Chapter 21

6. **(a)** $I = \dfrac{P}{\mathcal{E}} = \dfrac{85\text{ W}}{120\text{ V}} = \boxed{0.71\text{ A}}$

(b) $\Delta t = \dfrac{\Delta Q}{I} = \left(\dfrac{\mathcal{E}}{P}\right) \times (1\times 10^7 e) = \dfrac{1\times 10^7 (120\text{ V})(1.6\times 10^{-19}\text{ C})}{85\text{ W}} = \boxed{2\times 10^{-12}\text{ s}}$

14. $I = \dfrac{V}{R} = \dfrac{V}{\rho \frac{L}{A}} = \dfrac{VA}{\rho L} = \dfrac{(75\times 10^{-3}\text{ V})(1.0\times 10^{-6}\text{ m})^2}{(1.3\times 10^7\ \Omega\cdot\text{m})(8.0\times 10^{-9}\text{ m})} = \boxed{7.2\times 10^{-13}\text{ A}}$

22. $\text{cost} = \text{power} \times \text{time} \times \dfrac{\text{cost}}{\text{kWh}}$

$= (2.3\text{ A})(120\text{ V})(1\text{ h})\left(\dfrac{\$0.075}{10^3\text{ Wh}}\right)$

$= \boxed{\$0.021}$

26. $\dfrac{1}{R} = \dfrac{1}{35\ \Omega + 82\ \Omega} + \dfrac{1}{45\ \Omega}$

$R = \boxed{33\ \Omega}$

35. $\mathcal{E} = IR_{\text{eq}} = (0.62\text{ A})(84\ \Omega + 130\ \Omega) = \boxed{130\text{ V}}$

42. Assume that I is clockwise.

$0 = 11.5\text{ V} - I(6.22\ \Omega) - I(15.1\ \Omega) + 15.0\text{ V} - I(8.50\ \Omega)$

$I = \dfrac{26.5\text{ V}}{29.82\ \Omega} = 0.889\text{ A}$

The current flows $\boxed{\text{clockwise}}$.

47. $C_{\text{eq}} = 15\,\mu\text{F} + \left(\dfrac{1}{8.2\,\mu\text{F}} + \dfrac{1}{22\,\mu\text{F}}\right)^{-1} = \boxed{21\,\mu\text{F}}$

50. **(a)** $C_{\text{eq}} = 7.5\ \mu\text{F} + 15\ \mu\text{F} = \boxed{23\ \mu\text{F}}$

(b) Since each capacitor has the same voltage across its plates, and since $Q = CV$, $\boxed{\text{the 15-}\mu\text{F capacitor}}$ stores more charge.

(c) $Q_{7.5} = (7.5\times 10^{-6}\text{ F})(12\text{ V}) = \boxed{90\ \mu\text{C}}$

$Q_{15} = (15\times 10^{-6}\text{ F})(12\text{ V}) = \boxed{180\ \mu\text{C}}$