18.5/20 Nice Work

1) 1 (A)

Electric field = E_C = 2.00×10^{-3} V/m

Distance = 1mm = 10^{-3} m

$E_C = \frac{Kq}{r^2}$

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

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

$q = 2.22 \times 10^{-19}$

E_C at M = 5mm = 5×10^{-3} m

$E_C = \frac{Kq}{r^2}$ $\frac{(9 \times 10^9)(2.22 \times 10^{-19})}{(5 \times 10^{-3})^2}$

$= 8 \times 10^{-5}$ V/m

A) E_C at 5mm is 8×10^{-5} V/m

B) $r^2 = \frac{Kq}{E_C}$, $r = \sqrt{\frac{Kq}{E_C}}$

$r \sqrt{\frac{9 \times 10^9 \times 1 \times 10^{-6}}{8 \times 10^{-5}}}$

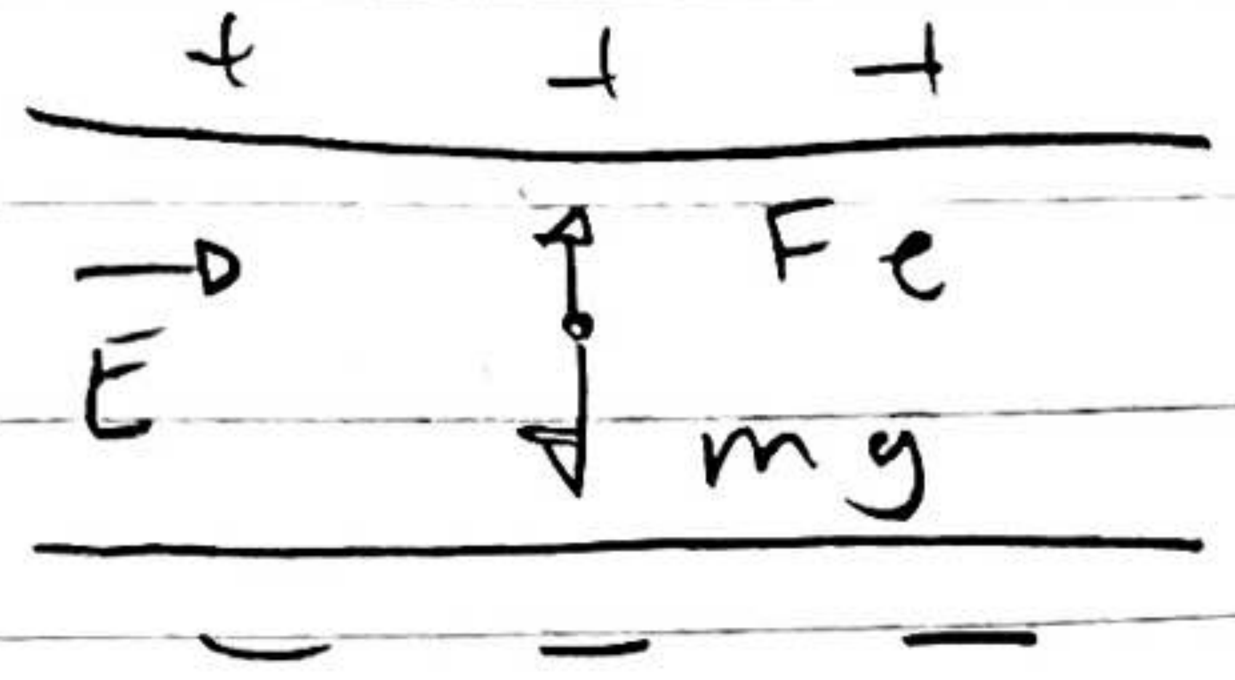
$= 1060.66$m

Charge.

$E_C = \frac{Kq}{r^2}$, $\frac{9 \times 10^9 \times 3 \times 10^{-6}}{(1066.66)^2}$

24×10^{-3} V/m

$E_C = 24 \times 10^{-3}$ V/m

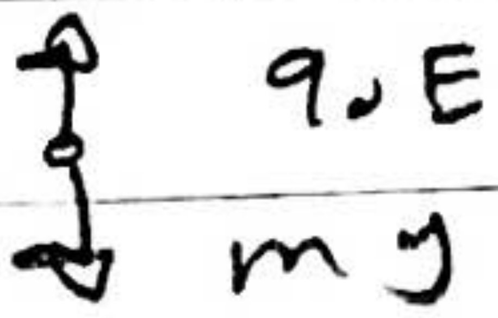
2) A) 

$qE = mg$

$q = \frac{mg}{e} = \frac{4 \times 10^{-16} \times 9.81}{61312 5}$

$q = 0,0064 \times 10^{-10}$

$= 6.4 \times 10^{-19}$ = $4\bar{e}$ $-\frac{1}{2}$

B) a 

$mg - q_o e = ma$

$a = \frac{mg - q_o E}{m}$

$a = \frac{(4 \times 10^{-16} \times 9.81) - (4.8 \times 10^{-19} \times 613125)}{4 \times 10^{-16}}$

$\frac{(39.24 \times 10^{-16}) - (29,43 \times 10^{+6})}{4 \times 10^{-16}}$

$a = 2,4525\ m/s^2$ ✓

Acc of droplet = $2.4525\ m/s^2$

3(1) $KE = qV$ Kehydrogens = $1.6 \times 10^{-19} \times 4 \times 10^{3} =$ $6.4 \times 10^{-16} j$

✓ $KEHE = 2 \cdot 10^{-19} \cdot 4 \cdot 10^{3} = 12.8 \cdot 10^{-16} j$

B) $E\ \frac{\Delta V}{\Delta x} = \frac{4 \times 10^3}{5 \times 10^{-2}} = 8 \cdot 10^{4} v/m$

3(a)

$E = 1 \text{ kv/m} \quad E = 1 \times 10^3 \text{ v/m}$

$d = 2mm = 2 \times 10^{-3} m$

$E = \frac{\Delta V}{x}$

$10^3 = \frac{\Delta V}{x}$

$\Delta V = 10^3 \cdot x$

voltage is negative and is 0.

$\Delta V = 10^3 x$

$V - 0 = 10^3 x$

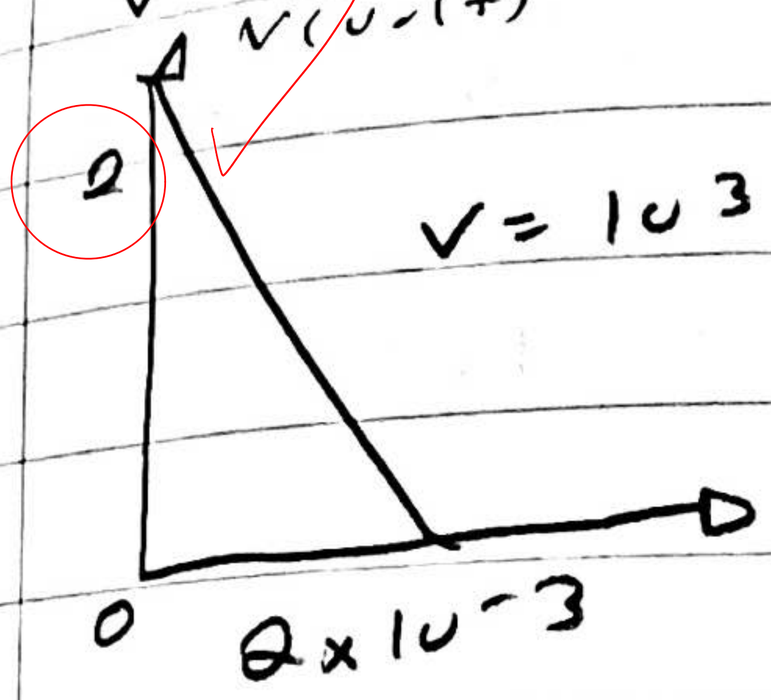
$V = 10^3 x$

Positive

$V = 10^3 \times 2 \times 10^{-3}$

$V = 2$ volt

Y intercept of function is zero as graph starts from origin



slope = $m = -1000 \text{ v/m}$

A) $C = \frac{\varepsilon_0 A}{d} = \frac{8.85 \times 10^{-12} \times 10^{-4}}{2 \times 10^{-3}}$

$= 4.425 \times 10^{-13} f$

B) energy $= \frac{1}{2} CV^2 = \frac{1}{2} \times 4.425 \times 10^{-3} \times 2$

$= 55.31 \times 10^{-13} J$

To obtain more capactiene the ideal connetion would be connecting the identical capacitors in parellel

Because Darrell capacitance gets add up in

$C_{net} = C_1 + C_2 = 2C$ 8 in series Cnet becomes C/2

4)

KVL

$-E_2 + IM2 + Ir_1 - E_1 + IR = 0$

$-1.5 + I(R + R_2 + R) - 1.5V = 0$

$I = \frac{3V}{R_1 + R_2 + R} = \frac{3}{2+2+50} = 3/54 = 55.56\,mA$

$P.C. = (55.56\,mA)^2 \times 2 + (55.56mA)^2 2 +$

$(55.56\,mA)^2 \times 50$ → here are mA

$= 6.17mw + 6.17mw + 154.34mw$

$= 777.51$ m watts ← the currents are being squared

$P_R = 154.34$ m watts

Parrell

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

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

$V_x = 1.47$ volts

$I_1 = \frac{1.5 - 1.47}{2R} = 15\,mamp$

$I_2 = 1.5 - 1.47 / 2 = 15\,mamp$

$I = I_1 + I_2 = 15mA + 15mA = 30\,mA$

T. P.C

$= (15m)^2 2 + (15m)^2 \times 2 + (30m)^2 \times 50$

$= 0.45mw + 0.45mw + 45mw$

$= 45.9\ mw$ ✓ Well done

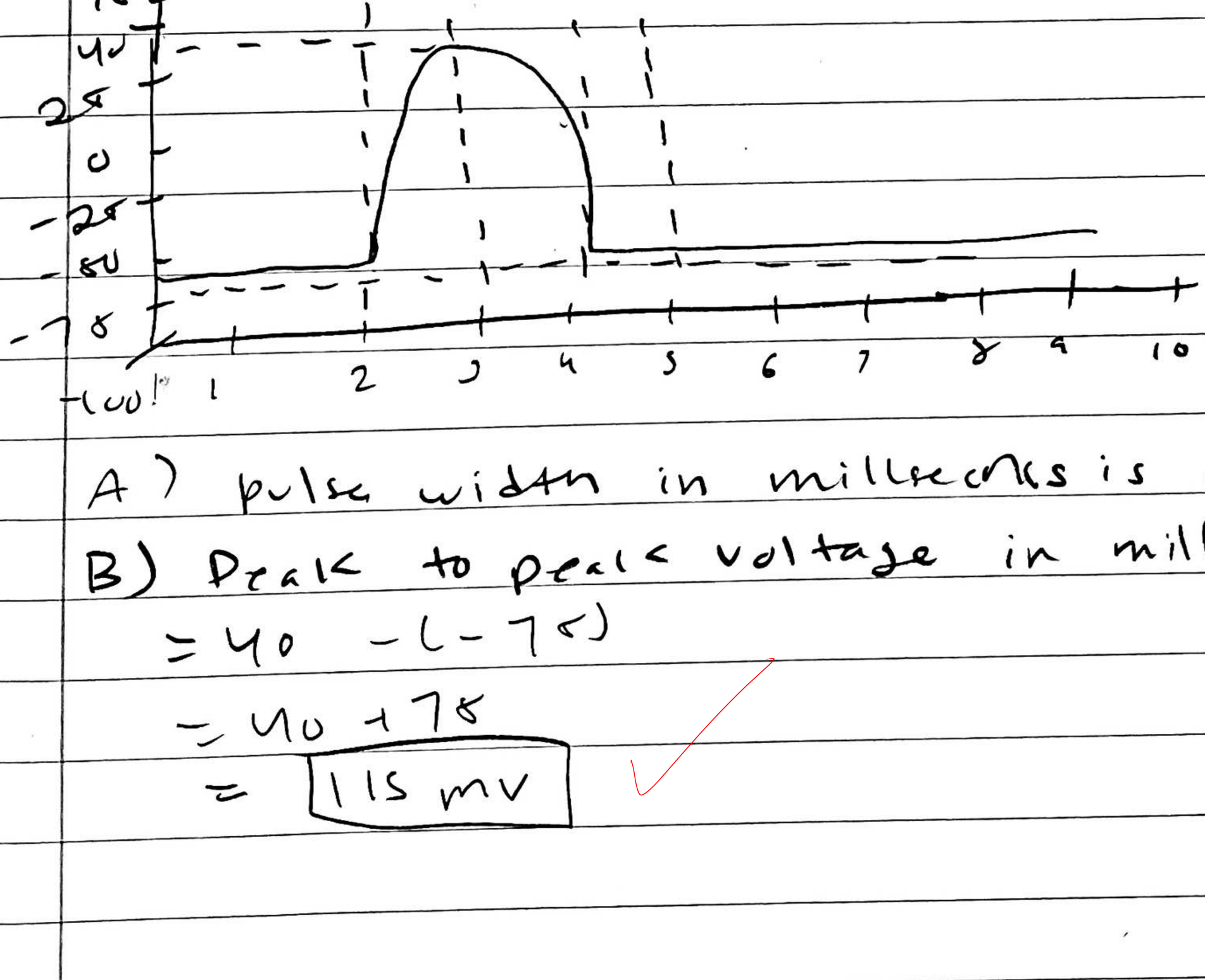
$P_R = I^2R$

$(30mi)^2 \times 50$

$45mw$ ✓

2) pulse width in milliseconds

potential hart versus time



A) pulse width in milliseconds is 2ms ✓

B) Peak to peak voltage in millivolts

$= 40 - (-75)$

$= 40 + 75$

$= \boxed{115\ mv}$ ✓