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

Curso: F2 R	Nota:
2S2022	
AUX. CÉSAR FERNÁNDEZ	

TAREA ■	No. 2		
HOJA DE TRABAJO ☐			
EXAMEN CORTO ☐			

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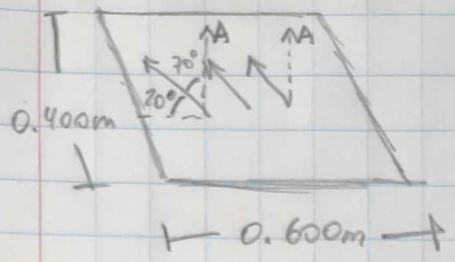
Unidad 2. Ley Gauss Capítulo 22 Pag. 745-749; Sección 22.2.

|2/22.2| #1



$|\vec{E}| = 90.0\ N/C$

$\Phi = EA\cos 70°$

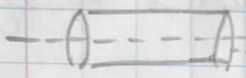
$\Phi = (90)(0.4 * 0.6)\cos 70° = 7.39\ \frac{N}{C}\ m^2$

$\Phi = 7.39\ \frac{N}{C} * m^2$ //

|4/22.2| #2

$E = \frac{\lambda}{2\pi\epsilon_0 r}$ $r = 0.250m$ $l = 0.400m$ $\lambda = 3.00\ \mu C/m$

a)



$E = \frac{(3 * 10^{-6})}{2\pi(8.8542 * 10^{-12})(0.250)}$

$E = 2.16 * 10^5\ N/C$

$\Phi = (2.16 * 10^5)(2\pi)(0.250)(0.400)\cos 0° = 1.36 * 10^5\ N/C * m^2$

$\Phi = 1.36 * 10^5\ \frac{N}{C}\ m^2$ //

b) $r = 0.500m$.

$\Phi = \frac{(3 * 10^{-6})}{2\pi(8.8542 * 10^{-12})(0.500)}(2\pi)(0.500)(0.400)\cos 0 = 1.36 * 10^5\ \frac{N}{C}\ m^2$.

$\Phi = 1.36 * 10^5\ \frac{N}{C}\ m^2$ //

c) $l = 0.800m$.

$\Phi = \frac{(3 * 10^{-6})(2\pi)(0.250)(0.800)}{2\pi(8.854 * 10^{-12})(0.250)} = 2.71 * 10^5\ \frac{N}{C}\ m^2$

$\Phi = 2.71 * 10^5\ \frac{N}{C}\ m^2$ //

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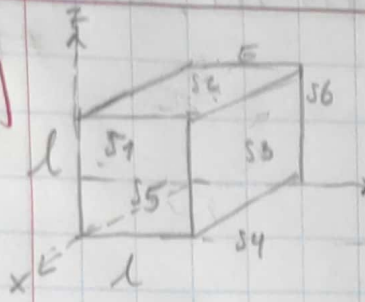
a)



$l = 0.1\,m$

$E = 4.00 \times 10^3\ N/C$

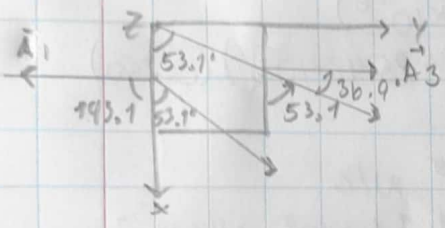
$\theta = 53.1°$

▲ Caras S_2 y S_4 desde "z"

$\Phi_2 = EA_2 \cos(90°) = 0$

$\Phi_4 = EA_4 \cos(90°) = 0$

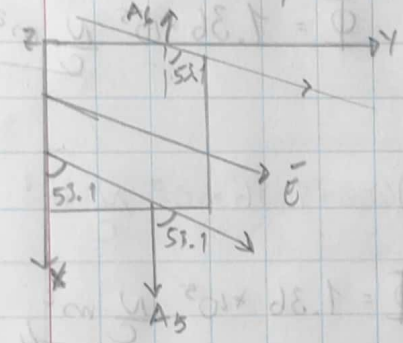
▲ Caras S_1 y S_3 desde "z"



$\Phi_3 = (4000)(0.1)^2 \cos 36.9° = 32\ \frac{N}{C}\cdot m^2$

$\Phi_1 = (4000)(0.1)^2 \cos 143.1° = -32\ \frac{N}{C}\cdot m^2$

▲ Caras S_5 y S_6 desde "z"



$\Phi_5 = (4000)(0.1)^2 \cos 53.1 = 24.0\ \frac{N}{C}\cdot m^2$

$\Phi_6 = (4000)(0.1)^2 \cos 126.9 = -24.0\ \frac{N}{C}\cdot m^2$

b) $\Phi_{TOTAL} = (-32) + 0 + 32 + 0 + 24 + (-24) = 0\ \frac{N}{C}\cdot m^2$

$\Phi_1 = -32\ N/C \cdot m^2$

$\Phi_2 = 0\ N/C \cdot m^2$

$\Phi_3 = 32\ N/C \cdot m^2$

$\Phi_4 = 0\ N/C \cdot m^2$

$\Phi_5 = 24\ N/C \cdot m^2$

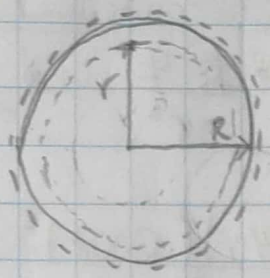
$\Phi_6 = -24\ N/C \cdot m^2$

$\Phi_{roral} = 0\ \frac{N}{C}\,m^2$

9 / 22.3 #4

$R = 0.06\ m$
$q = -49\ \mu C$

a)



$$E = \frac{q_{enc}}{\varepsilon_0} = 0$$

$E = 0\ N/C$

b) $r = 0.06\ m$

$$\int E\,dA = \frac{q_{enc}}{\varepsilon_0} \Rightarrow EA = \frac{q_{enc}}{\varepsilon_0}$$

$$E = \frac{q_{enc}}{\varepsilon_0 A} = \frac{49\ \mu}{(8.8542\times10^{-12})(4\pi(0.06)^2)}$$

$E = 1.22\times10^{8}\ N/C$

c) $r = 0.05\ m$
$R = 0.11\ m$

$$E = \frac{49\ \mu}{(8.8542\times10^{-12})(4\pi(0.11)^2)} = 3.64\times10^{7}\ N/C$$

$E = 0\ N/C$
$E = 1.22\times10^{8}\ N/C$
$E = 3.64\times10^{7}\ N/C$

15 / 22.5 #5

$r = 0.13\ m$
$E = 1150\ N/C$

$$EA = \frac{q_{enc}}{\varepsilon_0}$$

$$q_{enc} = \varepsilon_0 EA$$
$$q_{enc} = (8.8542\times10^{-12})(1150)(4\pi(0.13)^2)$$
$$q_{enc} = 2.16\times10^{-9}\ C$$

$$2.16\times10^{-9}\,\cancel{C} \times \frac{1e^-}{1.6022\times10^{-19}\,\cancel{C}} = 1.348\times10^{10}\ e^-$$

1.35×10^{10}

$R = 0.04\ m$ | 24 / 22.5 | #6

$r = 0.08\ m$

$E = 940\ N/C$

a)

$$E = \frac{kq}{r^2} \Rightarrow Q = \frac{Er^2}{k}$$

$$Q = \frac{(940)(0.08)^2}{9\times10^9} = 6.69\times10^{-10}\ C.$$

$$\rho = \frac{Q}{V}$$

$$\rho = \frac{6.69\times10^{-10}}{\frac{4}{3}\pi(0.04)^3} = 2.50\times10^{-6}\ C/m^3$$

$$\rho = 2.50\times10^{-6}\ C/m^3$$ 4

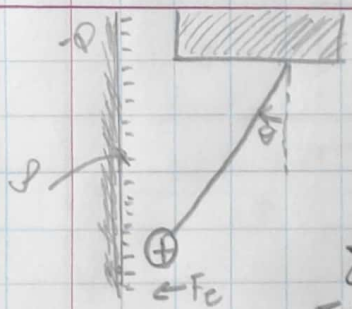
b) $r = 0.02\ m$

$$\oint E\,dA = \frac{q_{enc}}{\varepsilon_0} = \frac{\rho\,4/3\,\pi r^3}{\varepsilon_0}$$

$$E(4\pi r^2) = \frac{\rho\,4/3\,\pi r^3}{\varepsilon_0} = \frac{\rho r}{3\varepsilon_0}$$

$$E = \frac{2.50\times10^{-6}(0.02)}{3(8.8542\times10^{-12})} = 1882.3\ N/C$$

$$E = 1882\ N/C$$ 4



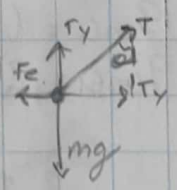
$E = \sigma/2\varepsilon_0$ | 33 / 22.5 | #7.

$m = 4\times10^{-6}\ kg$ $\quad \sigma = -2.50\times10^{-9}\ C/m^2$

$q = 5\times10^{-8}\ C$

$F_e = qE$

D.C.L. Esfera



$\Sigma F_x = 0$

$T\sin\theta - F_e = 0$ $\quad T = \frac{qE}{\sin\theta}$

$T\sin\theta = F_e$

$T\sin\theta = qE$

$T = T$

$\Sigma F_y = 0$

$T\cos\theta - mg = 0$

$T\cos\theta = mg$

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

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

$$\frac{qE}{mg} = \tan\theta$$

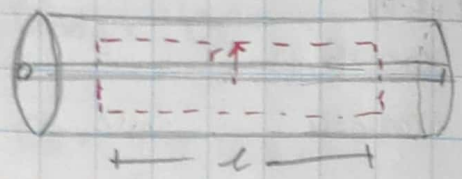
$$\theta = \tan^{-1}\left(\frac{q\sigma/2\varepsilon_0}{mg}\right)$$

$$\theta = \tan^{-1}\left(\frac{(5\times10^{-8})(2.50\times10^{-9}/2\varepsilon_0)}{(4\times10^{-6})(9.8)}\right)$$

$\theta = 10.2°$ 4 $\quad \theta = 10.21°$

39/22.5 #8

a)



λ

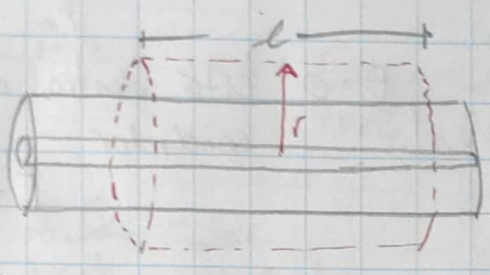
$\Phi_E = EA$ $\quad \Phi = \frac{Q_{enc}}{\varepsilon_0}$

$Q_{enc} = \lambda l$

$E(2\pi r l) = \frac{\lambda l}{\varepsilon_0} \Rightarrow E = \frac{\lambda}{2\pi r \varepsilon_0}$

$E = \frac{\lambda}{2\pi r \varepsilon_0}$ //

b)

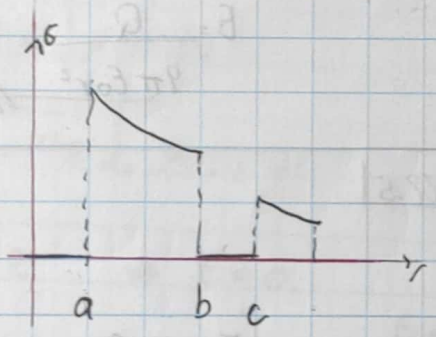


$\Phi_E = EA$ $\quad \Phi = \frac{Q_{en}}{\varepsilon_0} \Rightarrow EA = \frac{\lambda l}{\varepsilon_0} \Rightarrow E = \frac{\lambda l}{\varepsilon_0 A}$

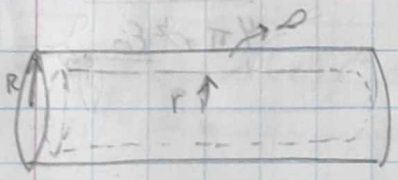
$E = \frac{\lambda}{2\pi r \varepsilon_0}$

$E = \frac{\lambda}{2\pi r \varepsilon_0}$ //

c)



41/22.5 #9



a) $r < R$ $\quad Q_{enc} = \lambda l$

$Q_{enc} = \rho \pi r^2 l$

$EA = \frac{Q_{enc}}{\varepsilon_0} \Rightarrow E = \frac{\rho \pi r^2 l}{2\pi r l \varepsilon_0} = \frac{\rho r}{2\varepsilon_0}$ $\quad E = \frac{\rho r}{2\varepsilon_0}$ //

b) $Q_{enc} = \rho \pi R^2 l$

$EA = \frac{\rho \pi R^2 l}{\varepsilon_0} \Rightarrow E = \frac{\rho R^2}{2\varepsilon_0 r} = \frac{\lambda}{2\pi \varepsilon_0 r}$ $\quad E = \frac{\lambda}{2\pi \varepsilon_0 r}$ //

#10

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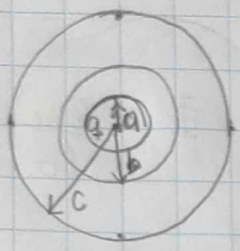

$R_{interior} = b$ Carga $= Q$

$R_{exterior} = c$ radio $= a$

a) $E\ (r<a)$

$$\oint E \cdot d\vec{A} = \frac{q_{enc}}{\varepsilon_0}$$

$$E\ (4\pi r^2) = \frac{\rho \frac{4}{3}\pi r^3}{\varepsilon_0}$$

$\vec{E} = \frac{\rho r}{3\varepsilon_0}$? $E = 0$ está dentro del conductor.

$E = 0$ ✓

b) $E\ (a<r<b) \Rightarrow EA = \frac{q_{enc}}{\varepsilon_0}$.

$$E(4\pi r^2) = \frac{Q}{\varepsilon_0} \Rightarrow E = \frac{Q}{4\pi\varepsilon_0 r^2} = \frac{kQ}{r^2}$$

$E = \frac{kQ}{r^2}$ ✓

c) $E = 0$ debido a que $q_{enc} = \emptyset$. $E = 0$. ✓

d) $E(4\pi r^2) = \frac{Q}{\varepsilon_0} \Rightarrow E = \frac{Q}{4\pi r^2 \varepsilon_0}$

$E = \frac{Q}{4\pi\varepsilon_0 r^2}$ ✓✓

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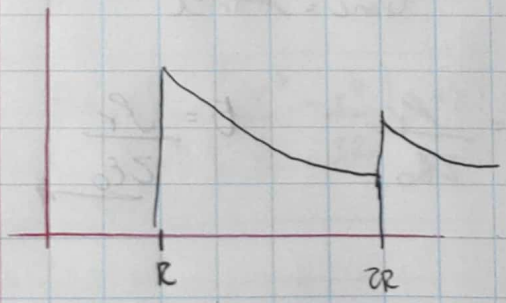
#11

a) $R < r < 2R$

$$E = \frac{q_{enc}}{4\pi r^2 \varepsilon_0} \Rightarrow E = \frac{2q_{enc}}{4\pi\varepsilon_0 r^2} \quad (r > 2R)$$

$E = \frac{2q_{enc}}{4\pi r^2 \varepsilon_0}$ ✓

b)



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#12

$Q_{neta} = 0.$

a) $Q_N = \frac{4}{3}\pi((2R)^3 - R^3)$

$Q_N = \frac{(32R^3 - 4R^3)}{3}\pi\rho = \frac{28\pi R^3\rho}{3}$

$\rho = \frac{3Q}{28\pi R^3}$

$\rho = \frac{3Q}{28\pi R^3}$ 4

b) $R < r < 2R$ $\quad E = \frac{Q_{enc}}{4\pi\varepsilon_0 r^2} + \frac{\rho}{3\varepsilon_0 r^2}(r^3 - R^3)$

$E = \frac{2Q}{7\pi r^2\varepsilon_0} - \frac{Q_r}{28\pi\varepsilon_0 R^3}$

$E = \frac{2Q}{7\pi\varepsilon_0 r^2} - \frac{Q_r}{28\pi\varepsilon_0 R^3}$ //

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13

$\rho(r) = \rho_0\left(1 - \frac{4r}{3R}\right)$ $\quad r \leq R$ $\quad dV = 4\pi r^2 dr$

a) $\rho(r) = 0$ $\quad r \geq R$ $\quad Q = 4\pi\rho_0\int_0^R (1 - 4r/3r)\, r^2 dr$

$Q = \int \rho(r)\, dV$ $\quad Q = 4\pi\rho_0\left(\frac{R^3}{3} - \frac{4}{3R}\frac{R^4}{4}\right) = 0$

$Q = 4\pi\int_0^{\infty} \rho(r) r^2 dr.$

$Q_{Total} = 0.$ 4

b) $r \geq R \Rightarrow E = 0.$

$E = 0.$ 4

c) $E = \frac{4\pi}{\varepsilon_0}\int_0^r \rho(r') r'^2 dr' \Rightarrow E 4\pi r^2 = \frac{4\pi\rho_0}{\varepsilon_0}\left(\int_0^r r'^2 dr' - \frac{4}{3R}\int_0^r r'^3 dr'\right)$

$E = \frac{\rho_0}{\varepsilon_0 r^2}\left(\frac{r^3}{3} - \frac{r^4}{3R}\right) \Rightarrow E = \frac{\rho_0}{3\varepsilon_0} r\left(1 - \frac{r}{R}\right)$

$E = \frac{\rho_0}{3\varepsilon_0} r\left(1 - \frac{r}{R}\right)$ //