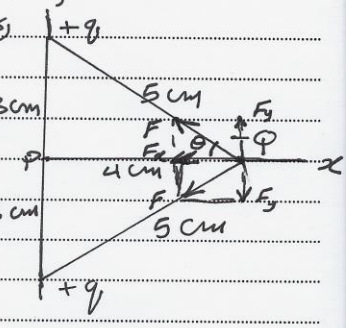
بسم الله الرحمن الرحيم

حل اختبار الوحدة ١٠٤ فيزياء ١٤٢٨/٨/١٥ هـ

لا يكتب في هذا الهامش



① $F = k\frac{|q||Q|}{r^2} = \frac{(9\times10^9)(5\times10^{-6})(30\times10^{-6})}{(5\times10^{-2})^2}$

$= 540\ N$

$F_x = -2F\cos\theta$

$= -(2)(540)\left(\frac{4}{5}\right)$

$= -864\ N$

② $F_y = 0$

③ $\theta = 180°$

في اتجاه محور x السالب

④ $U = k\left(\frac{q_1q_2}{r_{12}} + \frac{q_1q_3}{r_{13}} + \frac{q_2q_3}{r_{23}}\right)$

$q_1 = q_2 = 5\times10^{-6}$ C

$q_3 = -Q = -30\times$

$= 9\times10^9\left(\frac{(5\times10^{-6})^2}{6\times10^{-2}} + \frac{(5\times10^{-6})(-30\times10^{-6})}{5\times10^{-2}} + \frac{(5\times10^{-6})(-30\times10^{-6}}{5\times10^{-2}}\right.$

$= 0.9\left(\frac{25}{6} - 30 - 30\right) = (0.9)(4.16 - 60)$

$= -50.25\ J$

$\simeq -50\ J$

⑤ $E_p = k\frac{|-Q|}{r^2} = \frac{(9\times10^9)(30\times10^{-6})}{(4\times10^{-2})^2} = 16.875\times10^7$

$= 168.75\times10^6\ N/C$

$\simeq 169\times10^6\ N/C$

$= 169\ MN/C$ to the right

⑥ $\Delta V = k\sum\frac{q_i}{r_i} = 9\times10^9\left[\frac{5\times10^{-6}}{3\times10^{-2}} + \frac{5\times10^{-6}}{3\times10^{-2}} - \frac{30\times10^{-6}}{4\times10^{-2}}\right.$

$= 9\times10^5\left(\frac{5}{3} + \frac{5}{3} - \frac{30}{4}\right) = 9\times10^5\left(\frac{10}{3} - 7.5\right)$

$= -37.5\times10^5\ Volt = -3.75\times10^6\ V$

$= -3.75\ MV$

$\simeq -3.8\ MV$

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(7) $\Delta V = \frac{W}{q} \quad \therefore W = q\,\Delta V$

$W = (1.6\times10^{-19})(15) = 2.4\times10^{-18}\ J$

(8) $\Phi = \frac{q_{in}}{\varepsilon_0} = \frac{\rho V_{ol}}{\varepsilon_0} = \frac{(40\times10^{-9})(8\times10^{-2})^3}{8.85\times10^{-12}}$

$= 2.3 \ \frac{N\cdot m^2}{C}$

(9) $E_{in} = \text{zero}$ $\quad$ إذن $q_{in} = 0$

(10) $E = 9\times10^6\ N/C$

$r = 18\ mm$

$E = \frac{2k\lambda}{r} \quad \therefore \lambda = \frac{Er}{2k}$

$\lambda = \frac{(9\times10^6)(18\times10^{-3})}{(2)(9\times10^9)} = 9\times10^{-6}\ C/m$

$= 9\ \mu C/m$

(11) $\Phi_2 = \Phi_1$

(12) $E = k\frac{Qr}{a^3}$

(13) $U = \frac{1}{2}\frac{Q^2}{C}, \quad U' = \frac{1}{2}\frac{Q^2}{C'}$

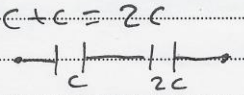
$\frac{U}{U'} = \left(\frac{1}{2}\frac{Q^2}{C}\right)\left(\frac{2C'}{Q^2}\right) = \frac{C'}{C} = \left(\frac{\varepsilon_0 A}{0.5d}\right)\left(\frac{d}{\varepsilon_0 A}\right)$

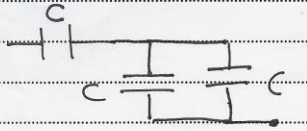
$\frac{U}{U'} = \frac{1}{0.5} = 2$

$U' = \frac{U}{2}$ Reduced to half

(14) $\frac{1}{C_1} = \frac{1}{2C} + \frac{1}{2C} = \frac{2}{2C} \quad \therefore C_1 = C$

$C_2 = C + C = 2C$





$\frac{1}{C_{eq}} = \frac{1}{C} + \frac{1}{2C} = \frac{3}{2C} \quad \therefore C_{eq} = \frac{2}{3}C$

لا يكتب في هذا الهامش

(14) $C_{eq} = \left(\frac{2}{3}\right)(24) = 16\,\mu F$

(15) $C_0 = \epsilon_0 \frac{A}{d} = \frac{(8.85\times10^{-12})(0.8\times10^{-4})}{35.4\times10^{-6}} = 2\times10^{-11}\,F$
$= 20\times10^{-12}\,F$

ثابت العزل $K = \frac{C}{C_0} = \frac{80\times10^{-12}}{20\times10^{-12}} = 4$

(16) $I = nevA$, $v = \frac{I}{neA}$
إذا تضاعف التيار ، فإن السرعة الدفقية تتضاعف Doubled

(17) $I = \frac{\Delta q}{\Delta t} = \frac{(5\times10^{21})(1.6\times10^{-19})}{10\times60} = 1.33$ Amp

$\Delta V = IR = (1.33)(30) = 40$ Volt

(18) $\Sigma\mathcal{E} = \Sigma RI$ $\quad \mathcal{E}_1 - 12 = (8)(0.5) + (10)(0.5)$

$\mathcal{E}_1 = 12 + 4 + 5 = 21$ Volt

(19) $\alpha = \frac{1}{R_0}\frac{\Delta R}{\Delta T}$ $\quad \therefore \frac{\Delta R}{R_0} = \alpha\,\Delta T$

$\frac{\Delta R}{R_0} = (5\times10^{-3})(60-20) = (5\times10^{-3})(40) = 200\times10^{-3}$

$\frac{\Delta R}{R_0} = 0.2$

(20) $J = \sigma E = \frac{E}{\rho}$
تشابه كثافة التيار J في مادة عكسية مع المقاومة وهي النوعية Resistivity

(21) $qvB = \frac{mv^2}{r} = m\omega$ $\quad \therefore \omega = \frac{qB}{m}$

$\omega = \frac{(1.6\times10^{-19})(6)}{9.11\times10^{-31}} = 1\times10^{12} = 10^{12}$ rad/s

(22) $v = \frac{E}{B}$ $\quad \therefore B = \frac{E}{v} = \frac{81\times10^{3}}{0.6\times10^{6}} = 0.135$

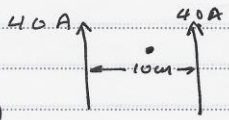
$B = 135$ mT

(23) $F = BIl$ $\quad \therefore l = \frac{F}{BI} = \frac{9\times10^{-3}}{(4)(3\times10^{-3})} = 0.75$ m

$l = 75$ cm

(24) $\oint \vec{B}\cdot d\vec{l} = \mu_0 I$

(25) Zero



(26) $L = \frac{N\Phi_B}{I} = \frac{NBA}{I} = \frac{N}{I}\left(\mu_0 \frac{N}{\ell} I A\right)$

$= \frac{\mu_0 N^2}{\ell} A$

self - Inductance (L) يقصد على البتا ,

(27) $\frac{N}{\ell} = 5000$, $I = 25A$

~~$B = \frac{\mu_0 N I}{\ell}$~~ $B = \mu_0 \frac{N}{\ell} I$

$B = (4\pi \times 10^{-7})(5000)(25) = 0.157\ T$

$= 0.157 \times 1000 = 157\ mT$

(28) $U = \frac{1}{2} L I^2 = (\frac{1}{2})(8 \times 10^{-6})(25)^2 = 0.0025\ J$

$= 0.0025 \times 1000 = 2.5\ mJ$

(29) $v(t) = 220 \sin(754t)$

$V_{max} = 220$ Volt

$I_{max} = \frac{V_{max}}{R} = \frac{220}{5} = 44\ A$

(30) $\omega = 754 = 2\pi f$ $\therefore f = \frac{754}{2\pi} = 120\ Hz$

(31) $V_{rms} = \frac{V_{max}}{\sqrt{2}} = (220)(0.707) = 155.5\ V$

(32) $P_{av} = \frac{1}{2} I_{rms}^2 R = (\frac{1}{2})(44)^2(5) = 4840$ Watt

$= \frac{4840}{1000}\ kW = 4.84\ kW$

$\simeq 4.8\ kW$