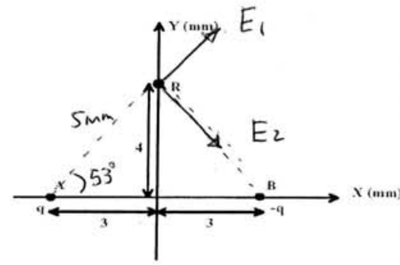
KING FAHD UNIVERSITY OF PERTOLEUM & MINERALS
PHYSICS DEPARTMENT
QUIZ #6- CHAPTER 22

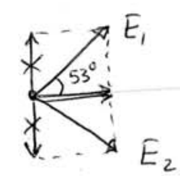
NAME: Key ID# SECTION# 37

In the figure, find the magnitude and direction of the electric field at point R: (0,4) mm due to two-point charges q (1 mC) and - q placed at points A: (-3, 0) mm and B: (3, 0) mm, respectively.



$E_y = 0$

$E_x = 2 \frac{kq}{r^2} \cos 53°$



$r = 5$ mm

$E_x = \frac{2 \times 9 \times 10^9 \times 1 \times 10^{-3}}{(5 \times 10^{-3})^2} \cos 53°$

$= 4.3 \times 10^{11}$ N/C

$$\vec{E} = 4.3 \times 10^{11} \hat{i} + 0 \hat{j}$$

magnitude $E = 4.3 \times 10^{11}$ N/C

direction +x-axis.

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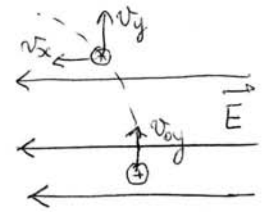
A particle of mass 5.0 g and charge 40 mC moves in a region of space where the electric field is uniform and given by E = –5.5 i (N/C). If the velocity of the particle at t = 0 is given by v = 50 j (m/s), find the speed of the particle at t = 2 s.



$v_{0x} = 0$

$v_{0y} = 50 \text{ m/s}$

acceleration $\vec{a} = \frac{q\vec{E}}{m}$

$= -44\,\hat{i}\ (\text{m/s}^2)$

$v_x = v_{0x} + at = 0 + 44 \times 2 = 88 \text{ m/s}$

$\Rightarrow \quad v = \sqrt{(50)^2 + (88)^2} = \boxed{101.2 \text{ m/s}}$

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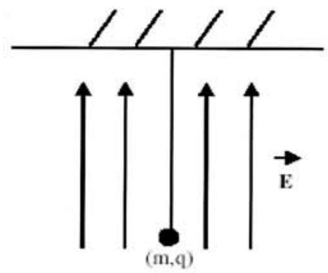
In the figure, a 0.3 g metallic ball hangs from an insulating string in a vertical electric field of 4000 N/C directed upward as shown. Calculate the charge on the ball if the tension in the string is 0.005 N.

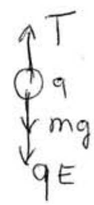


$mg = 2.94 \times 10^{-3}$ N

$T = 5 \times 10^{-3}$ N

$T > mg$

$\Rightarrow$ the force qE is down



$\Rightarrow$ the charge is <u>negative</u>!

Since we have equilibrium

$$T - mg - qE = 0$$

$$\Rightarrow q = \frac{T - mg}{E} = \frac{5\times10^{-3} - 2.94\times10^{-3}}{4000}$$

$$\Rightarrow q = 5.2 \times 10^{-7}\ C$$

$$\boxed{q = -5.2 \times 10^{-7}\ C}$$

the charge is negative!