① a) $\frac{2\times10^{-3}}{117} = \frac{(9\times10^{9})q}{(10^{-3})^2}$

$q = \frac{2\times10^{-3}\times(10^{-3})^2}{9\times10^{9}}$

$q = 2.22\times10^{-19}$

$\frac{(9\times10^{9})(2.22\times10^{-19})}{(5\times10^{-3})^2} = 8\times10^{-5}\ \text{v/m}$

17.5/20 Nice job

(where is the circuit one?)

(I'll grade it if you submit)

@ 5mm

① b) $117^2 = \frac{(9\times10^{9})(1\times10^{-6})}{8\times10^{-3}} = 1{,}060.66\text{m}$

$\frac{(9\times10^{9})(3\times10^{-6})}{(1066.66)^2} = 24\times10^{-3}\ \text{v/m}$

(or you can just "scale")

a) $\times\frac{1}{25}$ b) $\times 3$

2) a $qE = mg$

$q = \frac{mg}{E} \rightarrow \frac{4 \times 10^{-16} \times 98}{613125}$

$= 6.39 \times 10^{-19}$

$n = \frac{6.39 \times 10^{-19}}{1.60 \times 10^{-19}} = 3.99 \approx$ 4 electrons ✓

1b)

2b) $(6.39 \times 10^{-19}) - (1.60 \times 10^{-19}) = 4.79 \times 10^{-19}$

since e⁻ is removed

$Fe = 2.93 \times 10^{-15} N$

$a = \frac{(3.92 \times 10^{-15}) - (2.93 \times 10^{-15})}{4.0 \times 10^{-16}} =$ 2.45 m/s² ✓

=

(3) Potential Energy & Voltage, Capacitors

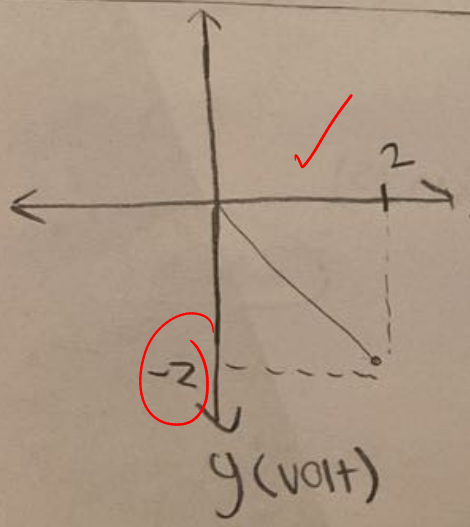
1a) $\Delta E = qV$

$H^+ = (1.6\times10^{-19})(4\times10^3) = 6.4\times10^{-16}$ J ✓

$He = (2\times10^{-19})(4\times10^3) = 12.8\times10^{-16}$ J ✓

1b) $\mathcal{E} = \frac{\Delta V}{\Delta x} = \frac{4\times10^3}{5\times10^{-2}} = 8\times10^4$ V/m ✓

2



$d = 2\times10^{-3}$ m ✓

slope = m = -1000 V/m

↑ mm?

-1/2

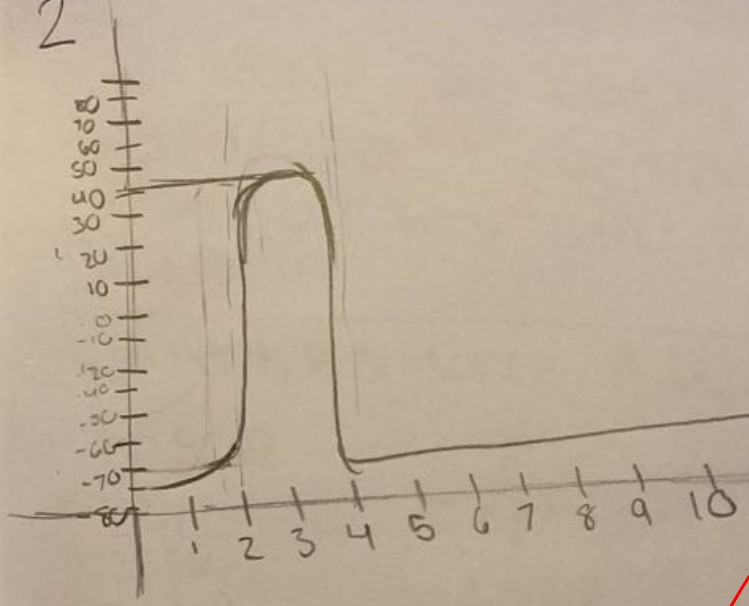
3a) $C = \frac{\varepsilon \cdot A}{d} = \frac{8.85\times10^{-12}\times10^{-4}}{2\times10^{-3}} = 4.42\times10^{-13}$ f ✓

3b) $\frac{1}{2}CV^2 = \frac{1}{2}\times4.42\times10^{-13}\times25$ ✓

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

current resistance & DC circuits

2



a) pulse width is 2ms ✓

b) 40 - (-75)
= 40 + 75
= 115mV ✓

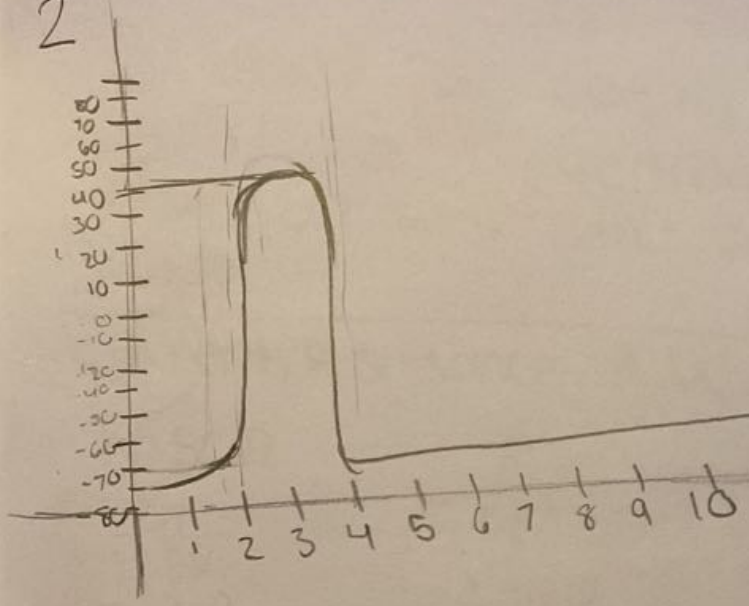
1a

1b

1c

Current resistance & DC circuits

2



a) pulse width is 2ms

b) 40 - (-75)
= 40 + 75
= 115mV

1a

1b

1c