Name: _____ Date: _____

Parallel Circuits

14.2

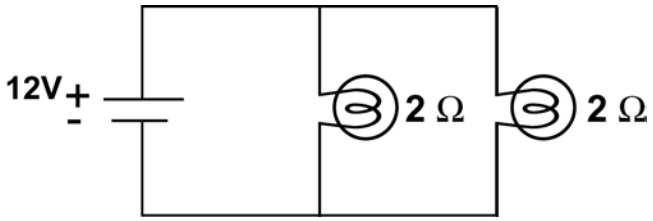
READ

A parallel circuit has at least one point where the circuit divides, creating more than one path for current. Each path is called a branch. The current through a branch is called branch current. If current flows into a branch in a circuit, the same amount of current must flow out again, This rule is known as **Kirchoff's current law**.

Because each branch in a parallel circuit has its own path to the battery, the voltage across each branch is equal to the battery's voltage. If you know the resistance and voltage of a branch you can calculate the current with Ohm's Law ($I=V/R$).

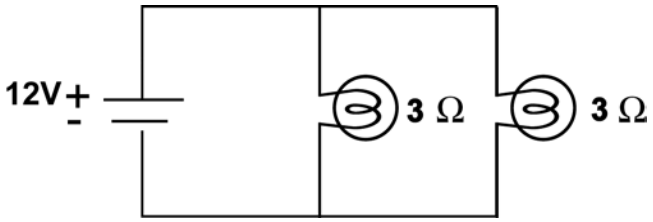
PRACTICE 1

1. Use the parallel circuit pictured right to answer questions (a) - (d).



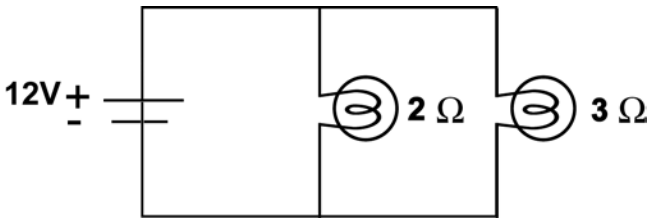
   a. What is the voltage across each bulb?
   b. What is the current in each branch?
   c. What is the total current provided by the battery?
   d. Use the total current and the total voltage to calculate the total resistance of the circuit.

2. Use the parallel circuit pictured right to answer questions (a) - (d).



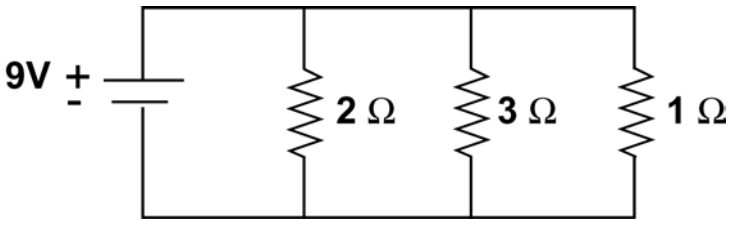
   a. What is the voltage across each bulb?
   b. What is the current in each branch?
   c. What is the total current provided by the battery?
   d. Use the total current and the total voltage to calculate the total resistance of the circuit.

3. Use the parallel circuit pictured right to answer questions (a) - (d).



   a. What is the voltage across each resistor?
   b. What is the current in each branch?
   c. What is the total current provided by the batteries?
   d. Use the total current and the total voltage to calculate the total resistance of the circuit.

4. Use the parallel circuit pictured right to answer questions (a) - (c).



   a. What is the voltage across each resistor?
   b. What is the current in each branch?
   c. What is the total current provided by the battery?

READ

In part (d) of problems 1, 2, and 3, you calculated the total resistance of each circuit. This required you to first find the current in each branch. Then you found the total current and used Ohm's law to calculate the total resistance. Another way to find the total resistance of two parallel resistors is to use the formula shown below.

$$R_{total} = \frac{R_1 \times R_2}{R_1 + R_2}$$

EXAMPLE

Calculate the total resistance of a circuit containing two 6 ohm resistors.

Given	**Solution**
The circuit contains two 6 Ω resistors in parallel.	$R_{total} = \frac{6\ \Omega \times 6\ \Omega}{6\ \Omega + 6\ \Omega}$
Looking for	$R_{total} = 3\ \Omega$
The total resistance of the circuit.	The total resistance is 3 ohms.
Relationships	
$R_{total} = \frac{R_1 \times R_2}{R_1 + R_2}$	

PRACTICE 2

1. Calculate the total resistance of a circuit containing each of the following combinations of resistors.
   a. Two 8 Ω resistors in parallel
   b. Two 12 Ω resistors in parallel
   c. A 4 Ω resistor and an 8 Ω resistor in parallel
   d. A 12 Ω resistor and a 3 Ω resistor in parallel
2. To find the total resistance of three resistors A, B, and C in parallel, first use the formula to find the total of resistors A and B. Then use the formula again to combine resistor C with the total of A and B. Use this method to find the total resistance of a circuit containing each of the following combinations of resistors
   a. Three 8 Ω resistors in parallel
   b. Two 6 Ω resistors and a 2 Ω resistor in parallel
   c. A 1 Ω, a 2 Ω, and a 3 Ω resistor in parallel

14.2 Parallel Circuits

Practice set 1:

1. Answers are:
   a. 12 volts
   b. 6 amps
   c. 12 amps
   d. 1 ohm
2. Answers are:
   a. 12 volts
   b. 4 amps
   c. 8 amps
   d. 1.5 ohms
3. Answers are:
   a. 12 volts
   b. 2 ohm branch: 6 amps; 3 ohm branch: 4 amps
   c. 10 amps
   d. 1.2 ohms
4. Answers are:
   a. 9 volts
   b. 2 ohm branch: 4.5 amps; 3 ohm branch: 3 amps; 1 ohm branch: 9 amps
   c. 16.5 amps

Practice set 2:

1. Answers are:
   a. 4 ohms
   b. 6 ohms
   c. 2.67 ohms
   d. 2.4 ohms
2. Answers are:
   a. 2.67 ohms
   b. 1.2 ohms
   c. 0.545 ohms