

# Series and Parallel Circuits

PHYSICS

NAME: \_\_\_\_\_

## OBJECTIVE:

In this activity you will be building and testing series and parallel circuits using a computer simulation. **Carefully read and follow the instructions.**

## PROCEDURE:

1. Go to the simulation Ohm Zone: <http://www.article19.com/shockwave/oz.htm>
2. On the right side of the screen you will find assorted items such as resistors, ammeter, voltmeter, circuit board, wires, a battery, bulbs and switches.
3. Click on the hand on the lower left side of the screen and a menu appears.
4. You will complete the first four activities. Just click on each activity and answer the questions.

**NOTE:** The values for voltages are NOT exactly the same as the value given for the battery. This is due to the existence of an **internal resistance** in the battery.

## ACTIVITY 1. *BUILDING A SIMPLE CIRCUIT.*

- a. What is the voltage of the battery?
- b. What is another name for voltage?
- c. In which direction does the electricity flow from the battery?
- d. Complete the data on the table by replacing the resistors and using the ammeter and voltmeter.

RESISTANCE ( $\Omega$ )	CURRENT (A)	VOLTAGE (V)
Blue (100 $\Omega$ )		
Green (10 $\Omega$ )		
Purple (200 $\Omega$ )		
Yellow (20 $\Omega$ )		

**ACTIVITY 2. BUILDING A SERIES CIRCUIT**

- a. How many different paths can the electricity take through the circuit?
  
- b. After you remove one of the light bulbs, what happened to the second bulb?
  
- c. Complete the data on the table (remember to use the ammeter and voltmeter):

<b>RESISTANCE (<math>\Omega</math>)</b>	<b>CURRENT (A)</b>	<b>VOLTAGE (V)</b>
<b>Light Bulb A (10 <math>\Omega</math>)</b>		
<b>Light Bulb B (10 <math>\Omega</math>)</b>		
<b>Equivalent Resistance:</b>	<b>Total Current:</b>	<b>Total Voltage:</b>

**ACTIVITY 3. BUILDING A PARALLEL CIRCUIT**

- a. What happens to the electricity at point “A” in the circuit?
  
- b. What happens to the electricity at point “B” in the circuit?
  
- c. After you remove one of the light bulbs, what happened to the second bulb?
  
- d. Complete the data on the table (use the ammeter and voltmeter):

<b>RESISTANCE (<math>\Omega</math>)</b>	<b>CURRENT (A)</b>	<b>VOLTAGE (V)</b>
<b>Light Bulb A (10 <math>\Omega</math>)</b>		
<b>Light Bulb B (10 <math>\Omega</math>)</b>		
<b>Equivalent Resistance:</b>	<b>Total Current:</b>	<b>Total Voltage:</b>

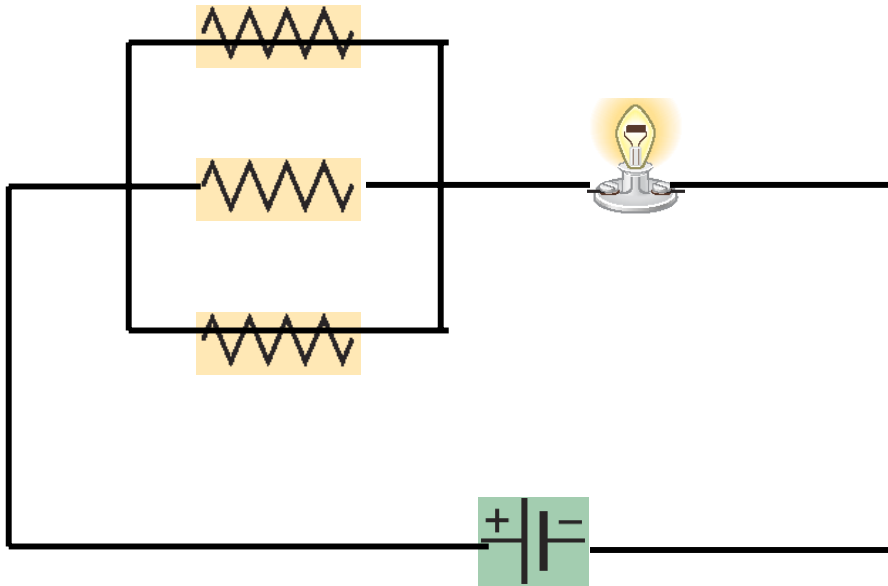
**ACTIVITY 4. BUILDING A COMBINATION CIRCUIT**

- a. What happens when light bulb “A” is removed from the circuit?
  
- b. What happens when either light bulb “B” or “C” is removed from the circuit?
  
- c. Complete the data on the table (use the ammeter and voltmeter):

<b>RESISTANCE (<math>\Omega</math>)</b>	<b>CURRENT (A)</b>	<b>VOLTAGE (V)</b>
<b>Light Bulb A (10 <math>\Omega</math>) (series)</b>		
<b>Light Bulb B (10 <math>\Omega</math>)</b>		
<b>Light Bulb C (10 <math>\Omega</math>)</b>		
<b>Equivalent Resistance:</b>	<b>Total Current:</b>	<b>Total Voltage:</b>

**ACTIVITY 5. BUILDING YOUR OWN CIRCUIT**

- a. Click on the QUIT button and wait for the original screen to restore.
- b. Drag the elements from the right side to the board and build a circuit that contains: three different resistors in parallel with a light bulb in series as shown in the diagram.



- c. Complete the data on the table by using the ammeter and voltmeter:

RESISTANCE ( $\Omega$ )	CURRENT (A)	VOLTAGE (V)
Light Bulb A (10 $\Omega$ ) (series)		
Resistor color: Resistance:		
Resistor color: Resistance:		
Resistor color: Resistance:		

d. Using Ohm's Law and the values of the resistances and voltage calculate the equivalent resistance of the circuit:

e. Calculate the values for the current and voltage of each individual resistance. Write your answers on the table below:

<b>RESISTANCE (<math>\Omega</math>)</b>	<b>CURRENT (A)</b>	<b>VOLTAGE (V)</b>
<b>Light Bulb A (<math>10 \Omega</math>) (series)</b>		
<b>Resistor color: Resistance:</b>		
<b>Resistor color: Resistance:</b>		
<b>Resistor color: Resistance:</b>		

f. Compare your answers to the data obtained in the simulation. Is there a significant difference among the values?

g. Calculate the internal resistance of the battery.