

Ch. 10 Prob. 65

$$I = 10.0 \text{ A}$$

$$\Delta T = 5.00 \text{ ms}$$

a) How much charge passed?

$$I = \frac{dQ}{dt}$$

→ assume a constant current

$$I = \frac{\Delta Q}{\Delta t}$$

$$\rightarrow \Delta Q = I \Delta t$$

$$\Delta Q = (10.0 \text{ A})(5.00 \times 10^{-3} \text{ s}) = \boxed{0.050 \text{ C}}$$

b) If 500 J is dissipated, what was the voltage?

Power is $P = I \cdot V$

and $P = \frac{\Delta E}{\Delta t} \rightarrow$ Now $P = \frac{500 \text{ J}}{5.00 \text{ ms}}$

$$P = 1.00 \times 10^5 \text{ W}$$

$$P = I \cdot V \rightarrow V = \frac{P}{I} = \frac{1.00 \times 10^5 \text{ W}}{10.0 \text{ A}} = 1.0 \times 10^4 \text{ V} = \boxed{10 \text{ kV}}$$

c) What is the path's resistance?

$$V = I \cdot R \rightarrow R = \frac{V}{I} = \frac{10 \times 10^3 \text{ V}}{10.0 \text{ A}}$$

$$R = 1.0 \times 10^3 \Omega$$

$$= \boxed{1 \text{ k}\Omega}$$

d) What is the temperature change of 8.00 kg of tissue

$$\Delta E = \Delta Q = mc \cdot \Delta T$$

$$C_{\text{H}_2\text{O}} = 4186 \frac{\text{J}}{\text{kg} \cdot ^\circ\text{C}}$$

Tissue
 $c = 3500 \frac{\text{J}}{\text{kg} \cdot ^\circ\text{C}}$

$$\Delta T = \frac{500 \text{ J}}{(8.00 \text{ kg})(3500 \frac{\text{J}}{\text{kg} \cdot ^\circ\text{C}})}$$

$$\Delta T = \boxed{0.0179 \text{ } ^\circ\text{C}}$$

$$\Delta T = \frac{\Delta E}{mc} = \frac{500 \text{ J}}{(8.00 \text{ kg})(4186 \text{ J/kg} \cdot ^\circ\text{C})}$$

$$\Delta T = \boxed{0.015 \text{ } ^\circ\text{C}}$$
 Assuming water