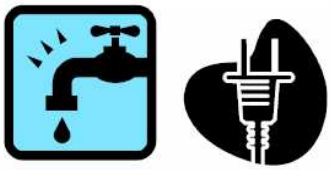
Name: _____

Period: _____

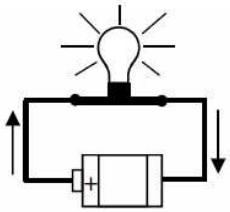
Circuits and Symbols

4.2

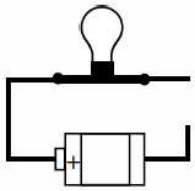
Electricity works a lot like water. Often imagining how water would work in an circuit will tell you how electricity will work as well.



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



A *closed circuit* has no break: electricity can flow.

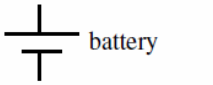


An *open circuit* has a break somewhere: electricity cannot flow.

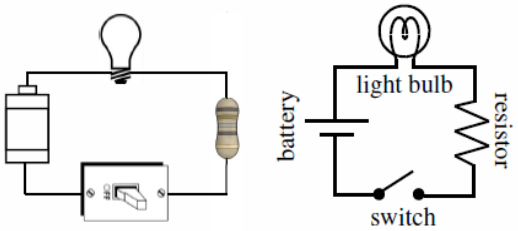
A break in a circuit is anywhere an insulator is in the way of electricity's flow. Paper, plastic, or even an air gap can keep electrons from flowing.

Circuit diagrams

Circuit diagrams are a short-cut method of drawing circuits. They don't need to be perfect, 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.*)

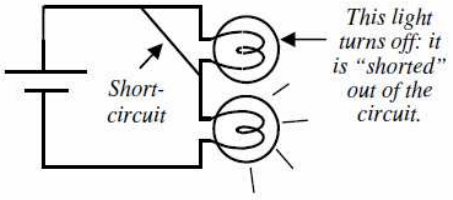
Electrical Symbols

Electrical Device	Symbol	Function	Water Equivalent
wire		path for electricity to flow	pipes
battery		pushes electricity through circuit	pump
light bulb		makes lights; resists electricity	water wheel
switch		turns electricity on and off	valve
resistor		resists flow of electricity.	restriction in a pipe

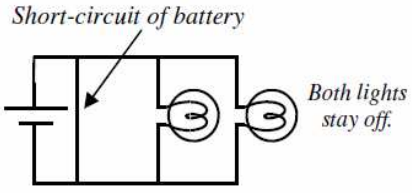
Short Circuits

A short-circuit (also called a "short") is a wire that by-passes a device in a circuit.

Electricity always chooses the path of least resistance. Since wires have virtually no resistance, electricity will go thru a wire instead of a device. This is known as a short-circuit.



When a device is short-circuited the current by-passes it. It is easier for the current to go thru the wire than the resistor.

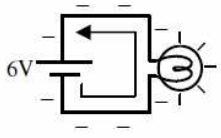


Short-circuiting a battery drains the battery and can be dangerous. Wires could overheat, melting the insulation, and even cause a fire.

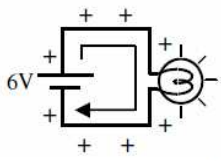
Conventional Current

When studying electricity, early scientists guessed that protons (+ charges) were flowing. We know now that it is the electrons that move, but it is most common to use conventional current, which follows the movement of positive charges.

What's really happening.



Conventional current.



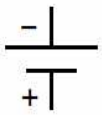
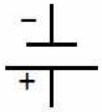
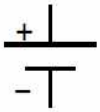
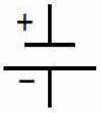
All sections marked with a ⚡ are considered essential concepts and must be completed to receive full credit on WS.

1. Open circuit	A. Slows down the flow of electricity.
2. Closed circuit	B. A short-hand way of drawing electrical circuits.
3. Circuit diagram	C. A circuit with a break in it; no electricity will flow.
4. Voltage	D. Pushes electricity through a circuit.
5. Current	E. Electricity can flow through this.
6. Resistance	F. The flow of electricity through a circuit.

Match the electrical component with the water component and diagram symbol

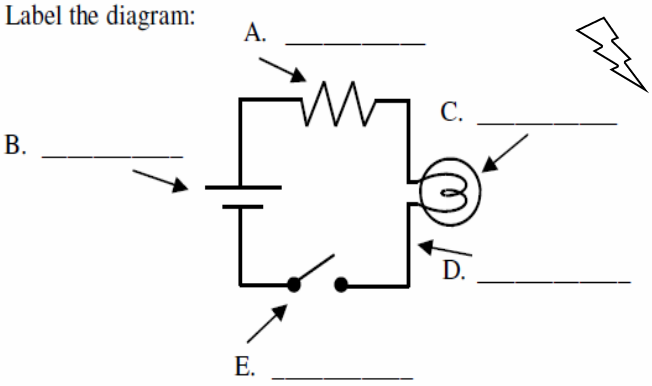
1. Valve	A. Resistor	a. b.  c.  d.  e. 
2. Pipes	B. Battery	
3. Water wheel	C. Switch	
4. Resists flow	D. Wire	
5. Pump	E. Light bulb	

Which of the following are correct?

A.  B.  C.  D. 

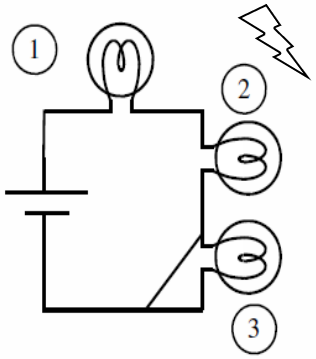
1. Wires	A. Used to create radiant energy.
2. Battery	B. Pushes electricity through the circuit.
3. Resistor	C. Can turn the electricity on and off.
4. Light bulb	D. Allows electricity to flow.
5. Switch	E. Slows down the flow of electricity.

Label the diagram:



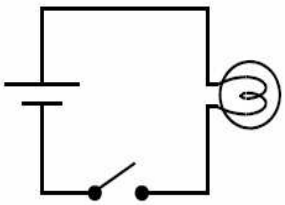
Do all of the light bulbs light up?

Why or why not?



In the Lab

1) *Build the following circuit, being sure to connect all components (parts) with wires. Make sure it works.*



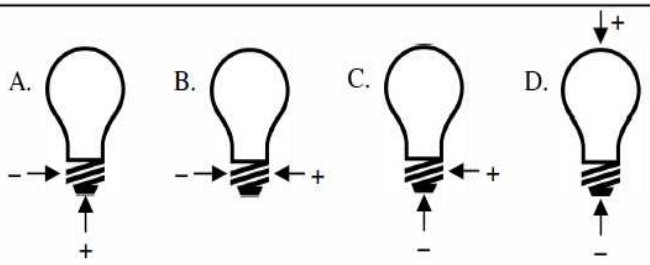
2) *Reverse the direction of the battery. Does the light still work?*

3) *Remove the switch. Touch the two wires between the light bulb and battery together to be sure the light still turns on.*

4) *Use these two wires as probes to test which of the following are conductors (C) or insulators (I).*

Paper _____	Plastic _____	Water _____
A Penny _____	Cloth _____	Salt Water _____
Paperclip _____	Wood _____	Sugar Water _____
Glass _____	A Dime _____	Rubber _____

Using only a battery, two wires, and a light bulb (no holder), make the light bulb light. Which of the following diagrams will light up the light bulb?



What two parts of a light bulb must be touched to make the light bulb light up?

When the light bulb lights up, is this a closed or open circuit?

What does this mean about the inside of the light bulb?

When the light bulb lights up, what types of energy are used and created?