UNIVERSIDAD DE SAN CARLOS DE GUATEMALA
FACULTAD DE INGENIERÍA
ESCUELA DE CIENCIAS
DEPARTAMENTO DE FÍSICA

Curso: Física 2 R	Nota:
2S2022	
AUX. CÉSAR FERNÁNDEZ	

TAREA ■	No. 1		
HOJA DE TRABAJO ☐			
EXAMEN CORTO ☐			

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Unidad 1, Capítulo 21, Pag. 713 - 719, Sección 21.3.

4/21.3 #1

Anillo Au.

$m = 10.8\,g$

$mat = 197\,g/mol$

$N = 79$

a) $10.8\,g\,Au \times \frac{1\,mol}{197\,g} \times \frac{6.022\times10^{23}\,at}{1\,mol} \times \frac{79\,e^+}{1\,at}$

$= 2.61\times10^{24}$ protones.

Carga positiva $= (2.61\times10^{24})(1.6022\times10^{-19}\,C) = 4.18\times10^{5}\,C.$

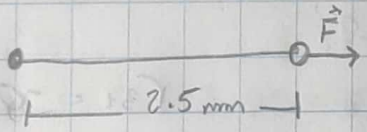
Protones $= 2.61\times10^{24}$

$Q^+ = 4.18\times10^{5}\,C$

electrones $= 2.61\times10^{24}$ #

11/21.3 #2

a)



$m_{p^+} = 1.6726\times10^{-27}\,kg$

$q_{p^+} = 1.6022\times10^{-19}\,C$

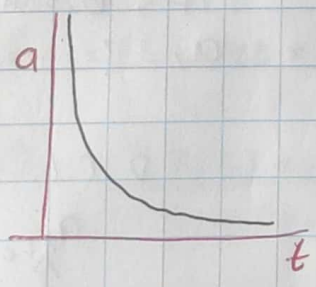
$\vec{F} = \frac{k\,q_1 q_2}{r^2}$

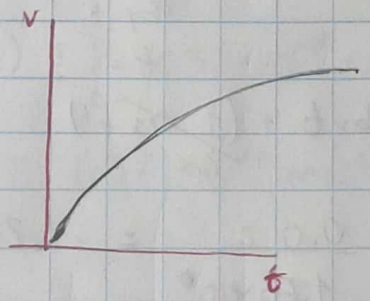
$\vec{F} = \frac{k(1.6022\times10^{-19})(1.6022\times10^{-19})}{(2.5\times10^{-3})^2} = 3.69\times10^{-23}\,N.$

$\vec{F} = m\vec{a} \Rightarrow \vec{a} = \frac{\vec{F}}{m} = \frac{3.69\times10^{-23}}{1.6726\times10^{-27}} = 22100.6\,m/s^2$

$a = 2.21\times10^{4}\,m/s$

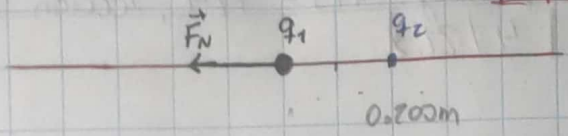
b)





#3

17 | 21.3



$q_1 = +3.00\ \mu C$

$q_2 = -500\ \mu C$

$q_3 = -8.00\ \mu C$

$\vec{F}_N = -7.00\ N\ (-\hat{\imath})$

$\vec{F}_N = \vec{F}_{21} + \vec{F}_{31}$

$\vec{F}_{21} = \dfrac{k\, q_2 q_1}{r_{21}^2} = \dfrac{k\,(5\mu)(3\mu)}{(0.200)^2} = 3.375\ N$

$\vec{F}_N - \vec{F}_{21} = \vec{F}_{31}$

$\vec{F}_{31} = -7 + 3.375\ N$

$\vec{F}_{31} = -10.375\ N$

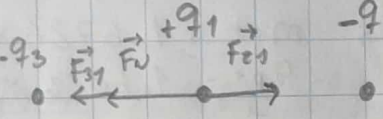
$|\vec{F}_{31}| = 10.375\ N$

$|F_{31}| = \dfrac{k\, q_3 q_1}{r_{31}^2}$

$r_{31} = \sqrt{\dfrac{k(8\mu)(3\mu)}{10.375}}$

$r_{31} = 0.144$

$r_{31} = -0.144\ m$

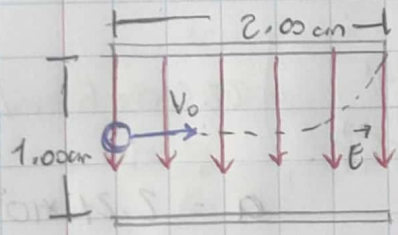


$r_{31} = -0.144\ m$ //

Seccion 21.4 Campo Electrico.

#4

29 | 21.4



$v_{0x} = 1.60 \times 10^6\ m/s$

$v_f = cte$

$t = ?$

$v_{0y} = 0$

$v_{fy} = ?$

$t = ?$

$x_0 = 0$

$x_f = 2.00cm$

$a_x = 0$

$y_0 = 0$

$y_f = 0.5cm$

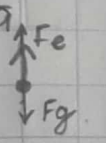
$a_y = ?$

a) En x

$x_f = x_0^{\,0} + v_{0x} t + \dfrac{1}{2} a_x t^{2\,0}$

$t = \dfrac{x_f}{v_{0x}} = \dfrac{0.02}{1.60 \times 10^6} = 1.25 \times 10^{-8}\ s$

D.C.L. e^-



$y_f = y_0^{\,0} + v_{0y}^{\,0} t + \dfrac{1}{2} a_y t^2$

$a_y = \dfrac{2 y_f}{t^2} = \dfrac{2(0.5 \times 10^{-2})}{(1.25 \times 10^{-8})^2} = 6.4 \times 10^{13}\ m/s^2$

$\Sigma F_y = ma_y$

$F_e - F_g = ma_y$

$F_e = ma_y$

$|E|q| = ma_y$

$E = \frac{ma_y}{q}$

$\vec{E} = \frac{\vec{F}}{q}$

$E = \frac{m_e a_y}{|q_e|} = \frac{(9.1094\times10^{-31})(6.4\times10^{5})}{(1.60\times10^{-19})}$

$\vec{E} = 364.38\ N/C$ //

$\vec{E} = 364\ N/C$ //

b) $a = \frac{\vec{E}\,q_{p^+}}{m_{p^+}} = \frac{(364.38)(1.6022\times10^{-19})}{1.6726\times10^{-27}}$

$a = 3.49\times10^{10}\ m/s^2$

No golpea las placas.

$y - y_0 = v_{0y}t + \frac{1}{2}a_y t^2$

$A_y = \frac{1}{2}(-3.49\times10^{10})(1.25\times10^{-8})^2 = -2.73\times10^{-6}\ m$

Se desplaza $2.73\times10^{-6}(-\hat{j})$ //

$\vec{E} = 1.50\ N/C$ |35|21.4| #5

$v_0 = 4.50\times10^{5}$

a) $X = 0.375\ m$

$E = \frac{F}{q}$ $\quad v_f^2 = v_0^2 + 2a(x - x_0)$

$\vec{F}_{ex} = q_e \vec{E}$

$F_x = (1.6022\times10^{-19})(1.50) = 2.4033\times10^{-19}\ N$

$\vec{F} = m\vec{a}_x$

$a_x = \frac{F}{m_e}$

$a_x = \frac{2.4033\times10^{-19}}{9.1094\times10^{-31}} = 2.638\times10^{11}\ m/s^2$

$v_{fx} = \sqrt{(4.50\times10^{5})^2 + 2(2.638\times10^{11})(0.375)} = 632732.17\ m/s$

b) $F_x = -(1.6022\times10^{-19})(1.50) = -2.4033\times10^{-19}\ N$

$a_x = \frac{-2.4033\times10^{-19}}{1.6726\times10^{-27}} = -1.436\times10^{8}\ m/s^2$

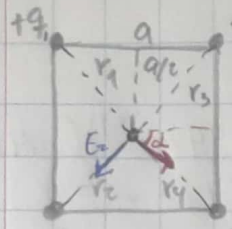
$v_x = \sqrt{(1.90\times10^{4})^2 + 2(-1.436\times10^{8})(0.375)} = 1.59\times10^{4}\ m/s$

$v_x = 6.33\times10^{5}\ m/s \rightarrow$ //

$v_x = 1.59\times10^{4}\ m/s \rightarrow$ //

Sección 21.5 Cálculos con el Campo Eléctrico.

[42 / 21.5] #6



$r_1 = r_2 = r_3 = r_4$

$r_1 = \sqrt{(a/2)^2 + (a/2)^2}$

$r_1 = a/\sqrt{2}$

$\text{Sen}\theta = \text{Sen}\,4 = \frac{\sqrt{2}}{2}$

Por simetría $\sum \vec{E}_x = 0$

$\vec{E}_T = \vec{E}_1 + \vec{E}_2 + \vec{E}_3 + \vec{E}_4$

$\vec{E}_T = \vec{E}_{1y} + \vec{E}_{2y} + \vec{E}_{3y} + \vec{E}_{4y} = 4\vec{E}_{1y}$

$E_{1y} = \frac{k|q_1|}{r_1^2} \text{Sen}\theta\,(-j)$

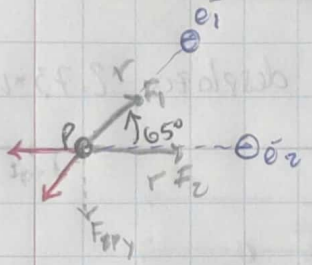
$\vec{E}_{1y} = \frac{kq}{\frac{a^2}{2}} \left(\frac{\sqrt{2}}{2}\right) j = -\frac{kq\sqrt{2}}{a^2} j$

$\vec{E}_T = -\frac{4\sqrt{2}kq}{a^2} j$

$E_T = \frac{4\sqrt{2}kq}{a^2} (-j)$ ✓

$\theta = 65°$ [45 / 21.5] #7

$r = 1.50 \times 10^{-10}\ m.$



$F_{1px} = F_1 \cos\theta$

$F_{1py} = F_1 \text{Sen}\theta$

$\vec{F}_T = \vec{F}_{1p} + \vec{F}_{2p}$

$F_{1px} = \frac{k\,q_1\,q_{p+}}{(1.50\times10^{-10})^2} \cos\theta = \frac{k(1.6022\times10^{-19})(1.6022\times10^{-19})}{(1.50\times10^{-10})^2} \cos 65° =$

[10]

$F_{1px} = 4.33 \times 10^{-9}\ N.$

$F_{1py} = \frac{k(1.6022\times10^{-19})^2}{(1.50\times10^{-10})^2} \text{Sen}\,65° = 9.30\times10^{-9}\ N.$

$\vec{F}_{2px} = \frac{k(1.6022\times10^{-19})^2}{(1.50\times10^{-10})^2} = 1.027\times10^{-8}\ N.$

$F_T = \sqrt{(F_{1px} + F_{2px})^2 + (F_{1py})^2} = \sqrt{(1.46\times10^{-8})^2 + (9.30\times10^{-9})^2}$

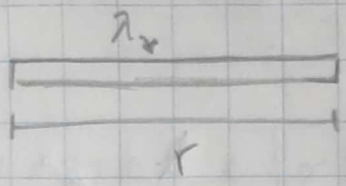
$F_T = 1.73\times10^{-8}\ N.$

$\theta = \text{Tan}^{-1}\left(\frac{9.30\times10^{-9}}{1.46\times10^{-8}}\right) = 32.4°$

$F_T = 1.73\times10^{-8}\ N.$

$\theta = 32.4°$ ✓

50 / 21.5 #8



$\lambda = 3.20 \times 10^{-10}$ C/m.

$E = 2.50$ N/C

$$E = \frac{\lambda}{2\pi\varepsilon_0 r} \Rightarrow r = \frac{\lambda}{2\pi\varepsilon E} = \frac{3.20\times10^{-10}}{2\pi(8.8542\times10^{-12})(2.5)}$$

$r = 2.30$ m.

$r = 2.30$ m. #

a) $q_1 = -4.5$ nC $\quad \ell = 3.1$ mm 53 / 21.7 #9

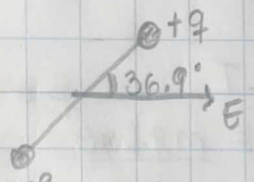
$q_2 = +4.5$ nC

$$|\vec{P}| = |q|\ell$$

$$|\vec{P}| = (4.5\text{ n})(3.1\times10^{-3})$$

$$|\vec{P}| = 1.40\times10^{-11}\ \text{C}\cdot\text{m}$$

b)



$\tau = 7.2\times10^{-9}$ N·m.

$|\vec{P}| = 1.40\times10^{-11}$ C·m #

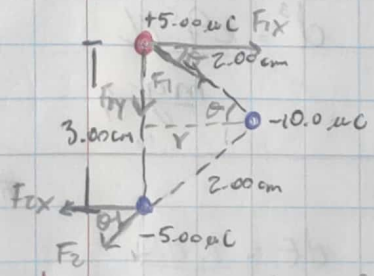
$$\tau = PE\sin\theta \Rightarrow E = \frac{7.2\times10^{-9}}{(1.40\times10^{-11})\sin(36.9)}$$

$$\frac{\tau}{P\sin\theta} = E$$

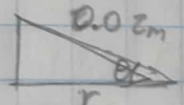
$E = 856.54$ N/C

$E = 856$ N/C #

57 / 21.7 #10



$F_p = F_1 + F_2$



$$\sin\theta = \frac{0.015}{0.02}$$

$$\theta = \sin^{-1}\left(\frac{0.015}{0.02}\right) = 48.6°$$

a) Fx de las fuerzas se cancelan $F_r = F_{ix} + F_{cx} = 0$

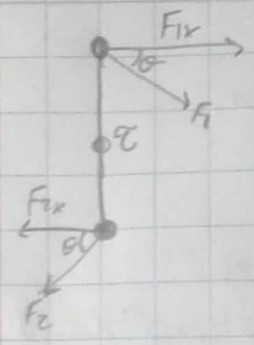
$$F_{iy} = \frac{k(5\mu)(10\mu)}{(0.02)^2}\sin(48.6) = 844\ \text{N}\ (-\hat{j})$$

$$F_{cy} = \frac{k(5\mu)(10\mu)}{(0.02)^2}\sin(48.6) = 844\ \text{N}\ (\hat{j})$$

$F_y = F_{iy} + F_{cy} = -1688$ N.

$F = -1688$ N. #

b)



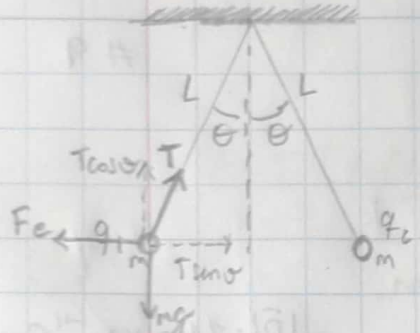
$$F_{1x} = \frac{K(5\mu)(10\mu)}{(0.02)^2}\cos 48.6 = 744\ N.$$

$F_{1x} = F_{2x}$

$q = F_x = 2(744)(0.015) = 22.32\ N.$

$T = 22.3\ N$ ↓ ↻

#11



masa = m. | 62 / 21.7 |

longitud = L $\quad \tan\theta \cong \sin\theta = d/2L$

$q_1 = q_2 = q$

$$d = \left(\frac{q^2 L}{2\pi\varepsilon_0 mg}\right)^{1/3}$$

$\Sigma F_x = 0$

$\Sigma F_y = 0$

$\Sigma F_x = 0 \qquad \Sigma F_y = 0 \qquad T = T$

$T\sin\theta - F_e = 0 \qquad T\cos\theta - mg = 0 \qquad F_e = mg\sin\theta \overset{\tan\theta}{\cdot} \cos\theta$

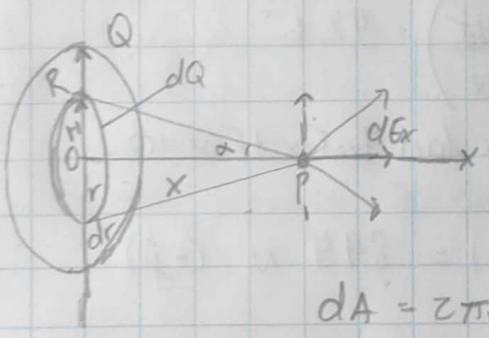
$T = \frac{F_e}{\sin\theta} \qquad T = \frac{mg}{\cos\theta} \qquad \frac{Kq^2}{d^2} = \tan\theta\, mg$

$$\frac{Kq^2}{d^2} = \frac{d}{2L}mg \Rightarrow d^3 = \frac{Kq^2 2L}{mg} = \left(\frac{q2L}{2\pi\varepsilon_0 mg}\right)^{1/3}$$

$$d^3 = \frac{Kq^2 2L}{mg}$$ ↓

#12

a)



| 83 / 21.7 |

$r = 7.50\ cm \qquad dE = \frac{K\,dq}{r^2}$

$Q = 7\times10^{-12}$

$x = 20.0\ cm.$

$\sigma = dq/dA.$

$dA = 2\pi r'\,dr' \qquad dq = \sigma\, dA$

$dq = \sigma 2\pi r'\,dr' \qquad$ Simetría $\Rightarrow E_\perp = 0$ N/C

$r = \sqrt{r''^2 + x^2}$

$$dE_x = dE\cos\alpha = \frac{K 2\pi r''\,dr''\,\sigma}{r''^2 + x^2} * \frac{x}{(r''^2+x^2)^{1/2}}$$

$$dE = \frac{K\,2\pi r''\,dr''}{(\sqrt{r''^2+x^2})^2}$$

$$dE_x = \frac{\sigma\, 2\pi K r'' dr''}{(r''^2 + x^2)^{3/2}} = 2\pi K\sigma \int_{r''=0}^{r''=R} \frac{r''\, dr'' x}{(r''^2 + x^2)^{3/2}}$$

$$E_x = 2\pi K \left(\frac{Q}{\pi R^2}\right) x \int \frac{r''\, dr''}{(r''^2 + x^2)^{3/2}} = \frac{2K\,(7\times10^{-12})(0.2)}{(2.50\times10^{-2})^2}$$

$$E_x = \int_0^{0.015} \frac{r''^2\, dr''}{(r''^2 + 0.2^2)^{3/2}} = 1.56\ N/C$$

$E_x = 1.56\ N/C$ //

b) $x \gg R$ $\quad E = \frac{Q}{4\pi\varepsilon_0 x^2}$ $\quad Q$ = carga Total

$$E = \frac{\sigma}{2\varepsilon_0}\left[1 - \left(\frac{1-R^2}{2x^2}\right)\right] = \frac{\sigma}{8\varepsilon_0}\frac{R^2}{2x^2} = \frac{\sigma\pi R^2}{4\pi\varepsilon_0 x^2} = \frac{Q}{4\pi\varepsilon_0 x^2}$$

$E = \frac{Q}{4\pi\varepsilon_0 x^2}$ //

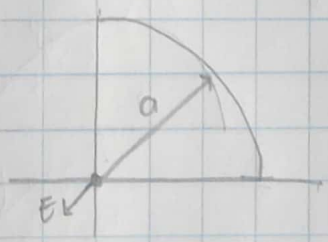
d) $x = 20.0\,cm \longrightarrow \frac{(1.58-1.56)}{1.56} = 0.01$

$x = 10.0\,cm$

$E_d = 6.00\ N/C$ $\quad E_p = 6.30\ N/C$. $\quad \frac{(6.30-6)}{6.30} = 5\%$

$\% = 5\%$ //

$-Q$ $\quad$ |86/217| $\quad$ #13



$$E_x = +\frac{Q}{2\pi^2\varepsilon_0 a^2} \qquad E_y = +\frac{Q}{2\pi^2\varepsilon_0 a^2}$$

$$E_x = 4\left(\frac{Q}{2\pi^2\varepsilon_0 a^2}\right) = \frac{Q}{\pi^2\varepsilon_0 a^2}$$

E_y por Simetría se Cancelan.

$$E_x = \frac{Q}{\pi^2\varepsilon_0 a^2}$$ //