2

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 r = 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 in 8×10^{-3} V/m

B) $r^2 = \frac{kq}{E_c}$, $r = \sqrt{\frac{kq}{E_c}}$

$r \sqrt{\frac{9 \times 10^{9} \times 1 \times 10^{-6}}{8 \times 10^{-3}}}$

= 1060.66m

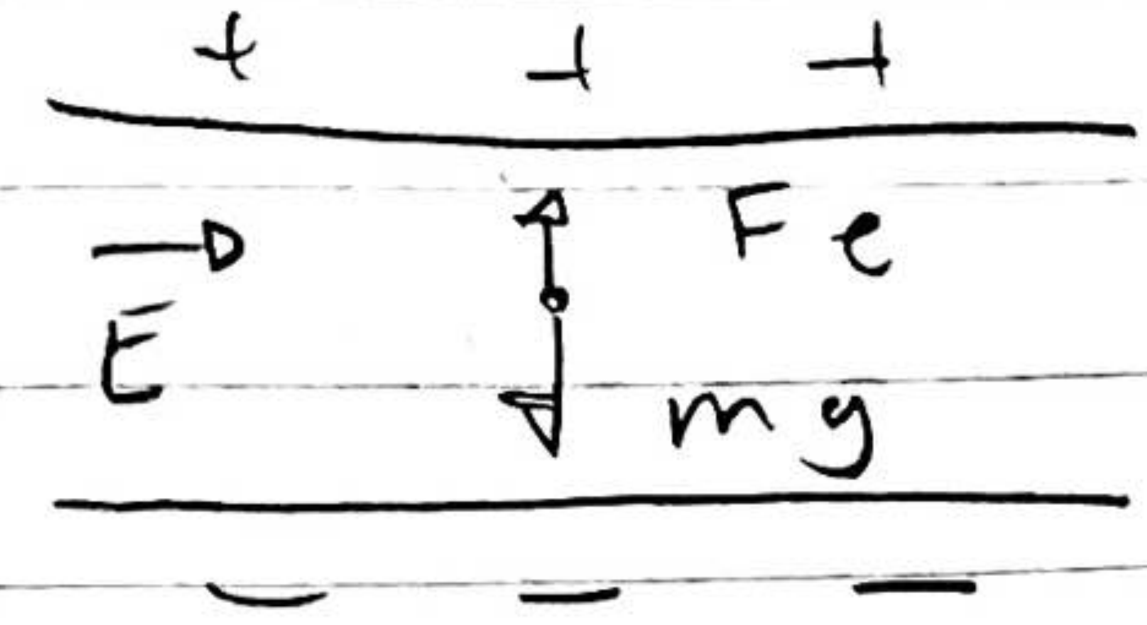
Charge.

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

24×10^{-3} V/m

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

2) A)



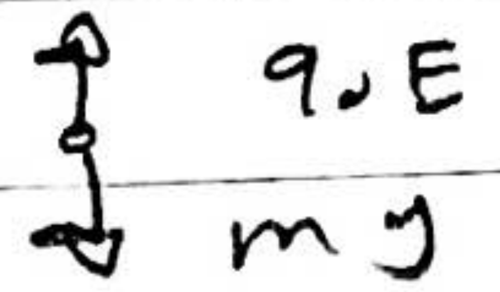
$qE = mg$

$q = \frac{mg}{e} = \frac{4 \times 10^{-16} \times 9.81}{613125}$

$q = 0.0064 \times 10^{-10}$

$= 6.4 \times 10^{-19}$.

B) a ↓



$mg - q_0 e = ma$

$a = \frac{mg - q_0 E}{m}$

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

$\frac{(39.24 \times 10^{-16}) - (29.43 \times 10^{+6})}{4 \times 10^{-16}}$

$a = 2.4525 \ m/s^2$

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

3(1) $KE = qV$ Kehydrogens =

$1.6 \times 10^{-19} \times 4 \times 10^{3} =$

$6.4 \times 10^{-16} j$

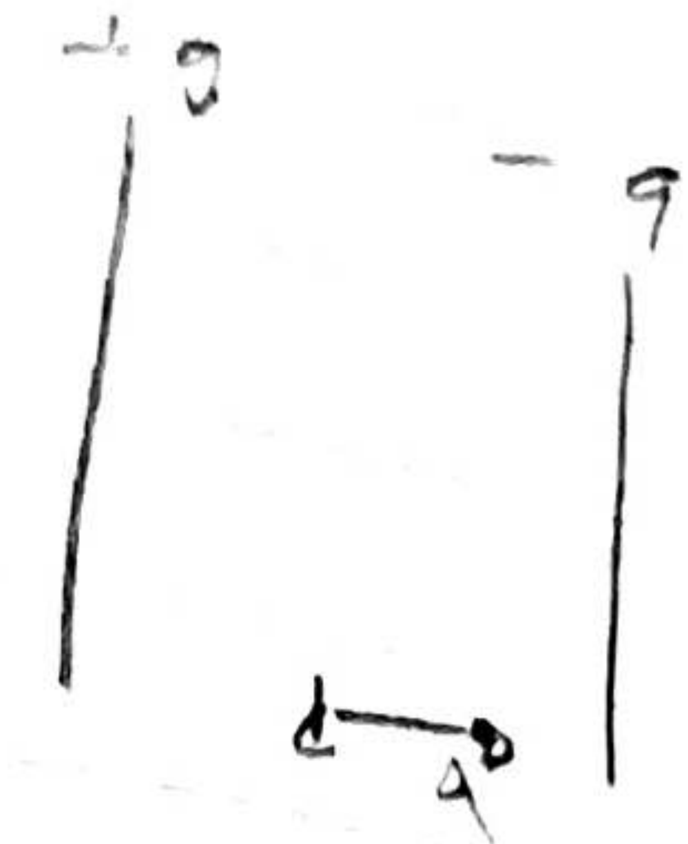
$KEHE = 2 \cdot 10^{-19} \cdot 4 \cdot 10^{3} = 12.8 \cdot 10^{-16} j$

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

3(2)

$E = 1$ kv/m $E = 1\times10^3$ v/m

$d = 2mm = 2\times10^{-3}m$



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

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

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

voltage is negative rate is 0.

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

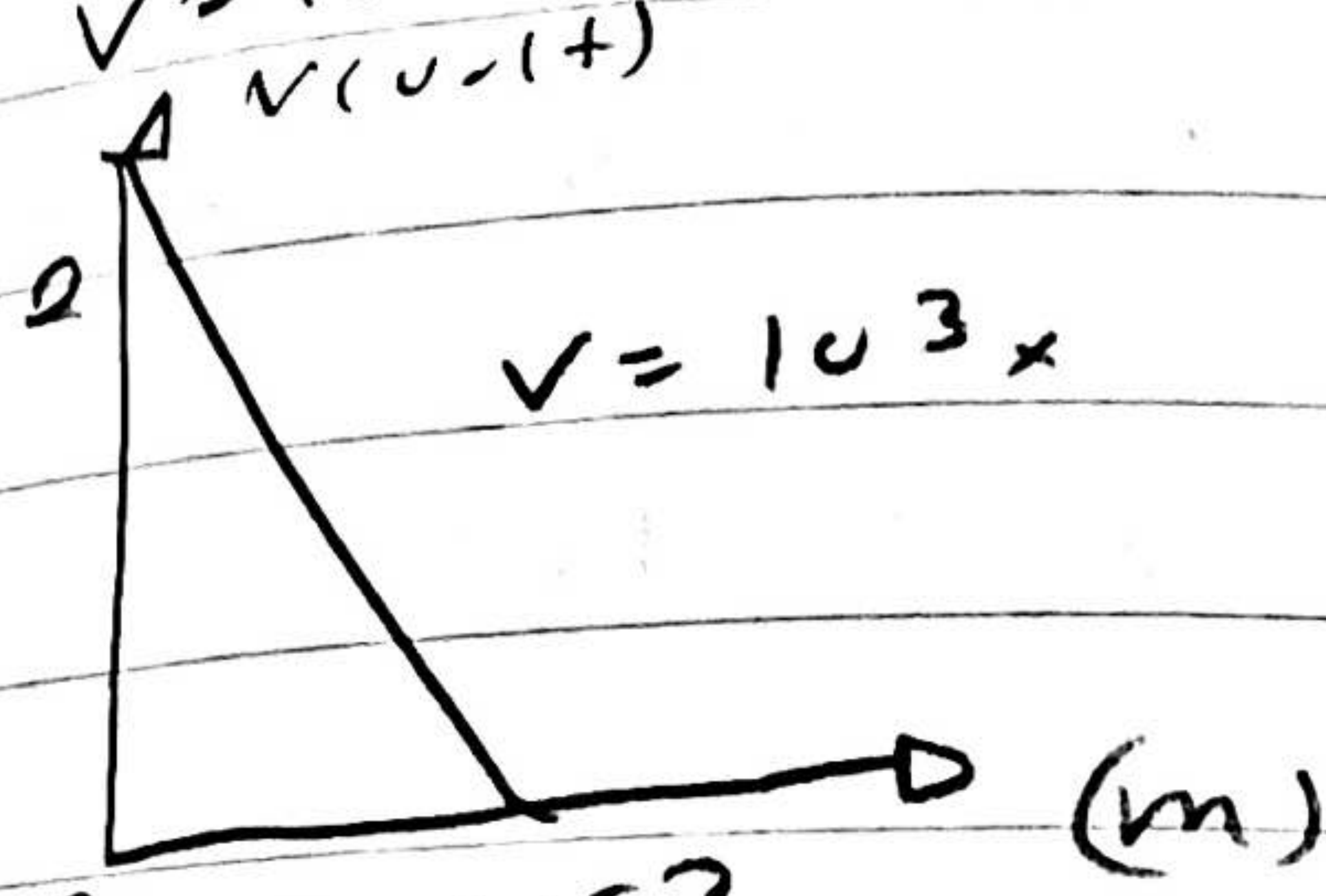
$V - 0 = 10^3 x$

Positive

$V = 10^3 \times 2\times10^{-3}$

$V = 10^3 x$

$V = 2$ volt



Y intercept of function is zero as graph starts from origin

slope = m = -1000 v/m

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

$= 4.425\times10^{-13}$ f

B) energy $= \frac{1}{2}CV^2 = \frac{1}{2}\times 4.425\times10^{-3}\times2$

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

To obtain more capactiance the ideal connection would be connecting the identical capacitors in parellel because capacitance gets add up in combination

Darrell

$C_{net} = C_1 + C_2 = 2c$ & in series C_{net} becomes $c/2$

4)

KVL

$-E_2 + Ir_2 + Ir_1 - E_1 + IR = 0$

$-1.5 + I(r_1 + r_2 + R) - 1.5V = 0$

$I = \frac{3V}{r_1 + r_2 + R} = \frac{3}{2+2+50} = 3/54 = 55.56\,mA$

$P.C. = (55.56\,mA)^2 \times 2 + (55.56\,mA)^2 2 + (55.56\,mA)^2 \times 50$

$= 6.17\,mW + 6.17\,mW\ \ 154.34\,mW$

$= 777.51$ m watts

$P_R = 154.34$ mwatts

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

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

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

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

T. P. C

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

$= 0.45mw + 0.45mw + 45mw$

$= 45.9 \, mw$

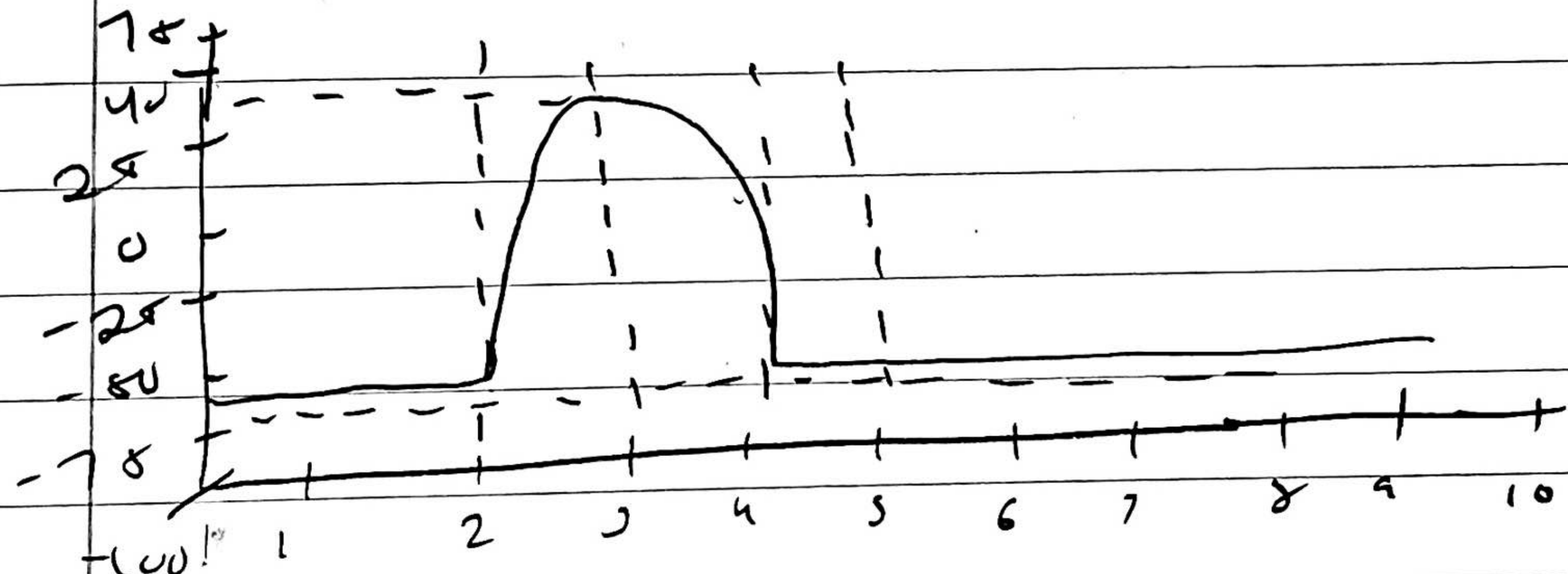
$P_R = I^2 R$

$(30m)^2 \times 50$

$45 mw$

2) pulse width in milliseconds

potential hast versus time



A) pulse width in millsecnds is 2ms

B) Peak to peak voltage in millivolts

$= 40 - (-75)$

$= 40 + 75$

$= \boxed{115 \, mv}$