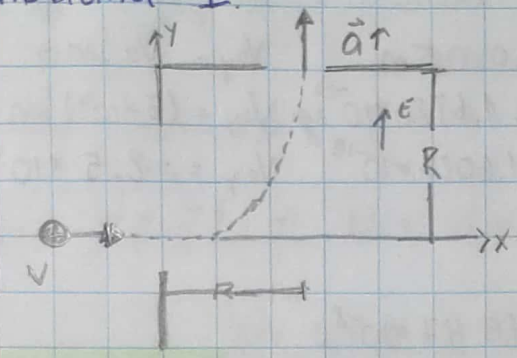
HT2

Problema 1.



$q = 1.6 * 10^{-19}\ C$

$m = 1.67 * 10^{-27}\ kg$

$E = 6.96\ j\ N/C$

$V = 10 * 10^3\ m/s$

$a = \frac{Eq}{m}$

$F_y = ma \Rightarrow F = Eq$

$a = \frac{(6.96)(1.6 * 10^{-19})}{1.67 * 10^{-27}} = 6.96 * 10^{8}$

$V_i = V_x = 10 * 10^3\ m/s$

$V_x = \frac{x}{t} = \frac{R}{t} \Rightarrow R = tV_x$

$Y_0 = 0 \quad V_{0y} = 0$

$Y_f = R$

$Y_f = \cancel{Y_0} + \cancel{V_{0y} t} + \frac{1}{2} a t^2$

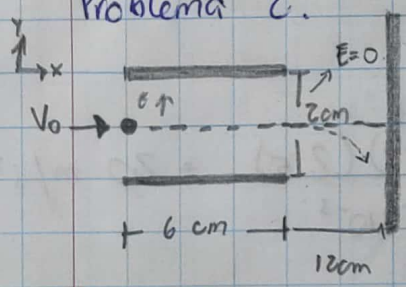
$Y_f = \frac{1}{2} a \left(\frac{R}{V}\right)^2 = \frac{1}{2} a \frac{R^2}{V^2}$

$\frac{\cancel{R}}{\cancel{R^2}} = \frac{a}{2V^2} \Rightarrow \frac{2V^2}{a} = R$

$R = 0.3\ m$

$R = \frac{2(10 * 10^3)^2}{(6.96 * 10^8)} = 0.287\ m$

Problema 2.



$V_0 = 6.50 * 10^6\ m/s$

$E = 1.1 * 10^3\ N/C$

$q_e = -1.6022 * 10^{-19}\ C$

$m_e = 9.1094 * 10^{-31}\ kg$

$a_y = \frac{-eE}{m_e} = \frac{-(1.6022 * 10^{-19})(1.1 * 10^3)}{9.1094 * 10^{-31}}$

$a_y = -1.934 * 10^{14}\ m/s^2$

$x = V_0 t \Rightarrow t = \frac{0.06}{6.5 * 10^6} = 9.23 * 10^{-9}\ s$

$\frac{x}{V_0} = t$

$\Delta y = -8.238 * 10^{-3}\ m$

$Y_f - Y_0 = \cancel{V_0 t} + \frac{1}{2} a t^2$

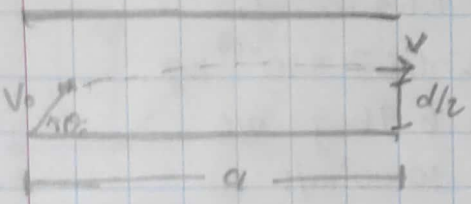
$\Delta Y = 8.24 * 10^{-3}\ m.$

$\Delta y = \frac{1}{2}(-1.934 * 10^{14})(9.23 * 10^{-9})^2$

Problema 3:

$V_0 = 5\times10^6$ m/s
$\theta_0 = 30°$
$a = 0.05$ m
$m_{p^+} = 1.6726\times10^{-27}$ kg
$p^+ = 1.6022\times10^{-19}$

$V_{0x} = V_0 \cos 30°$
$V_{0x} = (5\times10^6)\cos 30° = 4.3\times10^6$
$V_{0y} = V_0 \operatorname{sen}\theta$
$V_{0y} = (5\times10^6)\operatorname{sen} 30°$
$V_{0y} = 2.5\times10^6$ m/s



a)

$x = V_{0x} t$

$t = \frac{x}{V_{0x}} = \frac{0.05}{4.33\times10^6} = 1.1547\times10^{-8}$ s.

$t = 11.55\times10^{-9}$ s

b) $V_{0y} = V_0 \operatorname{sen}\theta$
$V_{fy} = 0$.

$V_{fy} = V_{0y} + at$.

$-\frac{V_{0y}}{t} = a$

$a = -\frac{2.5\times10^6}{1.1547\times10^{-8}} =$

$a = -2.165\times10^{14}$ m/s²

c) $a_y = \frac{Eq}{m} \rightarrow E = \frac{a_y m}{q}$

$E = \frac{(2.16\times10^{14})(1.6726\times10^{-27})}{1.6022\times10^{-19}} = 2.26\times10^6$ N/C.

$a = 2.16\times10^{14}$ m/s² $(-\hat{j})$

$E = 2.26\times10^6$ N/C

Problema 4:

$m = 5.0$ g
$q = 40$ mC
$E_x = 2.5$ N/C
$E_y = E_z = 0$

$t = 0 \rightarrow V_y = 50$ m/s
$V_x = V_z = 0$
$t = 2$ s $\rightarrow V = ?$

$a = \frac{qE}{m} = \frac{(40\times10^{-3})(2.5)}{5\times10^{-3}} = 20$ m/s² (O)

$V_{0x} = 0$
$V_{fx} = V_{0x} + axt$
$V_{fx} = 20(2) = 40$ m/s.

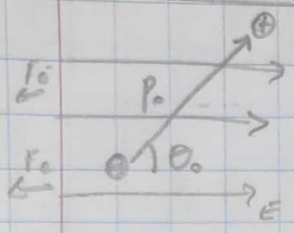
$V = \sqrt{40^2 + 50^2} = 64.03$ m/s.

$V_{fx} = V_x$
$V_{fy} = V_y$.

$V = 64$ m/s.

Problema 5: $p = 100\ \mu Cm$

$E = 2000\ N/C$



a) $\theta_0 = 30°$

$\tau = pE\,sen\theta = (100 * 10^{-6})(2000)\,sen30°$

$\tau = 0.1\ Nm.$

$\tau = 0.1\ Nm$

b) $F_e = 0\ N.$ Es cero debido a que la magnitud es igual pero en dirección opuesta.

c) $U = -pE\cos\theta =$

$U = -(100 * 10^{-6})(2000)\cos 0° = -0.2\ J.$ $U = -0.2\ J$

d) $\Delta U = W = U_f - U_0$

$U_0 = -(100 * 10^{-6})(2000)\cos 30 = -0.173\ J$

$U_f = -(100 * 10^{-6})(2000)\cos 180° = 0.2\ J.$ $W = 0.373\ J.$

$W = 0.2 - (-0.173) = 0.373 J.$

Problema 6: $W_E = U_0 - U_f$

a) $p = 6\ \mu Cm$

$\theta_0 = \pi/3$

$E = 1 * 10^3\ N/C.$

$U_0 = -(6 * 10^{-6})(1 * 10^3)\cos \pi/3 = -3 * 10^{-3}\ J$

$U_f = -(6 * 10^{-6})(1 * 10^3)\cos 0° = -6 * 10^{-3}\ J$

$W_E = -3 * 10^{-3} - (-6 * 10^{-3}) = 3 * 10^3\ J.$

$W_E = 3 * 10^3\ J.$

b) $I_{cm} = 1.1 * 10^{-11}\ kg\,m.$

$U_0 + K_0 = U_f + K_f$

$U_0 - U_f = K_f.$

$U_0 - U_f = \frac{1}{2} I w^2.$

$\sqrt{\frac{2(U_0 - U_f)}{I}} = w$

$w = \sqrt{\frac{2(-3 * 10^{-3} + 6 * 10^{-3})}{1.1 * 10^{-11}}} = 23,354.9\ rad/s$

$w = 23.35 * 10^3\ rad/s$

Problema 7:

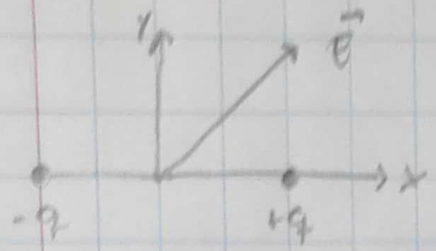
$+q = +3\ \mu C$

$-q = -3\ \mu C$

$x = 0.75\ m$

$-x = -0.75\ m.$

$\vec{E} = (4\hat{i} + 3\hat{j}) * 10^6\ N/C.$



a) $U = -(\vec{p} \cdot \vec{E}) \Rightarrow U = -(p_x E_x + p_y E_y)$

$U = -(4.5 * 10^{-4})(4 * 10^{-6}) = -18\ J.$

$U = -18\ J$

b) $W = \Delta U = U_f - U_0. \rightarrow U_0 = -18J.$

$\theta = 0$

$U_f = -pE\cos\theta$

$|E| = \sqrt{(4*10^6)^2 + (3*10^6)^2} = 5 * 10^6\ N/C.$

$U_f = -(4.5 * 10^{-6})(5 * 10^6)\cos 0 = -22.5\ J.$

$W = +22.5 + 18 = -4.5\ J.$ $W = -4.5\ J.$