

ELECTRICITY - LESSON 3

SIMPLE SERIES AND PARALLEL LIGHT BULB CIRCUITS

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OBJECTIVE

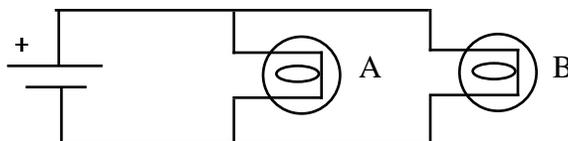
The objective of this lesson is to build and explain the operation of simple series and parallel light bulb circuits.

QUESTIONS AND EXPERIMENTS

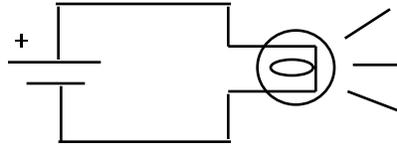
1. In the last lesson we built and analyzed circuits with one battery and one light bulb as follows:



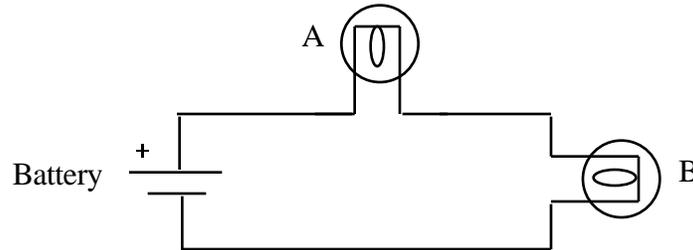
Now suppose we add a second identical light bulb in **parallel** as follows:



- Make your own drawing of this circuit.
 - Why do we call this a parallel circuit.
 - Draw a picture to illustrate how the electrons are flowing through the circuit.
2. Complete the following Table of Possibilities for the parallel circuit in Question (1).
- | Possibility | Light Bulb Brightness |
|-------------|-----------------------|
| 1 | A is brighter than B |
3. Suppose one student in your class is absolutely convinced that two light bulbs A and B in parallel should be just as bright as one light bulb by itself. And another student is absolutely convinced that the parallel light bulbs should be less bright. How would you settle the matter?
4. Build the parallel circuit in Question (1).
- How do the brightnesses of the two parallel light bulbs A and B compare with one another? What do you think is going on? Hint - measure the voltages across each light bulb.
 - Compare the brightnesses of the light bulbs in your parallel circuit with that in your circuit from the last Lesson containing just one light bulb. What do you think is going on? Hint - measure and compare the voltages across the battery and the light bulbs.
 - Is it ever possible for just one light bulb to be ON in a parallel circuit? Explain.
5. Now suppose we again start with our one light bulb circuit from Lesson 2 as follows:



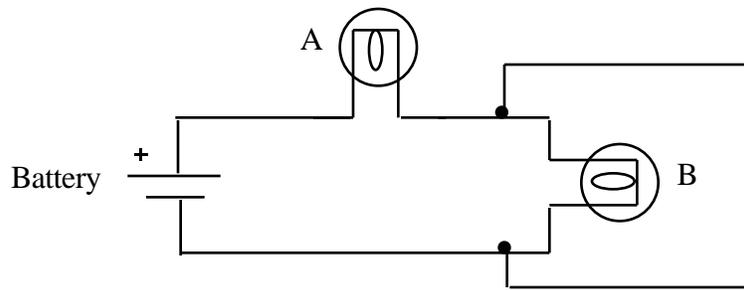
but this time add a second identical light bulb in **series** as follows;



- a. Draw your own picture of this new light bulb circuit.
 - b. Why do we call this a **series** circuit?
 - c. Draw a picture to show how the electrons are flowing through this series circuit.
 - d. Explain how electron flow through a series circuit is different from that through a parallel circuit.
6. Complete the following Table of Possibilities for the series circuit in Question (5).

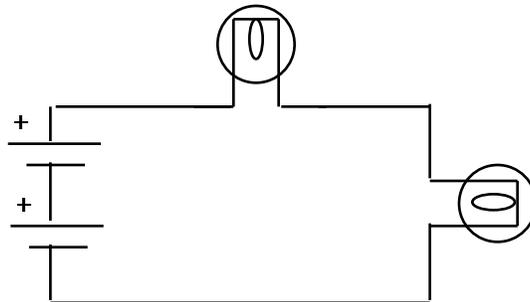
Possibility	Light Bulb Brightness
1	A is brighter than B

7. Suppose one student in your class is absolutely convinced that the light bulbs in a series circuit would be brighter than the light bulbs in a parallel circuit. And another student is absolutely convinced of just the opposite. How would you settle the matter?
8. Build your series circuit from Problem (5)
- a. How do the brightnesses of the two series light bulbs A and B compare with one another? What do you think is going on? Hint - measure the voltages across the battery and each light bulb.
 - b. Compare the brightnesses of the light bulbs in your series circuit with that in your circuit from the last Lesson containing just one light bulb. What do you think is going on? Hint - compare the voltages across them.
 - c. Compare the brightnesses of the light bulbs in your series circuit to those in the parallel circuit. What do you think is going on?
 - d. Is it ever possible for just one light bulb to be ON in a parallel circuit? Explain.
9. Now connect a wire across one of the light bulbs as follows:



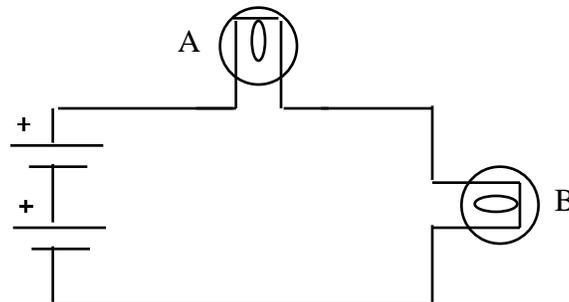
- Describe what happens.
- Explain what happens. Be sure to illustrate with a picture showing the flow of the electrons.
- Why do you think we call the wire across light bulb **B** a **short circuit**?

10. Suppose we add a second battery in series in our series circuit as follows:

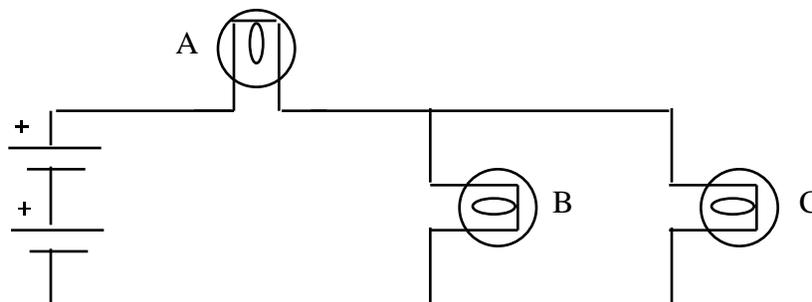


- What do you think will happen?
- Build the circuit and see what happens.
- Explain what happens. Hint - Measure . . .

11. Now suppose we take our series circuit with two batteries as follows:



and add a third light bulb C as follows:



- a. What do you think will happen to the brightnesses of light bulbs A and B? Put your results in a Table like the following:

Light Bulb	Predicted Brightness
A	
B	

- b. Which light bulb do you think will be the brightest?
c. Build the circuit and see what happens. Put your results in a Table like the following:

Light Bulb	Measured Brightness
A	
B	

- d. Explain what happens. Hint - draw a picture to show how the electrons are flowing.