Chapter 17

9. (a) $V = V_1 + V_2 + V_3 = 1.5\text{ V} + 1.5\text{ V} + 1.5\text{ V} = \boxed{4.5\text{ V}}$. (b) $V = V_1 = V_2 = V_3 = \boxed{1.5\text{ V}}$.

11. (a) $V = V_1 + V_2 + V_3 = 2(6.0\text{ V}) + 12\text{ V} = \boxed{24\text{ V}}$.

(b) The $\boxed{\text{two 6.0-V in series, together in parallel with the 12-V}}$.

19. $I = \dfrac{q}{t} = \dfrac{30\text{ C}}{120\text{ s}} = \boxed{0.25\text{ A}}$.

$\boxed{32}$. This is because the $\boxed{\text{resistance is low and the current is high at turn-on}}$. Once the lamp is hot, its resistance increases and current decreases, so there is less chance of burning out.

35. (a) $V = IR = (1.9\text{ A})(6.0\ \Omega) = \boxed{11.4\text{ V}}$.

(b) $\varepsilon = V + Ir$, ☞ $r = \dfrac{\varepsilon - V}{I} = \dfrac{12\text{ V} - 11.4\text{ V}}{1.9\text{ A}} = \boxed{0.32\ \Omega}$.

$\boxed{38}$. $I = \dfrac{V}{R} = \dfrac{12\text{ V}}{15\ \Omega} = \boxed{0.80\text{ A}}$.

41. $R = \dfrac{\rho L}{A} = \dfrac{\rho L}{\pi r^2} = \dfrac{(1.70 \times 10^{-8}\ \Omega\cdot\text{m})(0.60\text{ m})}{\pi(0.05 \times 10^{-2}\text{ m})^2} = \boxed{1.3 \times 10^{-2}\ \Omega}$.

47. (a) $\Delta R = R_o \alpha \Delta T = (25\text{ m}\Omega)(6.80 \times 10^{-3}\text{ C}^{\circ -1})(27\text{ C}^\circ) = \boxed{4.6\text{ m}\Omega}$.

(b) $I_o = \dfrac{V}{R_o}$ and $I = \dfrac{V}{R}$. $\dfrac{I}{I_o} = \dfrac{R_o}{R} = \dfrac{25\text{ m}\Omega}{(25 + 4.6)\text{ m}\Omega} = 0.845$. $I = (0.845)I_o = (0.845)(10.0\text{ mA}) = \boxed{8.5\text{ mA}}$.

68. (a) $I = \dfrac{V}{R} = \dfrac{1.50\text{ V}}{2.50\ \Omega} = \boxed{0.600\text{ A}}$.

(b) $q = It = (0.600\text{ A})(6.00\text{ h})(3600\text{ s/h}) = \boxed{1.30 \times 10^4\text{ C}}$.

(c) $E = qV = (1.30 \times 10^4\text{ C})(1.50\text{ V}) = \boxed{1.94 \times 10^4\text{ J}}$.

Alternate method: $E = pt = I^2 Rt = (0.600\text{ A})^2(2.50\ \Omega)(6.00\text{ h})(3600\text{ s/h}) = 1.94 \times 10^4\text{ J}$.