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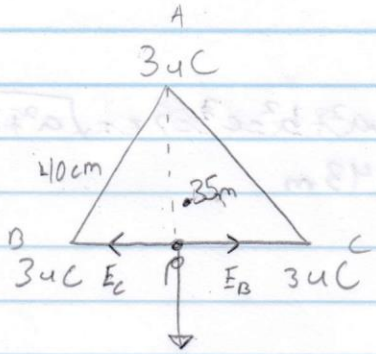
1)



$BP = 20cm = .2m$ $\quad k = 9\times10^9 N\cdot m^2/C^2$

$AP = .4m\sin60° = .346m$

$E_B = \frac{Kq}{r^2} = \frac{(9\times10^9 Nm^2/C^2)(3uC)}{(.2)^2_m} = 6.7\times10^{11}\frac{N}{C}$

$E_A = E_{net}$ $\quad E_C = 6.7\times10^{11} N/C$ $\quad E_B \to E_C$ cancel out

$\therefore E_A = E_{net}$

$$E_A = \frac{Kq}{r^2} = \frac{(9\times10^9 \frac{Nm^2}{C^2})(3uC)}{(.346m)^2} = 2.25\times10^{11}\frac{Nu}{C}$$

$$E_{net} = E_A = 2.25\times10^{11}\frac{Nu}{C} \downarrow$$

2) a) $V_1 = 3\times10^8 m/s\ (.01) = 3\times10^6 m/s$ $\quad V_0 = 0\ m/s$ $\quad x = 2mm = .002m$

$V^2 = V_0^2 + 2a\Delta x$ $\quad a = \frac{V^2 - V_0^2}{2\Delta x} = \frac{3\times10^6 m/s}{2(.002m)} = 2.25\times10^{15} m/s^2$

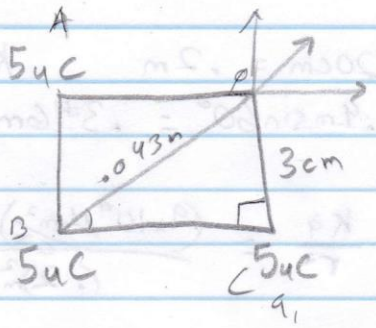
$F = qE \Rightarrow m_e a = qE$

$$E = \frac{m_e a}{q} = \frac{(9.11\times10^{-31} kg)(2.25\times10^{15} m/s^2)}{1.6\times10^{-19} C} = 1.28\times10^4 \frac{kg\ m}{Cs^2}$$

b) $V^2 = V_0^2 + 2a\Delta x \Rightarrow V = \sqrt{(0)^2 + 2(2.25\times10^{15} m/s^2)(.004m)}$

$x = 4mm = .004m$ $\quad = 4.24\times10^6 m/s$

3)



$BP = a^2+b^2=c^2 \Rightarrow c=\sqrt{a^2+b^2} = \sqrt{.03^2+.03^2}$

$= .043\,m$

$$V_{AP} = \frac{K q_{AP}}{r_{AP}} = \frac{9\times10^9 \frac{Nm}{C^2}\cdot 5\mu C}{.03m} = 1.5\times10^{12}$$

$V_{CP} = V_{AP}$ $\qquad V_{BP} = \frac{(9\times10^9 \frac{Nm}{C^2})\cdot 5\mu C}{.043m} = 1.04\times10^{12}\frac{Nm}{C}$

$$V = 2(V_{AP}) + V_{BP} = 2(1.5\times10^{12}) + 1.04\times10^{12} = \underline{4.04\times10^{12}\frac{Nm}{C}}$$

4) $Q = 3\times10^{-6}C$ $\qquad U = 2\times10^{-6}J$ $\qquad U_1 = 8\times10^{-6}J$

$$U = \frac{q^2}{2C} \Rightarrow C = \frac{Q^2}{2U} = \frac{(3\times10^{-6}C)^2}{2(2\times10^{-6}J)} = 2.25\times10^{-6}$$

$$U = \frac{Q^2}{2C} \Rightarrow Q = \sqrt{2CU}$$

$$Q = \sqrt{2(2.25\times10^{-6})(8\times10^{-6}J)} = 6\times10^{-6}C \rightarrow 6 \text{ microcoulombs}$$

5) $R_1 = ?$ $R_2 = ?$

$R_{eq} = R_1 + R_2 \Rightarrow 690\Omega = R_1 + R \Rightarrow R_1 = 690\Omega - R_2$

$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} \Rightarrow \frac{1}{150\Omega} = \frac{R_1 + R_2}{R_1 R_2}$

$\Rightarrow R_1 + R_2 = \frac{R_1 R_2}{150\Omega}$

$690\Omega - R_2 + R_2 = \frac{(690 - R_2) R_2}{150\Omega}$

$640\Omega = \frac{690\Omega R_2 - R_2^2}{150\Omega} \Rightarrow 103,500\ \Omega = 690 R_2 - R_2^2$

$\Rightarrow R_2^2 - 690 R_2 + 103,500\ \Omega = 0$

$R_2 = \frac{-(-690) \pm \sqrt{(690)^2 - 4(1)(103,500}}{2(1)}$

$\therefore 220.4\Omega + R_1 = 690\Omega$
$R_1 = 469.6\Omega$

$= 469.59\Omega, 220.4\Omega \quad R_2 = 220.4\Omega$

6) $I = .65A \rightarrow R_1 = 25\Omega$
$I_1 = .45A \rightarrow R_2 = 55\Omega$

$V_1 = .65A(25\Omega + r) \qquad V_2 = .45A(55\Omega + r)$

$V_1 = V_2 \Rightarrow .65A(25\Omega + r) = .45A(55\Omega + r)$
$16.25 + .65r = 27 + .45r$
$.20r = 9.75 \Rightarrow r = \frac{9.75}{.20} = \underline{48.75\ \Omega}$

$V = .65A(25\Omega + 48.75\Omega) = \underline{48 \text{ volts}}$