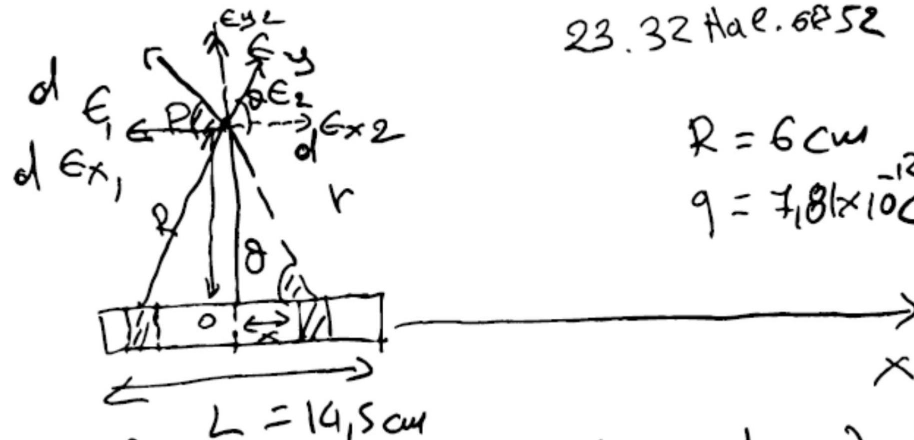
23.32 Hal. 6852



$R = 6$ cm

$q = 7{,}81 \times 10^{-12}$ C

$$\frac{dq}{dx} = \frac{q}{L} \Rightarrow dq = \frac{q}{L} \cdot dx \Rightarrow dq = \lambda \cdot dx$$

$$r = \sqrt{R^2 + x^2} \qquad \cos\theta = \frac{x}{r} = \frac{x}{\sqrt{R^2+x^2}}$$

$$\sin\theta = \frac{R}{\sqrt{R^2+x^2}}$$

$$dE = \frac{1}{4\pi\varepsilon_0} \cdot \frac{\lambda \cdot dx}{(R^2+x^2)}$$

$$dE_x = dE \cdot \cos\theta\,(-\hat{i}) \qquad dE_y = dE \cdot \sin\theta\,(\hat{j})$$

$$dE_x = \frac{1}{4\pi\varepsilon_0} \cdot \frac{\lambda \cdot dx}{(R^2+x^2)} \cdot \frac{x}{\sqrt{R^2+x^2}} \cdot (-\hat{i}) \Rightarrow$$

$$dE_x = \frac{1}{4\pi\varepsilon_0} \frac{\lambda x\, dx}{(R^2+x^2)^{3/2}} \cdot (-\hat{i})$$

$$dE_y = \frac{1}{4\pi\varepsilon_0} \cdot \frac{\lambda \cdot R\, dx}{(R^2+x^2)^{3/2}} \cdot (\hat{j})$$

$$E_x = \int dE_x \Rightarrow E_x = 0$$

$$dE_{o\lambda y} = \frac{2}{4\pi\varepsilon_0} \cdot \frac{\lambda\, dx\, R}{(R^2+x^2)^{3/2}} \Rightarrow$$

$$dE_{o\lambda y} = \frac{2}{4\pi\varepsilon_0} \frac{\lambda \cdot R \cdot dx}{(R^2+x^2)^{3/2}}$$

$$E_{yo\lambda} = \int dE_{o\lambda y} \Rightarrow$$

$$E_{yo\lambda} = \int_{-\frac{L}{2}}^{\frac{L}{2}} \frac{2}{4\pi\varepsilon_0} \cdot \frac{\lambda \cdot R\, dx}{(R^2+x^2)^{3/2}} \Rightarrow$$

$$\Rightarrow E_{yo\lambda} = \frac{2 R \cdot \lambda}{4\pi\varepsilon_0} \int_{-L/2}^{L/2} \frac{dx}{(R^2+x^2)^{3/2}} \Rightarrow$$

$$\Rightarrow E_{yo\lambda} = \frac{2 R \cdot \lambda}{4\pi\varepsilon_0} \cdot \left[\frac{x}{R^2 \cdot (R^2+x^2)^{1/2}} \right]_{-L/2}^{L/2} \Rightarrow$$

$$\Rightarrow E_{yo\lambda} = \frac{2R\lambda}{4\pi\varepsilon_0} \left[\frac{L/2}{R^2\left(R^2+\frac{L^2}{4}\right)^{1/2}} + \frac{L/2}{R^2\left(R^2+\frac{L^2}{4}\right)^{1/2}} \right] \Rightarrow$$

$$E_{yo\lambda} = \frac{2 R \cdot \lambda\, L}{4\pi\varepsilon_0 \left[R^2 (R^2 + L^2/4)^{1/2}\right]} \Rightarrow 24{,}87 \frac{N}{C}$$