Mid term

Scaling problem: a) E field $E_c = 2.00 \times 10^{-3}$ V/ distance of 1mm value of E c at 5mm

$$2 \times 10^{-3} = \frac{1}{4\pi \epsilon_0} \frac{2\lambda}{z} \hat{k}$$

$\frac{17.5}{20}$

Nice work

$$2 \times 10^{-3} = \frac{1}{4\pi \epsilon_0} \frac{q}{(1 \times 10^{-3})^2}$$

$$2 \times 10^{-3} \times 1 \times 10 \times^{-6} = \frac{q}{4\pi \epsilon_0}$$

$$\frac{1}{4\pi \epsilon_0} \frac{q}{(5 \times 10^{-3})^2}$$

$-\frac{1}{2}$

$$2 \times 10^{-3} \times 10^{-6} \cdot \frac{1}{25 \times 10^{-6}}$$

8

$$E = 0.05 \times 10^{-3} \Rightarrow \boxed{5 \times 10^{-5}\ V/C}$$

B) 1 μC $E_c = 8.00 \times 10^{-3}$ V/m E c at same d if c

$E = 1/4\pi\epsilon_0 \frac{q}{r^2}$ $q = 1$ μc $E = 8 \times 10^{-3}$ V/C

$$8 \times 10^{-3} = \frac{1}{4\pi\epsilon_0} \frac{1 \times 10^{-6}}{r}$$

$$8 \times 10^{3} = \frac{3 \times 10^{-6}}{4\pi\epsilon_0 r^2}$$

$$E = 8 \times 10^{3} \times 3 \times 10^{-6}$$

$$\boxed{E = 24 \times 10^{-3}\ N/C}$$

✓

2) $m = 4\times10^{-16}$ kg $E = 6131.25$ N/C

a) $E^- = 9.1\times10^{-31}$ kg (−1) excess e^-;

$\frac{4\times10^{-16}}{9.1\times10^{-31}} = \boxed{4.3956\times10^{14}}$ → assumes all e^-

b) $q = Ne = 4.3956\times10^{14}$

$a = qE/m$ $-\frac{1}{2}$ gravity?

$$\frac{7.03296\times10^{-5}\times6131.25}{4\times10^{-16}}$$

$a = 1.078\times10^{15}$ m/sec²

13 a) $\Delta V = 4$kV $H^+ = qe$ $He + 2qe$

$KE = qV$

$1/2\, mv^2 = qV$

K.E Hydrogen $= 1.6\times10^{-19}\times4\times10^{3} = 6.4\times10^{-16}$ J ✓

K.E Helium $= 2\times1.6\times10^{-19}\times4\times10^{3} = 12.8\times10^{-16}$ J

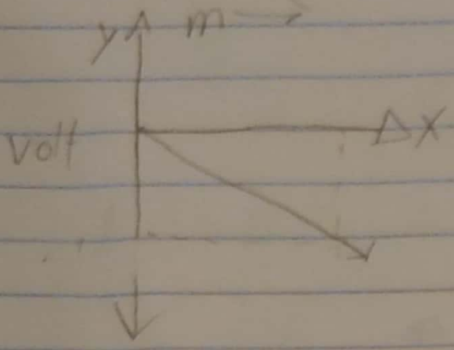
b) $E = \frac{\Delta V}{\Delta X}$ $\Delta x = 5$ cm ✓

$\frac{4\times10^{3}}{5\times10^{-2}} = 8\times10^{4}$ V/m

Scanned with CamSca

$E = 1000\ V/m$

2)



slope = -1000 V/m

$\frac{2\times10^{-3}}{-2}$ -1000

3) a) $C = \frac{\varepsilon_0 A}{d} = \frac{8.85\times10^{-12}\times10^{-4}}{2\times10^{-3}} = 4.425\times10^{-13}$

b) $E = 1/2 CV^2 = 1/2 \times 4.425\times10^{-13}\times 25$

$\boxed{= 55.31\times10^{-13}\ J}$

4) parralelle because capacitance adds up in parallelle capacitance

1) a) $-E_2 + I_2 + I_1 - E_1 + IR_3 \quad E_1 + E_2 + C_3 + \ldots = 0$

$-1.5 + I(R_1 + R_2 + R_3) - 1.5 = 0$

$I = \frac{3V}{R_1 + R_2 + R_3} = \frac{3}{2+2+50} = \frac{3}{54} = 55.56$ ~~micro~~ milli Amp

b) $P_{total} = P_1 + P_2 + P_R$

$(55.56mA)^2 \times 2 + (55.56mA)^2 \, 2 + (5.556mA)^2 \times 50$

$6.17mW + 6.17mW + 154.34mW$

$= 777.58m$ Watts $-\frac{1}{2}$ units led to error

?

$\boxed{P_R = 154.34m \text{ Watts}}$

$$\frac{V_x - 1.5}{2} + \frac{V_x \, 1.5}{2} + \frac{V_x}{50} = 0$$

$$\frac{25V_x - 37.5 + 25V_x - 37.5 + V_x = 0}{50}$$

$51V_x - 75$

$\boxed{V_x = 1.47 \text{ Volts}}$

$I_1 = \frac{1.5 \; 1.47}{2 \times}$

$I_2 = \frac{1.5 - 1.47}{2} = 15m$ Amp

$I = I_1 + I_2 = \boxed{30 \text{ mA}}$ ✓

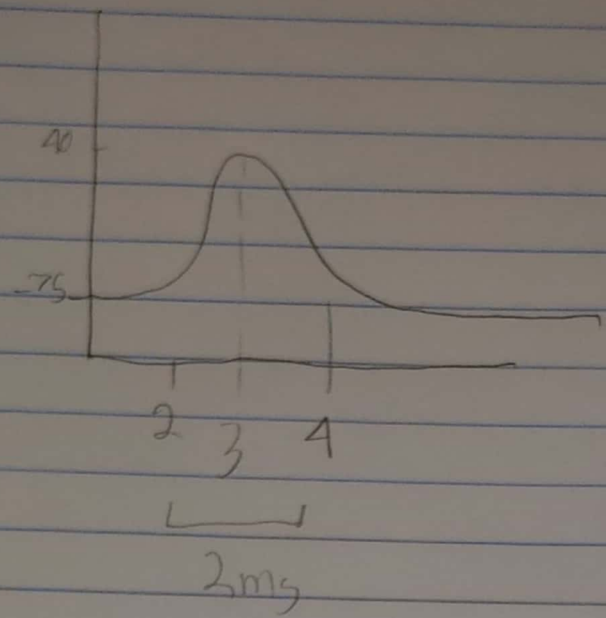
$P_{total} = P_{x_1} + P_{x_2} + P_R$

$I_1^2 \, P_{x_1} + I_2^2 x_2 + I^2 R$

$(15)^2 \, 2 + (15m)^2 \times 2 + (30m)^2 \times 50 = \boxed{45.9mW} = P_R$ ✓

2) a) 2

pulse width is 2ms



b) peak to peak voltage in millivolts

$= 40 - (-75)$

$= 40 + 75$

V peak-peak

$\boxed{V_{peak-peak} = 115mV}$