Tarea No. 2

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Sección: P Nombre del Capitulo: Ley de Gauss

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22.1

$A = 0.25 m^2$ $\phi = 60°$ $\vec{E} = 14 \frac{N}{C}$

(a) $\Phi_E = EA\cos\theta = (14)(0.25)\cos 60° = \boxed{1.75 \frac{Nm^2}{C}}$

(b) No. No depende de la forma de la hoja porque es independiente el flujo electrico a la hoja.

(c) mas grande
$\cos\phi = 1$
$\phi = \cos^{-1}$
$\boxed{\phi = 0°}$

mas pequeño
$\cos\phi = 0$
$\phi = \cos^{-1} 0$
$\boxed{\phi = 90°}$

22.3

$E = 1.25 \times 10^6 \frac{N}{C}$ $r = 0.15m$

(a) $\Phi_E = EA \rightarrow E(4\pi r^2) = (1.25\times10^6)(4\pi(0.15)^2) = 3.53429.1735$
$\boxed{3.53 \times 10^5 \frac{Nm^2}{C}}$

(b) $E = \frac{1}{4\pi\varepsilon_0}\frac{|q|}{r^2} = E r^2 4\pi\varepsilon_0 = |q|$
$= (1.25\times10^6)(0.15)^2 4\pi)(8.8542\times10^{-12})$
$= 3.13\times10^{-6} C = \boxed{3.13 \mu C}$

22.9

$q = -49\,\mu C$ Diametro = 12cm

$r = 6\,cm \rightarrow 0.06\,m$

(a) $\vec{E} = \frac{Kq}{r^2}$ adentro de la esfera de plastico $q = 0$

$E = \frac{K(0)}{(0.06)^2} = \boxed{0}$

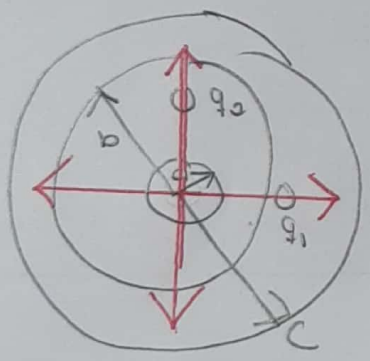
(b) afuera de la capa $q = -49\mu$

$E = \frac{K|q|}{r^2} = \frac{K(49\times10^{-6})}{(0.06)^2} = \boxed{1.22\times10^{8}\,\frac{N}{C}}$

(c) $r = 0.06 + 0.05$

$E = \frac{K|q|}{(0.11)^2} = \frac{K|-49\mu C|}{(0.11)^2} = \boxed{3.64\times10^{7}\,\frac{N}{C}}$

22.10



$q_1 = 4nC$ $q_2 = -6nC$ $Q_T = q_1 + q_2$

$x = 2m$ $y = 1m$ $Q_T = -2nC$

$a = 0.5$ $b = 1.5m$ $c = 2.5m$

(a) $q < q_r$ ó q_{2r} $\boxed{E = 0}$

(b) $\Phi_E = \frac{Q_{encerrada}}{\varepsilon_0} = \frac{-6nC}{\varepsilon_0} = \boxed{-678\,\frac{N\cdot m^2}{C}}$

(c) $\Phi_E = \frac{-2nC}{\varepsilon_0} = \boxed{-226\,\frac{N\cdot m^2}{C}}$

22.14

$R_E = 0.45m$ $q = 0.25nC$ $R_T = 0.45 + 0.1\,m = 0.55\,m$

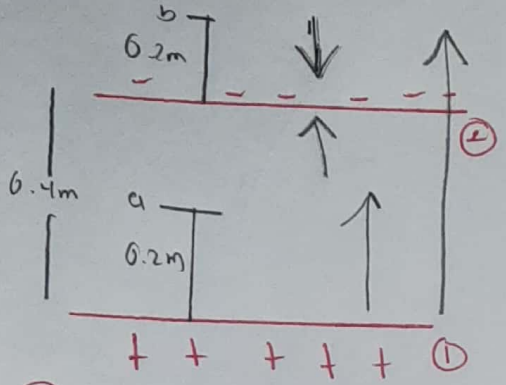
(a) $E = K\frac{q}{R_T^2} = \left(9\times10^{9}\,\frac{N\cdot m^2}{C^2}\right)\left(\frac{0.25\,nC}{(0.55)^2}\right) = \boxed{7.44\,\frac{N}{C}}$

(b) $R_E > R_T$ $R_T = 0.45 - 0.1 = 0.35m$

$\boxed{E = 0}$

22.17

$\lambda_1 = 4.8\ \mu C/m$ $\quad \lambda_2 = -2.4\ \mu C/m$



(a) $E_{net} = E_{1a} + E_{2a}$

$E_{net} = \frac{1}{2\pi\varepsilon_0}\frac{\lambda_1}{r} + \frac{1}{2\pi\varepsilon_0}\frac{\lambda_2}{r}$

$E_{net} = \frac{1}{2\pi\varepsilon_0 r}(\lambda_1 + \lambda_2)$

$= \left(18\times10^9\ \frac{N\cdot m^2}{C^2}\right)\left(\frac{1}{0.2m}\right)(4.8 + 2.4)\times10^{-6}$

$= \boxed{6.5\times10^5\ \frac{N}{C}}$

(b) $E = \frac{1}{2\pi\varepsilon_0}\frac{\lambda}{r}$

$E_{net} = E_{2b} - E_{1b} \rightarrow \frac{1}{2\pi\varepsilon_0}\frac{\lambda_2}{r^2} - \frac{1}{2\pi\varepsilon_0}\frac{\lambda_1}{r_1}$

$= \left(18\times10^9\ \frac{N\cdot m^2}{C^2}\right)\left(\frac{2.4\times10^{-6}\ C/m}{0.2} - \frac{4.8\times10^{-6}\ C/m}{0.6m}\right)$

$= \boxed{7.2\times10^4\ \frac{N}{C}}$

22.18

$E = 840\ N/C \quad r = 0.4m \quad l = 2m = 0.02\ m$

$A_c = 2\pi r l$

$\Phi_E = \frac{q}{\varepsilon_0} \quad \Phi_E = AE$

$\Phi_E = 2\pi r l E \rightarrow 2\pi(0.4)(0.02)\left(840\frac{N}{C}\right)$

$\Phi_E = 42.22\ N\cdot m^2/C$

$q = \varepsilon_0 \Phi_E$

$q = (8.854\times10^{-12})(42.22\ N\cdot m^2/C) = \boxed{3.74\times10^{10}\ C}$

22.21

$E = 1750\ \frac{N}{C} \quad r_E = 0.355m \quad D = 0.145m \quad R_T = r_E + D = 0.5m$

(a) $\frac{dq}{dV} = \rho \quad \frac{q}{V} = \rho \quad EA = \frac{q_{en}}{\varepsilon_0} \quad V = \frac{4}{3}\pi r^3$

$EA\varepsilon_0 = q_{en} \quad A = 4\pi r^2$

$\rho = \frac{\varepsilon_0 EA}{(4\pi/3)r_E^3} = \frac{4\pi\varepsilon_0 E R_T}{(4\pi/3)R_E^3} = \rho = \frac{\varepsilon_0 E r^2}{r_E^3/3} = \frac{(8.854\times10^{-12})(1750)(0.5)^2}{(0.355)^3}$

$= \boxed{2.60\times10^{-7}\ C/m^3}$

(b) $q_{enc} = \rho V = \rho\left(\frac{4\pi}{3}\right)r^3$

$E = \frac{1}{4\pi\varepsilon_0}\frac{q_{enc}}{r^2} = \frac{1}{4\pi\varepsilon_0}\frac{\rho(4\pi/3)r^3}{r^2} = E = \frac{r\rho}{3\varepsilon_0}$

$E = \frac{(0.2)(2.6\times10^{-7})}{3\cdot(8.854\times10^{-12})} = \boxed{1960\ \frac{N}{C}}$