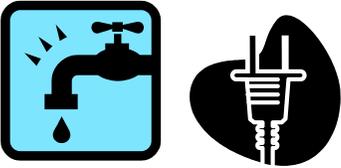
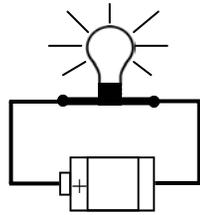


## Circuits and Symbols

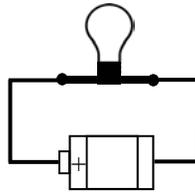
Electricity works a lot like water. Often imagining how water would work in an circuit will tell you how electricity will work as well.



**Electricity flows through circuits:** paths of conductors (usually wires). Any break in the circuit will cause the circuit to fail, just like a break in a pipe lets water leak out of a water system.



A closed circuit has no breaks: the light lights up.

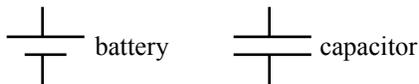


An open circuit has a break in it: the light will not light up.

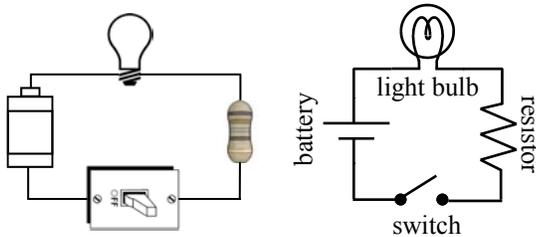
A break in a circuit is any spot where an insulator is in the way of the electricity's flow. Paper, plastic, or even an air gap can keep electricity from flowing.

## Circuit diagrams

Circuit diagrams are a short-cut method of drawing circuits. They don't need to be perfectly drawn, but they can be drawn wrong.



These components *look* similar, but are very different and have different functions.



The diagram on the right is a faster way of drawing the circuit on the left. (Notice the direction of the battery, which is important)

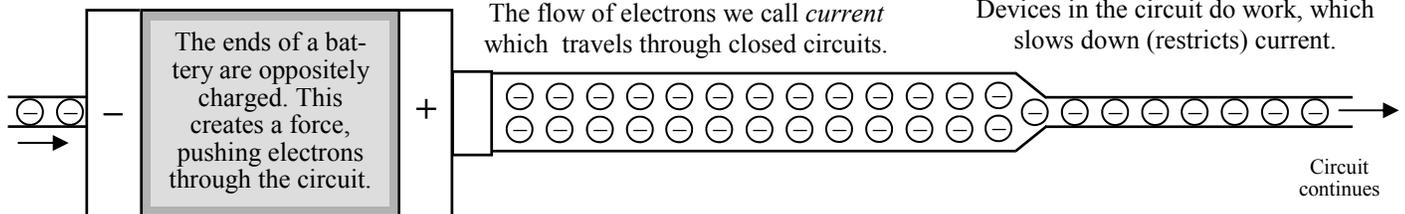
Electrical Symbols			
Electrical Device	Symbol	Function	Water Equivalents
wire	—	paths for electricity to flow.	pipes
battery	+   - 	pushes electricity through circuit.	pump
light bulb	⦿	lights up; resists electricity.	no equivalent
switch	— ● — ● —	turns electricity on and off	valve
resistor	⚡	resists flow of electricity.	restriction in a pipe

## 3 Quantities of a Circuit

**Voltage Pushes Electrons**

**Current Flows Through Circuits**

**Resistance Resists Current Flow**

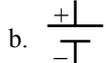
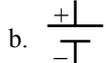
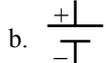
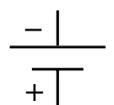
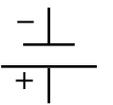
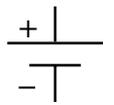
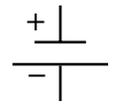
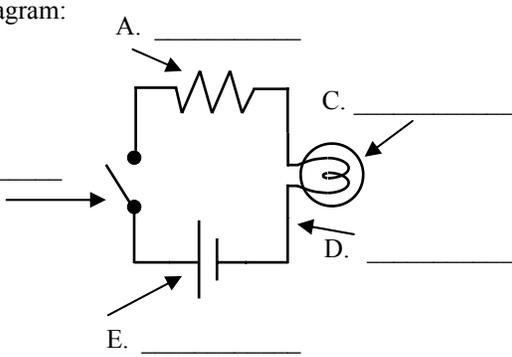


**Voltage** is measured in *Volts*.

**Current** is measured in *Amps*.

**Resistance** is measured in *Ohms*.

These three quantities are linked in any circuit. Change one of them and one or both of the others will change.

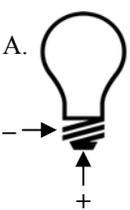
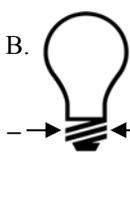
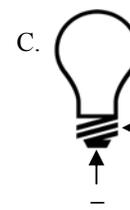
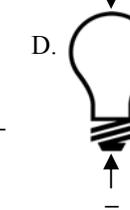
<ol style="list-style-type: none"> <li>1. Open circuit</li> <li>2. Closed circuit</li> <li>3. Circuit diagram</li> <li>4. Voltage</li> <li>5. Current</li> <li>6. Resistance</li> </ol>	<ol style="list-style-type: none"> <li>A. Slows down the flow of electricity.</li> <li>B. A short-hand way of drawing electrical circuits.</li> <li>C. A circuit with a break in it; no electricity will flow.</li> <li>D. Pushes electricity through a circuit.</li> <li>E. Electricity can flow through this.</li> <li>F. The flow of electricity through a circuit.</li> </ol>	<p>Match the electrical component with the water component and diagram symbol</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; vertical-align: top;"> <ol style="list-style-type: none"> <li>1. Valve</li> <li>2. Pipes</li> <li>3. No equivalent</li> <li>4. Resists flow</li> <li>5. Pump</li> </ol> </td> <td style="width: 33%; vertical-align: top;"> <ol style="list-style-type: none"> <li>A. Resistor</li> <li>B. Battery</li> <li>C. Switch</li> <li>D. Wire</li> <li>E. Light bulb</li> </ol> </td> <td style="width: 33%; vertical-align: top;"> <p>a. </p> <p>b. </p> <p>c. </p> <p>d. </p> <p>e. </p> </td> </tr> </table>	<ol style="list-style-type: none"> <li>1. Valve</li> <li>2. Pipes</li> <li>3. No equivalent</li> <li>4. Resists flow</li> <li>5. Pump</li> </ol>	<ol style="list-style-type: none"> <li>A. Resistor</li> <li>B. Battery</li> <li>C. Switch</li> <li>D. Wire</li> <li>E. Light bulb</li> </ol>	<p>a. </p> <p>b. </p> <p>c. </p> <p>d. </p> <p>e. </p>
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<p>Which of the following are correct?</p> <p>A.  B.  C.  D. </p>		<ol style="list-style-type: none"> <li>1. Wires</li> <li>2. Battery</li> <li>3. Resistor</li> <li>4. Light bulb</li> <li>5. Switch</li> </ol> <ol style="list-style-type: none"> <li>A. Used to create radiant energy.</li> <li>B. Pushes electricity through the circuit.</li> <li>C. Can turn the electricity on and off.</li> <li>D. Allows electricity to flow.</li> <li>E. Slows down the flow of electricity.</li> </ol>			
<p>Label the diagram:</p> 		<p>Draw a circuit diagram (starting on the left) with a battery, a resistor, a lightbulb, and a switch. Make sure it is a closed circuit, connected with wires.</p>			

**In the Lab**

Start by making a circuit with a battery, light bulb, and switch. Turn on the switch to be sure the circuit is correct (light comes on). Next connect an alligator clip wire to either side of the switch. Touch the free ends of the alligator clip wires together to be sure the light still turns on. If not find the problem. When correct, use the free ends as probes to complete the following task.

Using the electrical circuit above, test which of these are conductors (C) or insulators (I)		
Paper _____	Paperclip _____	Cloth _____
Lock Nut _____	Glass _____	Wood _____
Penny _____	Plastic _____	Rubber _____

Connect alligator clip wires to either side of the battery. Take a light bulb out of the holder. Circle the letter of the following diagrams that light up the light bulb.

A. 	B. 	C. 	D. 
--	--	--	--

Where are the two parts of a light bulb that must be touched complete the light bulb circuit?

Create in the lab and draw the diagram for the following circuit: battery; light bulb; switch; complete the circuit (close the circuit). What happens if you reverse (turn around) the battery? (You must reverse the whole battery holder.)