TPV2

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HACIA AFUERA

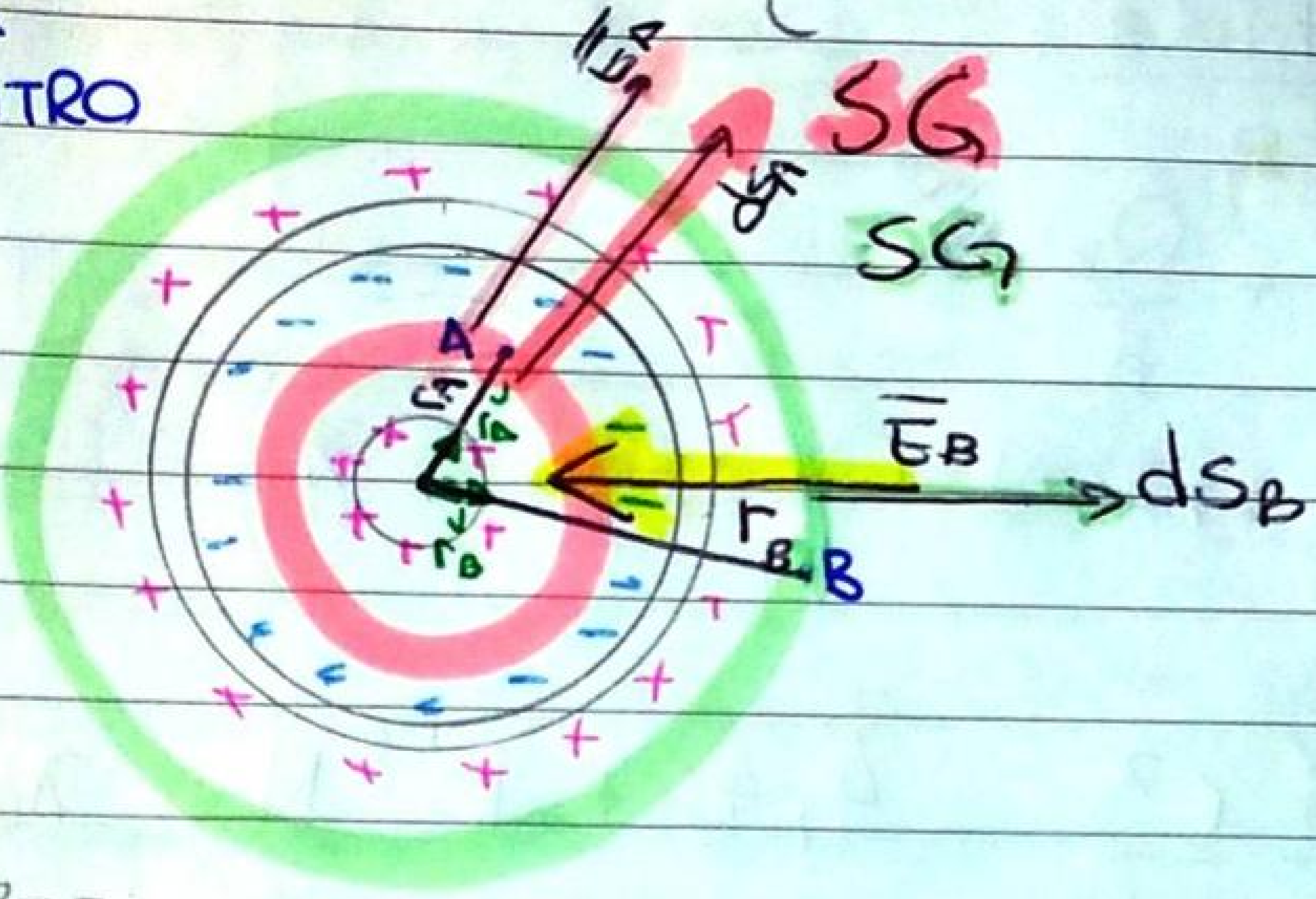
1) $\overline{E}_A = 11989\ \check{r}_A\ \frac{N}{C}$

$r_A = 0{,}067\ m$

$r_B = 0{,}230\ m$

$\overline{E}_B = 4857(-\check{r}_B)\ \frac{N}{C}$

HACIA ADENTRO

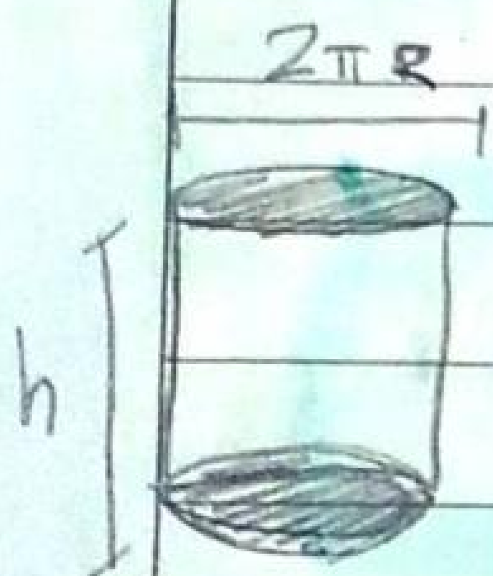


¿ $\frac{Q}{l}$? cara exterior

$\lambda = \frac{Q}{L}$

• ley de Gauss

$$\oint_{SG} \overline{E}\, d\overline{s} = \frac{Q_{neta}}{\varepsilon_0}$$



$d\frac{Q}{sup} = d\sigma$

• sup gaussiana (pasa por A)

$dQ = d\sigma . sup$

$\int dQ = \int d\sigma\ (2\pi r h)$

$\boxed{Q = \sigma\, 2\pi R h}$

$\lambda = \frac{Q}{h} \rightarrow \boxed{\lambda = \frac{\sigma\, 2\pi R h}{h}}$

$\boxed{\sigma R = \frac{Q}{2\pi h}}$

$$\oint_{SG} \overline{E}_A\, d\overline{s} = \frac{Q}{\varepsilon_0}$$

$$E_A . \cancel{2\pi} r_A \cancel{h} = \frac{\sigma \cancel{2\pi} R \cancel{h}}{\varepsilon_0}$$

$$E_A\, r_A\, \varepsilon_0 = \sigma . R$$

$$E_A\, r_A\, \varepsilon_0 = \frac{Q}{2\pi h}$$

$$E_A\, r_A\, \varepsilon_0 . 2\pi = \frac{Q}{h}$$

$$11989 . 0{,}067 . 8{,}85\times10^{-12}\ 2\pi\ \frac{N}{C}\ \frac{F}{\cancel{m}} . \cancel{m} = \lambda_A$$

$$4{,}467 \times 10^{-8}\ \frac{\cancel{N}}{\cancel{C}}\ \frac{C^2}{m \cancel{N}} = \lambda_A$$

$$4{,}467 \times 10^{-8}\ \frac{C}{m} = \lambda_A$$

sup gaussiana (que pasa por B)

$$\oint_{SG} \bar{E}_B \, d\bar{S} = \frac{Q_{neta}}{\varepsilon_0}$$

$$\bar{E}_B \, (h \, 2\pi r_B) = \frac{Q_A^+ + Q_B^-}{\varepsilon_0}$$

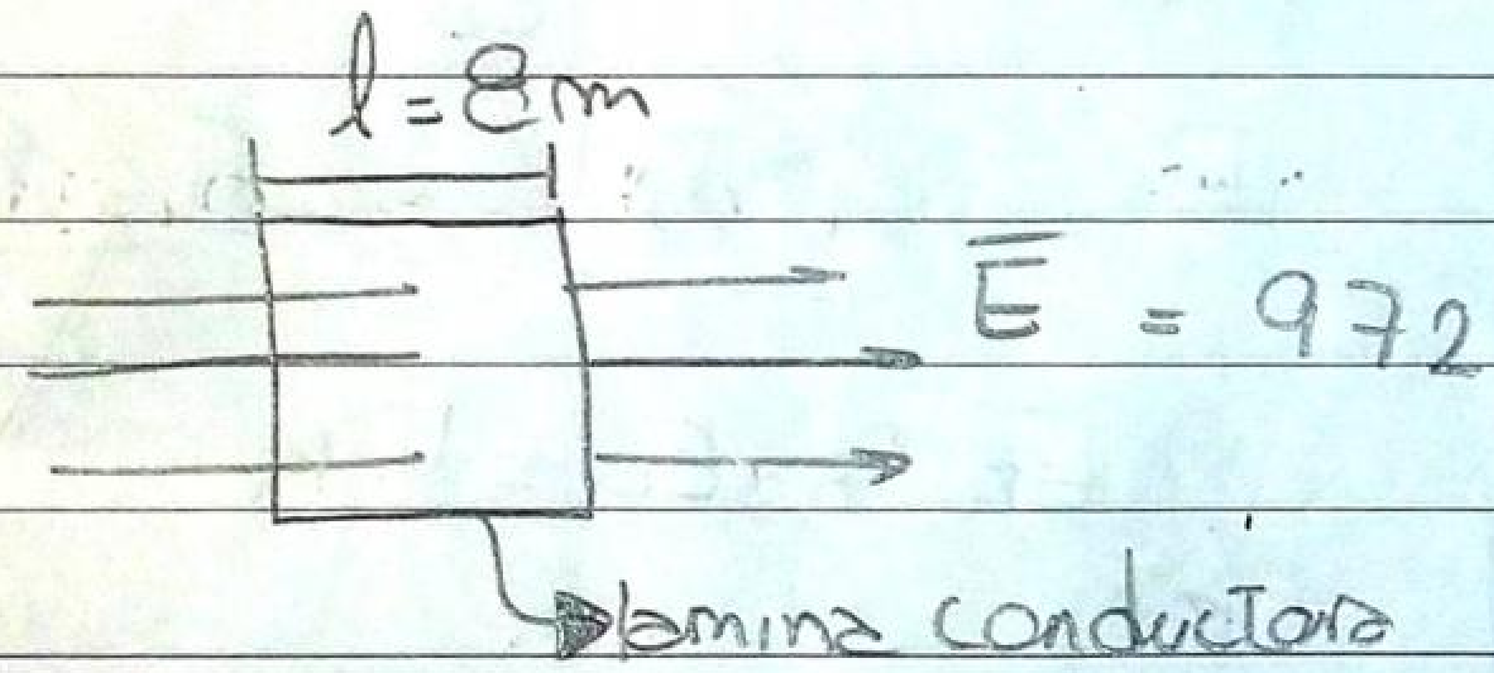
$$\bar{E}_B \, \varepsilon_0 \, 2\pi r_B = \frac{Q_A^+}{h} + \frac{Q_B^-}{h}$$

$$-4857 \frac{N}{C} \; 8{,}85\times10^{-12} \frac{F}{\cancel{m}} \; 2\pi \, (0{,}230)\cancel{m} = -\lambda_A + \lambda_B$$

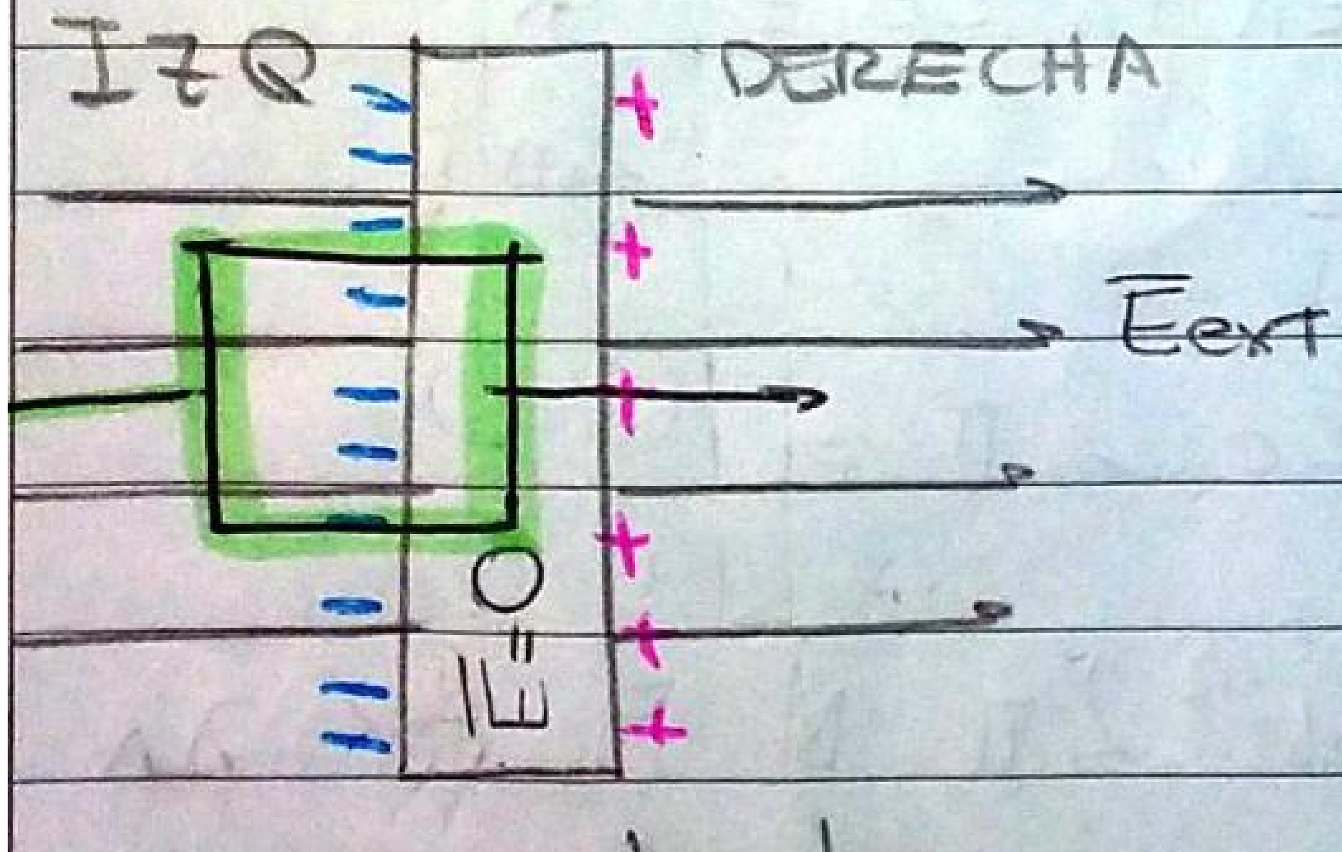
$$-6{,}212\times10^{-8} \frac{\cancel{N}}{\cancel{C}} \frac{C^{\cancel{2}}}{m\cancel{N}} - 4{,}467\times10^{-8} \frac{N}{m} = \lambda_B$$

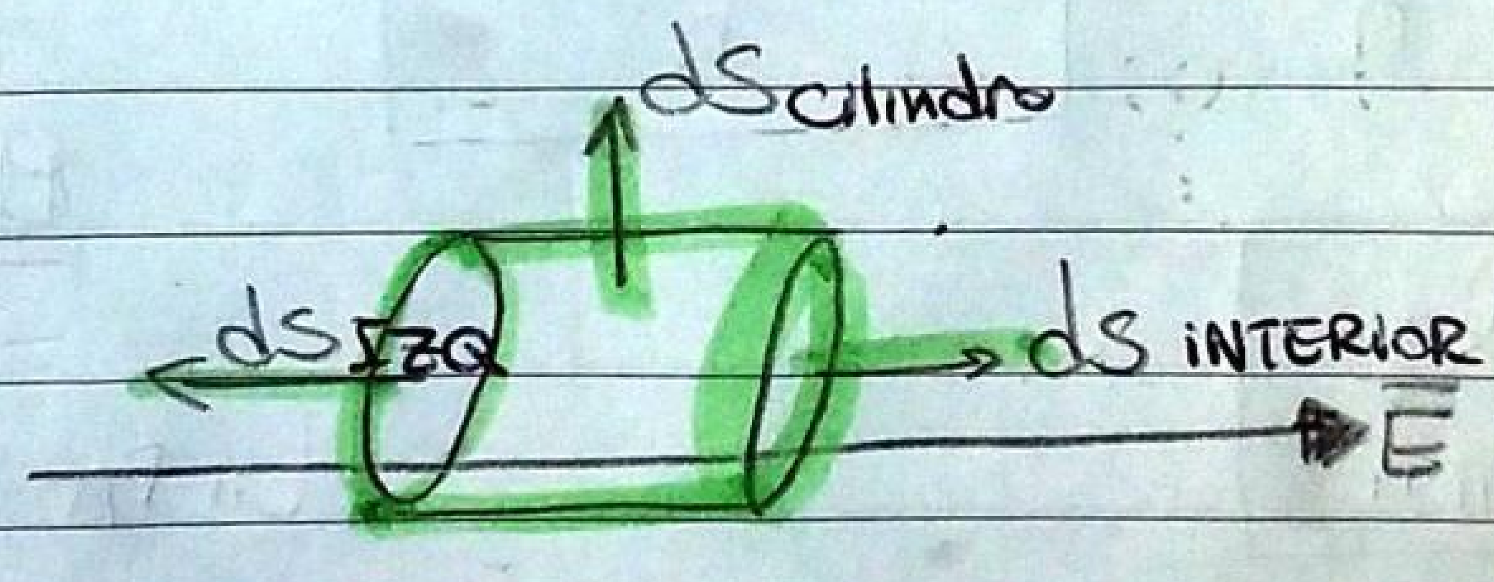
$$\boxed{-0{,}00000010679 \frac{N}{m} = -1{,}0679\times10^{-7} \frac{N}{m} = \lambda_B}$$

2)



$\bar{E} = 972349 \, \hat{i} \, \frac{N}{C}$ ¿λ_{IZQ}?





$$\Rightarrow \oint_{SG} \bar{E} \, d\bar{S} = \frac{Q_{neta}}{\varepsilon_0}$$

cargas inducidas por el campo $\bar{E}_{EXT}$

$$\Rightarrow \int_{IZQ} \bar{E} \, d\bar{S}_{IZQ} + \underbrace{\int_{INT.} \bar{E} \, dS_{INT}}_{\bar{E}=0 \text{ (Dentro del conductor)}} + \underbrace{\int_{cilindro} \bar{E} \, dS_{cil}}_{\cos\frac{\pi}{2}=0} = \frac{Q_{neta}}{\varepsilon_0}$$

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Asamblea

$$\Rightarrow \int \overline{E}\, d\overline{S} = \frac{Q_{neta}}{\varepsilon_0}$$

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$$(-1)\ \overline{E}_{ext}\ Sup_{IZQ} = \frac{Q_{neta}}{\varepsilon_0}$$

$$-\overline{E}_{ext}\ \varepsilon_0 = \frac{Q_{neta}}{Sup_{IZQ}}$$

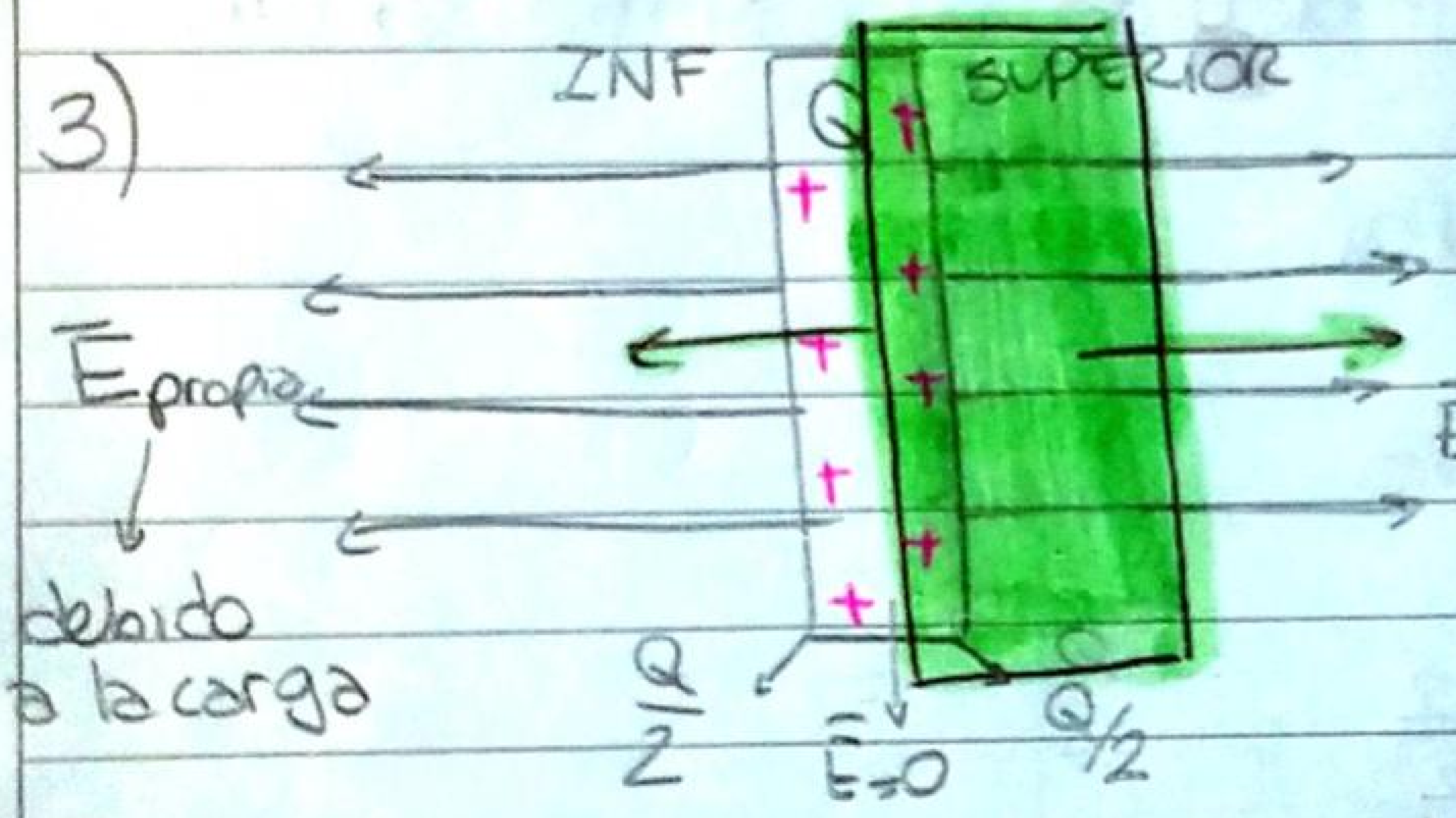
$$-\overline{E}_{ext}\ \varepsilon_0 = \sigma_{IZQ}$$

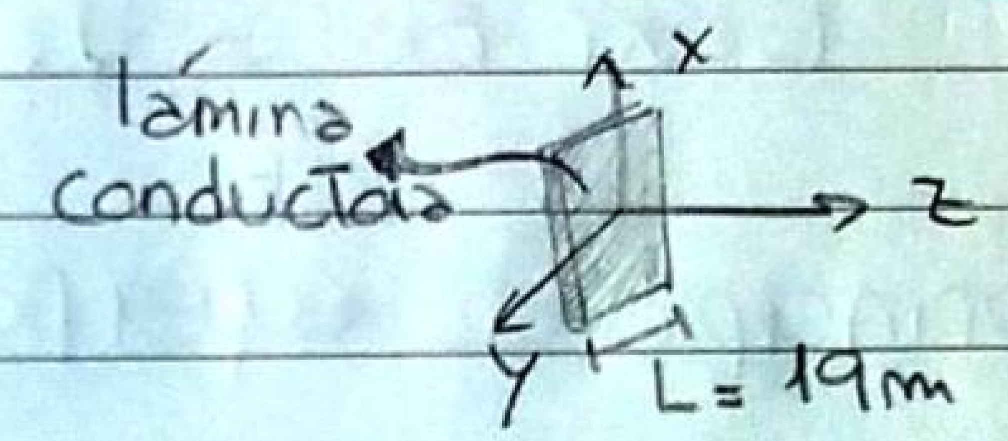
$$-972349 \cdot 8{,}85 \times 10^{-12}\ \frac{N}{C}\ \frac{F}{m} = \sigma_{IZQ}$$

$$-8{,}605 \times 10^{-6}\ \frac{\cancel{N}}{\cancel{C}}\ \frac{C^{\cancel{2}}}{\cancel{N} m^2} = \sigma_{IZQ}$$

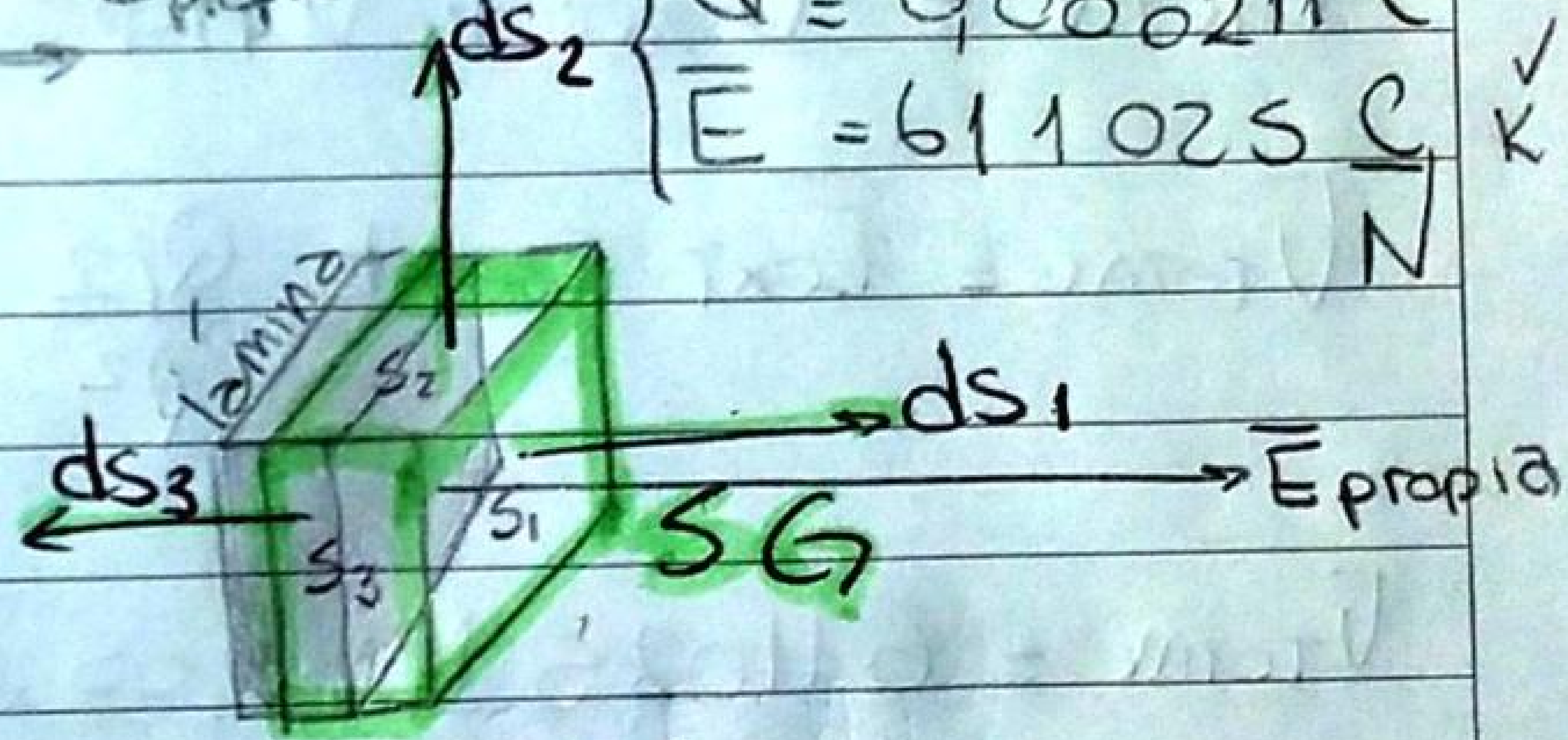
$$\boxed{-0{,}000008605\ \frac{C}{m^2} = -8{,}605 \times 10^{-6}\ \frac{C}{m^2} = \sigma_{IZQ}}$$

3)





$$\begin{cases} Q = 0{,}000211\ C \\ \overline{E} = 611025\ \frac{C}{N} \end{cases}$$



$$\overline{E}_{propio} \rightarrow \oint_{SG} \overline{E} \cdot ds = \frac{Q}{\varepsilon_0}$$

LADO SUPERIOR:
$$\int_{S_1} \overline{E}\, ds_1 + \cancel{\int_{S_2} \underbrace{\overline{E}\, ds_2}_{\overline{E} \perp ds_2}}^{0} + \int \underbrace{\overline{E}\, ds_3}_{E_{interior}=0} = \frac{Q_{neta}}{\varepsilon_0}$$

$$\Rightarrow (+1)\ \overline{E}_{propio}\ S_1 = \frac{Q/2}{\varepsilon_0}$$

$$\overline{E}_{propio}\ \varepsilon = \frac{Q/2}{S_1} \quad \text{siendo} \quad \frac{Q/2}{l\,l} = \sigma_{propio}$$

cargas inducidas

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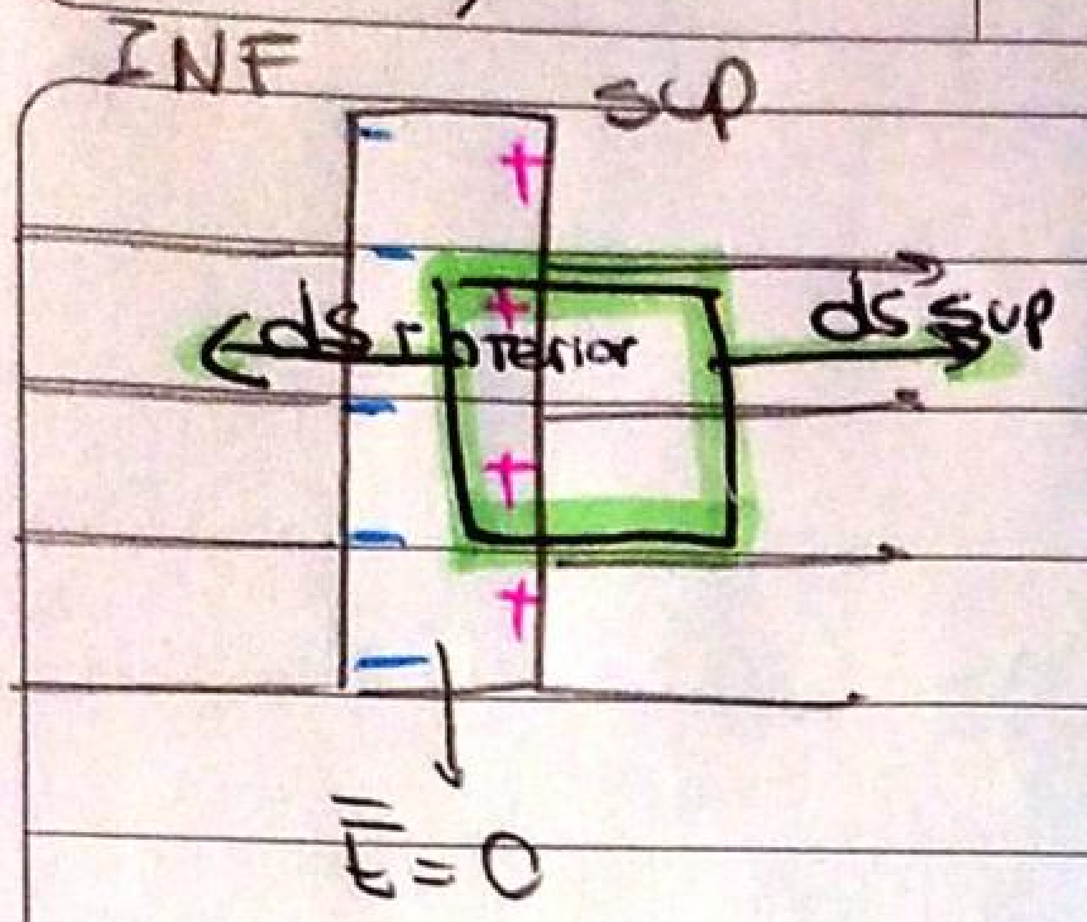
ley de Gauss



$$\oint_{SG} \bar{E} \cdot ds = \frac{Q_{neta}}{\varepsilon_o}$$

$$\Rightarrow \int_{sup} \bar{E}_{ext} d\bar{S}_{sup} + \int_{interior} \underbrace{\bar{E}_{ext}}_{\bar{E}_{int}=0} d\bar{S}_{INT} + \cancel{\int_{cilindro} \bar{E}_{ext} d\bar{S}_{cil}} = \frac{Q_{neta}}{\varepsilon_o}$$

$ds \perp \bar{E}_{ext}$

$$\Rightarrow (+1)\, \bar{E}_{ext} \cdot S_{up} = \frac{Q_{sup}}{\varepsilon_o}$$

$$\bar{E}_{ext}\, \varepsilon_o = \frac{Q_{sup}}{sup}$$

$$\bar{E}_{ext}\, \varepsilon_o = \sigma \longrightarrow \text{debido al campo externo}$$

Por principio de superposición

$$\sigma_{TOTAL} = \sigma_{ext} + \sigma_{propio}$$

$$\sigma_{TOTAL} = \bar{E}_{ext}\, \varepsilon_o + \frac{Q/2}{l^2}$$

$$\sigma_{TOTAL} = 611025 \frac{N}{C} \cdot 8{,}85 \times 10^{-12} \frac{F}{m} + \frac{\frac{0{,}000211\, C}{2}}{(19)^2\, m^2}$$

$$\sigma_{TOTAL} = 5{,}408 \times 10^{-6} \frac{\cancel{N}}{\cancel{C}} \frac{C^{\cancel{2}}}{\cancel{N} m^2} + 2{,}922 \times 10^{-7} \frac{C}{m^2}$$

$$\boxed{\sigma_{TOTAL} = 5{,}7002 \times 10^{-6} \frac{C}{m^2} = 0{,}0000057 \frac{C}{m^2}}$$

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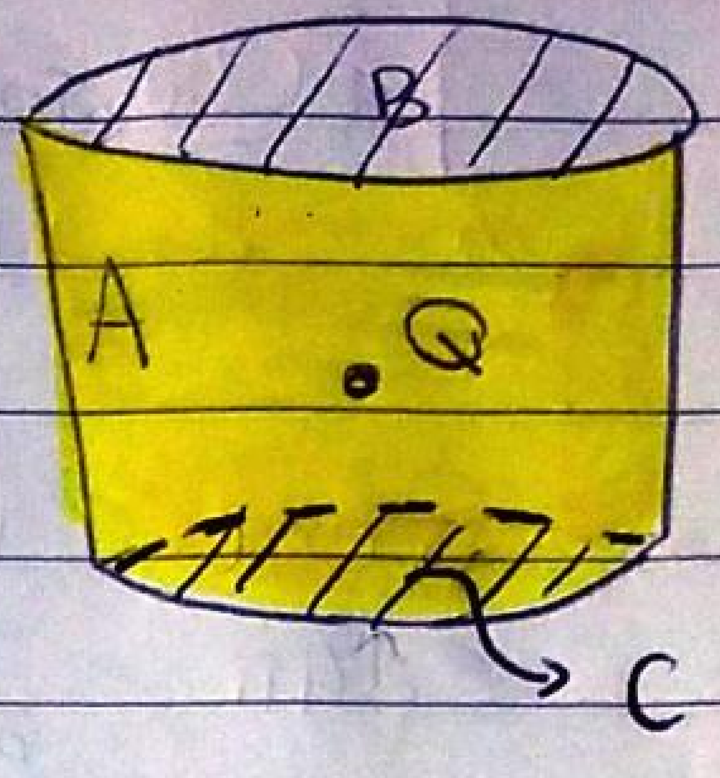
4) $Q = 0{,}000000658\ C$

$\Phi_A = 4322{,}5\ \frac{Nm^2}{C}$



Ley de Gauss

$$\oint_{SG} \bar{E}ds = \frac{Q_{neta}}{\varepsilon_0}$$

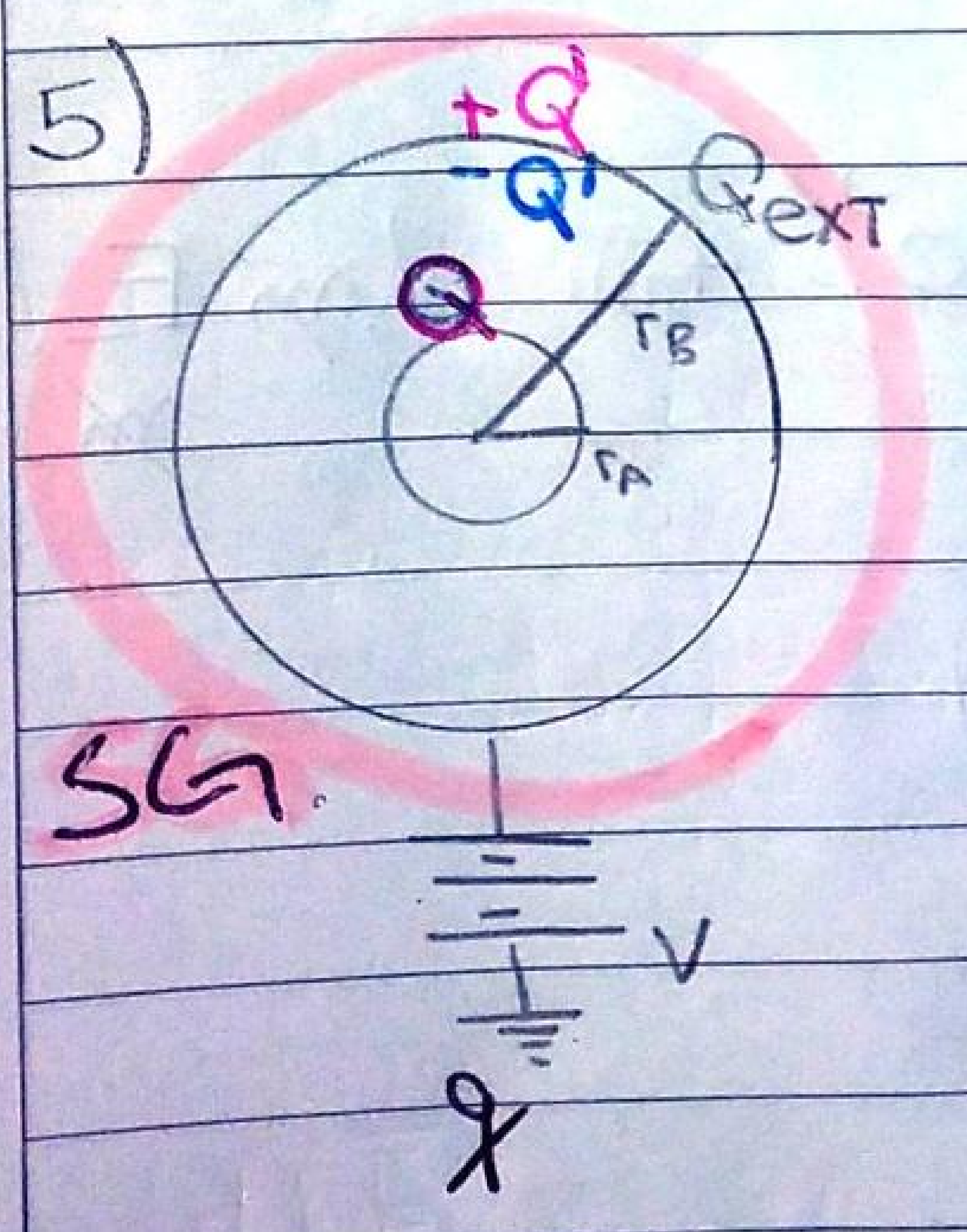
$$\Rightarrow \Phi_{TOTAL} = \Phi_A + \Phi_B + \Phi_C = \frac{Q_{neta}}{\varepsilon_0}$$

$$4322{,}5\ \frac{Nm^2}{C} + \Phi_B + \Phi_C = \frac{0{,}000000658\ C}{8{,}85 \times 10^{-12}\ \frac{F}{m}}$$

$$\Phi_B + \Phi_C = 74350{,}28249\ \frac{\cancel{C}}{\cancel{C^2}/Nm^2} - 4322{,}5\ \frac{Nm^2}{C}$$

$$\boxed{\Phi_B + \Phi_C = 70027{,}78249\ \frac{Nm^2}{C}}$$

5)



$r_b = 0{,}32\ m$ $\qquad V = 10709\ V$

$r_a = 0{,}01\ m$ $\qquad Q = 0{,}000000138\ C$

Ley de gauss $\oint_{SG} \bar{E}ds = \frac{Q_{neta}}{\varepsilon_0}$

$$\bar{E} = \frac{Q + \cancel{Q'} - \cancel{Q'} + q}{\varepsilon_0} \cdot \left(\frac{1}{4\pi r^2}\right)$$

$$\bar{E} = \frac{Q_{externa}}{\varepsilon_0\ 4\pi r^2}$$

Asamblea

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$$V_{\infty,b} = -\int_{\infty}^{b} \bar{E}\, dl$$

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$$V_{\infty,b} = -\int_{\infty}^{b} \frac{Q_{externa}}{\varepsilon_0 4\pi r^2}\, dr$$

$$V_{\infty,b} = -\frac{Q_{ext}}{\varepsilon_0 4\pi} \int_{\infty}^{b} \frac{dr}{r^2}$$

$$V_{\infty,b} = -\frac{Q_{ext}}{\varepsilon_0 4\pi} \int_{\infty}^{b} r^{-2}\, dr$$

$$V_{\infty,b} = -\frac{Q_{ext}}{\varepsilon_0 4\pi} \left(\frac{r^{-2+1}}{-2+1} \right) \Big|_{\infty}^{b}$$

$$V_{\infty,b} = \cancel{-}\frac{Q_{ext}}{\varepsilon_0 4\pi} \left(\cancel{-} r^{-1} \right) \Big|_{\infty}^{b}$$

Tiende a 0

$$V_{\infty,b} = \frac{Q_{ext}}{\varepsilon_0 4\pi} \left(\frac{1}{r_b} - \cancel{\frac{1}{\infty}} \right)$$

$$\Rightarrow Q_{ext} = V_b \cdot r_b \cdot \varepsilon_0 4\pi$$

$$Q_{ext} = 10709 \cdot 0{,}32 \cdot 8{,}85 \times 10^{-12}\, 4\pi \;\; V \cdot \cancel{m} \frac{E}{\cancel{m}}$$

$$Q_{ext} = 3{,}81 \times 10^{-7}\; \cancel{V} \cdot \frac{C}{\cancel{V}}$$

$$\boxed{Q_{ext} = 0{,}000000381\, C}$$

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