Chapter Assessment
Section 1 Currents and Circuits: Mastering Problems

54. **Lightbulbs** A current of 1.2 A is measured through a lightbulb when it is connected across a 120-V source. At what rate does the bulb transform energy? (Level 1)

SOLUTION:

$P = IV = (1.2\ \text{A})(120\ \text{V}) = 1.4\times10^2\ \text{W}$

ANSWER:

$P = 1.4\times10^2\ \text{W}$

62. What voltage is applied to a 4.0-Ω resistor if the current is 1.5 A? (Level 1)

SOLUTION:

$V = IR = (1.5\ \text{A})(4.0\ \Omega) = 6.0\ \text{V}$

ANSWER:

$V = 6.0\ \text{V}$

64. A voltage of 75 V is placed across a 150-Ω resistor. What is the current through the resistor? (Level 1)

SOLUTION:

$V = IR$

$$I = \frac{V}{R} = \frac{75\ \text{V}}{150\ \Omega} = 5.0\ \text{A}$$

ANSWER:

$I = 5.0\ \text{A}$

Section 1 Simple Circuits: Practice Problems

1. Three 22-Ω resistors are connected in series across a 125-V generator. What is the equivalent resistance of the circuit? What is the current in the circuit?

SOLUTION:

$$R = R_1 + R_2 + R_3$$
$$= 22\ \Omega + 22\ \Omega + 22\ \Omega$$
$$= 66\ \Omega$$
$$I = \frac{\Delta V}{R} = \frac{125\ V}{66\ \Omega} = 2.9\ A$$

ANSWER:

R = 66 Ω, I = 2.9 A

2. A 12-Ω, a 15-Ω, and a 5-Ω resistor are connected in a series circuit with a 75-V battery. What is the equivalent resistance of the circuit? What is the current in the circuit?

SOLUTION:

$$R = R_1 + R_2 + R_3$$
$$= 12\ \Omega + 15\ \Omega + 5\ \Omega = 32\ \Omega$$
$$I = \frac{\Delta V}{R} = \frac{75\ V}{32\ \Omega} = 2.3\ A$$

ANSWER:

R = 32 Ω, I = 2.3 A

4. A 9-V battery is in a circuit with three resistors connected in series.

a. If the resistance of one of the resistors increases, how will the equivalent resistance change?
b. What will happen to the current?
c. Will there be any change in the battery voltage?

SOLUTION:

a. It will increase.

b. $I = \frac{\Delta V}{R}$ **, so it will decrease.**

c. No. It does not depend on the resistance.

ANSWER:

a. It will increase.

b. $I = \frac{\Delta V}{R}$ **, so it will decrease.**

c. No. It does not depend on the resistance.

5. **CHALLENGE** Calculate the potential differences across three resistors, 12-Ω, 15-Ω, and 5-Ω, that are connected in series with a 75-V battery. Verify that their sum equals the potential difference across the battery.

SOLUTION:

$\Delta V_1 = IR1 = (2.3\text{ A})(12\ \Omega) = 28\text{ V}$

$\Delta V_2 = IR2 = (2.3\text{ A})(15\ \Omega) = 35\text{ V}$

$\Delta V_3 = IR3 = (2.3\text{ A})(5\ \Omega) = 12\text{ V}$

$\Delta V_1 + \Delta V_2 + \Delta V_3 = 28\text{ V} + 35\text{ V} + 12\text{ V}$

$= 75\text{ V}$

= voltage of battery

ANSWER:

Yes, 75 V = voltage of battery.

11. A 22-Ω resistor and a 33-Ω resistor are connected in series and are connected to a 120-V power source.

a. What is the equivalent resistance of the circuit?
b. What is the current in the circuit?
c. What is the potential difference across each resistor?

SOLUTION:

a. $R = R_1 + R_2 = 22\ \Omega + 33\ \Omega = 55\ \Omega$

b.

$$I = \frac{\Delta V}{R} = \frac{120\text{ V}}{55\ \Omega} = 2.2\text{ A}$$

c.

$$\Delta V_1 = IR_1$$
$$= \left(\frac{\Delta V}{R}\right)R_1$$
$$= \left(\frac{120\text{ V}}{55\ \Omega}\right)(22\ \Omega)$$
$$= 48\text{ V}$$
$$\Delta V_2 = IR_2 = \left(\frac{120\text{ V}}{55\ \Omega}\right)(33\ \Omega) = 72\text{ V}$$

ANSWER:

a. $R = 55\ \Omega$
b. $I = 2.2\text{ A}$
c. $\Delta V_1 = 48\text{ V}$, $\Delta V_2 = 72\text{ V}$