Problema 1
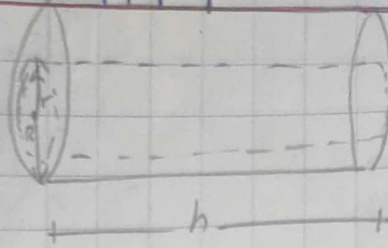
$R = 12\,cm \rightarrow 0.12\,m$

$\rho = 5n\,C/m^3$

$r = 0.05\,m$

$\oint E\,dA = \dfrac{q_{enc}}{\varepsilon_0}$

$\Rightarrow q_{enc} = \rho V$

$q_{enc} = \rho \pi r^2 h$

$E(2\pi r K) = \dfrac{\rho \pi r^2 h}{\varepsilon_0} = \dfrac{\rho r}{2\varepsilon_0} = \dfrac{(5n)(0.05)}{2\varepsilon_0} = 14.12\,\dfrac{N}{C}$

$\boxed{E = 14\ N/C}$

Problema 2

$R = 12\,cm$

$\rho = 5n\,C/m^3$
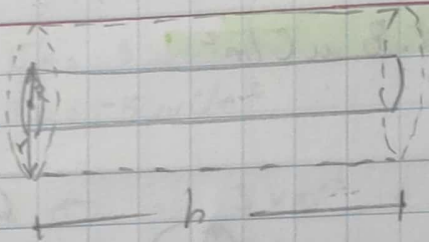
$r = 15\,cm$

$q_{enc} = \rho \pi R^2 h$

$\oint E\,dA = \dfrac{q_{enc}}{\varepsilon_0} \Rightarrow E(2\pi r h) = \dfrac{\rho \pi R^2 h}{\varepsilon_0} = \dfrac{\rho R^2}{2r\varepsilon_0}$

$E = \dfrac{(5n)(0.12)^2}{2(0.15)\varepsilon_0} = 27.10\ N/C$

$\boxed{E = 27\ N/C}$

Problema 3: DCL. STyrofoam

$m = 10\,g$

$Q = -0.700\,mC$
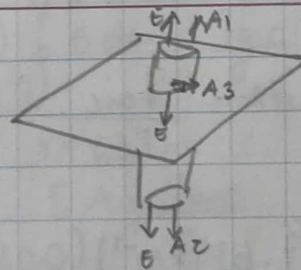
$\sum F_y = mg$

$Fe = mg$

$qE = mg$

$\oint E\,dA_1 + \oint E\,dA_2 + \oint E\,dA_3{}^{\nearrow 0} = \dfrac{q_{enc}}{\varepsilon_0}$

$A_1 = A_2 = A_3$

$E A_1 + E A_2 = \dfrac{q_{enc}}{\varepsilon_0}$

$E = \dfrac{q_{enc}}{2A\varepsilon_0} = \dfrac{\sigma A}{2A\varepsilon_0} = \dfrac{\sigma}{2\varepsilon_0}$

$q\left(\dfrac{\sigma}{2\varepsilon_0}\right) = mg$

$\sigma = \dfrac{2mg\varepsilon_0}{q}$

$\boxed{\sigma = -2.48\,n\,C/m^2}$

$\sigma = \dfrac{2(10\times10^{-3})(9.8)\varepsilon_0}{0.7\times10^{-3}} = 2.48\,nC/m^2$

Problema 4:
q: 6nC
R_{int}: 0.01m
R_{ext}: 0.02m
$Q = -4nC$
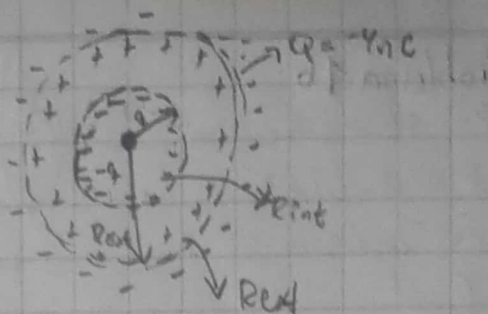
$q_{enc} = 6nc \Rightarrow$ $q_{int} = -6nC$ $\quad$ $\sigma = \dfrac{q_{int}}{A}$
$\phantom{q_{enc} = 6nc \Rightarrow}$ $q_{ext} = 2nC$
$\phantom{q_{enc} = 6nc \Rightarrow}$ $Q_T = -4nC$ $\quad$ $\sigma = \dfrac{-6n}{4\pi r^2}$

$\sigma = \dfrac{-6\times10^{-9}}{4\pi(0.01)^2} = -4.77 \,\mu C/m^2$

$\boxed{\sigma = -4.8 \,\mu C/m^2}$

$Q_T = q_{int} + q_{ext}$
$Q_T - q_{int} = q_{ext}$
$-4 + 6 = q_{ext}$
$2 = q_{ext}$

Problema 5:
No Conductora
q: 4uC, $q_a = +4uc$
$a = 0.05m$

Conductora
$R_{int}\, b = 0.08m$
$R_{ext}\, c = 0.1m$
$Q = -6uC$

$q_{ext} = -2uC$

$q_{ext} = -6 + 4 = -2$

a) $E(r = 0.03m)$

$\rho = \dfrac{q}{V} = \dfrac{3(4u)}{4\pi a^3} = \dfrac{3(4\times10^{-6})}{4\pi(0.05)^3} = 7.639\times10^{-3} \,C/m^3$

$\oint E\,dA = \dfrac{q_{enc}}{\varepsilon_0} \Rightarrow E(4\pi r^2) = \dfrac{\rho(4/3\pi r^3)}{\varepsilon_0} = \dfrac{\rho r}{3\varepsilon_0}$

$E = \dfrac{(7.639\times10^{-3})(0.03)}{3(8.8542\times10^{-12})} = 8.627\times10^{6} \,N/c$

$\boxed{E(r=0.03m) = 8.6 \,\dfrac{KN}{C}}$

b) $E(r = 0.09m)$ $\quad$ $q_{enc} = 4u + (-4u) = 0$

$\oint E\,dA = \dfrac{q_{enc}}{\varepsilon_0} \Rightarrow E = 0 \,N/C$

$\boxed{E = 0}$

c) $E (r = 0.12 \, m)$. $q_{enc} = 4u - 6u = -2u$

$$\oint E \, dA = \frac{q_{enc}}{\varepsilon_0} \qquad\qquad E = \frac{q_{enc}}{4\pi r^2 \varepsilon_0}$$

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

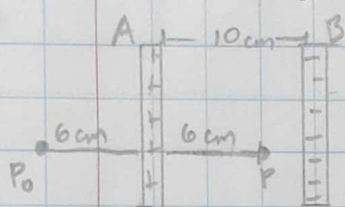$$E = \frac{-2u}{4\pi (0.12)^2 \varepsilon_0} = -1.248 \times 10^6 \, N/C$$

$$\boxed{E (r = 0.12m) = -1.25 \, KN/C}$$

d) $Q_T = -6u$
    $q_{int} = -4u$ — $\boxed{\text{Superficie Interna} = -4 \, uC}$
    $q_{ext} = -2uu$. $\boxed{\text{Superficie Externa} = -2 \, uC}$

Problema 6 $\sigma_A = 3 \, uC/m^2$
  A |—10cm—| B $\sigma_B = -5 \, uC/m^2$

6cm | 6 cm   a) $E = \dfrac{\sigma}{2\varepsilon_0} = \dfrac{3 \times 10^{-6}}{2\varepsilon_0} + \dfrac{5 \times 10^{-6}}{2\varepsilon_0}$

P_0

$$E = 452 \, KN/C.$$

$$\boxed{E = 452 \, KN/C}$$

b) $\dfrac{-(3 \times 10^{-6})}{2\varepsilon_0} + \dfrac{(5 \times 10^{-6})}{2\varepsilon_0} = 113 \, KN/C.$
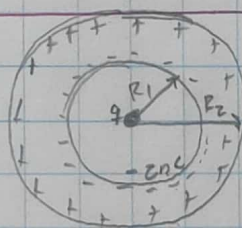
$$\boxed{E = 113 \, KN/C}$$

Problema 7   a) $\oint E \, dA = \dfrac{q_{enc}}{\varepsilon_0}$
$R_{int} = 0.1 \, m$
$R_{ext} = 0.2 \, m$ $r = 0.3 \, m.$
$E = 750 \, N/C$ $E A = \dfrac{q_{enc}}{\varepsilon_0}$
$q = 2 nC.$

$$T = q;$$

$E (4\pi r^2) \varepsilon_0 = q_{enc}$ $\boxed{q = 7.5 \, nC}$

$q_{enc} = (750)(4\pi (0.3)^2) \varepsilon_0 = 7.51 \times 10^{-9} C$

b) $Q_T = 7.5$ $q_{ext} = Q_T - q_{int}$ $\boxed{q_{ext} = 9.5 \, nC.}$
   $q_{int} = -2$ $q_{ext} = 7.5 + 2 = 9.5 nC$

c) $\Phi = \dfrac{q_{enc}}{\varepsilon_0} = \dfrac{2 \times 10^{-9}}{8.8542 \times 10^{-12}} = 225.8$ $\boxed{\Phi = 226 \, N/C.}$