Mid term COCO

Section 2

(1)

a. $\frac{2\times10^{-3}}{(1\times10^{-3})^2} = \frac{x}{1}$ $\quad x = Vq$

$x = 2\times10^{-9}$

$E_c = \frac{2\times10^{-9}}{(.006)^2}$

$\boxed{E_c = 8\times10^{-5}\ V/m}$

b. $8\times10^{-3} = \frac{(9\times10^9)(1\times10^{-6})}{d^2}$

$d = \sqrt{\frac{(1\times10^{-6})(9\times10^9)}{8\times10^{-3}}}$

$d = 1060$

$E_c = \frac{(3\times10^{-6})(9\times10^9)}{(1060.66)^2}$

$\boxed{E_c = 2.4\times10^{-2}\ V/m}$

(2) a. $F = ma$ $\quad m = 4\times10^{-16}\ kg$ $\quad a = 10\ m/s^2$

$F = 4\times10^{-15}\ N$

$F = qE$

$$\frac{4\times10^{-15}\ N}{6131.25} = \frac{q(6131.25\ N/C)}{6131.25\ N/C}$$

$q_{tot} = 6.5\times10^{-19} \rightarrow \frac{6.5\times10^{-19}}{1.6\times10^{-19}} = \boxed{4e}$

b)

$q = 6.5\times10^{-19} - 1.6\times10^{-19}$

$q = 4.9\times10^{-19}$

$F = qE$ $\quad F_{(g)} = 4\times10^{-15}$

$F = (4.9\times10^{-19})(6131.25)$

$F_E = 3\times10^{-15}$

4 $\quad a = \frac{f_g - f_e}{m}$ $\quad F_{net} = ma$ $\quad \frac{F_g - F_e}{m} = a$

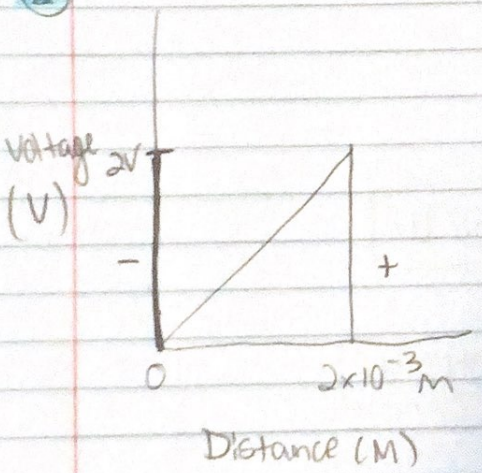
$a = \frac{4\times10^{-15} - 3\times10^{-15}}{4\times10^{-16}}$ $\quad \boxed{a = 2.5\ m/s^2}$

Section 3

① a) $\Delta E = qV$

$1.6\times10^{-19}\left((4\times10^{+3})+(4\times10^{3}\cdot2)\right) = \boxed{12000\,eV}$

b) $E = \frac{+\Delta V}{\Delta x}$ $\quad E = \frac{4000V}{.05} = \boxed{8\times10^{4}\,\frac{V}{m}}$

② 

$V - Int = 0$

③ a) $C = \frac{\varepsilon_0 A}{d}$ $\quad 1\,cm^2 \rightarrow 1\times10^{-4}\,m$

$C = \frac{(18.85\times10^{-12})(1\times10^{-4})}{(2\times10^{-3})}$

$\boxed{C = 4.43\times10^{-13}\,F}$

b) $U = \frac{1}{2}CV^2$

$U = (4.43\times10^{-13})(25)(\frac{1}{2})$

$\boxed{= 5.5\times10^{-12}\,J}$

④ Parallel

Section 4

① a)

Series: $I = \frac{(emf_1 + emf_2)}{(r_1 + r_2 + R_{load})}$

$I = \frac{(1.5+1.5)}{2+2+50} = \boxed{.056\ A}$

Parallel: $r_{tot}^{-1} = \frac{1}{2} + \frac{1}{2} = 1$

$\frac{1.5}{1+50} = \boxed{.03A}$

b) $P = IV$

Series: $P = (.056)(3) = \boxed{.168\ W}$

Parallel: $P = (.03)(1.5) = \boxed{.045\ W}$

c) ✓

② a) $\boxed{2\ ms}$

b) $35 - (-75) = \boxed{105V}$