بسم الله الرحمن الرحيم

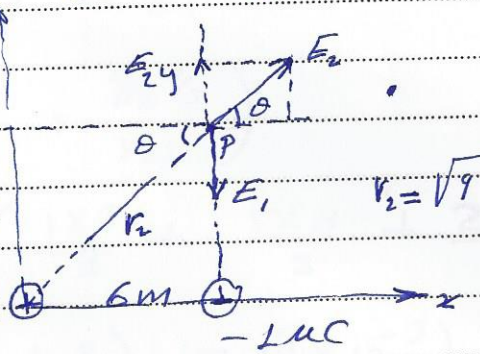
الاختبار الأول 104فيز ١٤٣١/٤/٢٥هـ

(1) If $q = 1\,C$ $\therefore N = \frac{q}{e} = \frac{1}{1.6\times10^{-19}}$

$m = N m_p = \left(\frac{1}{1.6\times10^{-19}}\right)(1.67\times10^{-27}) = 0.1\,87\times10^{-8}\ kg$

(2) $F = k\frac{q_1 q_2}{r^2} = (9\times10^9)\frac{(20\times10^{-3})(20\times10^{-3})}{(20\times10^{-3})^2} = 9\times10^{-3}\ N$

(3)



$E_1 = k\frac{q_1}{r_1^2} = (9\times10^9)\frac{(1\times10^{-6})}{(9)^2} = 111.1\ N/C$ نحو اليسار

$r_2 = \sqrt{9^2+6^2} = \sqrt{117} = 10.8$

$E_2 = k\frac{q_2}{r_2^2} = (9\times10^9)\left(\frac{1\times10^{-6}}{117}\right) = 76.92$

$E_{2y} = E_2 \sin\theta = (76.92)\left(\frac{9}{10.8}\right) = 64.1$ نحو الاسفل

$E_y = 64.1 - 111.11 = -47.01$

(4) المركبة السينية محصلة المجال الكهربي عند النقطة P والاتجاه الموجب لمحور x

$E_x = E_2\cos\theta = (76.92)\left(\frac{6}{10.8}\right) = 42.7$

$\tan\theta = \frac{E_y}{E_x} = \frac{-47.01}{42.7} = -1.1$

$\theta = -47.7^\circ$

$\theta = 360 - 47.7 = 312.2^\circ$

(5) $F = m_p a = qE = eE$ $\therefore a = \frac{eE}{m_p}$

$v^2 = 2ax = 2\left(\frac{eE}{m_p}\right)\left(\frac{L}{2}\right)$

$v = \left(\frac{eEL}{m_p}\right)^{\frac{1}{2}}$

(6) السطح ذو التماثل الكروي هو S_2

(7) $\int \vec{E}\cdot d\vec{A} = \frac{q_{in}}{\epsilon_0}$, $E(2\pi r L) = \frac{\Phi}{\epsilon_0}$

$\therefore E = \frac{1}{4\pi\epsilon_0}\frac{2\Phi}{rL} = (9\times10^9)\left(\frac{2\times20}{20\times10^{-3}}\right)(1\times10^{-3})$

$= 1.8\times10^{10}\ N/C$

$$V_B = k\frac{q}{r_B} = (9\times10^9)\ \frac{(8\times10^{-9})}{2} = 36\ V \quad (8)$$

$$V_A = k\frac{q}{r_A} = (9\times10^9)\ \frac{(8\times10^{-9})}{8} = 9\ V$$

$$V_B - V_A = 36 - 9 = 27\ V$$

$$U = k\left(\frac{q_1 q_2}{r_{12}} + \frac{q_1 q_3}{r_{13}} + \frac{q_2 q_3}{r_{23}}\right) \quad (9)$$

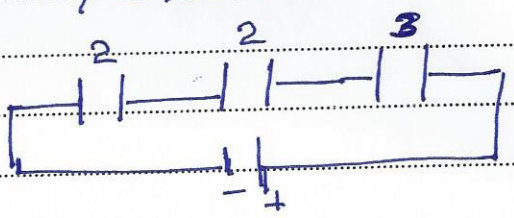
$$= 9\times10^9 \times 10^{-12}\left(\frac{1\times2}{1} + \frac{1\times3}{3} + \frac{2\times3}{2}\right)$$

$$= 9\times10^{-3}(2+1+3) = (9\times10^{-3})(6)$$

$$= 54\times10^{-3}\ J$$

$$\frac{1}{C_1} = \frac{1}{2} + \frac{1}{2} = \frac{2}{2} = 1 \quad \therefore C_1 = 1\ \mu F \quad (10)$$

$$C_2 = 1+1+1 = 3\ \mu F$$



$$\frac{1}{C_{eq}} = \frac{1}{2} + \frac{1}{2} + \frac{1}{3} = \frac{3+3+2}{6} = \frac{8}{6}$$

$$C_{eq} = \frac{6}{8} = \frac{3}{4}\ \mu F$$

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

$$V = \frac{Q}{C} = (3\times10^{-6})\left(\frac{4}{3}\right)\times10^6 = 4\ Volt$$