Capítulo 21. Carga Eléctrica y Campo Eléctrico.

P 21.4 #1

$m = 10.8\,g$

$mat = 197\,g/mol$

$nat = 79$

a) # Protones

$$10.8\,g \times \frac{1\,mol}{197\,g} \times \frac{6.022 \times 10^{23}\,at}{1\,mol} \times \frac{79\,Prot}{1\,at} = 2.61 \times 10^{24}\,p.$$

$$\text{Carga positiva} = (2.61 \times 10^{24}\,p)(1.6022 \times 10^{-19}\,c/p) = 4.18 \times 10^{5}\,C.$$

Protones: 2.61×10^{24} p.

$Q+ = 4.18 \times 10^{5}$ C.

b) # electrones = # Protones

electrones: 2.61×10^{24} e

P. 21.11 #2

a) $^{1}\oplus$ ——— $\oplus^{2}$ $F = ma$

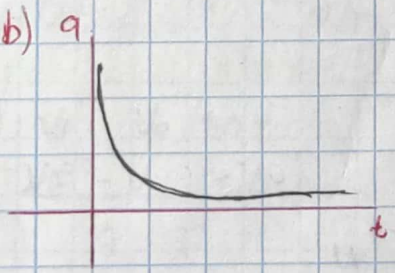
2.50 mm. $a = \frac{F}{m}$

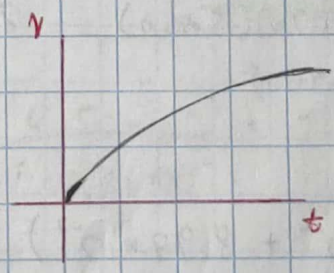
$$F_e = \frac{K q_p^2}{r_{12}} = \frac{9 \times 10^{9} (1.6 \times 10^{-19})^2}{(0.00250)^2} = 3.69 \times 10^{-23}\,N$$

$$a = \frac{3.69 \times 10^{-23}}{1.67 \times 10^{-27}} = 22074.2\,m/s^2$$

$a = 2.21 \times 10^{4}\,m/s^2$

b)



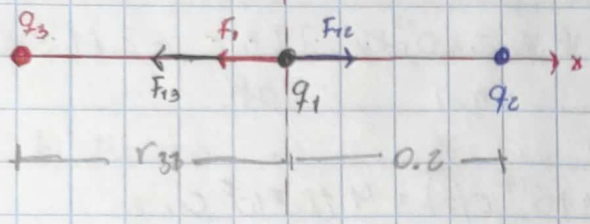


P. 21.17.

$q_1 = +3.00\,\mu C$ $x = 0$ $F_1 = 7.00\,N, -\hat{\imath}$

$q_2 = -5.00\,\mu C$ $x = 0.200\,m$

$q_3 = -8.00\,\mu C$



$\vec{F}_1 = \vec{F}_{12} + \vec{F}_{13}$

$-7 = \frac{k|q_1||q_2|}{0.2^2} + \vec{F}_{13}$

$\vec{F}_{13} = -7 - \frac{9\times10^9 (3\times10^{-6})(5\times10^{-6})}{0.2^2}$

$|F_{13}| = \frac{k|q_1||q_3|}{r_{31}^2}$

$\vec{F}_{13} = -10.375\,N.$

$r_{13} = \sqrt{\frac{9\times10^9 (8\times10^{-6})(3\times10^{-6})}{10.375}} = 0.144\,m.$

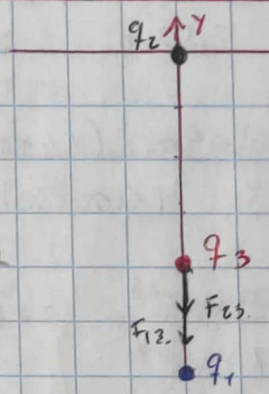
$x = -0.144\,m.$

P. 21.19

$q_1 = -1.50\,nC$ $y = -0.600\,m.$

$q_2 = +3.20\,nC$ $y = 0$

$q_3 = +5.00\,nC$ $y = -0.400\,m$



$\vec{F}_R = \vec{F}_{13} + \vec{F}_{23}$

$F_{13} = \frac{k|q_1||q_3|}{r_{13}} = \frac{9\times10^9 (1.50n)(5.00n)}{(0.200)^2}$

$F_{13} = 1.69\times10^{-6}\,N.$

$F_{23} = \frac{9\times10^9 (3.20n)(5.00n)}{(0.400)^2} = 8.97\times10^{-7}\,N.$

$F_{Rx} = 0$

$F_{Ry} = -(1.69\times10^{-6} + 8.97\times10^{-7}) = -2.59\times10^{-6}\,N.$

$|F_R| = 2.59\times10^{-6}\,N\,(-\hat{\jmath})$

P. 21. 23 #5

$\vec{E} = 2.75 * 10^3$ N/C $q_{proton} = 1.60 * 10^{-19}$ C

a) $\vec{E} = \frac{F}{q}$ → $F = Eq$

$F = (2.75 * 10^3)(1.60 * 10^{-19})$

$F = 4.4 * 10^{-16}$ N

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b) $F = ma$ → $a = \frac{F}{m} = \frac{4.4 * 10^{-16}}{1.67 * 10^{-27}}$

$a = 2.63 * 10^{11}$ m/s²

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c) $V_f = V_0^{\to 0} + at$

$t = 1\ \mu s$ $V = (2.63 * 10^{11})(1 * 10^{-6}) = 263473.05$ m/s

$V = 2.63 * 10^5$ m/s

P. 21. 25 #6

$V = 4.50 * 10^6$ m/s.

$q_{proton} = 1.60 * 10^{-19}$ C.

$x = 3.20$ cm

a) $V_f^{2 \to 0} = V_0^2 + 2a\Delta x$.

$\frac{-V_0^2}{2\Delta x} = a$. → $a = \frac{-(4.50 * 10^6)^2}{2(0.0320)}$

$E = \frac{F}{q} = \frac{ma}{q} = \frac{(1.67 * 10^{-27})(3.16 * 10^{14})}{1.60 * 10^{-19}}$ $a = -3.16 * 10^{14}$ m/s²

$E = 3.3 * 10^6$ N/C. +x

$E = 3.3 * 10^6 (+\hat{x})$ N/C.

b) $V_f = V_0 + at$.

$\frac{V_f^{\to 0} - V_0}{a} = t$.

$t = \frac{-V_0}{a} = \frac{4.50 * 10^6}{3.16 * 10^{14}} = 1.42 * 10^{-8}$

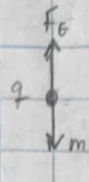
$t = 1.42 * 10^{-8}$ s.

c) $E_e = \frac{m_e}{m_p} E_p = \frac{9.10 * 10^{-31}}{1.67 * 10^{-27}} (3.3 * 10^6) = 1798.2$ N/C

$E_e = 1.80 * 10^3$ N/C

P. 21.27 #7

$m = 1.45\,g$
$E = 650\ N/C$

a) 

$F = mg$

$F = Eq_0$
$mg = Eq_0$
$q_0 = \frac{mg}{E}$

$$q_0 = \frac{(1.45\times10^{-3})(9.80)}{650} = 2.19\times10^{-5}\ C$$

$q = -21.9\ \mu C$

b) $F_E = |q|E = eE$

$$E = \frac{mg}{e} = \frac{(1.67\times10^{-27})(9.80)}{1.602\times10^{-19}} = 1.02\times10^{-7}\ N/C$$

$E = 1.02\times10^{-7}\ N/C$

P. 21.32 #8

$x = 1.60\ cm$
$t = 3.20\times10^{-6}\ s$
$m_p = 1.67\times10^{-27}$
$E = \frac{F}{|q|} \rightarrow q = \frac{Eq_e}{m_p}$

a) $x - x_0 = \cancel{v_{0x}^{\rightarrow 0}}t + \frac{1}{2}at^2$

$$\frac{2(x-x_0)}{t^2} = q$$

$$\frac{2(x-x_0)}{t^2} = \frac{Eq_e}{m_p}$$

$$E = \frac{2(x-x_0)m_p}{q_e t^2} = \frac{2(0.0160)(1.67\times10^{-27})}{(1.60\times10^{-19})(3.20\times10^{-6})^2} = 32.6\ N/C$$

$E = 32.6\ N/C$

b) $v_f = \cancel{v_0^{\rightarrow 0}} + at$

$$v_f = \frac{Eq_e}{m_p}t = \frac{(32.6)(1.60\times10^{-19})}{(1.67\times10^{-17})}(3.20\times10^{-6}) = 1.00\times10^{4}\ m/s$$

$v = 1.00\times10^{4}\ m/s$