Firma:

Carné : 201709088   Curso: Física 2   Sección: C

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Pregunta 1 Puede iniciar su examen a partir de aquí

a)

$$m_e = 9.1094 * 10^{-31} \, kg \qquad d = 0.0196m$$
$$q_e^- = 1.6022 * 10^{-19} \, C$$
$$V_0 = 5.83 * 10^6 \, m/s$$
$$\alpha = 40.0°$$
$$E = +2000 \, \hat{j} \, (N/C)$$

$$\vec{a_y} = \frac{\vec{E} \, q_e^-}{m_e^-}$$

$$a_y = \frac{(2000)(1.6022 \times 10^{-19})}{9.11 \times 10^{-31}} = 3.517 * 10^{14} \, m/s^2$$

$$\boxed{a_y = 3.52 * 10^{14} \, m/s^2}$$

b) $V_{0y} = V_0 \sin \alpha$

$$V_{0y} = (5.83 \times 10^6) \sin 40° = 3.74 * 10^6 \, m/s$$

$$y_f = y_0 + V_{0y} t + \frac{1}{2} a t^2$$

$$\frac{1}{2}(3.52 \times 10^{14}) t^2 + 3.74 \times 10^6 - 0.0196 =$$
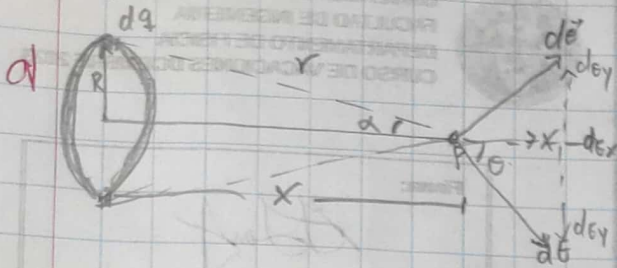
$$\Delta y = V_{0y} t + \frac{1}{2} a t^2$$

$$t_1 = 4.35 \, ns \quad t_2 = -2.56 \times 10^{-8} s$$

$$\frac{1}{2} a t^2 + V_{0y} t - \Delta y = 0.$$

$$\boxed{t = 4.35 \, ns}$$

Escaneado con CamScanner

Pregunta 2:

$R = 0.0250$ m.
$Q_T = 130 \, \mu C$
$X = 0.60$ m.
$ds = R \, d\theta$
$l = 2\pi R$

$\lambda = \dfrac{Q}{l} = \dfrac{130 \times 10^{-6}}{2\pi(0.0250)} = 827.6 \times 10^{-6} \, C/m$

$r^2 = (x^2 + R^2)$
$dq = \lambda \, dl$
$dq = \lambda \, ds$
$dq = \lambda R \, d\theta$

Por Simetría $\theta_y = 0$.

$\boxed{\lambda = 828 \, \mu C/m}$

$dE = \dfrac{k \, dq}{r^2}$

$\cos\alpha = \dfrac{x}{(x^2 + R^2)^{1/2}}$

$dE = \dfrac{k\lambda R \, d\theta}{x^2 + R^2}$

$dE_x = dE \cos\alpha$

b)

$dE_x = \dfrac{k\lambda R \, d\theta}{x^2 + R^2} \times \dfrac{x}{(x^2 + R^2)^{1/2}} = \dfrac{k\lambda x R \, d\theta}{(x^2 + R^2)^{3/2}}$
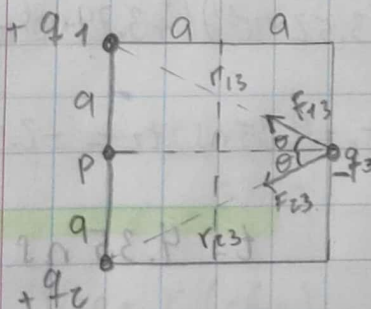
$E_x = \dfrac{k\lambda x R}{(x^2 + R^2)^{3/2}} \displaystyle\int_0^{2\pi} d\theta = \dfrac{k\lambda x R}{(x^2 + R^2)^{3/2}} (2\pi) =$

$E_x = \dfrac{2\pi(9 \times 10^9)(828 \times 10^{-6})(0.60)(0.0250)}{(0.60^2 + 0.0250^2)^{3/2}} = 3243099.16 \, N/C.$

$\boxed{E_x = 3.24 \times 10^6 \, N/C.}$

$\boxed{\text{Dirección} = (+x)}$

Pregunta 3.

$q_1 = +4.00 \, \mu C.$
$q_2 = +4.00 \, \mu C.$
$q_3 = -6.00 \, \mu C.$
$a = 0.150$ m
$\theta = 45°$

a) $Fe = \dfrac{k \, q_1 q_2}{r^2}$

$r = r_{13} = r_{23} = \sqrt{2a^2 + a^2}$
$r^2 = 2a^2 + a^2 = 3a^2$

$\vec{F}_{13} = \dfrac{k \, q_1 q_3}{3a^2}(-\cos 45° \, \hat{i} - \text{sen} \, 45° \hat{j}) = \dfrac{k(4\mu)(6\mu)(-\cos 45 + \text{sen} 45°)}{3(0.150)^2}$

$\vec{F}_{13} = -2.26 \, N(\hat{i}) + 2.26 \, N \, \hat{j}$

$|F_{13}| = \sqrt{(2.26)^2 + (-2.26)^2} = 3.19 \, N.$

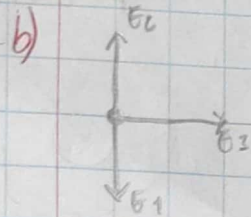$$F_{23} = \frac{K q_2 q_3}{r^2} (-\cos 45° - \sin 45°)$$

$$F_{23} = \frac{K (4u)(6u)}{3a^2} (-\cos 45° - \sin 45°)$$

$$F_{23} = -2.26 \, \hat{\imath} - 2.26 \, \hat{\jmath} \quad \Rightarrow \quad |F_{23}| = 3.19 \, N.$$

$$F_R = F_{13} + F_{23} = [-2.26 - 2.26] \, \hat{\imath} + [2.26 - 2.26] \, \hat{\jmath}$$

$$F_R = -4.52 \, \hat{\imath}$$

$$\boxed{F_R = 4.52 \, N.}$$

b)

$$E_1 = \frac{Kq}{r^2} = \frac{K|q_1|}{r_1^2} = \frac{K(4u)}{(0.150)^2} = 1.6 \times 10^6 \, N/c$$

$$E_2 = \frac{K|q_2|}{r_2^2} = \frac{K(4u)}{(0.150)^2} = 1.6 \times 10^6 \, N/c$$

$$E_3 = \frac{K|q_3|}{r_3^2} = \frac{K(6u)}{(2(0.150))^2} = 6 \times 10^5 \, N/c.$$

$$|E_t| = 1.6 \times 10^6 + 1.6 \times 10^6 + 6 \times 10^5 = 3800 \times 10^3 \, N/c.$$

$$V = \frac{Kq}{r}$$

$$\boxed{E = 3800 \, KN/c.}$$

c) $V_P = V_{1P} + V_{2P} + V_{3P}.$

$$V_{1P} = \frac{K(4u)}{0.150} = 240 \times 10^3 \, V$$

$$V_{2P} = \frac{K(4u)}{0.150} = 240 \times 10^3 \, V$$

$$V_{3P} = \frac{K(-6u)}{0.300} = -180 \times 10^3 \, V$$

$$V_P = (240 + 240 - 180) \times 10^3 \, V$$

$$V_P = 300 \times 10^3 \, V.$$

$$\boxed{V = 300 \, KV.}$$

d) $U_{sist} = \frac{Kq_1 q_2}{r_{12}} + \frac{Kq_1 q_3}{r_{13}} + \frac{Kq_2 q_3}{r_{23}} = \qquad \boxed{U_{sist} = -1182 \, mJ}$

$$U_{sist} = K\left[\frac{(4u)(4u)}{0.3} + \frac{(4u)(-6u)}{\sqrt{3}(0.150)} + \frac{(4u)(-6u)}{\sqrt{3}(0.150)} \right] = -1.18276 \, J.$$

Escaneado con CamScanner

Pregunta 4.
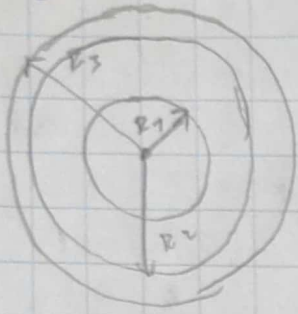
$R_1 = 0.1m.$

$\rho = 60 \times 10^{-9} \, C/m^3$

$Q_T = 100 \times 10^{-12} \, C.$

$R_2 = 0.3m$

$R_3 = 0.4m.$

$$\rho = \frac{q}{V} \quad \rightarrow \quad q = 60n \left(\frac{4}{3} \pi (0.1)^3 \right)$$

$Q_{enc} = q_{int} + q_{ext}.$

$q_{ext} = Q_{enc} - q_{int}.$

$q = 2.513 \times 10^{-10} \, C.$

$q_{ext} = 100 \times 10^{-12} - (-251.3 \times 10^{-12})$

$q = 251.3 \times 10^{-12} \, C.$

$q_{ext} = 351.3 \times 10^{-12}$

$\boxed{q = 251.3 \times 10^{-12} C}$

$r = 0.50 m.$
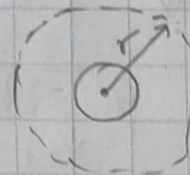
$$\Phi = E \, dA = \frac{q_{enc}}{\varepsilon_0}.$$

$$\Phi = E \, dA = \frac{q_{enc}}{\varepsilon_0}$$

$$\Phi = \frac{100 \times 10^{-12}}{\varepsilon_0} =$$

$$E(4\pi r^2) = \frac{100 \times 10^{-12}}{\varepsilon_0}.$$

$\boxed{q_{ext} = 351.3 \, pC.}$

$$E = \frac{100 \times 10^{-12}}{\varepsilon_0 (4\pi r^2)} = 3.595 \, N/c$$

$$\Phi = 11.29 \, \frac{N \cdot m^2}{C}$$

$\boxed{E = 3.59 \, N/c.}$

$\boxed{\Phi = 11.29 \, \frac{N \cdot m^2}{C}.}$