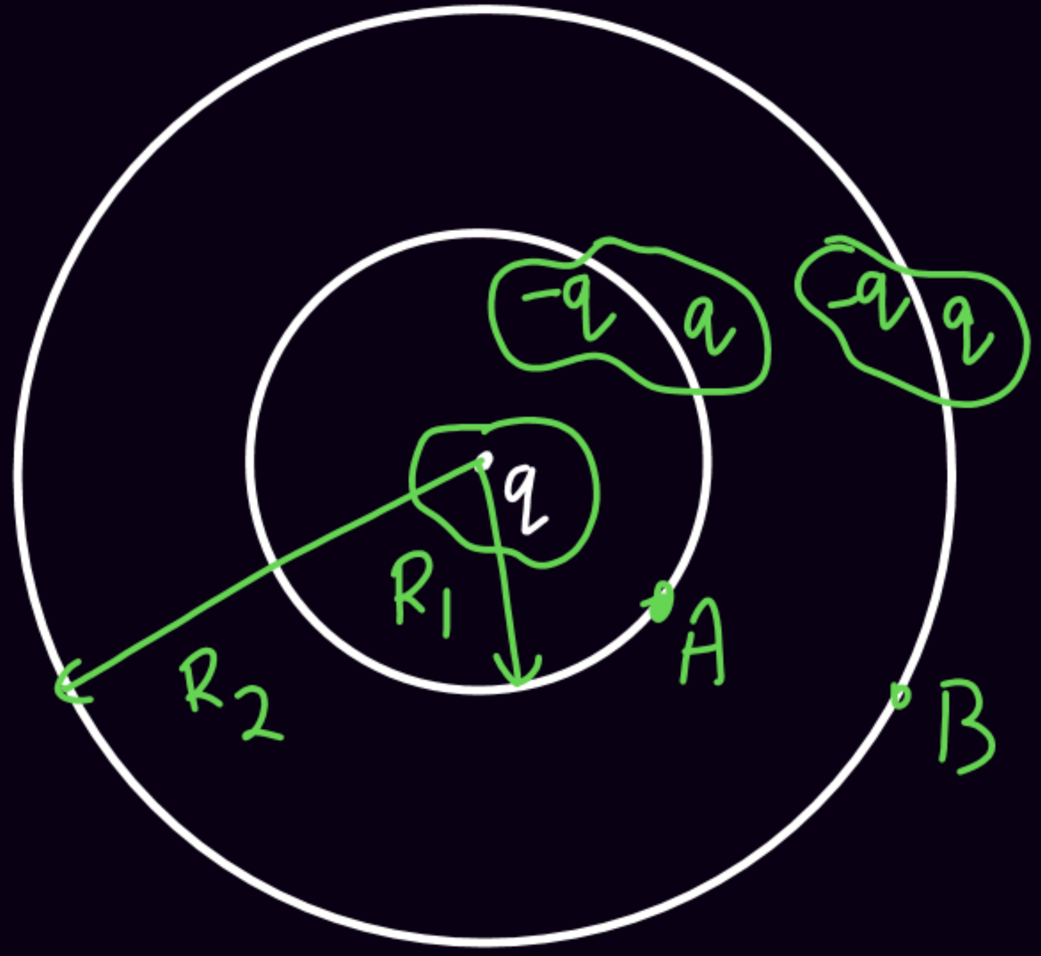
$$V_A = \frac{Kq}{2R}$$

Find V_c = ?

$$V_c = \frac{Kq}{R} - \frac{Kq}{R} + \frac{Kq}{R/2}$$

$$V_c = \frac{2Kq}{R}$$

green charge :- induced charge.

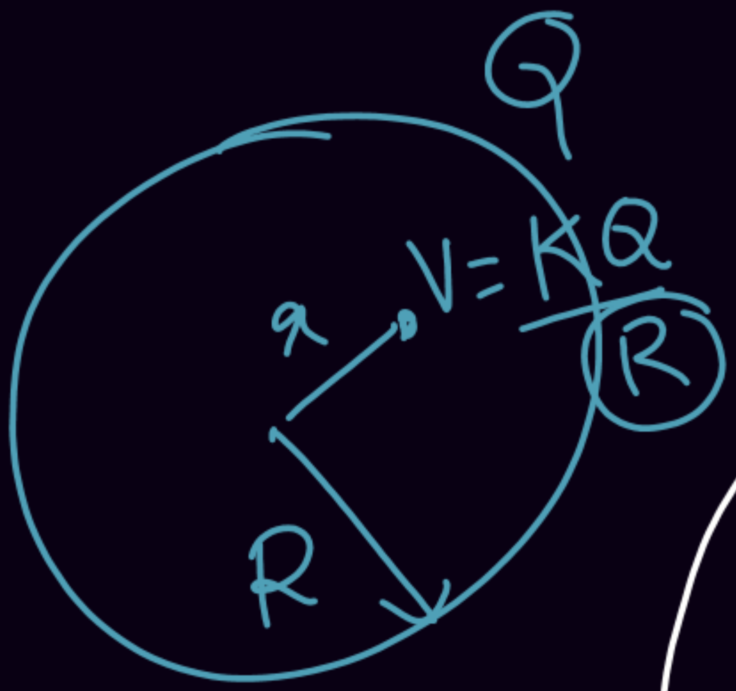


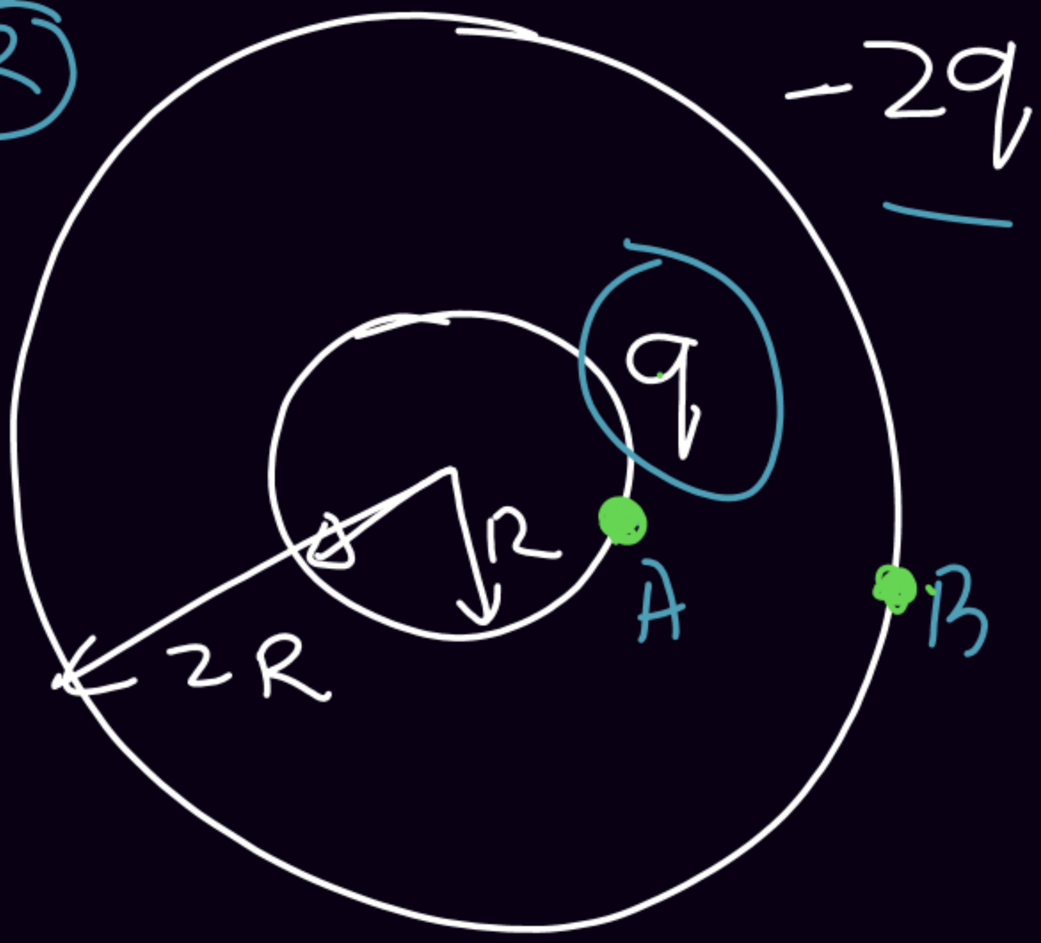
$$V_A = \frac{Kq}{R_1}$$

$$V_B = \frac{Kq}{R_2}$$

$\cdot A \quad E_A = 0$

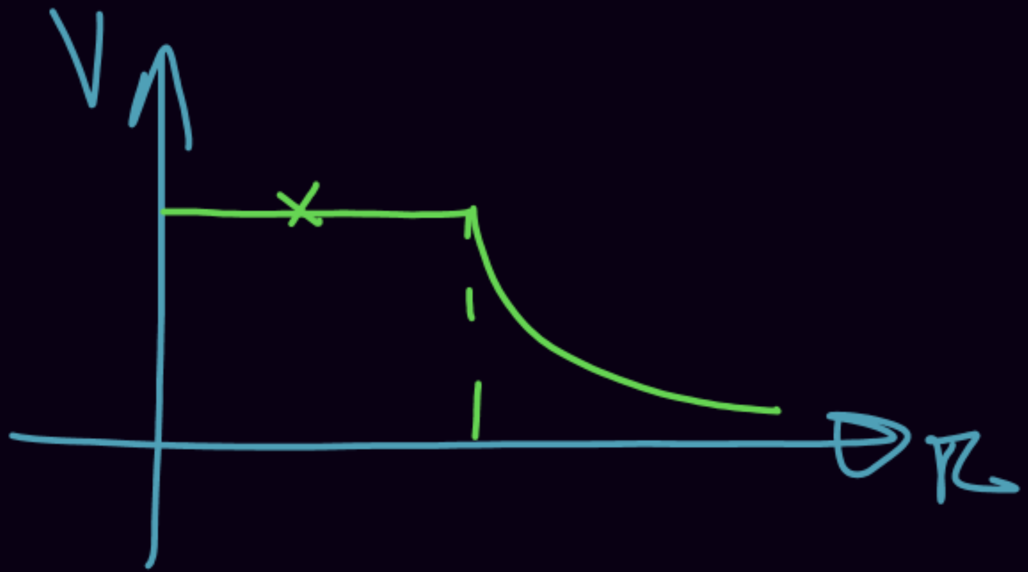
$V_A = 0$.

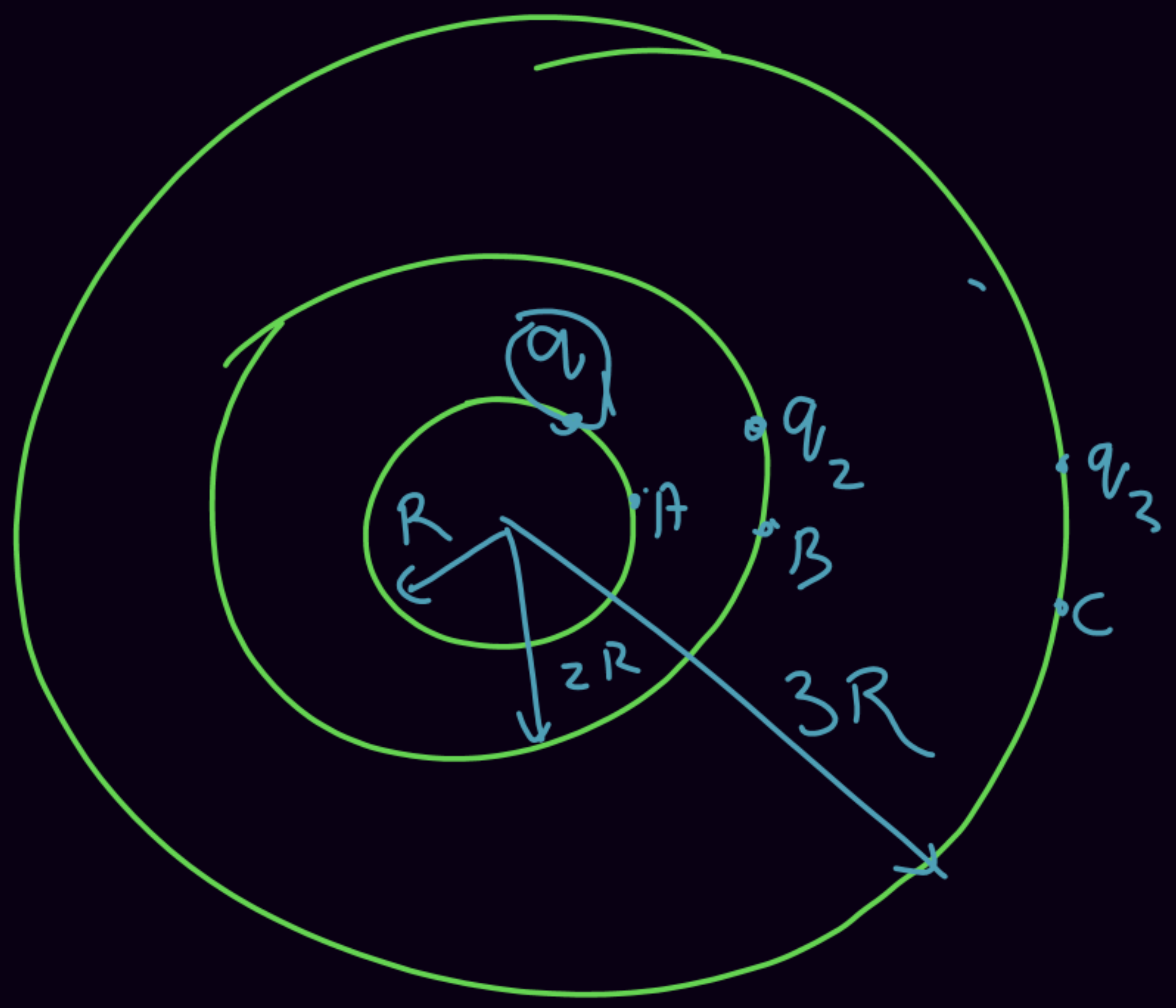




$$V_A = \frac{Kq}{R} - \frac{2Kq}{2R}$$

$$V_B = \frac{Kq}{2R} - \frac{2Kq}{2R}$$





$V_{A|A}$ $V_{A|B}$ $V_{A|C}$

$$V_A = \frac{Kq_1}{R} + \frac{Kq_2}{2R} + \frac{Kq_3}{3R}$$

$$V_B = V_{B|A} + V_{B|B} + V_{B|C}$$

$$= \frac{Kq_1}{2R} + \frac{Kq_2}{2R} + \frac{kq_3}{3R}$$

$$V_C = \frac{Kq_1}{3R} + \frac{Kq_2}{3R} + \frac{Kq_3}{3R}$$

$V_{A|C}$ $V_{B|C}$ $V_{C|C}$

Thank You Lakshyians