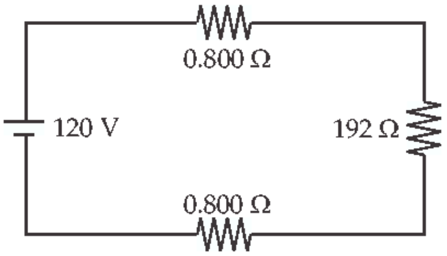
18.3 For the bulb in use as intended,



$$R_{bulb} = \frac{(\Delta V)^2}{\mathcal{P}} = \frac{(120\text{ V})^2}{75.0\text{ W}} = 192\ \Omega$$

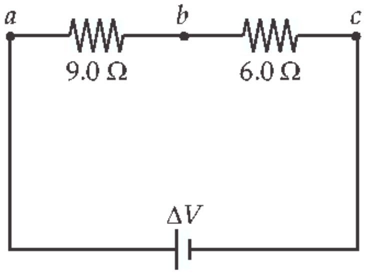
Now, presuming the bulb resistance is unchanged, the current in the circuit shown is

$$I = \frac{\Delta V}{R_{eq}} = \frac{120\text{ V}}{0.800\ \Omega + 192\ \Omega + 0.800\ \Omega} = 0.620\text{ A}$$

and the actual power dissipated in the bulb is

$$\mathcal{P} = I^2 R_{bulb} = (0.620\text{ A})^2(192\ \Omega) = \boxed{73.8\text{ W}}$$

18.4 (a) The current through this series combination is



$$I = \frac{(\Delta V)_{bc}}{R_{bc}} = \frac{12\text{ V}}{6.0\ \Omega} = 2.0\text{ A}$$

Therefore, the terminal potential difference of the power supply is

$$\Delta V = I\,R_{eq} = (2.0\text{ A})(9.0\ \Omega + 6.0\ \Omega\ ) = \boxed{30\text{ V}}$$

(b) When connected in parallel, the potential difference across either resistor is the voltage setting of the power supply. Thus,

$$\Delta V = I_9\,R_9 = (0.25\text{ A})(9.0\ \Omega\ ) = \boxed{2.3\text{ V}}$$

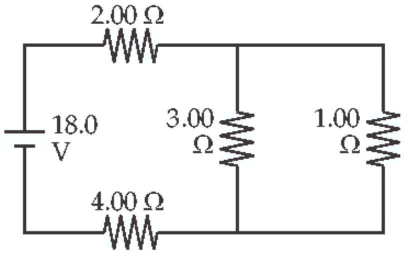
18.6 The equivalent resistance of the parallel combination of three resistors is

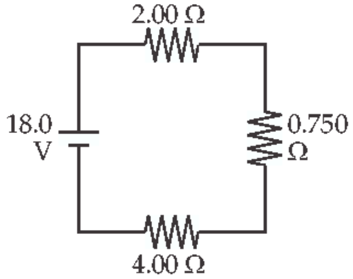
$$R_p = \left(\frac{1}{18\ \Omega} + \frac{1}{9.0\ \Omega} + \frac{1}{6.0\ \Omega}\right)^{-1} = 3.0\ \Omega$$

Hence, the equivalent resistance of the circuit connected to the 30 V source is

$$R_{eq} = R_{12} + R_p = 12\ \Omega + 3.0\ \Omega = \boxed{15\ \Omega}$$

18.14 The resistance of the parallel combination of the $3.00\ \Omega$ and $1.00\ \Omega$ resistors is





$$R_p = \left(\frac{1}{3.00\ \Omega} + \frac{1}{1.00\ \Omega}\right)^{-1} = 0.750\ \Omega$$

The equivalent resistance of the circuit connected to the battery is

$$R_{eq} = 2.00\ \Omega + R_p + 4.00\ \Omega = 6.75\ \Omega$$

and the current supplied by the battery is

$$I = \frac{\Delta V}{R_{eq}} = \frac{18.0\ \text{V}}{6.75\ \Omega} = 2.67\ \text{A}$$

The power dissipated in the $2.00\text{-}\Omega$ resistor is

$$\mathcal{P}_2 = I^2 R_2 = (2.67\ \text{A})^2 (2.00\ \Omega) = \boxed{14.2\ \text{W}}$$

and that dissipated in the $4.00\text{-}\Omega$ resistor is

$$\mathcal{P}_4 = I^2 R_4 = (2.67\ \text{A})^2 (4.00\ \Omega) = \boxed{28.4\ \text{W}}$$

The potential difference across the parallel combination of the $3.00\ \Omega$ and $1.00\ \Omega$ resistors is

$$(\Delta V)_p = I R_p = (2.67\ \text{A})(0.750\ \Omega) = 2.00\ \text{V}$$

Thus, the power dissipation in these resistors is given by

$$\mathcal{P}_3 = \frac{(\Delta V)_p^2}{R_3} = \frac{(2.00\ \text{V})^2}{3.00\ \Omega} = 1.33\ \text{W}$$

and $$\mathcal{P}_1 = \frac{(\Delta V)_p^2}{R_1} = \frac{(2.00\ \text{V})^2}{1.00\ \Omega} = 4.00\ \text{W}$$