

①

$$L = Q [V(P) - V(O)] \quad \lambda = \frac{q}{2\pi R}$$

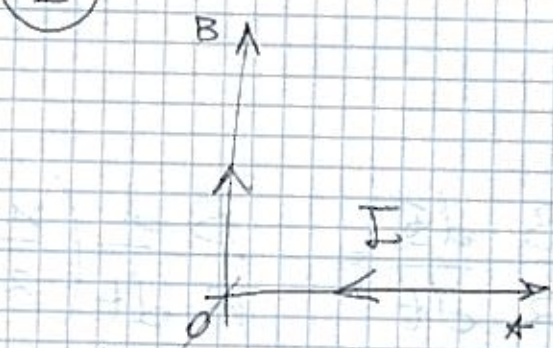
$$V(x) = \frac{1}{4\pi\epsilon_0} \int_{\text{cav}} \frac{\lambda dl}{r} = \frac{1}{4\pi\epsilon_0} \frac{q}{\sqrt{x^2 + R^2}}$$

$$V(P) = \frac{q}{4\pi\epsilon_0} \frac{1}{2R} \quad ; \quad V(O) = \frac{q}{4\pi\epsilon_0} \frac{1}{R}$$

$$L = Q \frac{q}{4\pi\epsilon_0} \left( \frac{1}{2R} - \frac{1}{R} \right) = - \frac{1}{4\pi\epsilon_0} \frac{qQ}{2R} =$$

$$= 9 \cdot 10^9 \frac{10^{-7} \cdot 2 \cdot 10^{-8}}{2 \cdot 9 \cdot 10^{-2}} = 10^{-4} \text{ J} = 100 \mu\text{J}$$

②



$\left. \begin{array}{l} \text{campo gerado de } OB \\ \text{campo gerado de } OA \end{array} \right\} = \frac{\mu_0 I}{4\pi dl}$

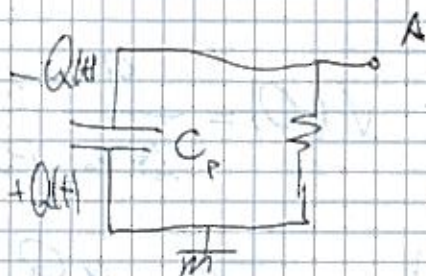
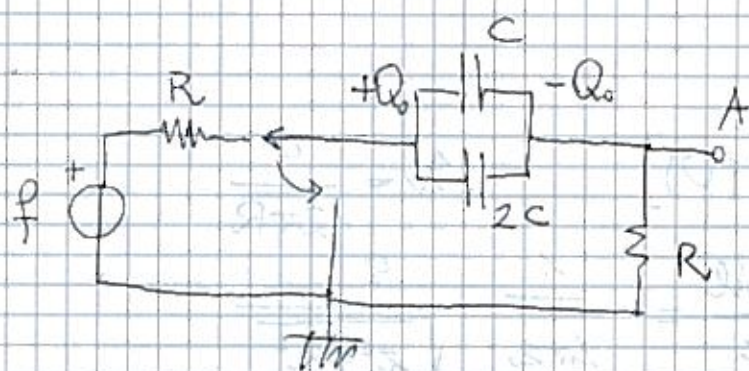
$$B_x = \frac{\mu_0 I}{4\pi dl} = 2 \cdot 10^{-6} \text{ T}$$

$$B_y = 2 \cdot 10^{-6} \text{ T}$$

$$B_z = 0$$

$$\Rightarrow |B(P)| = \sqrt{2} B_x = 2,83 \cdot 10^{-6} \text{ T}$$

③



$$C = \epsilon_0 \frac{S}{d} \quad C_p = C + 2C = 3\epsilon_0 \frac{S}{d}$$

$$V(t) = \frac{-Q(t)}{C_p} = -\frac{Q_0}{C_p} e^{-t/\tau} = -\frac{1}{3} e^{-t/\tau}$$

$$\tau = R \frac{3\epsilon_0 S}{d}$$

④

$$\begin{aligned} I(t) &= -\frac{1}{R} \frac{d\Phi}{dt} = -\frac{B}{R} \frac{dS}{dt} = -\frac{B}{R} \frac{d}{dt} \left( \frac{\pi e}{z} \right) \\ &= -\frac{B \pi d n}{2R} \frac{d}{dt} = \frac{B \pi n \omega e}{2R} \sin \omega t \end{aligned}$$

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Intensità media che entra nel materiale:

$$I_1 = I_0 \left( 1 - \frac{1}{9} \right) = \frac{8}{9} I_0$$

$$I_1 = \frac{E_{eff}^2}{Z}$$

$$E_{eff} = \sqrt{I_1 Z} = \sqrt{\frac{8}{9} I_0 \frac{Z_0}{\sqrt{\epsilon_2}}} =$$

$$= \frac{2}{3} \sqrt{I_0 Z_0} = 13 \text{ V/m}$$