2.) 1a) $E = \frac{1}{4\pi\varepsilon_0} \frac{q}{r^2}$ apply given

1×10^{-6} $2\times10^{-3} = \frac{1}{4\pi\varepsilon_0}\left(\frac{q}{1\times10^{-3\,2}}\right)$ 1×10^{-L}

$2\times10^{-9} = \frac{q}{4\pi\varepsilon_0}$

↳ 5mm

$2\times10^{-9}\left(\frac{q}{(5\times10^{-3})^2}\right)$

$2\times10^{-9}\left(\frac{1}{25\times10^{-6}}\right)$

$0.08\times10^{-3} = 8\times10^{-5}$

2.) 1b) $\frac{8.00\times10^{-3}}{1\times10^{6}} = \left(\frac{1}{4\pi\varepsilon_0}\frac{1\times10^{-6}}{r}\right)\frac{1}{1\times10^{-6}}$

$8\times10^{3} = \frac{1}{4\pi\varepsilon_0 r^2}$

↳

$8\times10^{3} \times 3\times10^{-6}$

24×10^{-3}

2)a) $qE_0 = mg$

$$E_0 = \frac{4 \times 10^{-16} \times 98}{6131.3}$$

$$= \frac{6.4 \times 10^{-19}}{1.6 \times 10^{-19}} \approx 4 \text{ electrons}$$

b) $(6.4 \times 10^{-19}) - (1.6 \times 10^{-19}) = 4.79 \times 10^{-19}$

$$\frac{(3.92 \times 10^{-15}) - (2.93 \times 10^{-15})}{4.0 \times 10^{-16}}$$

E 2.5

3)a) $KE = qV$

$KE_{hydrogen} = (1.6 \times 10^{-19}) \cdot (4 \cdot 10^3)$

6.4×10^{-16}

$KE_{helium} = (2 \times 10^{-19}) \cdot (4 \cdot 10^3) =$

$12.8 \cdot 10^{-16}$

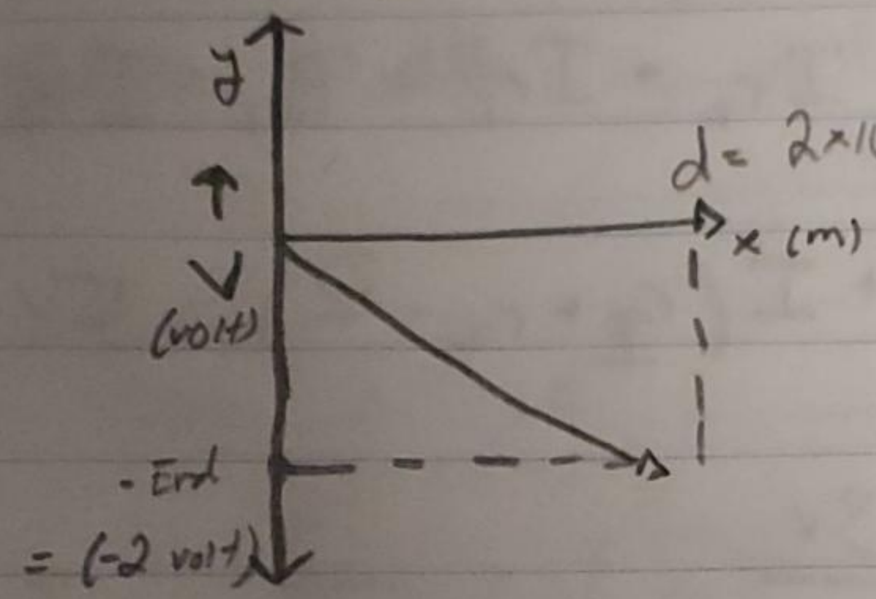
b) $\frac{\Delta V}{\Delta x} = \frac{4 \times 10^3}{5 \times 10^{-2}} = 8 \times 10^4 \text{ V/m}$

3)2a) $E = 1000$ v/m

as

$$E = \frac{-dv}{dx}$$

graph looks like



y-intercept = function is zero as graph start from

slope = -1000 v/m

3)3a) Capacitance $= \frac{E_0 H}{2} = \frac{8 \cdot (8.5 \times 10^{-12}) \times 10^{-11}}{2 \times 10^{-3}} = 4.425$

3b) Energy $= \frac{1}{2} C v^2 = \frac{1}{2} \times 4.425 \times 10^{-13} \times 25$

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

3.)1) We should connect the identical capciters in parrallel due to the addition of parallel combination

4.)1a) Applying Kirchhoff's

$$-\mathcal{E}_2 + Ir_2 + Ir_1 - E_1 + IR = 0$$

$$-1.5 + I(r_2 + r_2 + R) - 15V = 0$$

$$I = \frac{3v}{r_1 + r_2 + R} = \frac{3}{2+2+50} = \boxed{55.6\ mA}$$

4.)1b) $P_{total} = P_{r_1} + P_{r_2} + P_r$

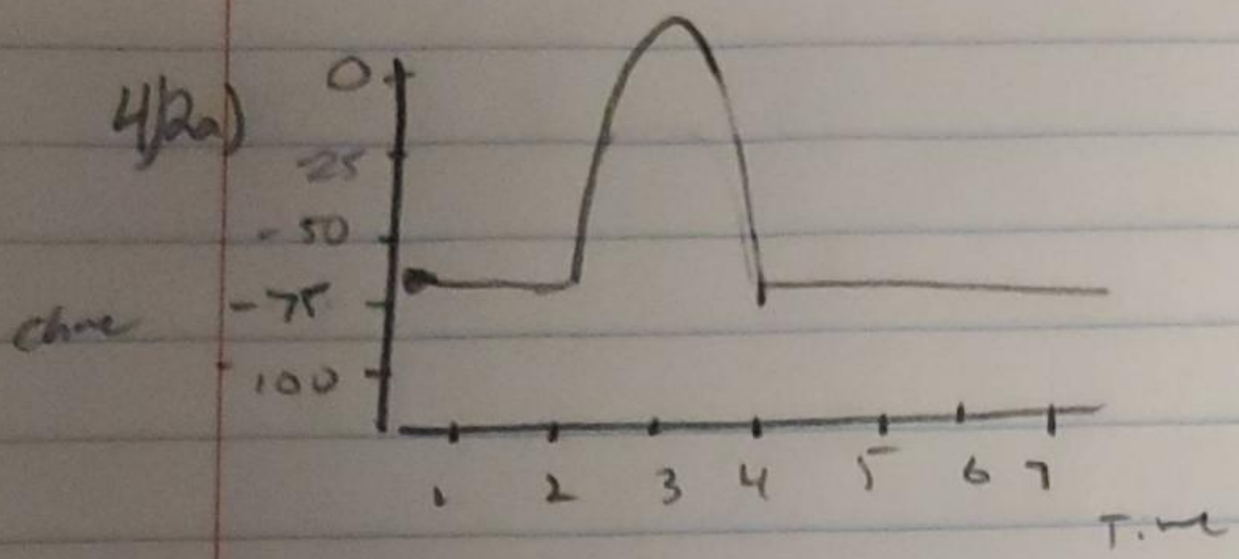
$$I^2 r_1 + I^2 r_2 \quad I^2 R$$

$$(55.6)^2(2) + (55.6)^2(2) + (55.6)^2(50)$$

$$6.17 + 6.17 + 154.34$$

$$\boxed{777.5\ W}$$

c)



a) pulse width in milliseconds in 2ms

4(2b) Peak voltage

$40 + (-75)$

$= 115$ mV