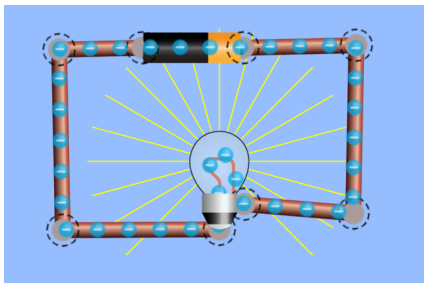
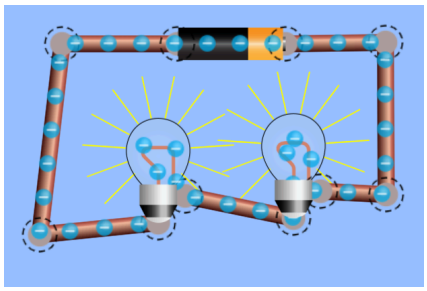
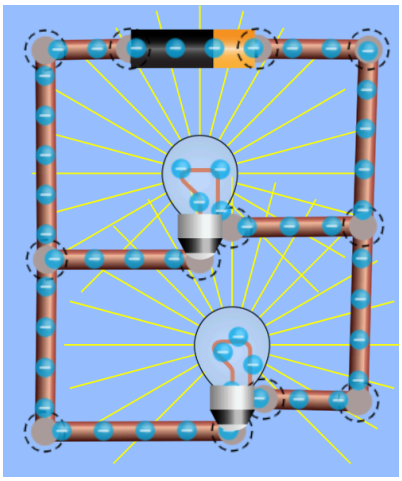
Circuits Concepts Simulation Lab

EQ: What factors cause a battery to produce more current or less current? What factors affect the total resistance of a circuit? How does current compare at different locations in a circuit?

1. Go to the Circuit Construction Simulation from PhET.
2. Select “Intro”
3. Build the following circuits
4. Answer the questions that follow.

Single Bulb	Two Bulbs in Series	Two Bulbs in Parallel
		

Analysis:

Please read the following definitions and then use the ideas in these definitions to answer the questions below.

- In this simulation, the *current* travelling through a circuit is represented by the rate (speed) that charged particles move through a wire.
- We may think of a lightbulb as presenting an obstacle or *resistance* to current.
- The *current produced by a battery* attached to a circuit and the *total resistance* of that circuit are *inversely proportional*. If the same battery produces more current in circuit A and less current in circuit B, circuit A has less resistance and circuit B has more resistance.

1) Comparing current within a circuit:
   a) Use the Ammeter tool to compare the amount of current at different locations in the single bulb circuit. What do you notice about the amount of current at different locations in the circuit?

   b) Use the Ammeter tool to compare the amount of current at different locations in the series circuit. What do you notice about the amount of current at different locations in the circuit?

   c) Use the Ammeter tool to compare the amount of current at different locations in the parallel circuit. What do you notice about the amount of current at different locations in the circuit?

   d) Use your observations above to explain how current divides and recombines in circuits.

2) Comparing current produced by a battery attached to different circuits:
    a) Compare the current produced in the circuit with a single bulb and the circuit with two bulbs in series. In which circuit does the battery produce the most current? What does this tell you about the resistance of the two circuits?

    b) Compare the current produced in the circuit with a single bulb and the circuit with two bulbs in parallel. In which circuit does the battery produce the most current? What does this tell you about the resistance of the two circuits?

    c) Rank the current produced by the battery in the 3 circuits above.

    d) Rank the resistance of the 3 circuits above. Explain your reasoning.

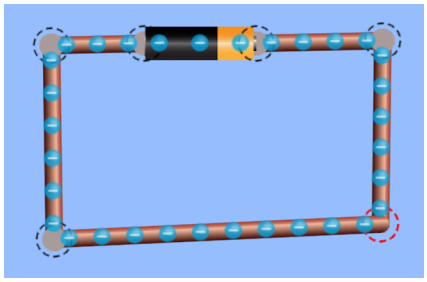
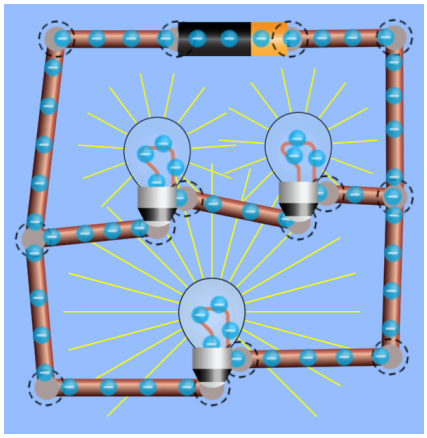
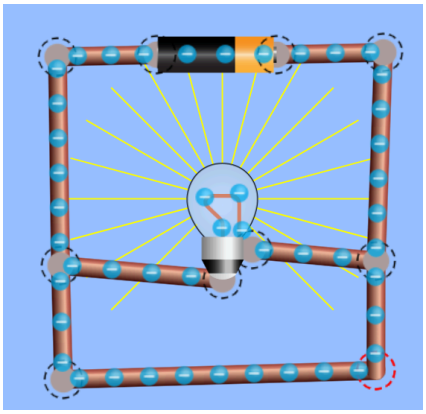
3) Measuring current in different circuits:
    a) Use the Ammeter Tool to measure the current produced by the battery in all 3 circuits. Record your results here:

	Single Bulb	**Two Bulbs in Series**	**Two Bulbs in Parallel**
Current			

    b) Do your results agree with your answers to question 3 and 4? If so, explain why. If not, resolve anything that you notice is inconsistent.

(Optional) Extension:

The three questions below refer to the following circuits

Short Circuit	Paths with different resistance	Shorting a Light Bulb
		

4) What happens when you “short circuit” a battery by connecting a path of wires from one end of the batter to the other? Why do you think this happens? What does this tell you about the resistance of a wire?

5) How does the current travelling through a parallel branch with only one bulb compare to the current travelling through a parallel branch with two bulbs? What does this tell you about how the resistance of a branch affects the current through it?

6) What happens in a circuit when you “short circuit” a light bulb by using a wire (or multiple wires) to create a path of wire in parallel with the light bulb? What does this tell you about how the resistance of a wire compares to the resistance of a bulb?

7) There are a lot of other things you can try. Try making circuits with the other objects in the simulation (switches, fuses, graphite, dogs…). Take screenshots of something interesting that you tried. Explain what is interesting about your results.