	UNIVERSIDAD DE SAN CARLOS DE GUATEMALA	FÍSICA 2 C	NOTA:
	FACULTAD DE INGENIERÍA		
	ESCUELA DE CIENCIAS	1S2023	
	DEPARTAMENTO DE FÍSICA		
	INGA. CLAUDIA CECILIA CONTRERAS FOLGAR DE ALFARO	AUX. ANGEL QUIM	

CARNÉ:	201709088	FECHA:	29/01/2023
NOMBRE:	Leonel Antonio González García		

Tarea 1

Capítulo 21. Carga Eléctrica y Campo Eléctrico

P 21.4

#1

$$m = 10.8g$$

$$m_{at} = 197g/mol \quad a) \# \text{Protones}$$

$$n_{at} = 79$$

$$10.8g \times \frac{1mol}{197g} \times \frac{6.022 \times 10^{23} \text{ atoms}}{1mol} \times \frac{79 \text{ protons}}{1 \text{ atom}} = 2.61 \times 10^{24}$$

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

$$\# \text{Protones: } 2.61 \times 10^{24} p$$

$$Q^+ = 4.18 \times 10^5 C$$

$$b) \# \text{electrones} = \# \text{Protones}$$

$$\# \text{electrones: } 2.61 \times 10^{24} e$$

P. 21.11

#2

$$a) \quad \oplus \quad \oplus^2$$

$$2.50mm$$

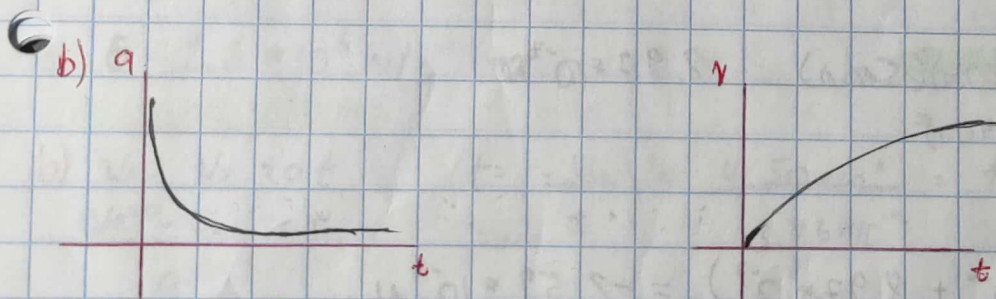
$$F = ma$$

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

$$F_e = \frac{k q_1 q_2}{r^2} = \frac{9 \times 10^9 (1.6 \times 10^{-19})^2}{(0.00250)^2} = 3.69 \times 10^{-23} N$$

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

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

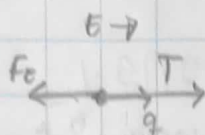


$$q_1 = 8.75 \mu\text{C}$$

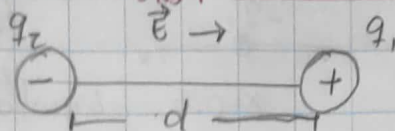
$$q_2 = -6.50 \mu\text{C}$$

$$d = 2.50 \text{ cm}$$

$$|E| = 1.85 \times 10^8 \text{ N/C}$$



a)



$$F_e = qE$$

$$F_e = (6.50 \times 10^{-6}) (1.85 \times 10^8)$$

$$F_e = 1.20 \times 10^3 \text{ N}$$

$$F_r = \frac{k |q_1| |q_2|}{r^2} = \frac{k (8.75 \mu\text{C}) (6.50 \mu\text{C})}{(0.0250)^2} = 8.18 \times 10^2 \text{ N}$$

$$\sum F_x = 0$$

$$T = (1.20 \times 10^3) - (8.18 \times 10^2)$$

$$T + F_r - F_e = 0$$

$$T = 382 \text{ N}$$

$$T = F_e - F_r$$

$$T = 382 \text{ N}$$

b) If q_1 and q_2 are +.

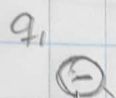
$$T = 2.02 \times 10^3 \text{ N}$$

$$T = F_e + F_r$$

$$T = (1.20 \times 10^3) + (8.18 \times 10^2) = 2.02 \times 10^3 \text{ N}$$

P. 21.41

#4



$$q_1 = -5.00 \mu\text{C}$$

$$q_2 = 2.00 \mu\text{C}$$

$$q_3 = -5.00 \mu\text{C}$$

$$\theta = \tan^{-1} \left(\frac{0.08}{0.06} \right) =$$

$$\theta = 53.13^\circ$$

$$E_1 = E_3$$

$$E_y = 0$$

$$E_x = 2E_{1x} + E_{2x}$$

$$r^2 = 8^2 + 6^2 = 100$$

$$r = 10 = 0.1 \text{ m}$$

$$E_1 = \frac{k (5 \mu\text{C})}{(0.1)^2} = 4.49 \times 10^6 \text{ N/C}$$

$$E_{1x} = E \cos \theta = (4.49 \times 10^6) \cos 53.13 = 2.7 \times 10^6 \text{ N/C}$$

$$E_{3x} = 2.7 \times 10^6 \text{ N/C}$$

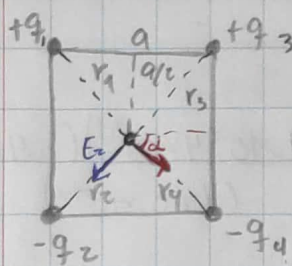
$$E_{2x} = E_2 = \frac{k (2 \mu\text{C})}{(0.06)^2} = 4.99 \times 10^6 \text{ N/C}$$

$$E_x = 4.99 \times 10^6 + 2(2.7 \times 10^6) = 1.04 \times 10^7 \text{ N/C} \quad (-x)$$

$$|E| = 1.04 \times 10^7 \text{ N/C} \quad (-x)$$

[P. 21.42]

#5



$$r_1 = r_2 = r_3 = r_4$$

$$\text{sen } \theta = \text{sen } 45^\circ = \frac{\sqrt{2}}{2}$$

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

$$r_1 = a/\sqrt{2}$$

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

Por simetria $\sum \vec{E}_x = 0$

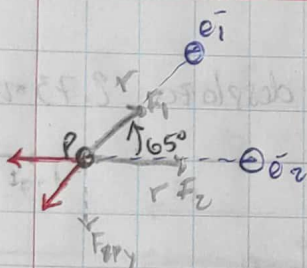
$$\vec{E}_T = \vec{E}_{1y} + \vec{E}_{2y} + \vec{E}_{3y} + \vec{E}_{4y} = 4\vec{E}_{1y}$$

$$\vec{E}_{1y} = \frac{k|q_1|}{r_1^2} \text{sen } \theta (-\hat{j})$$

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

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

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



$\theta = 65^\circ$ [P. 21.45]

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

#6

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

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

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

$$F_{1px} = \frac{kq_1q_2}{(1.50 \times 10^{-10})^2} \cos 65^\circ = \frac{k(1.6022 \times 10^{-19})(1.6022 \times 10^{-19}) \cos 65^\circ}{(1.50 \times 10^{-10})^2}$$

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

$$F_{1py} = \frac{k(1.6022 \times 10^{-19})^2}{(1.50 \times 10^{-10})^2} \text{sen } 65^\circ = 9.30 \times 10^{-9} \text{ N}$$

$$F_{2px} = \frac{k(1.6022 \times 10^{-19})^2}{(1.50 \times 10^{-10})^2} = 1.027 \times 10^{-8} \text{ N}$$

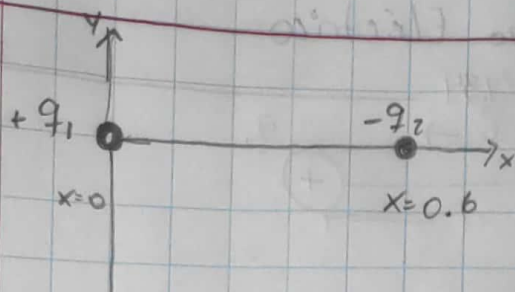
$$F_T = \sqrt{(F_{1px} + F_{2px})^2 + (F_{1py})^2} = \sqrt{(1.46 \times 10^{-8})^2 + (9.30 \times 10^{-9})^2}$$

$$F_T = 1.73 \times 10^{-8} \text{ N}$$

$$\theta = \tan^{-1} \left(\frac{9.30 \times 10^{-9}}{1.46 \times 10^{-8}} \right) = 32.4^\circ$$

$$F_T = 1.73 \times 10^{-8} \text{ N}$$

$$\theta = 32.4^\circ$$



P 21.60-2

#7

$$q_1 = +2.50 \mu\text{C}$$

$$q_2 = -3.50 \mu\text{C}$$

$$F_1 = F_2$$

$$F_1 = \frac{K |q_1| |q_1|}{r^2}$$

$$\frac{K |q_1| |q_1|}{r^2} = \frac{K |q_1| |q_2|}{(r+0.6)^2}$$

$$F_2 = \frac{K |q_1| |q_2|}{(r+0.6)^2}$$

$$\frac{|q_1|}{|q_2|} (r+0.6)^2 = r^2$$

$$r = \sqrt{\frac{|q_1|}{|q_2|}} (r+0.6) = \sqrt{\frac{|q_1|}{|q_2|}} (r) + \sqrt{\frac{|q_1|}{|q_2|}} (0.6)$$

$$r - \sqrt{\frac{|q_1|}{|q_2|}} r = \sqrt{\frac{|q_1|}{|q_2|}} (0.6)$$

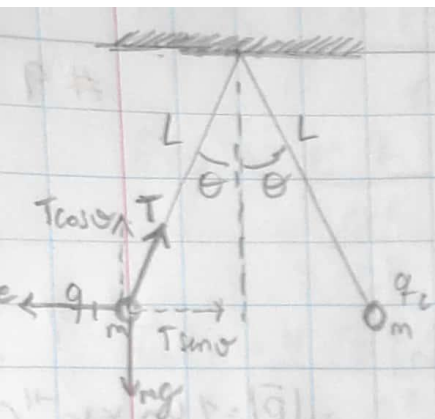
$$r = \frac{\sqrt{\frac{|q_1|}{|q_2|}} (0.6)}{1 - \sqrt{\frac{|q_1|}{|q_2|}}}$$

$$r \left(1 - \sqrt{\frac{|q_1|}{|q_2|}} \right) = \sqrt{\frac{|q_1|}{|q_2|}} (0.6)$$

$$\Rightarrow \frac{\sqrt{\frac{|q_1|}{|q_2|}} (0.6)}{1 - \sqrt{\frac{|q_1|}{|q_2|}}}$$

$$r = \frac{(0.8452)(0.6)}{1 - 0.8452} = 3.27 \text{ m}$$

$$F_N = 0 \text{ en } x = -3.27 \text{ m}$$



$$m_1 = m_2 = m$$

$$q_1 = q_2 = q$$

$$L = L$$

$$q_1 = q_2 = q$$

$$\tan \theta = \frac{d}{2L}$$

$$d = \left(\frac{q^2 L}{2\pi \epsilon_0 m g} \right)^{1/3}$$

$$\sum F_x = 0$$

$$\sum F_y = 0$$

$$\sum F_x = 0$$

$$T \sin \theta - F_e = 0$$

$$T = \frac{F_e}{\sin \theta}$$

$$\sum F_y = 0$$

$$T \cos \theta - mg = 0$$

$$T = \frac{mg}{\cos \theta}$$

$$T = T$$

$$F_e = \frac{mg \sin \theta}{\cos \theta}$$

$$\frac{k q^2}{d^2} = \tan \theta mg$$

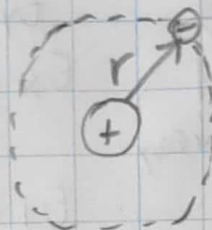
$$\frac{k q^2}{d^2} = \frac{d}{2L} mg \Rightarrow d^3 = \frac{k q^2 2L}{mg} = \left(\frac{q^2 L}{2\pi \epsilon_0 m g} \right)^{1/3}$$

$$d^3 = \frac{k q^2 2L}{mg}$$

P 21.75

#9

$$r = 5.29 \times 10^{-11} \text{ m.}$$



$$F = ma \Rightarrow a = \frac{v^2}{r}$$

$$F = m \frac{v^2}{r}$$

$$F_e = k \frac{e^2}{r^2}$$

$$F = F_e$$

$$m \frac{v^2}{r} = k \frac{e^2}{r^2}$$

$$v = 2.19 \times 10^6 \text{ m/s}$$

$$v^2 = \frac{k e^2}{m r}$$

$$v = \sqrt{\frac{k e^2}{m r}} = \sqrt{\frac{k (1.60 \times 10^{-19})^2}{(9.109 \times 10^{-31}) (5.29 \times 10^{-11})}} = 2.19 \times 10^6 \text{ m/s.}$$