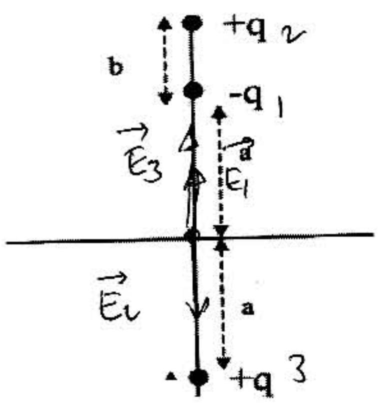
KING FAHD UNIVERSITY OF PERTOLEUM & MINERALS
PHYSICS DEPARTMENT
QUIZ #6- CHAPTER 22

NAME: Key ID# SECTION# 16

Consider the three charges arranged as shown in the figure.
Find the electric field at the origin.
Take q = 20 nC, a = 10 cm and b = 5.0 cm.



$$E_1 = \frac{kq}{a^2} = \frac{9\times10^{9}\times 20\times10^{-9}}{(0.1)^2}$$

$$= 18\,000 \text{ N/C}$$

$$E_2 = \frac{kq}{(a+b)^2} = \frac{9\times10^{9}\times 20\times10^{-9}}{(0.15)^2} = 8000 \text{ N/C}$$

$$E_3 = \frac{kq}{a^2} = 18\,000 \text{ N/C}$$

$$\vec{E}_{net} = \vec{E}_1 + \vec{E}_3 - \vec{E}_2 = \boxed{28\,000\,\hat{j} \text{ N/C}}$$

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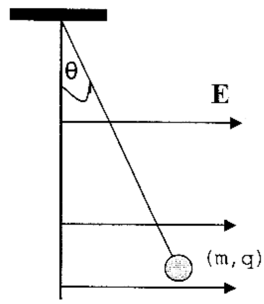
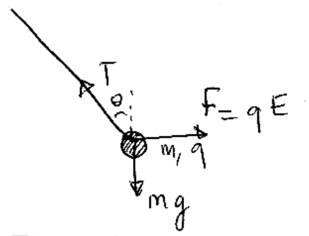
In figure the, a small ball of mass m = 5.0 g is hanging from a fixed point by a non-conducting string of length 1.00 m. The ball carries a charge q = 50 nC. The mass of the string is negligible. An electric field E with magnitude $E = 1.0 \times 10^6$ N/C, in the positive x-direction, causes the ball to be in an equilibrium position with an angle Theta. Find the angle Theta. [Take $g = 9.80\ m/s^2$]





equilibrium

$$\sum F_x = qE - T\sin\theta = 0 \Rightarrow T\sin\theta = qE \quad -(1)$$

$$\sum F_y = T\cos\theta - mg = 0 \Rightarrow T\sin\theta = mg \quad -(2)$$

devide: $\frac{(1)}{(2)} \Rightarrow \tan\theta = \frac{qE}{mg}$

$$\theta = \tan^{-1}\left(\frac{qE}{mg}\right) = \tan^{-1}\left(\frac{50\times10^{-9}\times 1\times10^{6}}{5\times10^{-3}\times 9.8}\right)$$

$$\boxed{\theta = 45.6^\circ}$$

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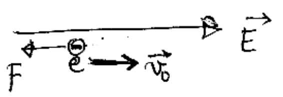
NAME: Key   ID#   SECTION# 18

An electron, traveling with initial velocity 1×10^5 **i** m/s, enters a region of a uniform electric field given by E = 4.0×10^3 **i** N/C.

(a) What is the deceleration of the electron?

$$qE = ma \Rightarrow a = \frac{qE}{m} = \frac{(1.6\times10^{-19})(4\times10^{3})}{9.1\times10^{-31}} = \boxed{7\times10^{14}\ m/s^2}$$



(b) Determine the distance travelled by the electron before coming to rest.

$$v^2 = v_0^2 + 2ax$$

$$x = -\frac{v_0^2}{2a} = -\frac{(1\times10^5)^2}{2\times(-7\times10^{14})} = \boxed{7.1\times10^{-6}m}$$

$$x = 7\ \mu m$$

(c) Determine the time it takes for the electron to come to rest momentarily.

$$v = v_0 + at$$

$$t = -\frac{v_0}{a} = -\frac{1\times10^5}{(-7\times10^{14})} = \boxed{1.4\times10^{-10}\ s}$$