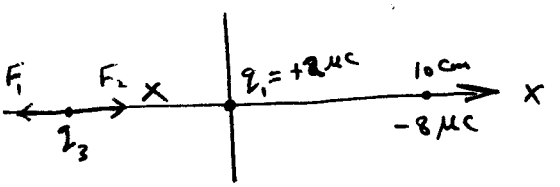
Phys102 (Sec # 41) Quiz # 6 (Ch.21&22)

Name: Key ID #

1- Two point charges $q_1 = +2.0\ \mu C$ and $q_2 = -8.0\ \mu C$ are located at (0.0, 0.0) cm and (10.0, 0.0) cm, respectively. Another positive point charge q_3 is to be located somewhere, on x-axis, such that the net electrostatic force on it due to q_1 and q_2 is zero. What is the location of q_3? Ans(-10.0,0.0)

$F_{net} = 0$ on q_3.



$|F_1| = |F_2|$

$K \frac{q_1 q_3}{x^2} = K \frac{q_2 q_3}{(x+0.1)^2}$

$q_1 (x+0.1)^2 = q_2 x^2$

$\sqrt{(2\times10^{-6})}\ (x+0.1) = \sqrt{(8\times10^{-6})}\ x \Rightarrow 1.4\times10^{-3} x = 1.4\times10^{-4}$

$x = 0.1\ m = \boxed{10\ cm}$

2- A proton with a speed of 3.0×10^5 m/s moves in uniform electric field of 1.9×10^3 N/C. The field is acting to decelerate the proton. How far does the proton travel before it is brought to rest? (Ans: 0.25 m)

$v_i = 3\times10^5\ m/s$

$v_f = 0$

$a = \frac{F}{m_p} = \frac{qE}{m_p} = \frac{(1.6\times10^{-19})(1.9\times10^3)}{1.67\times10^{-27}} = -1.8\times10^{11}\ m/s^2$

applying $v_f^2 - v_i^2 = 2a\Delta x$

$\Delta x = \frac{v_f^2 - v_i^2}{2a} = \frac{0 - (3\times10^5)^2}{-2(1.8\times10^{11})} = \boxed{0.25\ m}$