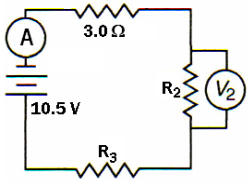
Questions

1. The circuit below shows three resistors connected in series to a 18.0 V battery.



   a. Draw a voltmeter onto the diagram to measure the voltage of R_2. Draw an ammeter onto the diagram to measure the total current in the circuit.

   b. If voltmeter V_1 reads 4.7 V and voltmeter V_2 reads 2.1 V, what is the potential drop across resistor R_3?

$$V_3 = V_T - V_1 - V_2$$
$$V_3 = 10.5V - 4.7V - 2.1V = 3.7V$$

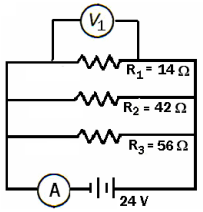
   c. Considering R_1 has a resistance of 3.0 ohms, determine the current that passes through R_1 and the following resistors (R_2 and R_3) in the circuit.

$$I_T = I_1 = I_2 = I_3 = \frac{V_1}{R_1} = \frac{4.7V}{3.0\Omega} = 1.6A$$

   d. Determine the resistance of R_2 and R_3.

$$R_2 = \frac{V_2}{I_2} = \frac{2.1V}{1.6A} = 1.3\Omega \qquad R_3 = \frac{V_3}{I_3} = \frac{3.7V}{1.6A} = 2.3\Omega$$

2. Using the circuit diagram below, solve for the following information.



   a. Draw a voltmeter onto the diagram to measure the voltage of R_1. Draw an ammeter onto the diagram to measure the total current in the circuit.

   b. The voltage across each resistor.

$$V_T = V_1 = V_2 = V_3 = 24V$$

   c. The current through each resistor.

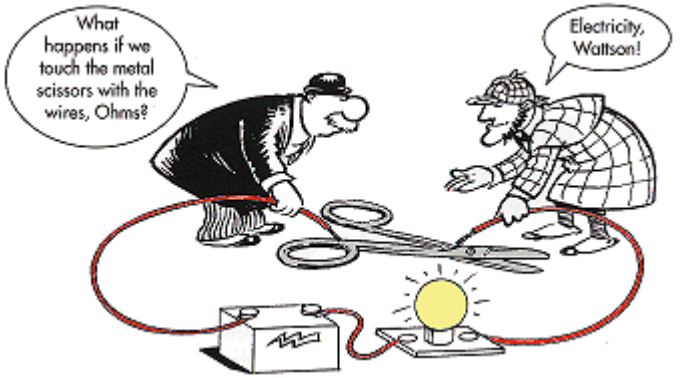
$$I_1 = \frac{V_1}{R_1} = \frac{24V}{14\Omega} = 1.7A \quad I_2 = \frac{V_2}{R_2} = \frac{24V}{42\Omega} = 0.57A \quad I_3 = \frac{V_3}{R_3} = \frac{24V}{56\Omega} = 0.43A$$

   d. The equivalent resistance of the circuit.

$$R_T = \frac{V_T}{I_T} = \frac{24V}{(1.7A + 0.57A + 0.43A)} = 8.9\Omega$$

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_1} + \frac{1}{R_1}$$
$$\frac{1}{R_{eq}} = \frac{1}{14\Omega} + \frac{1}{42\Omega} + \frac{1}{56\Omega}$$
$$R_{eq} = 8.8\Omega$$

Electric Circuits



Definitions

1. Current - the rate at which charge pass through a wire
2. Resistance - the opposition that a device or conductor present to the flow of electric current
3. Resistor - a device used in a circuit to limit current flow or provide a potential drop
4. Variable Resistor - a coil of resistance wire whose effective resistance can be varied by sliding a contact point
5. Voltmeter - a device used to measure the potential difference across a circuit
6. Ammeter - a device used to measure the current through a circuit
7. Power - the rate of conversion of electrical energy
8. Series Connection - a circuit in which all parts are connected end to end to provide a single path for the current
9. Parallel Connection - a circuit in which there are several paths for current flow
10. Kirchoff's Junction Rule - The total current going into a junction must equal the total current going out of a junction

Equations

1. $I=\frac{\Delta q}{t}$

2. $R=\frac{\rho L}{A}$

3. $R=\frac{V}{I}$

4. $P=VI=I^2R=\frac{V^2}{R}$

5. $W=Pt=VIt=I^2Rt=\frac{V^2t}{R}$

Series Connection

6. $I = I_1 = I_2 = I_3 = \ldots$

7. $V = V_1 + V_2 + V_3 + \ldots$

8. $R = R_1 + R_2 + R_3 + \ldots$

Parallel Connection

9. $I = I_1 + I_2 + I_3 + \ldots$

10. $V = V_1 = V_2 = V_3 = \ldots$

11. $\frac{1}{R_{eq}}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}+\ldots$

Symbols & Units

Resistance	Potential Difference	Charge	Current	Power	Energy
R	V	q	I	P	W
Ω	V	C	A	W	J