

17.5/20

2.) 1a)

$$E = \frac{1}{4\pi\epsilon_0} \frac{q}{r^2}$$

apply givens

good job

$$1 \times 10^{-6} \quad 2 \times 10^{-3} = \frac{1}{4\pi\epsilon_0} \left(\frac{q}{1 \times 10^{-3}^2} \right) \quad 1 \times 10^{-4}$$

$$2 \times 10^{-9} = \frac{q}{4\pi\epsilon_0}$$

↳ 5mm

$$2 \times 10^{-9} \left(\frac{q}{(5 \times 10^{-3})^2} \right)$$

$$2 \times 10^{-9} \left(\frac{1}{25 \times 10^{-6}} \right)$$

$$0.08 \times 10^{-3} = 8 \times 10^{-5}$$

2.) 1b)

$$\frac{8.00 \times 10^{-3}}{1 \times 10^{-6}} = \left(\frac{1}{4\pi\epsilon_0} \frac{1 \times 10^{-6}}{r} \right) \frac{1}{1 \times 10^{-6}}$$

$$8 \times 10^3 = \frac{1}{4\pi\epsilon_0 r}$$

just scale
by 3

↳

$$8 \times 10^3 \times 3 \times 10^{-6}$$

$$24 \times 10^{-3}$$

$$-1/2$$

$$2/a) \quad q_{\text{Co}} = m_{\text{Co}} \cdot g$$

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

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

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

$$\rightarrow \frac{(3.912 \times 10^{-15}) - (2.93 \times 10^{-15})}{4.0 \times 10^{-16}} = 2.5 \text{ m/s}^2$$

3/a)

$$KE = qV$$

$$KE_{\text{hydrogen}} = (1.6 \times 10^{-19}) \cdot (4 \cdot 10^3) = 6.4 \times 10^{-16}$$

$$KE_{\text{helium}} = (2 \times 10^{-19}) \cdot (4 \cdot 10^3) = 12.8 \times 10^{-16}$$

eV are easier units though

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

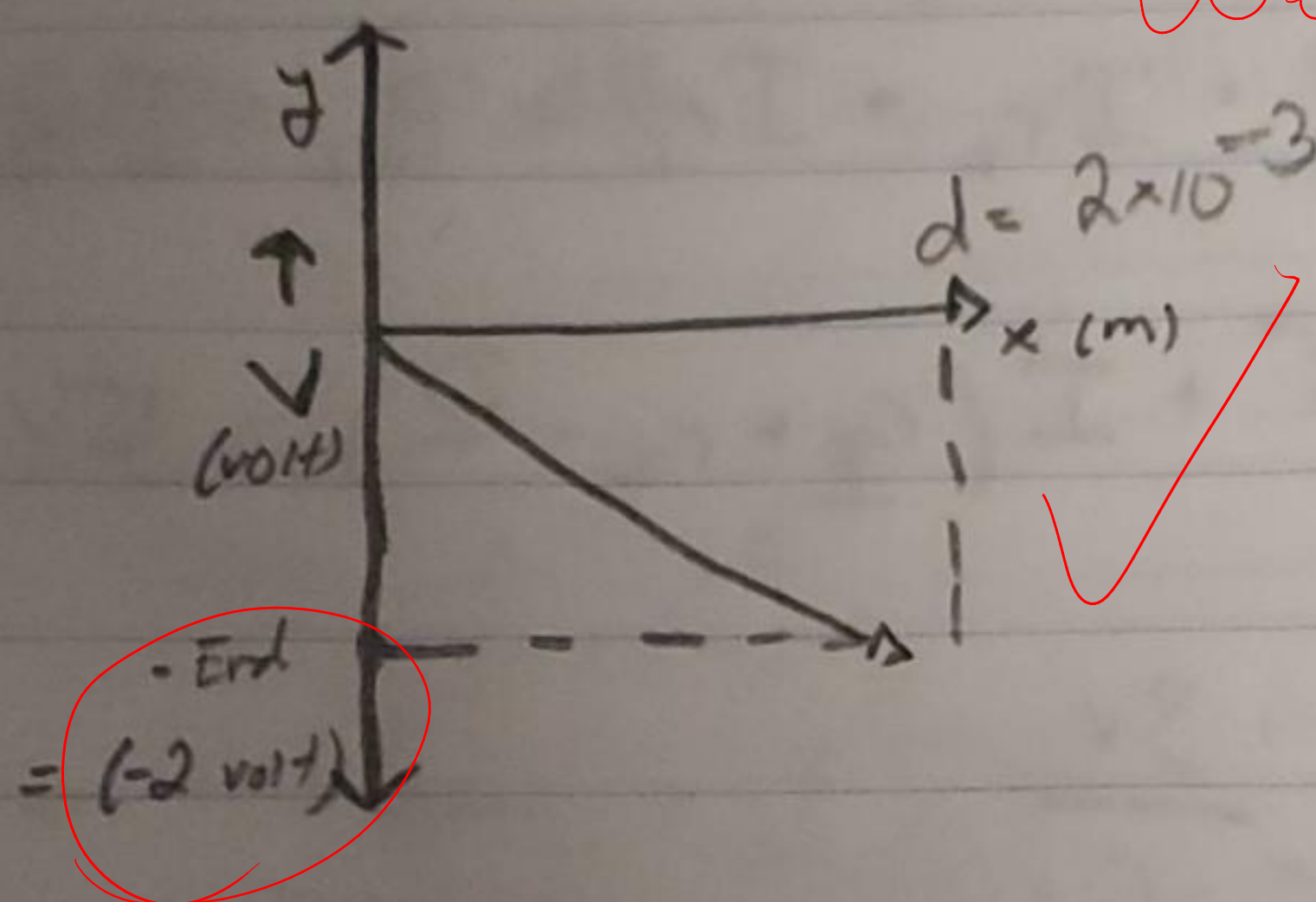
3)2a) $E = 1000 \text{ V/m}$

as

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

graph looks like

well done



y-intercept = function is zero as graph start from

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

3)3a)

$$\text{Capacitance} = \frac{\epsilon_0 H}{d}$$

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

3b)

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

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

3.) i) we should connect the identical capacitors in parallel due to the addition of parallel combination ✓

4.) i)

Applying Kirchhoff's

$$-E_2 + I r_2 + I r_1 - E_1 + I R = 0$$

$$-1.5 + I(r_1 + r_2 + R) - 15V = 0$$

$$I = \frac{3V}{r_1 + r_2 + R} = \frac{3}{2+2+50} = \frac{3}{55.6} \text{ mF}$$

4.) ii)

$$P_{\text{total}} = P_{r_1} + P_{r_2} + P_R$$

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

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

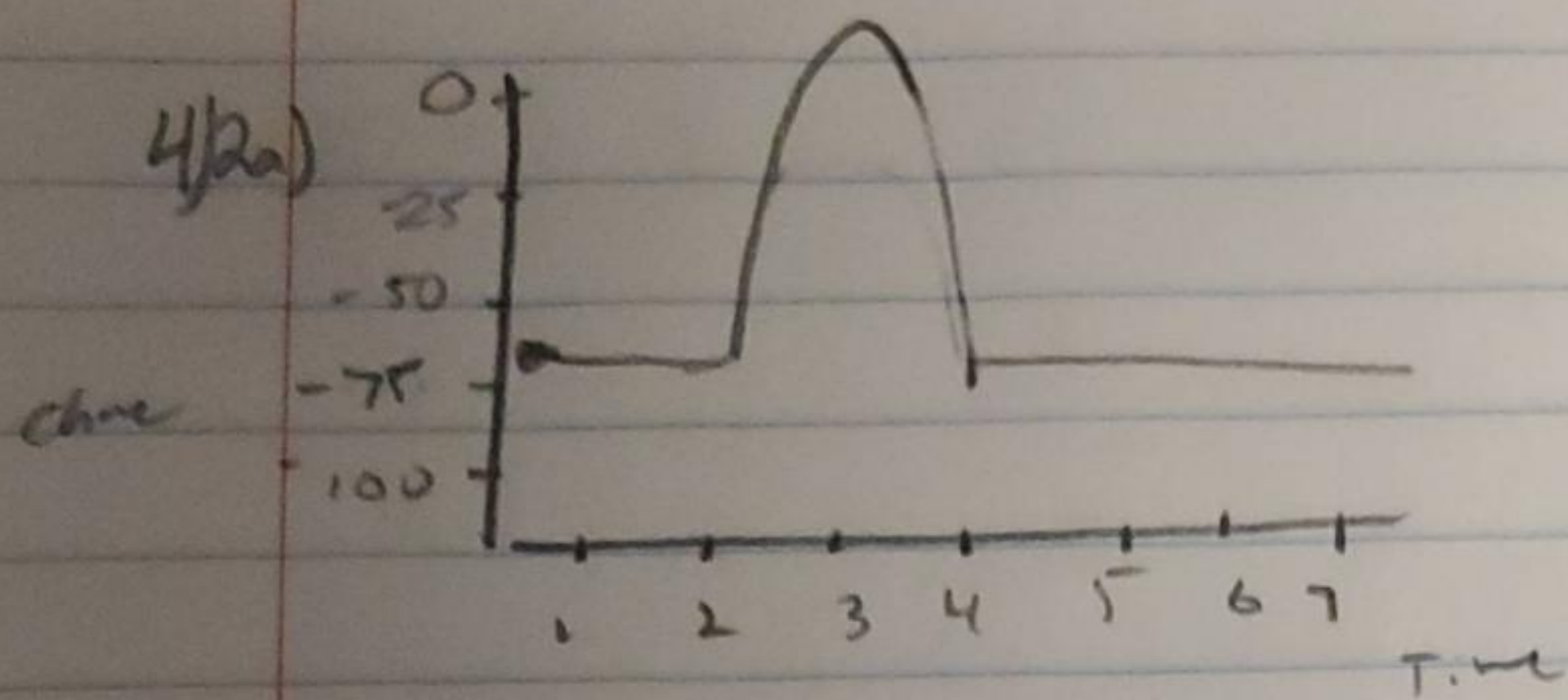
$$6.17 + 6.17 + 154.34$$

-1

$$\boxed{177.5 \text{ W}}$$

c)

? -1



a) pulse width in milliseconds in 2ms

4/2b) Peak voltage

$$40 + (-75)$$

$$I = 115 \text{ mV}$$