1PF2 1S2022

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Clave general 1PF2 1S2022

P1

$$\vec{E} = -\frac{2K|q_1|}{r^2}\cos 45^\circ\,\hat{\imath} - \frac{2K|q_3|}{r^2}\cos 45^\circ\,\hat{\imath} = -\frac{2K\cos 45^\circ}{[(a/2)\sqrt{2}]^2}[q_1 + q_3]\,\hat{\imath}$$

$$\vec{E} = -\frac{2K\cos 45^\circ}{\left[\frac{a^2}{2}\right]}[q_1 + q_3]\,\hat{\imath} = -\frac{2K}{\frac{0.2^2}{2}}[(5\mu) + (10\mu]\cos 45^\circ\,\hat{\imath} = 9.55*10^6\ \frac{N}{C}$$

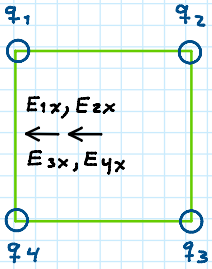
$$V_R = K\frac{q_1}{a\sqrt{2}} + K\frac{q_2}{a} + K\frac{q_3}{a} = K\left[\frac{(-5\mu)}{0.2\sqrt{2}} + \frac{(+5\mu)}{0.2} + \frac{(-10\mu)}{0.2}\right] = -384\ KV$$

$$U_{sist(3q)} = K\frac{q_1q_2}{a} + K\frac{q_1q_3}{a} + K\frac{q_2q_3}{a\sqrt{2}}$$

$$U_{sist(3q)} = K\left[\frac{(-5\mu)(5\mu)}{0.2} + \frac{(-5\mu)(-10\mu)}{0.2} + \frac{(5\mu)(-10\mu)}{0.2\sqrt{2}}\right]$$

$$U_{sist(3q)} = -0.466\ J$$

$$F = |q_4|E = (6\mu)(9.55*10^6) = 57.3\ N$$



P2

$$p = |q|d = (6*10^{-3})(9*10^{-2}) = 540\ \mu C.m$$

$$p_x = (540\mu)\cos(-130^\circ) = -347\ \mu C.m$$

$$p_y = (540\mu)\,\text{sen}(-130^\circ) = -414\ \mu C.m$$

$$\tau = pE\,\text{sen}\,\theta = (540\mu)(8.5*10^5)\,\text{sen}\,50^\circ = 352\ N.m$$

$$U_{EL} = -pE\cos\theta = -(540\mu)(8.5*10^5)\cos 50^\circ = -295\ J$$

P3

$$\Delta x = v_{ox}t \qquad t = \frac{\Delta x}{v_{ox}} = \frac{0.09}{7*10^6\cos 50^\circ} = 20.0\ ns$$

$$\Delta Y = v_{oy}t + (1/2)a_y t^2 \qquad a_y = \frac{2[(d/2) - v_o\,\text{sen}\,\theta\, t]}{t^2}$$

$$a_y = \frac{2[(0.03/2) - 7*10^6\,\text{sen}\,50\,(20n)]}{(20n)^2} = -4.61*10^{14}\ m/s^2$$

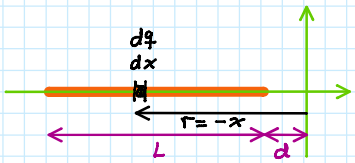
$$F = |q|E \qquad ma = |q|E \qquad E = \frac{ma}{|q|} = \frac{(1.67*10^{-27})(4.61*10^{14})}{1.60*10^{-19}} = 4.81*10^6\ \frac{N}{C}$$

$$v_{fy}^2 = v_{oy}^2 + 2a_y\Delta Y \qquad a_y = -\frac{[v_o\,\text{sen}\,\alpha]^2}{2(d/2)} = -\frac{[7*10^6\,\text{sen}\,50^\circ]^2}{2(0.03/2)} = -9.58*10^{14}\ m/s^2$$

$$E = \frac{(1.67*10^{-27})(9.58*10^{14})}{1.60*10^{-19}} = 10.0*10^6\ \frac{N}{C}$$

P4

dq ↑ $\qquad dE = \frac{K\lambda\,dx}{\quad} \qquad E = K\lambda\int\frac{dx}{\quad} = KQ\left[-\frac{1}{\quad}\right]^{-d}$

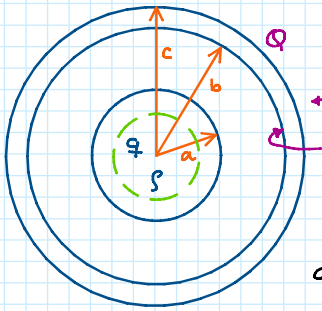


$$dE = \frac{K\lambda\,dx}{(-x)^2} \qquad E = K\lambda\int\frac{dx}{x^2} = \frac{KQ}{L}\left[-\frac{1}{x}\Big|_{-(d+L)}^{-d}\right]$$

$$E = -\frac{K(12n)}{8}\left[\frac{1}{-1.50} - \frac{1}{-(1.50+8)}\right] = 7.58\ N/C$$

$$F = |q|E \qquad q = \frac{F}{E} = \frac{1.50}{7.58} = 198\ mC$$

P5



$a = 12.0cm \quad b = 30.0cm \quad c = 50.0\ cm \quad \rho = 150\ nC/m^3 \quad q_{ext} = -2.00\ nC$

$$\int\vec{E}\cdot d\vec{A} = \frac{q_{C.N.E.}}{\varepsilon_0} \qquad E[4\pi r^2] = \frac{q_{CNE}}{\varepsilon_0}$$

$$q_{C.N.E.} = \rho V_{ENC} \qquad E[4\pi r^2] = \frac{\rho(4/3)\pi r^3}{\varepsilon_0}$$

$$q_{C.N.E} = \rho\frac{4}{3}\pi r^3 \qquad E = \frac{\rho r}{3\varepsilon_0} = \frac{(150n)(0.08)}{3\varepsilon_0} = 452\ \frac{N}{C}$$

$$a \le r \le b: \quad E = K\frac{q_{C.N.E}}{\varepsilon_0} = \frac{K\rho(4/3)\pi a^3}{r^2} = \frac{K(150n)(4/3)\pi(0.12)^3}{(0.25)^2} = 156\ \frac{N}{C}$$

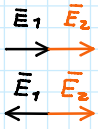
c) Si $Q = -2.00nC$ $\quad r \ge b$:

$$q = \rho(4/3)\pi a^3 = (150n)(4/3)\pi(0.12)^3 = 1.086\ nC$$

$$q_{int} = -1.086\ nC \qquad q_{ext} = Q - q_{int} = -2n - (-1.086n) = -0.914nC$$

$$E = \frac{K(0.914n)}{(0.7)^2} = 16.8\ \frac{N}{C}$$

P6



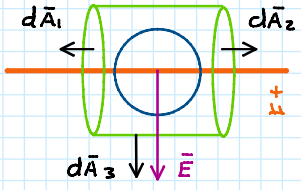
$$E_R = \frac{\sigma_1}{2\varepsilon_0} + \frac{\sigma_2}{2\varepsilon_0} = \frac{6\mu}{2\varepsilon_0} + \frac{10\mu}{2\varepsilon_0} = 904\ KN/C$$

$$\vec{E}_R = \frac{\sigma_1}{2\varepsilon_0} - \frac{\sigma_2}{2\varepsilon_0} = \frac{6\mu}{2\varepsilon_0} - \frac{10\mu}{2\varepsilon_0} = -226\ KN/C\ \hat{i}$$

$$|\vec{E}_R| = 226\ KN/C$$

P7

$$\Phi_E = \frac{q_{C.N.E}}{\varepsilon_0} = \frac{\phi\lambda}{\varepsilon_0} = \frac{(0.1)(9n)}{\varepsilon_0} = 102\ \frac{N\cdot m^2}{C}$$



$$\phi_{A_1}^{0} + \phi_{A_2}^{0} + \int E\,dA_3\cos 0^{0\,(1)} = \frac{q_{C.N.E}}{\varepsilon_0}$$

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

$$E = \frac{\lambda}{2\pi r\varepsilon_0} = \frac{(9n)}{2\pi(0.06)\varepsilon_0} = 2.70\ KN/C$$