Basic Circuits
Name ________________________________

Objectives:

Students will be able to….
- know the difference between a closed circuit and an open circuit.
- construct simple to more complicated series and parallel circuits
- explain the difference between a series and parallel circuit.
- use symbols to draw the different circuits they created.

Vocabulary: Define these words on a sheet of paper or in your science notebook.

- Circuit
- Conductor
- Current
- Electrons
- Voltage
- Series Circuit
- Parallel Circuit
- Resistance

Materials per group of 2 students

- 2 D batteries
- 3 Small penlight bulbs
- 3 Sockets
- 2 switches
- Many pieces of Insulated wire

Symbols to use when you draw your circuits:

Images from http://whyfiles.larc.nasa.gov/text/kids/Problem_Board/problems/electricity/circuits2.html

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Directions:

Using the materials on your desk, create the following circuits:

**Series Circuits**: Once your circuit is working, have your teacher check the circuit. Using the symbols above, draw the circuit you created.

<table>
<thead>
<tr>
<th>a. Using one bulb, batteries and some wires, <strong>make one light bulb turn on.</strong></th>
<th>b. Now make <strong>2 light bulbs turn on</strong> with batteries and some wire.</th>
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<td>c. Using 3 bulbs, batteries, and some wires, <strong>make 3 light bulbs turn on.</strong></td>
<td>What do you notice about the <strong>brightness</strong> of the bulbs in each circuit?</td>
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<td>After you have made 3 light bulbs light, <strong>unscrew one bulb</strong> and record what happens.</td>
<td>d. Using one light bulb and a switch, make <strong>one bulb turn on and off</strong> with the <strong>switch</strong>.</td>
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<td>Screw the bulb back on, what happens?</td>
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<tr>
<td>e. using 2 bulbs, batteries, 1 switch, and some wires, make 2 light bulbs light up and turn off at the <strong>same time</strong> with the <strong>switch</strong>.</td>
<td>f. using 3 bulbs, batteries, and 1 switch, <strong>make 3 light bulbs light up and turn off at the same time with the switch.</strong></td>
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<td>g. With 3 light bulbs and a switch, can you make 1 or 2 light bulbs light up and not the other(s)? Why/Why not?</td>
<td>Explain what makes a circuit <strong>closed</strong> or <strong>open</strong>.</td>
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**Parallel Circuits:** Remember to draw your circuits after your teacher has checked to see if your circuit works.

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<td><strong>h.</strong> Using 2 bulbs, batteries, and some wires, <strong>make 2 light bulbs light up.</strong> After they are lit, unscrew one bulb, what happens? If both lights go out, try the circuit again.</td>
<td><strong>i. Make 3 light bulbs light up.</strong> Unscrew one bulb, what happens to the other 2? Unscrew 2 bulbs, what happens to the 3rd bulb?</td>
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<tr>
<td><strong>j.</strong> Make 2 light bulbs <strong>turn on and off</strong> at the <strong>same time</strong> with a switch.</td>
<td><strong>k.</strong> Make 1 light bulb <strong>turn on and off</strong> with a <strong>switch</strong> while the other bulb stays lit.</td>
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1. **Challenge:** Make 2 light bulbs turn on and off with a switch while the 3rd bulb stays lit.

   **m. Challenge:** Using 2 switches and 3 bulbs, what other combinations can you make?

   

   

   

   

**Conclusions:**

1. Describe the differences between a **closed** and **open** circuit.

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

2. What do you notice about the **brightness** of the bulbs in the **series** circuits as you added more bulbs to it?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

3. What do you notice about the **brightness** of the bulbs in the **parallel** circuits as you added more bulbs to it?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________
__________________________________________________________________


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4. How does removing a bulb or opening and closing the switch affect a **series** circuit?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

5. How does removing a bulb or opening and closing the switch affect a **parallel** circuit?

__________________________________________________________________
__________________________________________________________________
__________________________________________________________________

6. Look at the diagrams below and label all the parts and tell if each is a series or parallel circuit:

Image source: [http://iss.cet.edu/electricity/pages/q1.xml](http://iss.cet.edu/electricity/pages/q1.xml)
Online Resources:

- This site has really good basic information about circuits:
  http://www.energyquest.ca.gov/story/chapter04.html

- This is a very informative site with great diagrams:
  http://www.glenbrook.k12.il.us/gbssci/phys/Class/circuits/u9l4b.html

- This is great interactive website that uses Flash, you can view this before or after this exercise:
  http://www.thetech.org/exhibits/online/topics/1xa_flash.html  then click on #3 Circuits, or this link:
  http://www.thetech.org/exhibits/online/topics/12a.html


- For advanced students or students who are done with the experiment early, try this interactive circuit lesson online:
  http://www.schoolscience.co.uk/content/3/physics/circuits/circh3pg1.html