

$$\#1$$

$$i = 30 \mu\text{A} = \frac{\Delta Q}{\Delta t}$$

$$\#e = ?$$

$$\Rightarrow \Delta Q = i \Delta t$$

$$\#e = \frac{\Delta Q}{e} = \frac{i \Delta t}{e}$$

$$= \frac{(30 \times 10^{-6} \text{ A})(40 \text{ s})}{1.6 \times 10^{-19}}$$

$$= 7.5 \times 10^{15} \text{ electrons!}$$

$$\frac{1}{R} = \frac{1}{4} + \frac{1}{12}$$
$$= \frac{3}{36} + \frac{3}{36}$$
$$= \frac{6}{36}$$

$$R = 3$$

(#3)

$$i = i_0 e^{-t/\tau} = \frac{dq}{dt}$$

$$i = \int_0^t i dt = i_0 \int_0^t e^{-t/\tau} dt$$

$$u = -t/\tau$$
$$du = -\frac{dt}{\tau}$$

$$= i_0 \tau \int_0^{-t/\tau} e^u du$$

$$= i_0 \tau (e^{-t/\tau} - 1)$$

$$= i_0 \tau (1 - e^{-t/\tau})$$

$$i_{\text{max}} = i_0 \tau$$



$$I = I_1 + I_2$$

$$\sum -I_1 R_1 = 0$$

$$I_1 R_1 - I_2 R_2 = 0$$

$$P = IV = I_{1,2} \mathcal{E} = \frac{\mathcal{E}^2}{R_{1,2}}$$

$$I_1 = \frac{\mathcal{E}}{R_1}$$

$$I_2 = \frac{I_1 R_1}{R_2}$$

$$= \frac{\mathcal{E}}{R_2}$$

#13

$$R = 240 \Omega$$

$$\Delta V = 120 \text{ V}$$

$$i = ?$$

$$V = iR$$

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

$$i = \frac{120}{240} = 1.5 \text{ A}$$

#14

$$A = 5 \text{ (mm)}^2$$

$$\Delta V = 15 \text{ V}$$

$$i = 4 \times 10^{-3} \text{ A}$$

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

$$R = \frac{\rho}{A} \ell \Rightarrow$$

$$\rho = \frac{AR}{\ell}$$

$$\rho = 3.5 \times 10^{-5}$$