(1) $\Phi E = E A \cos\theta$ Area, $A = (0.400)(0.600) = 0.24 m^2$

$\theta = 90° - 20° = 70°$

$\Phi_E = (90.0)(0.24)\cos(70°) = \underline{7.39\ Nm^2/C}$

(2) $\Phi = \lambda \cdot L/\varepsilon = 5.25 \times 10^{-6} \times 0.475 / (8.854 \times 10^{-12})$

$= \underline{2.82 \cdot 10^5} \leftarrow$ (a)

b)

$$\frac{5.25 \cdot 10^{-6} \cdot 0.475}{8.854 \cdot 10^{-12}} = 2.82 \cdot 10^5 \frac{Nm^2}{C}$$

Gauss low

$$\frac{5.25 \cdot 10^{-6} - 6 \cdot 0.855}{8.854 \cdot 10^{-12}} = 5.07 \cdot 10^5 \frac{Nm^2}{C}$$

(3) $q_1 = 4nC$ $q_2 = -7.8nC$ $q_3 = 2.4nC$

(a) Flux $\phi = Q$ enclosed

$\phi(S_1) = \dfrac{4 \times 10^{-9}}{8.85 \times 10^{-12}} = 451.98\ Nm^2/C$

$\phi(S_2) = -\dfrac{7.8 \cdot 10^{-9}}{8.85 \times 10^{-12}} = -881.35\ Nm^2/C$

$\phi(S_3) = -429.38\ Nm^2/C$ $\phi(S_5) = -158.19\ Nm^2/C$

$\phi(S_4) = 72.316\ Nm^2/C$

(b) No

(4) (a) Inside the layer enclosed charge $(q_{enc}) = 0$

So $\underline{E = 0}$

(b) $E = kq/r^2$

$E = 9e9 \cdot 49e-6 / 0.06^2$

$E = 4.1e5$ N/C

(c)

$r = 6 + 6 = 12$ cm $= 0.12$m

$E = 9e9 \cdot 49e-6 / 0.12^2$

$E = 3e987$ N/C

(5)

$\rho = \frac{q}{V} = \frac{q}{\frac{4}{3}\pi R^3}$ $\quad EA = \frac{q}{\varepsilon_0}$

$q = \varepsilon_0 E A$ $\quad \rho = \frac{\varepsilon_0 E A}{\frac{4}{3}\pi R^3}$ $\quad A = 4\pi r^2$

$$\rho = \frac{(8.854 \times 10^{-12} C^2/(Nm^2))(1750 N/C)(0.5 m)^2}{(0.355 m)^3/3}$$

$\approx 0.26 \times 10^{-6}\ C/m^3 = \underline{0.26\ \mu C/m^3}$

6] a) By Gauss's law

$$\oint \vec{E} d\vec{A} = -\frac{q_{in}}{\epsilon_0} \qquad a < r < b$$

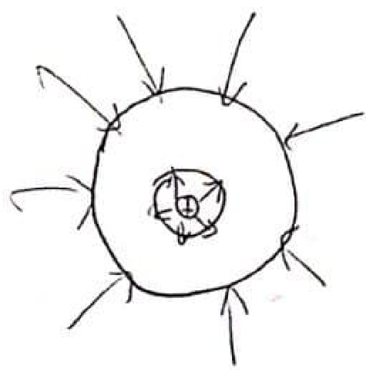
$$E \cdot 4\pi r^2 = \frac{q}{\epsilon_0} \qquad E\,4\pi r^2 = \frac{q-q}{\epsilon_0}$$

$$E = 0$$

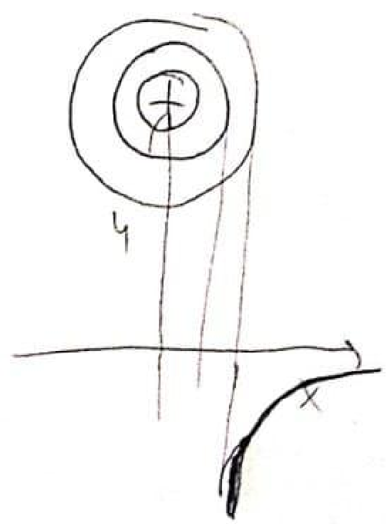
$$E = -\frac{1}{4\pi\epsilon r^2} - 2q = -\frac{1}{4\pi\epsilon}\frac{2q}{r^2} \qquad r > b$$

(b) $\sigma_{in} = -\frac{q}{4\pi a^2} \qquad \sigma_{out} = -\frac{2q}{4\pi b^2}$

d)



e)



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