Universidad de San Carlos de Guatemala.
Facultad de Ingeniería, Departamento de Física
Primer Examen Física 2

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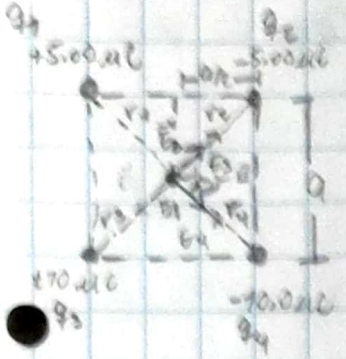
Problema 1:



$a = 0.3\,m$

$\sin 45° = \frac{\sqrt{2}}{2}$

$\cos 45° = \frac{\sqrt{2}}{2}$

$E_R = E_1 + E_2 + E_3 + E_4$

$r_1 = r_2 = r_3 = r_4$

$r = \sqrt{(a/2)^2 + (a/2)^2} = a/\sqrt{2}$

a) $E_{1x} = \frac{K|5\mu C|}{(a/\sqrt{2})^2} = \frac{9\times10^9 (5\times10^{-6})}{\frac{a^2}{2}} \left(\frac{\sqrt{2}}{2}\right) = -707106.78$

$E_{2x} = \frac{K|5\mu C|}{(a/\sqrt{2})^2} \frac{\sqrt{2}}{2} = \frac{9\times10^9 (5\times10^{-6})(\sqrt{2})}{a^2} = 707106.78$

$E_{3x} = \frac{K|10\mu C|}{(a/\sqrt{2})^2} \left(\frac{\sqrt{2}}{2}\right) = \frac{9\times10^9 (10\times10^{-6})(\sqrt{2})}{a^2} = 1414213.56$

$E_{4x} = \frac{K(10\times10^{-6})}{a^2} (\sqrt{2}) = 1414213.56$

$E_{1y} = \frac{9\times10^9 (5\times10^{-6})(\sqrt{2})}{a^2} = -707106.78$

$\Rightarrow$ Por simetría $\Sigma E_y = 0$.

$E_{2y} = \frac{9\times10^9 (5\times10^{-6})(\sqrt{2})}{a^2} = 707106.78$

$E_R = \Sigma E_x = 4242640.68 \cong 4.24\times10^6\ N/C$ →

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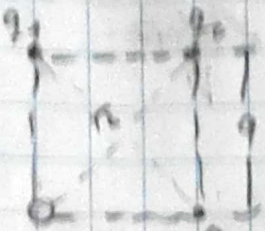
b)



$a = 0.3\ m$

$V = \frac{\Sigma V\ c/carga}{r}$

$V_1 = \frac{K(15.00\times10^{-6})}{0.3} = 150000\ V$

$r_2 = \sqrt{(0.3)^2+(0.3)^2} = 0.42$

$V_2 = \frac{K(-5.00\times10^{-6})}{0.42} = -107142.86\ V$

$V_4 = \frac{K(-10\times10^{-6})}{0.3} = -300000\ V$

$V_T = 150000 + (-107142.86) + (-300000) = -257142.86\ V$

$V_T = -0.26\ kV$ //

c) $U_{sistema} = K\frac{(5\times10^{-6})(-5\times10^{-6})}{0.3} + K\frac{(5\times10^{-6})(-10\times10^{-6})}{0.42} + K\frac{(-5\times10^{-6})(-10\times10^{-6})}{0.3} = -0.321428$

$U_{sistema} = 0.00000032\ kJ$ //

d) $Q = -8.00\ \mu C$

$\vec{E} = \frac{\vec{F}}{Q} \Rightarrow \vec{F}_T = Q\vec{E}_T$

$\vec{F}_T = (-8.00\times10^{-6})(4.24\times10^{6}) = -33.92\ N$

$|\vec{F}_T| = 33.92\ N$ //

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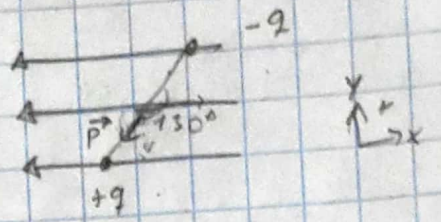
Pregunta 8: $q = 6 \times 10^{-3}\ C$
$r = 9.00\ cm$
$\vec{E} = 8.50 \times 10^{5}\ N/C$



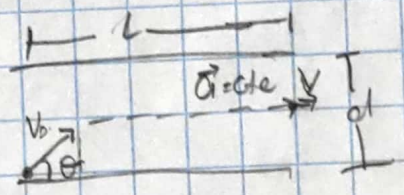
a) $\vec{P}_x = (0.09)(6 * 10^{-3})\cos 130° = 3.4710 * 10^{-4} = -347\ \mu C\ cm$.
$\vec{P}_x = -347\ \mu C\ cm$.

b) $\vec{P}_y = (0.09)(6 * 10^{-3})\ sen\ 130° = 4.1366 * 10^{-4} = 413 * 10^{-4}$
$\vec{P}_y = -413 * 10^{-6}\ Cm$

c) $\tau = (0.09)(6 * 10^{-3})(8.50 * 10^{5})\ Sen\ 130 = 351.6\ Nm$.
$\tau = 351.6\ Nm$

d) $U = -PE\cos\theta$
$U = -(0.09)(6 * 10^{-3})(8.50 * 10^{5})\cos 130 = 295.03\ J$.
$U = 295\ J$.

Pregunta 3:
$V_0 = 6.00 * 10^{6}\ m/s$
$\theta = 40°$
$L = 0.07\ m$
$d = 0.03\ m$



$V_{fx} = V_{ox} + at$.
$V_{ox} = V_0 \cos 40°$
$V_{ox} = 4.60 * 10^{6}$.

$x_f = x_0 + V_0 x t + \frac{1}{2}at^2$

$\frac{0.07 - 0}{V_{ox}} = t \rightarrow t = \frac{0.07}{4.60 * 10^{6}} = 1.52 * 10^{-8}\ s$

$a_y = \frac{2y_f}{t^2} = \frac{2(0.03/2)}{1.52 * 10^{-8}} = 1.97\ m/s^2$

$F_y = (1.6726 * 10^{-27})(1.97 * 10^{8}\ m/s^2) = 3.2950 * 10^{-21}$