

## Electricity and Circuits

### Learning Goals:

- Students will understand basic properties of circuits.
- Students will understand what is required to complete a circuit.
- Students will be able to build series and parallel circuits and understand the difference between the different circuits.
- Students will learn about conductors and insulators.

### CAP

#### 1.1 (RED)

Ask questions and state hypotheses that lead to different types of scientific investigations (for example: experimentation, collecting specimens, constructing models, researching scientific literature)

#### 2.8 (BLUE)

There are different forms of energy and those forms of energy can be transferred and stored (for example: kinetic, potential) but total energy is conserved

Open the phET simulator by...

Open the DC only circuit simulator

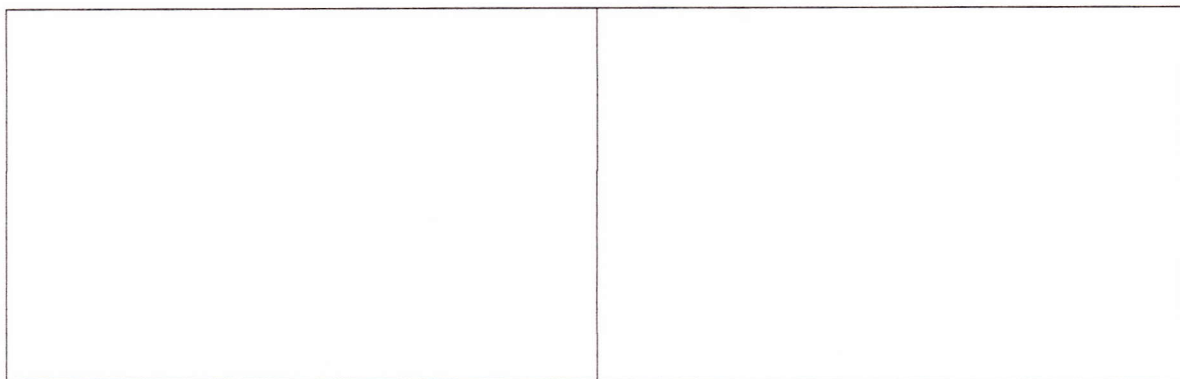
Find a way to make a single light bulb light up with as FEW parts hooked up as possible. When electricity flows through wires and makes something work, like a light bulb, it is called a circuit.

1. Sketch your circuit below:
  
  
  
  
  
  
  
  
  
  
2. What seems to be making the light bulb turn on in your circuit? (what do you think electricity is based on the simulator?)

Make a gap in your circuit.

Go to the grab bag and play with the different objects. Find out which objects allow electricity to flow and fill in the data table:

Objects that allow electricity to flow (conductors)	Objects that do NOT allow electricity to flow (insulators)
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3. What do the conductors have in common?

4. What do the insulators have in common?

For the next few activities, you need to light up more than 1 bulb at the same time, using just one battery.

First circuit: find a way to hook up your bulbs in a way that if you break the connection at one bulb, ALL bulbs go out.

5. Sketch your new circuit:

6. Why did the rest of the bulbs go out if you break the connection at one bulb?

7. This circuit is called a **series circuit** because the bulbs are hooked up in one long “series” or line. Name somewhere you have seen a string of lights that are also a series circuit.

Second circuit: find a way to hook up your bulbs in a way that if you break the connection at one bulb, ONLY that bulb goes out.

8. Sketch this circuit:

9. Why do the rest of the bulbs stay lit if you break the connection at one bulb?

10. This circuit is called a **parallel circuit**, which has 2 or more single loops connected to the same battery. When 1 bulb goes out in these circuits, the rest of the lights stay on! Name somewhere you have seen many bulbs hooked up to one power source, where one bulb can go out without affecting the others.
  
11. You design toys for a toy company. Your boss wants you to hook up the lights in the toy car you are working on in the cheapest way possible, without consideration of the quality of the toy. Which circuit should you use if you want to save money by using fewer parts? Why would this circuit be cheaper?
  
12. You are an electrician working on a house. What type of circuit should you use for the house so that the owners don't call to complain about their wiring? Why use this circuit?

Experiment with the simulator, see what you can make it do!!!

13. What did you do to make light bulbs glow brighter?
  
14. What did you do to make light bulbs glow dimmer?
  
15. How can you cause a fire? (In the simulator... NOT in the real world!)
  
16. Can you catch the puppy on fire?

### Ohm's Law Worksheet Regents Physics

1. Determine the direction of the electron flow
2. Define positive and negative terminals of the battery
3. What do black dots within the wire represent?
4. Complete the table:

<i>Voltage</i>	<i>Current</i>	<i>Resistance</i>
0.1 V		800 Ohms
2.0 V		
3.0 V		
4.0 V		
5.0 V		
9.0 V		
0.1 V		405 Ohms
2.0 V		
3.0 V		
4.0 V		
5.0 V		
9.0 V		
0.1 V		40 Ohms
2.0 V		
3.0 V		
4.0 V		
5.0 V		
9.0 V		

5. Graph your data below. Plot the voltage  $V$  as the ordinate (y-axis) and the current  $I$  as the abscissa (x-axis).
6. What kind of relationship did you obtain?
7. Calculate the slope, if possible