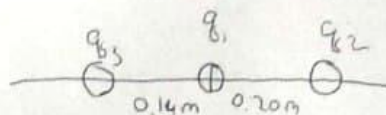


Homework 1

$$1) F_x = -k \frac{q_1 q_3}{x^2} + k \frac{q_1 q_2}{0.2^2}$$

$$-7.00 = 9 \times 10^9 \left(-\frac{3 \times 8}{x^2} + \frac{3 \times 5}{0.2^2} \right) \times 10^{-12}$$

$$x = 0.14 \text{ m}$$



2) a)

$$E = \frac{k|q|}{r^2} = \frac{9 \cdot 10^9 \frac{\text{Nm}^2}{\text{C}^2} \cdot |-3 \cdot 10^{-9} \text{C}|}{(0.25 \text{ m})^2} = 432 \frac{\text{N}}{\text{C}}$$

b)

$$r = \sqrt{\frac{k|q|}{E}} = \sqrt{\frac{9 \cdot 10^9 \frac{\text{Nm}^2}{\text{C}^2} \cdot |-3 \cdot 10^{-9} \text{C}|}{12 \frac{\text{N}}{\text{C}}}} = 1.5 \text{ m}$$

3) a) $\hat{r} = -\hat{j}$

$$b) \hat{r} = \frac{1}{\sqrt{2}} \hat{i} + \frac{1}{\sqrt{2}} \hat{j}$$

$$c) \hat{r} = -0.387 \hat{i} + 0.915 \hat{j}$$

$$5) E = k \left(\frac{q_1}{r_1} - \frac{q_2}{r_2} \right) = \left(9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2} \right) \left(\frac{(-6.25 \text{ nC}) \left(\frac{10^{-9} \text{ C}}{1 \text{ nC}} \right)}{(0.15 \text{ m})^2} \right)$$

$$\left(\frac{(-12 \text{ nC}) \left(\frac{10^{-9} \text{ C}}{1 \text{ nC}} \right)}{(0.10 \text{ m})^2} \right) = 8750 \text{ N/C at A}$$

$$6543.36 \text{ N/C at B}$$

The electric force on a proton at A is $1.4 \times 10^{-15} \text{ N}$

6)

$$\cos \alpha = \frac{z}{r} = \frac{z}{\sqrt{R^2 + z^2}}$$

$$dq = \lambda ds$$

$$dE = \frac{1}{4\pi\epsilon_0} \cdot \frac{\lambda ds}{r^2} = \frac{1}{4\pi\epsilon_0} \frac{\lambda ds}{z^2 + R^2}$$

$$E = \frac{2\lambda L}{4\pi\epsilon_0 (z^2 + L^2/4)^{3/2}}$$

$$E = \frac{0.045 \times 100 \times 10^{-9} \times 0.085}{4\pi (8.85 \times 10^{-12}) \left(0.06^2 + \frac{0.085^2}{4} \right)^{3/2}}$$

$$\Rightarrow E = 1.48 \times 10^4 \text{ V/m}$$

Student iD : 201923250

Name : KOBILOV ILKHOMJON