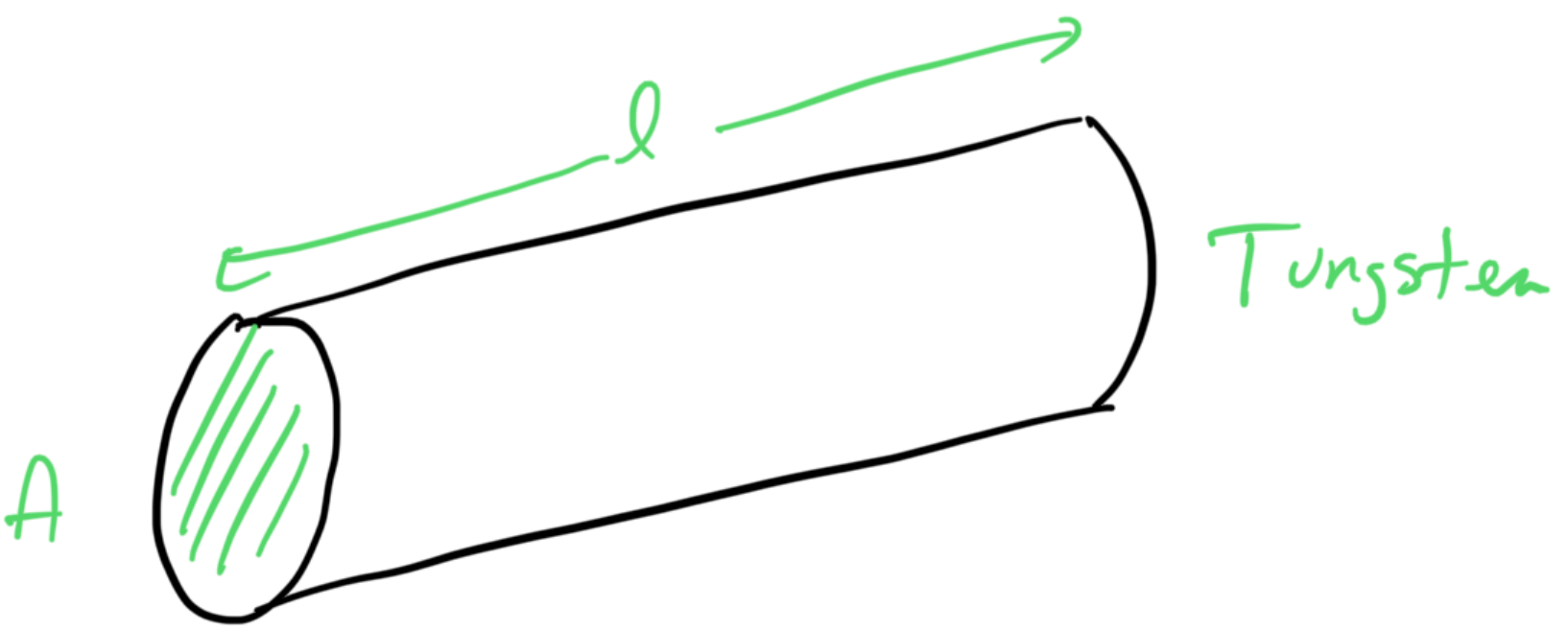
Assignment 4 12 -

12.



$$R = \rho \frac{l}{A} = \frac{(5.6 \times 10^{-8}\ \Omega \cdot m)(1.5m)}{0.8 \times 10^{-6}\ m^2}$$

$$R = 0.105\ \Omega$$

$$\Delta V = iR$$

$$\therefore i = \frac{\Delta V}{R} = \frac{0.500V}{0.105\Omega} = 4.76A$$

13.

Toaster : $P = 400\ W$

$\Delta V = 240\ V$

$$P = i\Delta V \quad \therefore i = \frac{P}{\Delta V} = \frac{400W}{240V}$$

a) ΔV 240 V

$= 1.67\,A$

b) $\Delta V = iR \quad \therefore R = \frac{\Delta V}{i} = \frac{240\,V}{1.67\,A}$

$= 144\,\Omega$

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14. 120 V, 100 W light bulb

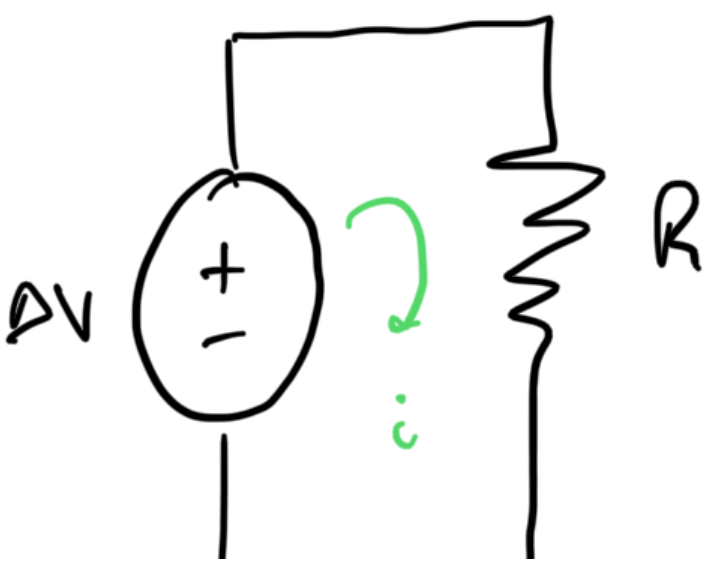
$$P = i\,\Delta V$$

Suppose 120 V → 150 V

$$\%\ change = \frac{\Delta V}{V_i} \times 100\%$$

$$= \frac{30\,V}{120\,V} \times 100\%$$

$= 25\%$



$i = \frac{\Delta V}{R}$ ← 25% increase.
← constant

∴ i increases by 25% !

$$\therefore \quad P \longrightarrow P_0 \times \underbrace{1.25}_{\text{voltage}} \times \underbrace{1.25}_{\text{current}}$$

$$= 1.5625$$

$\Rightarrow$ 56.25 % increase !!

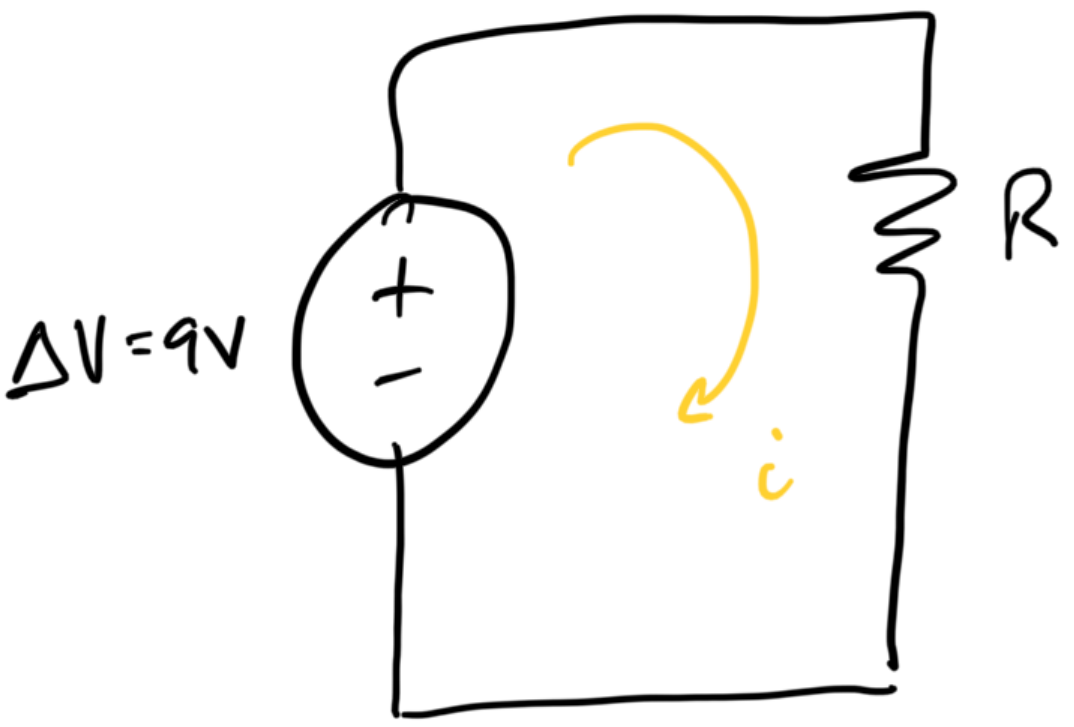
15.

Batteries $\Rightarrow$ A . hours

$$1 \text{ A} \cdot \text{h} = 1 \frac{\text{C}}{\text{s}} \times 3600 \text{ s}$$

$$1 \text{ A} \cdot \text{h} = 3600 \text{ C} \; !!$$

$\therefore 54 \text{ A} \cdot \text{h} =$
194400 C



$$i = \frac{\Delta V}{R} = \frac{9}{R}$$

$$P = i \, \Delta V = \left(\frac{9}{R}\right)(9) = \frac{81}{R}$$

$$\boxed{P = \frac{\mathcal{E}}{R}}$$

$$P \equiv \frac{E}{t} \qquad \therefore \; E = P \cdot t = \frac{\mathcal{E} t}{R}$$

$$\boxed{E = \frac{\mathcal{E} t}{R}}$$

don't know t,
don't know R

$$i = \frac{q}{R} \quad (\text{coulombs/s})$$

$$\therefore \; i = \frac{\Delta Q}{\Delta t}$$

$$\therefore \; \Delta t = \frac{\Delta Q}{i} = \frac{\Delta Q}{(q/R)}$$

$$\boxed{\Delta t = \frac{\Delta Q \cdot R}{q}}$$

$$E = \frac{\mathcal{E}\left(\frac{\Delta Q\, R}{q}\right)}{R} = q\Delta Q$$

$$= q\,(19440\,\omega)$$

$$= 1.7496 \times 10^{6}\,\text{J}$$

"kW·hr"

$$1\ \text{kW·hr} = 1(1000\ \text{W})\cdot 3600\ \text{s}$$

$$= 1(1000\ \text{J/s})(3600\ \text{s})$$

$$= 3.6\times10^{6}\ \text{J}$$

$$\therefore\quad E = \frac{1.7496\times10^{6}\ \text{J}}{3.6\times10^{6}\ \text{J/kW·hr}}$$

$$= 0.486\ \text{kW·hr}$$

@ 0.0650 ¢/kWr → ¢0.0316

= 3.16 ¢