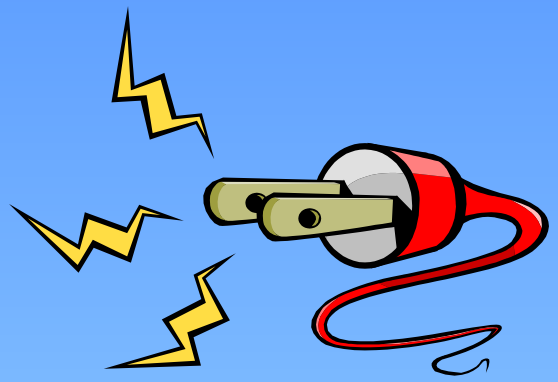
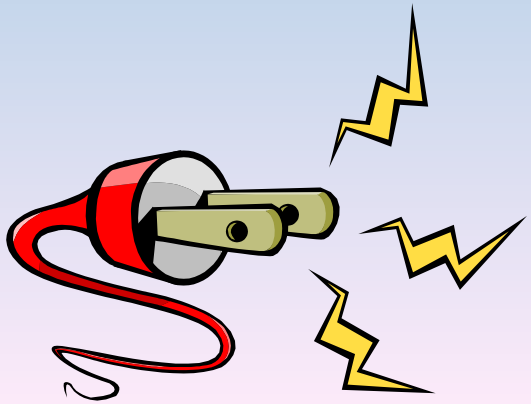
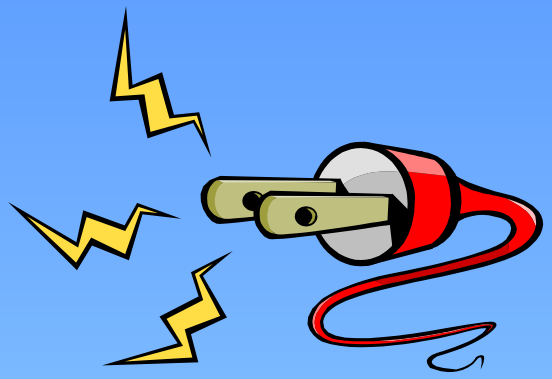
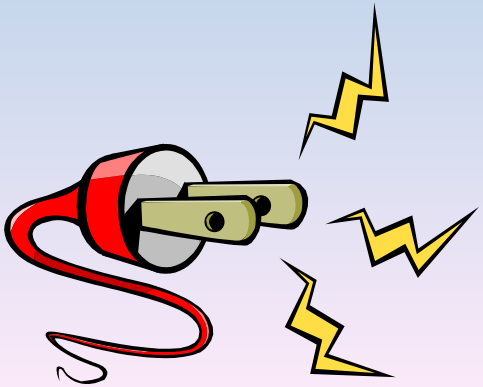


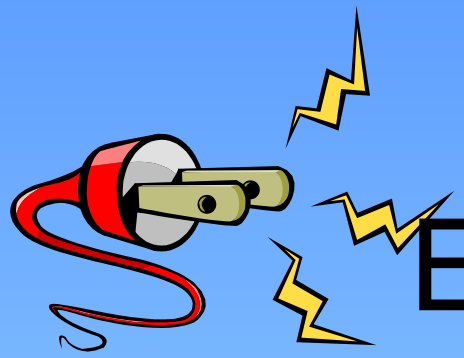
Electric Circuits

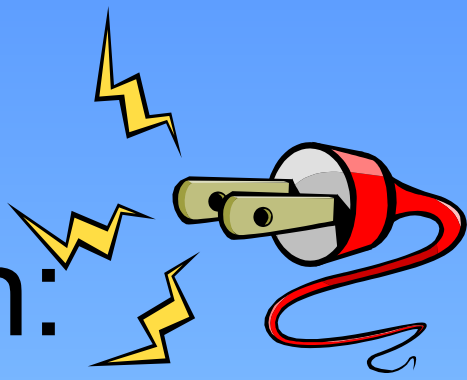




Circuits Activator



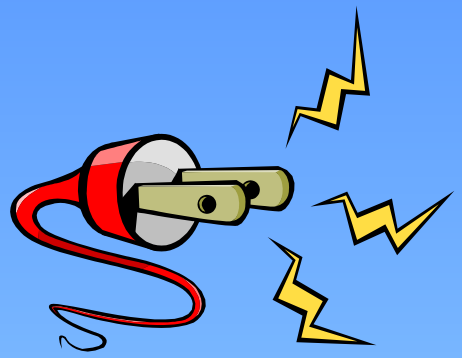


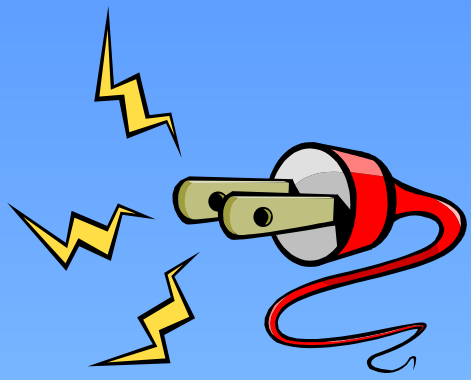


Essential Question:

How are series and parallel circuits similar and different in how they transfer energy?

Standard:
S8P5b. Demonstrate the advantages and disadvantages of series and parallel circuits and how they transfer energy



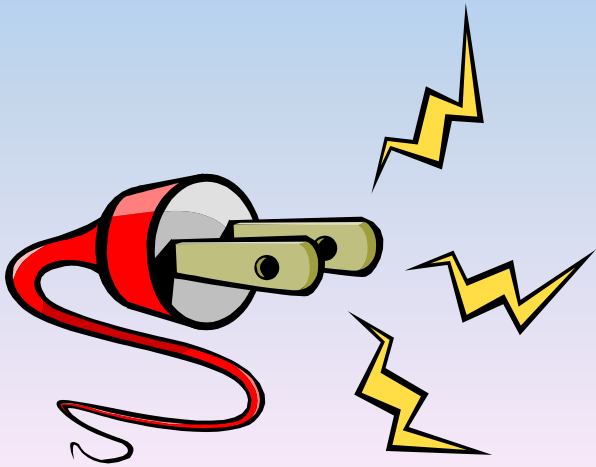


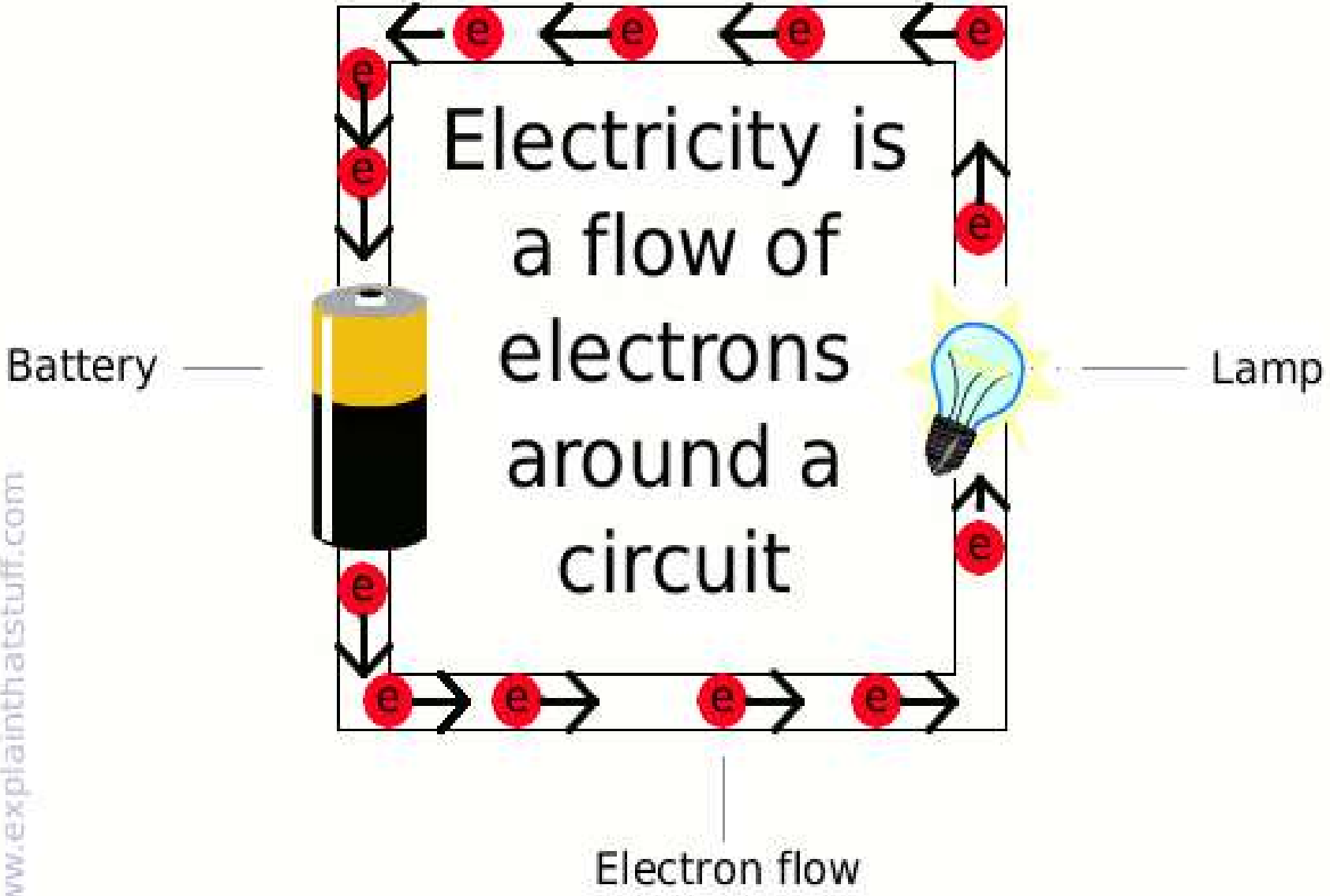
Review:

Turn to a seat partner and discuss the meaning of: electric charge and electricity

Electric Charge: Objects become positively charged when they lose electrons and negatively charged when they gain electrons; objects with like charges repel and objects with opposite charges attract

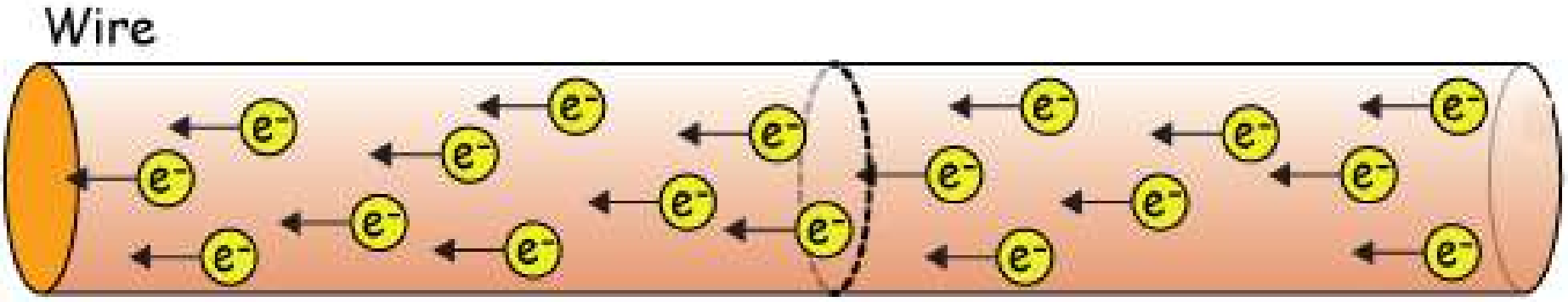
Electricity: the presence and/or flow of electric charges





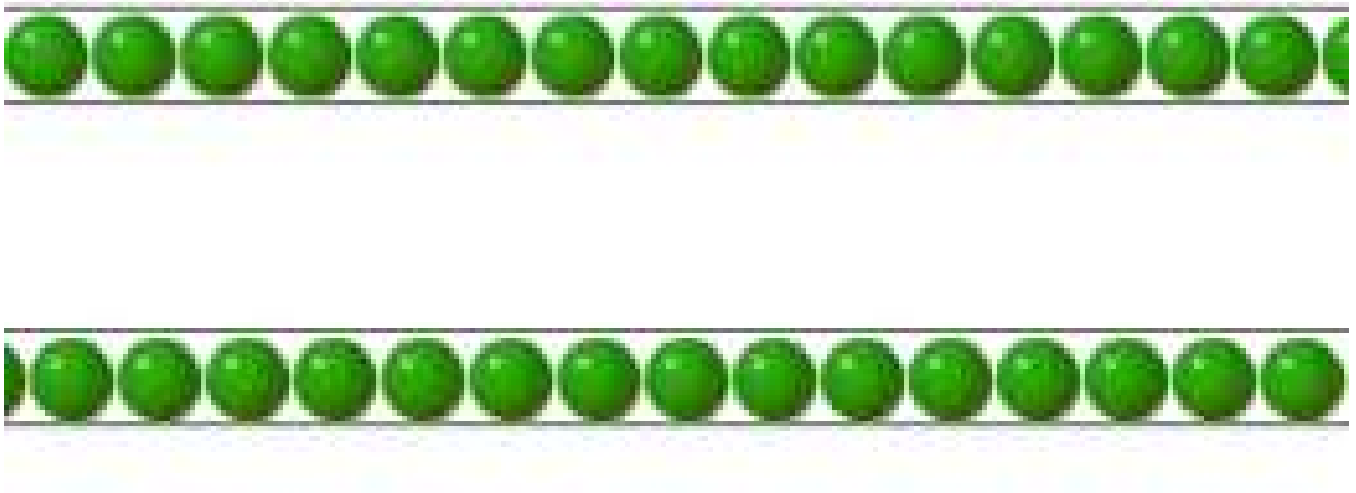
All matter is composed of positive and negative particles.

The flow of charged particles is an electric current.

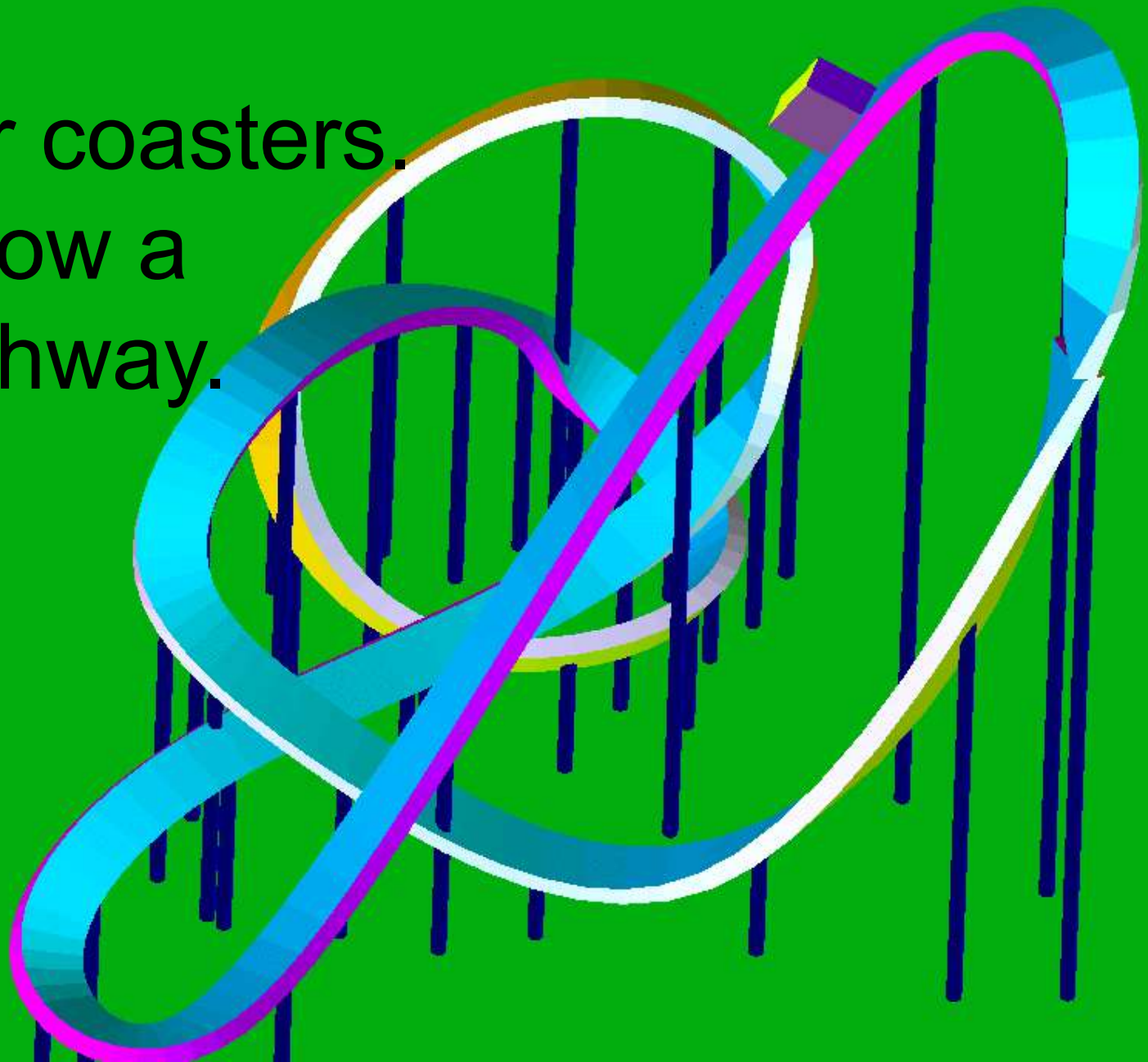


When you watch TV, use a computer, or even turn on a light, you depend on moving charges for the electrical energy that you need.

Higher Current = Faster Moving Electric Charges (Electrons)



Electric Currents
are
like roller coasters.
They follow a
fixed pathway.



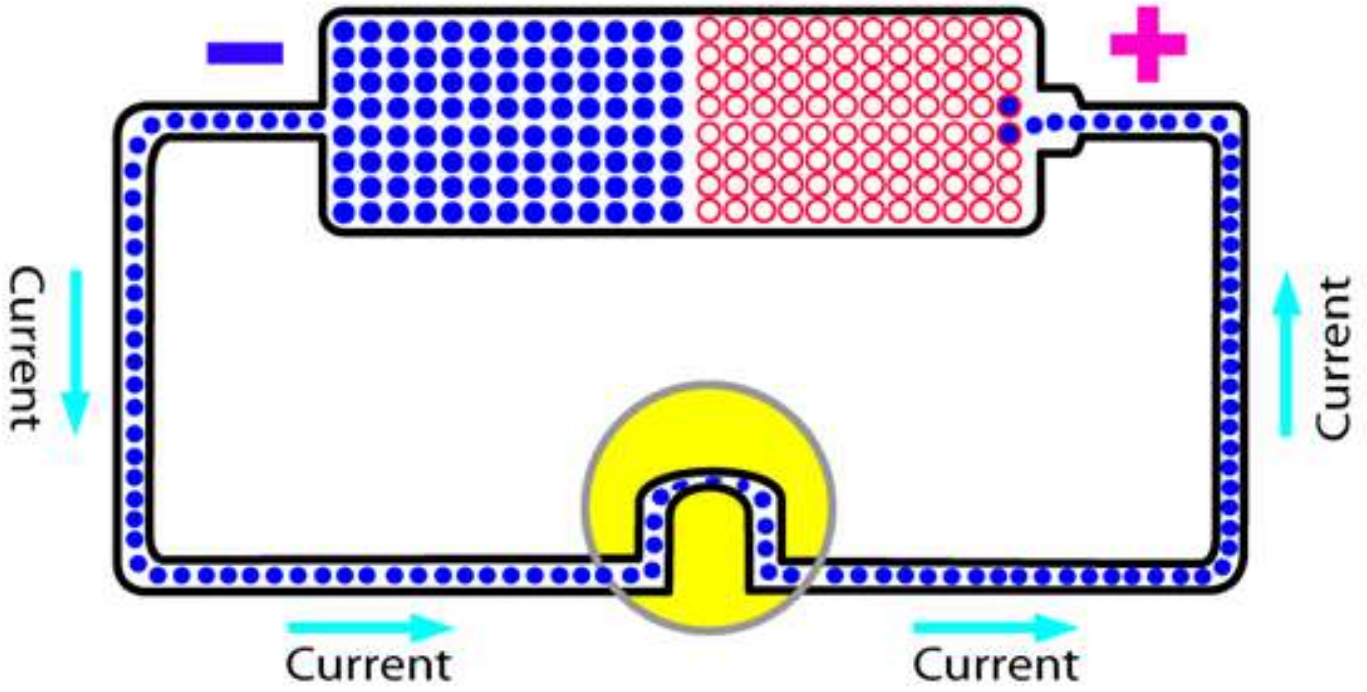
Electric Circuits

- **Circuits control the movement of electric current by providing paths for electrons to follow.**

- **The path of an electric circuit is a closed loop.**

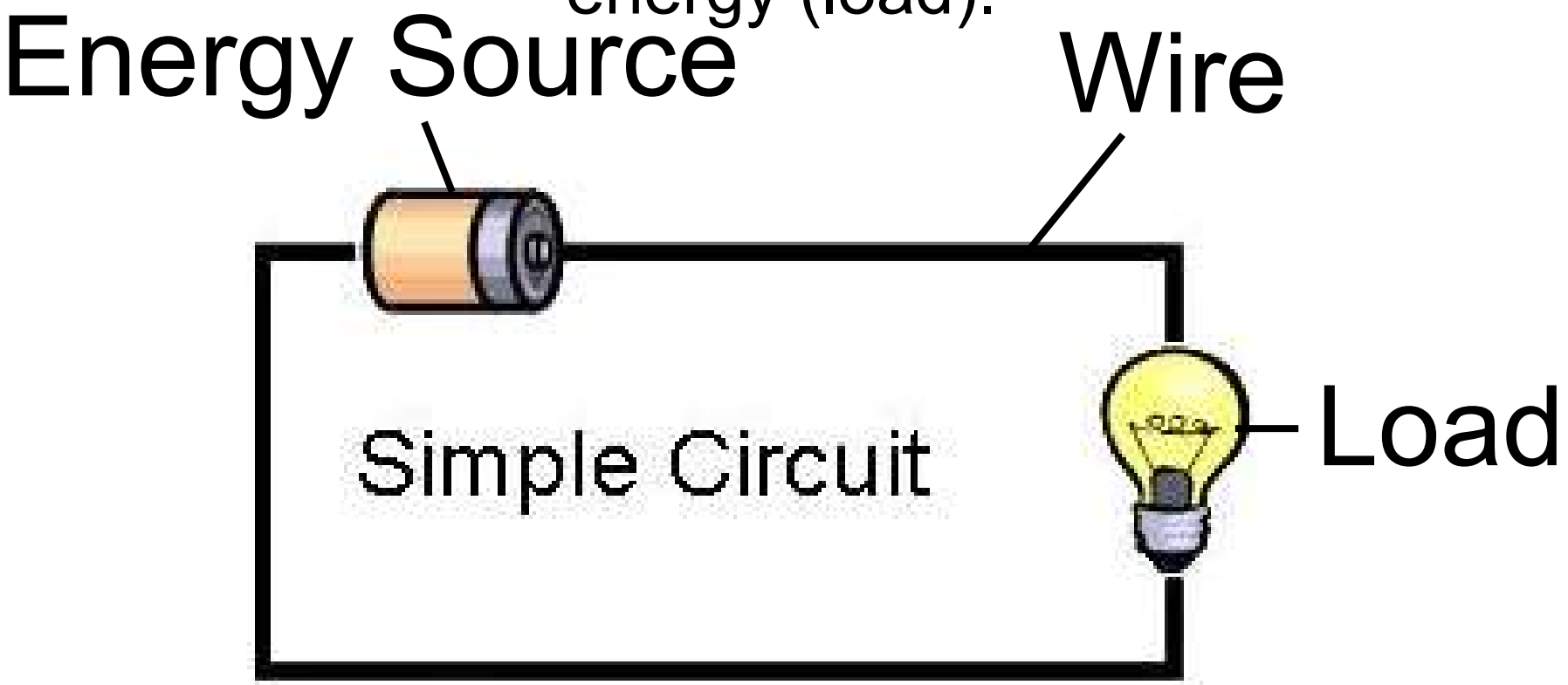
Electric Circuits

An electric circuit allows electrons to flow from a negative pole (excess electrons) to a positive pole (deficient in electrons)



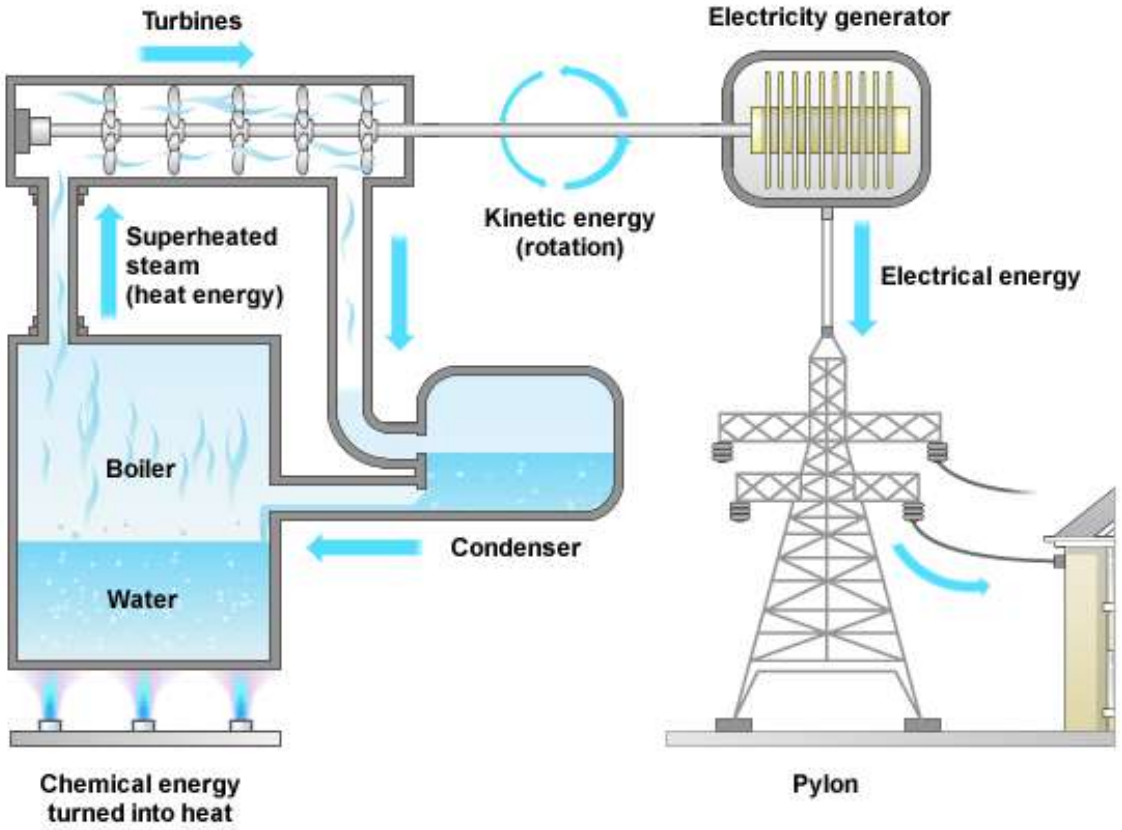
Electric Circuits

All circuits need three basic parts: an energy source, wires, and the object that is going to change the electrical energy into another form of energy (load).



Energy Source Examples

Battery



Power Plant Generator

Load Examples

Changes electrical energy to other forms of energy

Light Bulb

Car

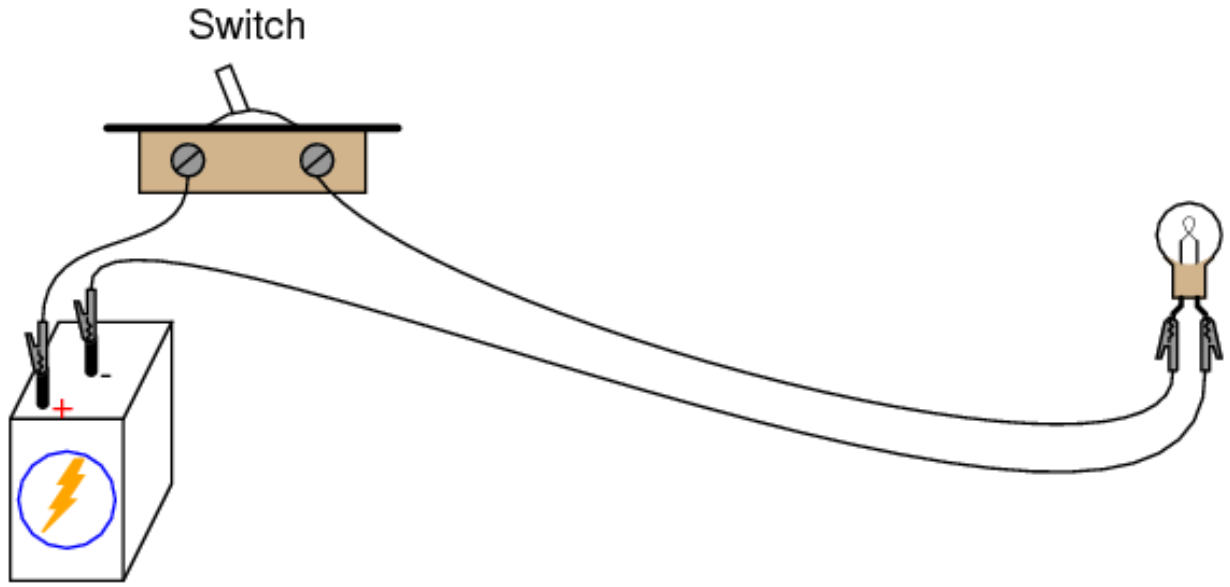
Speaker

Fan

Toaster

Electric Circuits

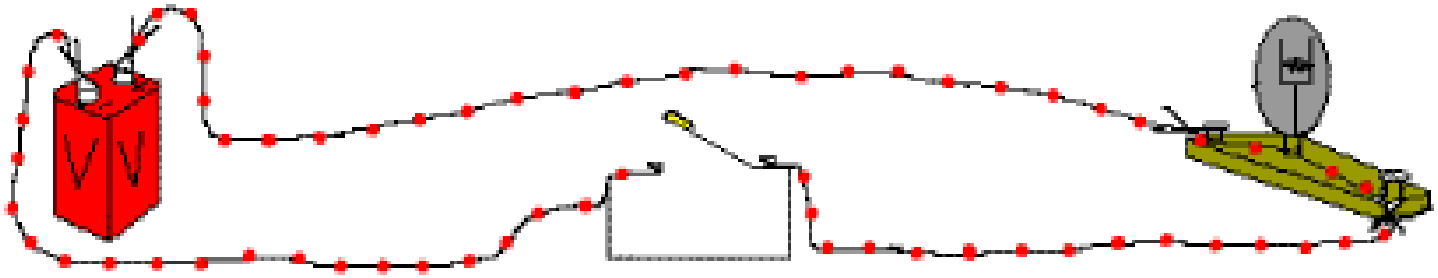
Sometimes a circuit also contains a switch that is used to open and close a circuit.



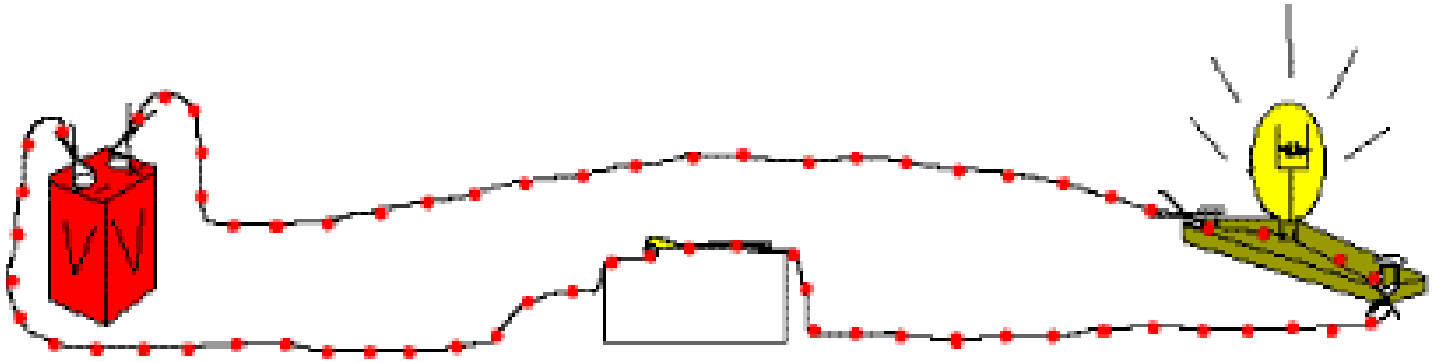
http://tdflashzone.net23.net/index.php?p=2_37

Electric Circuits

OPEN CIRCUIT

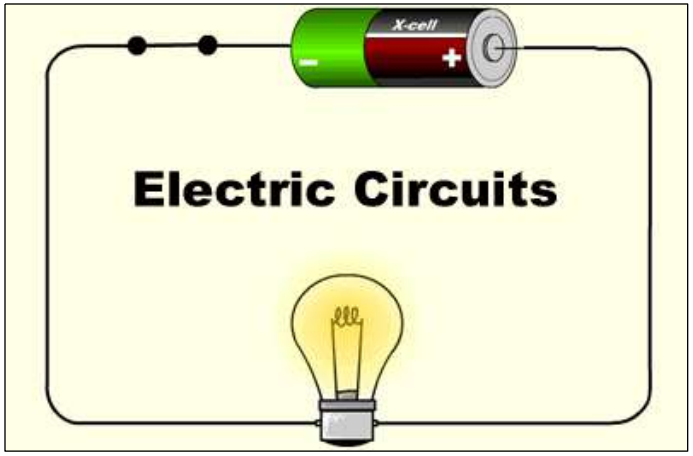


CLOSED CIRCUIT



Connections in a Circuit

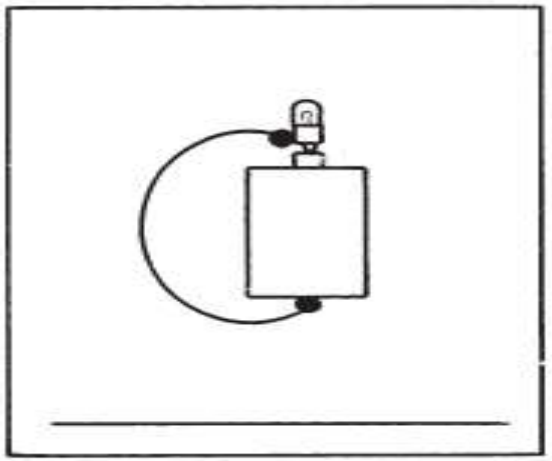
- Electrons flow from negative to positive; therefore, a complete circuit must have wires that connect the negative pole of the energy source to the positive pole of the energy source.
- The circuit is established when there is a continuous path for electricity to travel from one end of the energy source to the other end.

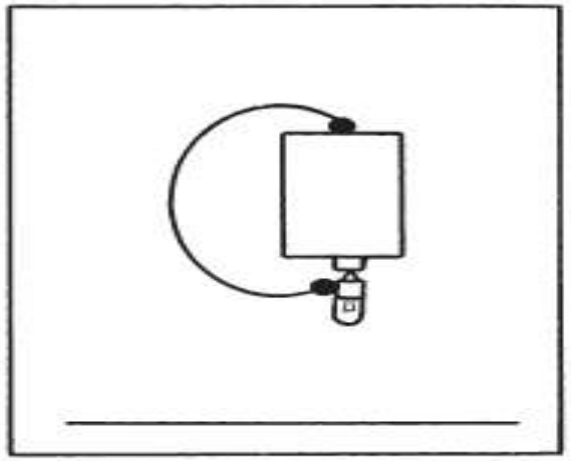


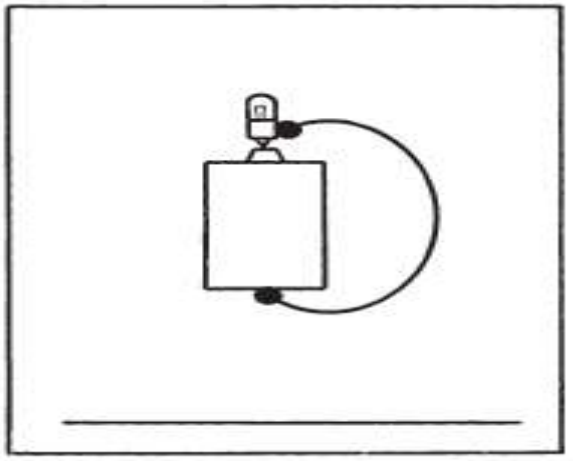
Make a Simple Circuit

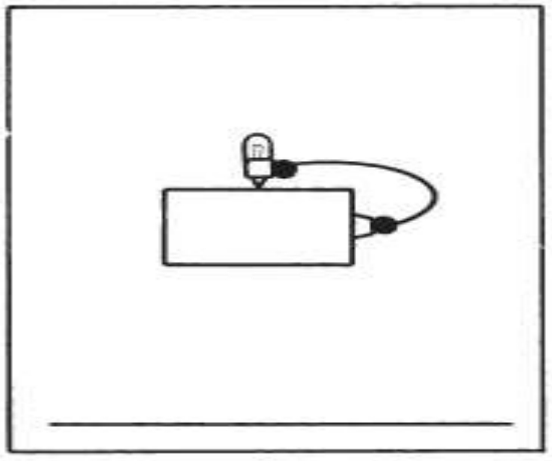
With a partner, determine whether the light bulbs in the following images will be On or Off based on the circuit connections.

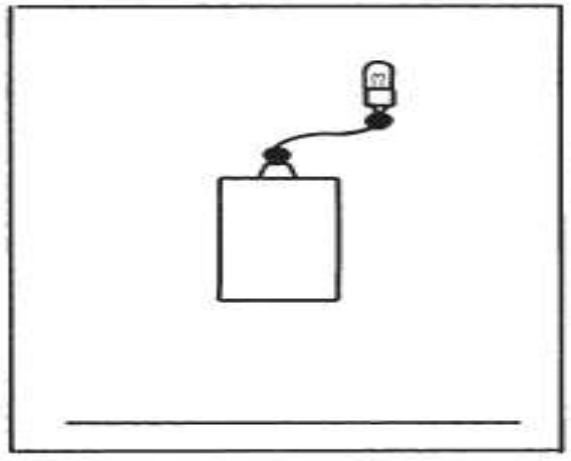
Be able to explain your answer

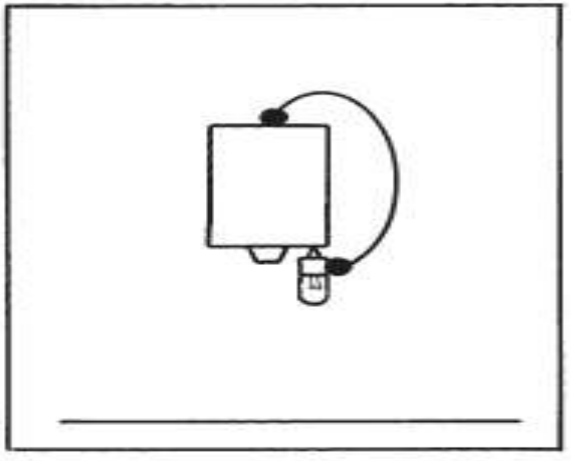


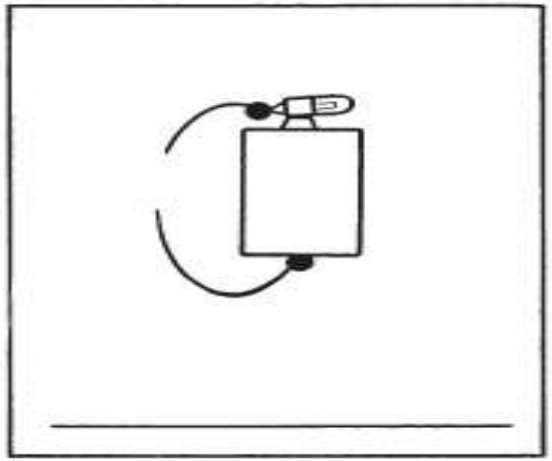


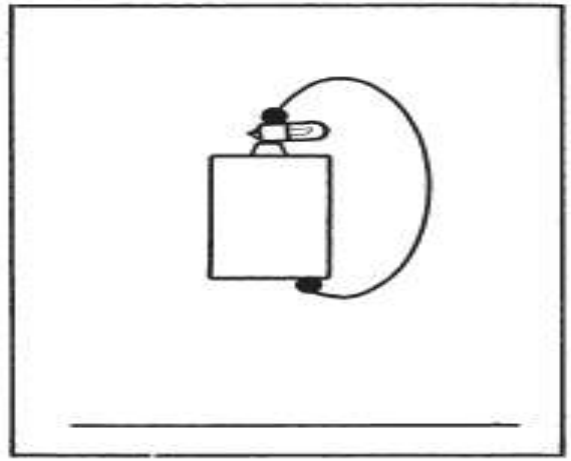


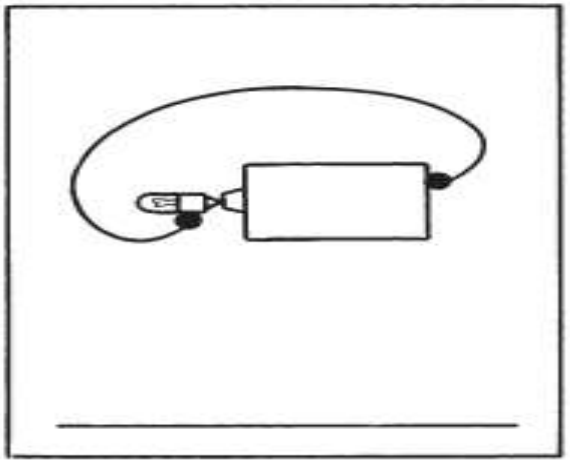


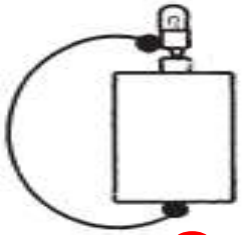






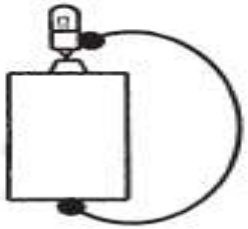




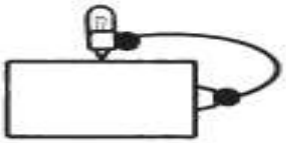


On

On



On



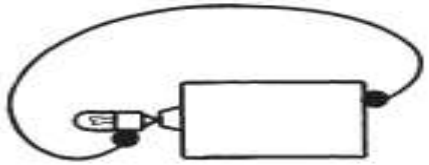
Off

Off

Either

Off

Off

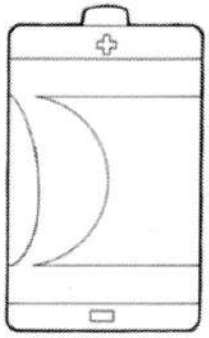


On

Formative Assessment

Circuits: Formative Assessment #1 Name _____ Date _____

Draw wires to correctly connect the circuit in the diagram below so that the bulb will light. Label and identify the following: Arrows showing the flow of the current; Arrows showing the flow of electrons; Energy Source; Load



Identify whether your illustration is a closed circuit or an open circuit. Explain your answer.

Electric Circuits

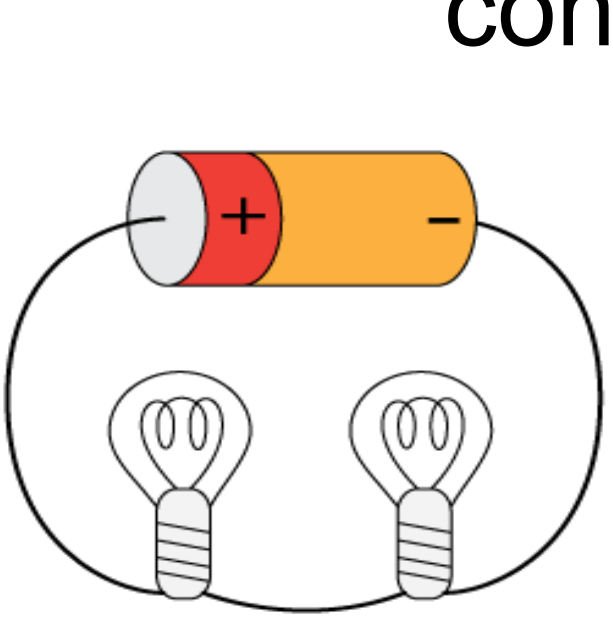
With a partner, look around the room and identify all of the objects that use electrical energy.

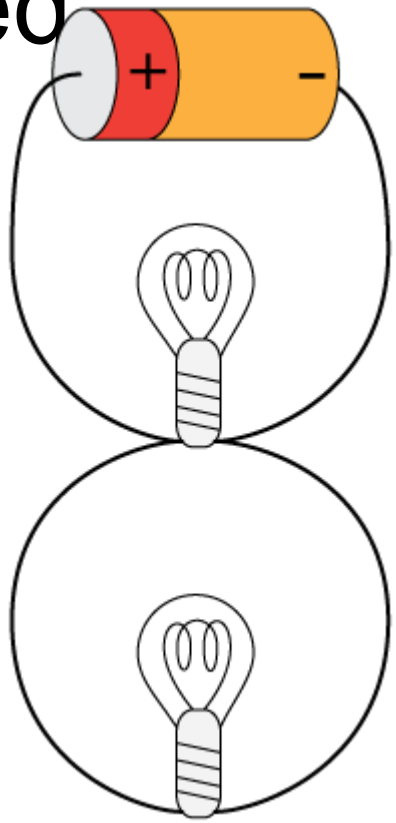
All of the things you counted are loads in a large circuit.

Most circuits have more than one load.

Different Types of Circuits

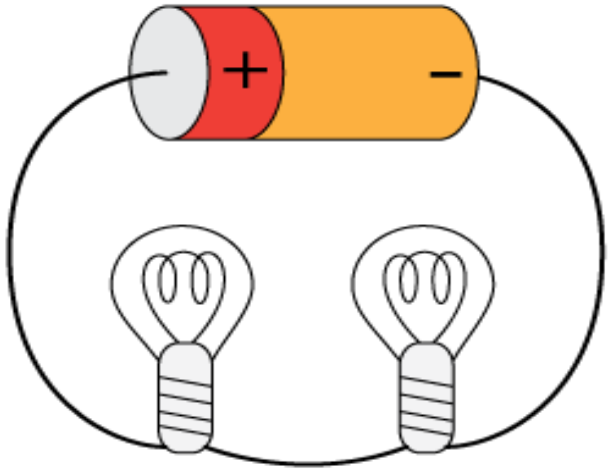
Circuits are distinguished based on the way in which loads are connected

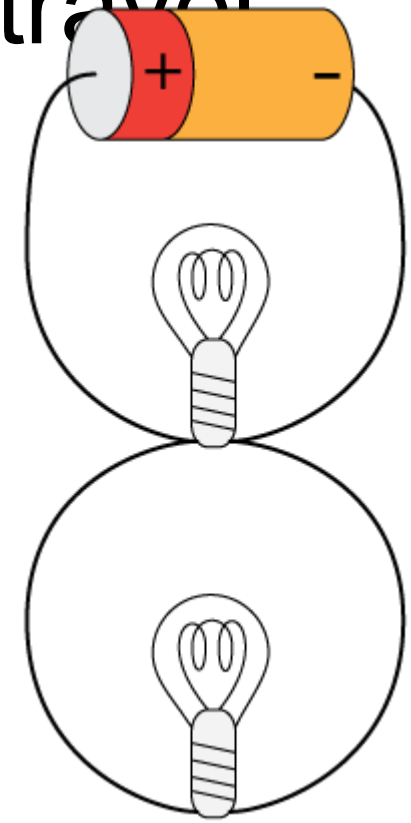




Different Types of Circuits

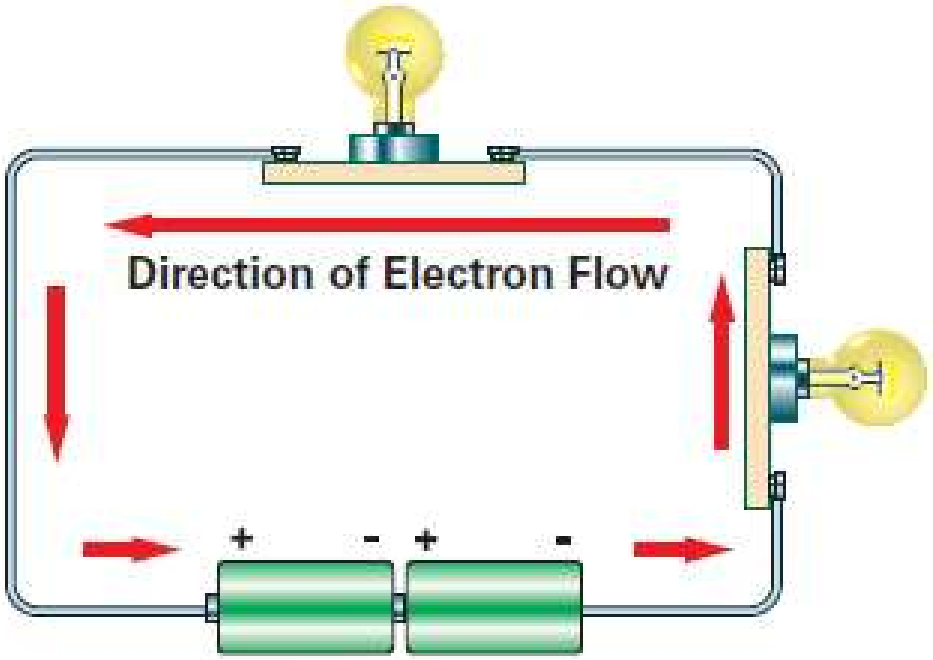
With a partner, discuss the differences in which the electric current will travel.





Series Circuit

In a Series Circuit there is only one path for the electric current or electricity to flow.

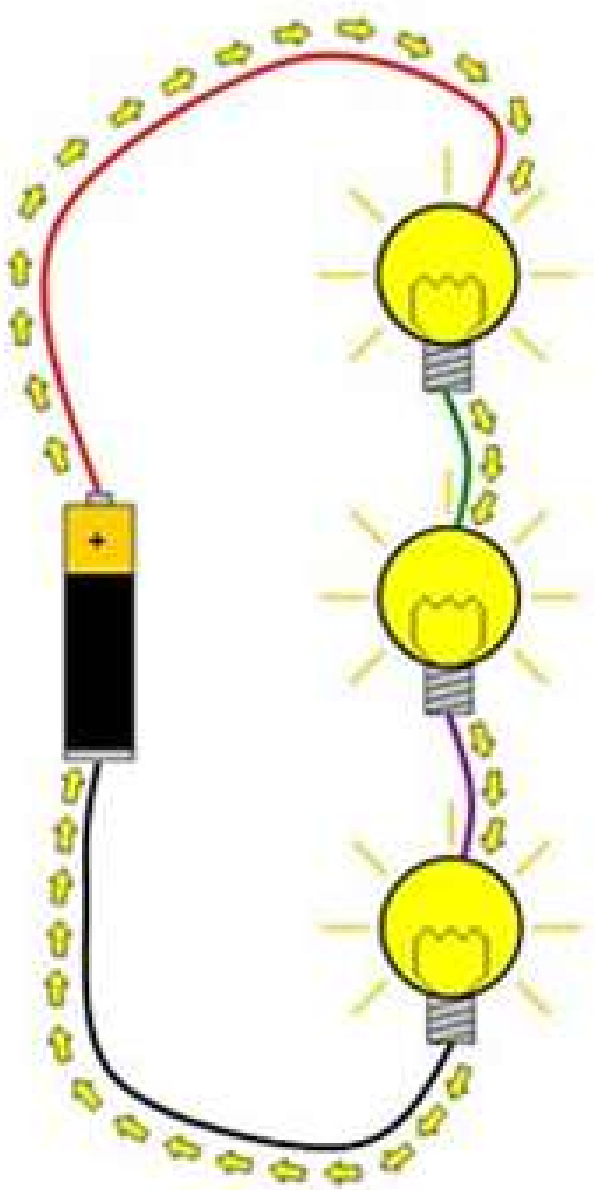


Series Circuit

Series Circuit

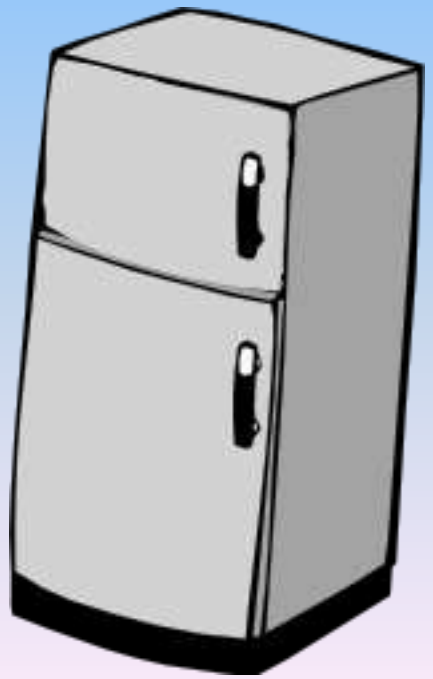
- All of the loads in a series circuit share the same current.

- If there is any break in the circuit, the charges will stop flowing



Series Circuit

Imagine if your refrigerator and a lamp were in a series circuit together. Your refrigerator would run only when the lamp was on. And when the bulb burns out, the refrigerator would stop working.



Series Circuit

There are some cases when a series circuit is useful. For example, series circuits are useful in wiring burglar alarms. Why?

If any part of the circuit in a burglar alarm fails, there will be no current in the system. The lack of current signals that a problem exists, and the alarm will sound.

Can you think of any other examples?

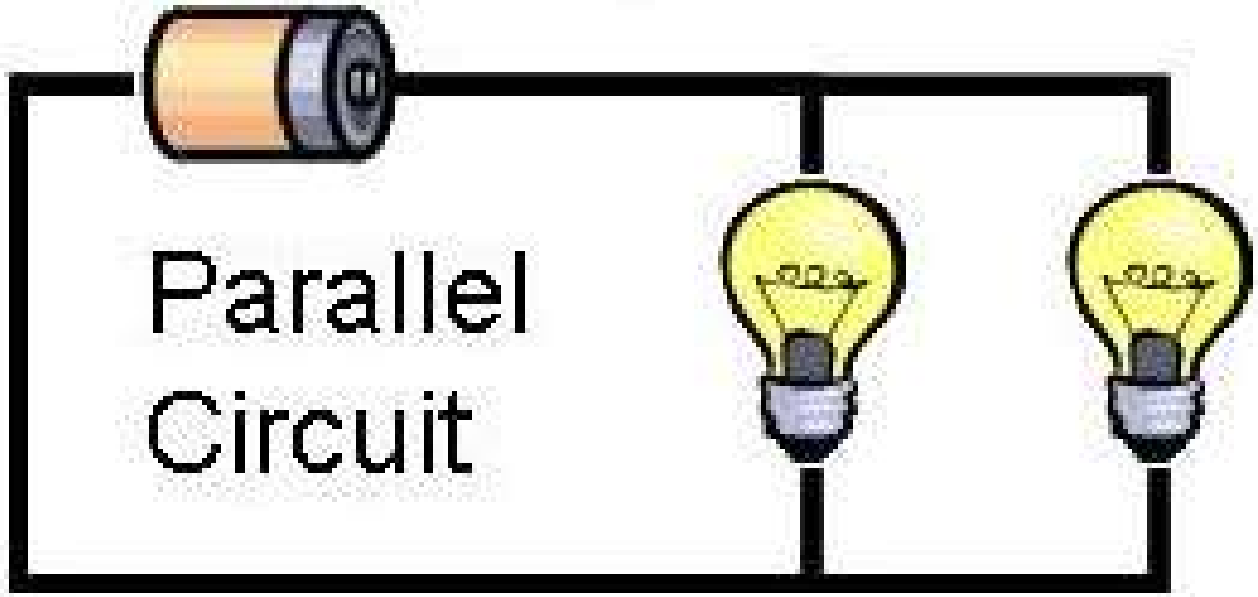
Imagine that your house is wired in a series circuit. What would have to happen if you wanted to watch TV?

You would have to turn on other appliances in order to watch TV. Stupid right?

Circuits in buildings are wired in Parallel.

Parallel Circuit

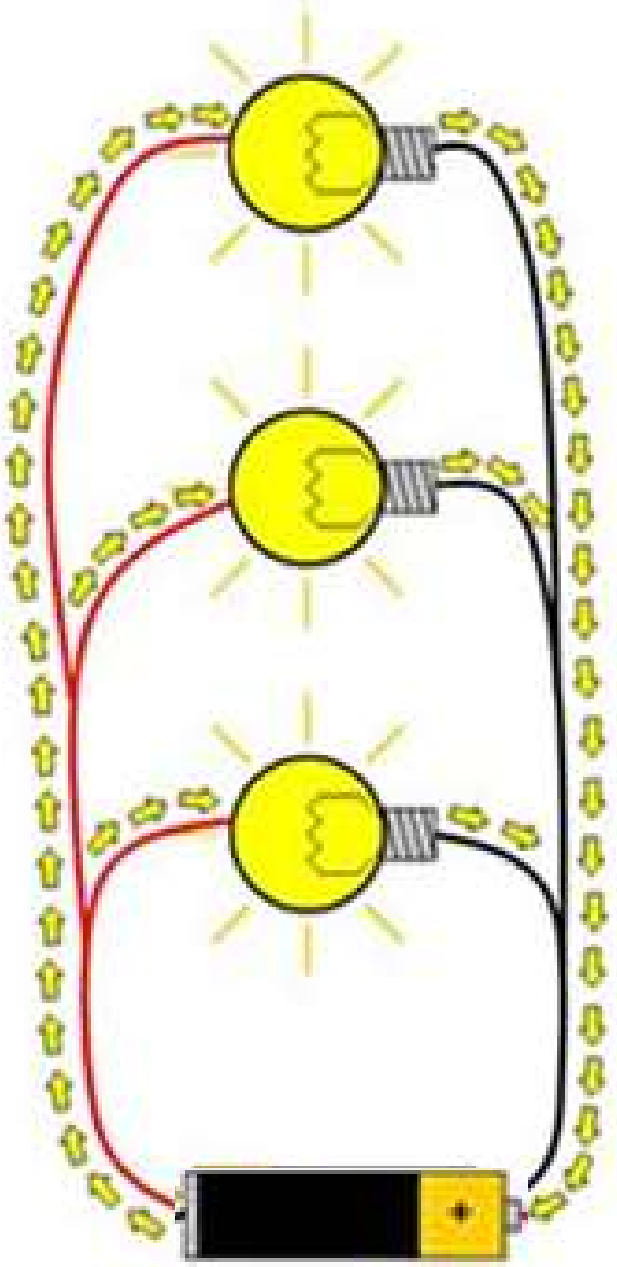
In a Parallel Circuit there is more than one path for the electric current or electricity to flow.



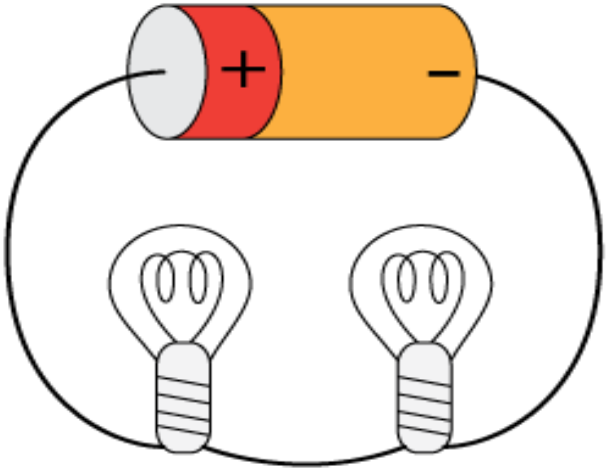
Parallel Circuit

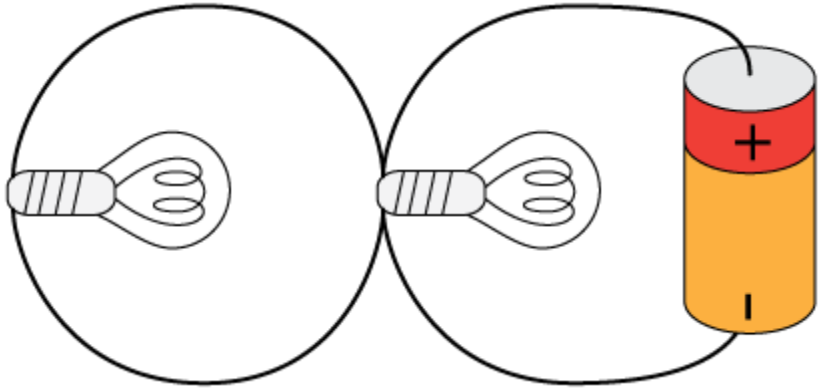
- The electric current branches so that electrons flow through each of the paths

- If one path is broken, electrons continue to flow to the other paths

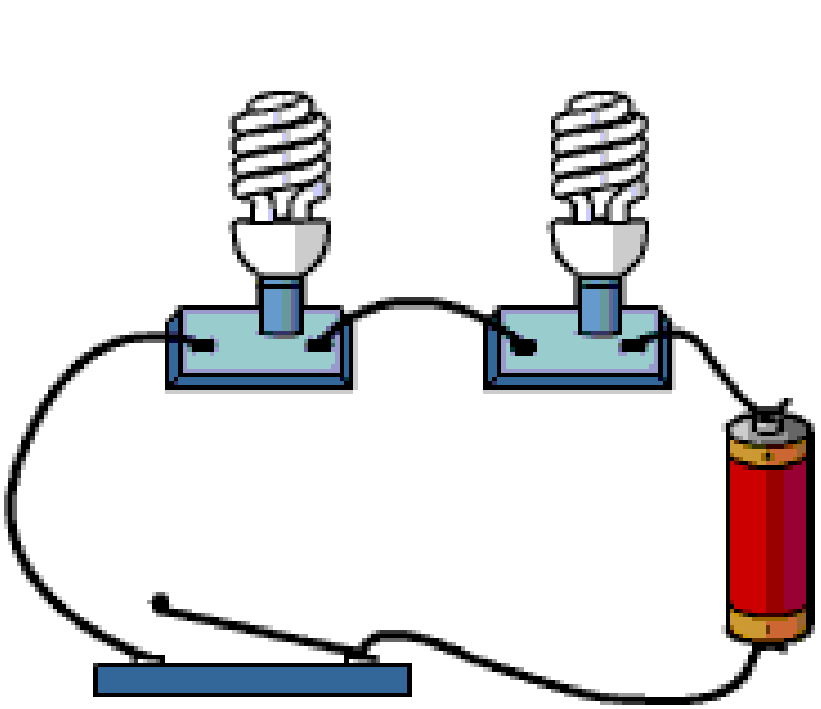


Circuit Sort Activity

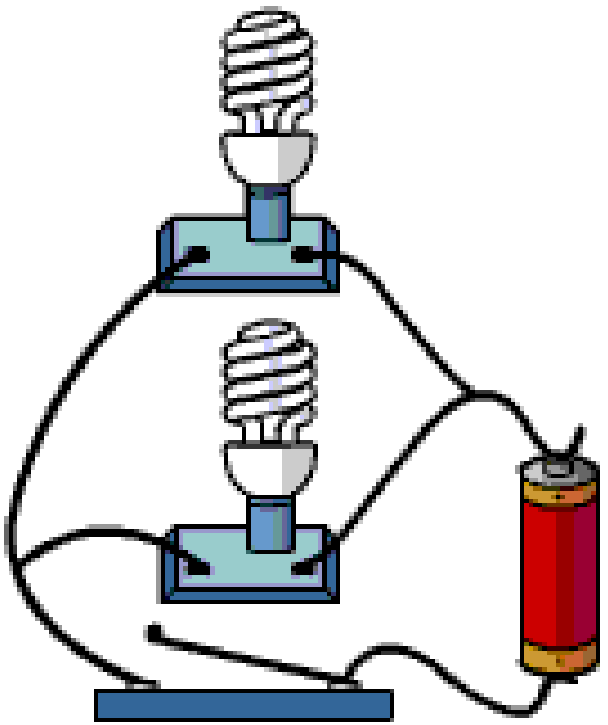




Comparing Series & Parallel



Series Circuit



Parallel Circuit

Source: http://oviattfamily.net/electricity/flash/simpleCircuit.swf

Comparing Series & Parallel

What are the advantages of using a parallel circuit to a series circuit?

The load in a parallel circuit will still work if one of the loads is broken or missing. You can use one load at a time, even it another load fails.

Comparing Series & Parallel

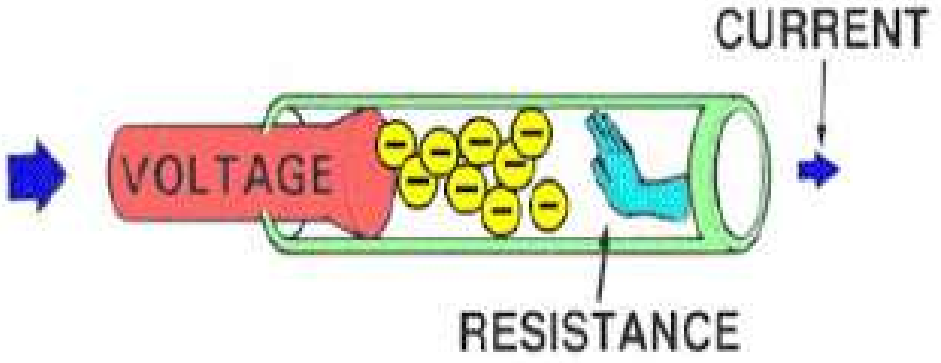
Watch the online simulation comparing Series and Parallel circuits.

- Voltage is the potential difference between two points in a circuit.
- As voltage increases, more electrical potential energy is available to be changed into other forms of energy.
- Basically, higher voltage means a faster flow of electrons or electric current.

Comparing Series & Parallel

In a Series circuit, the current has to travel through each bulb; therefore, adding more light bulbs makes each bulb dimmer because the resistance of the whole circuit has increased.

Resistance is how difficult it is for electrons to flow through a material (friction).



Think of the relationship between Electric Current, Voltage, and Resistance as shown in the diagram below.

As the bucket is raised, potential energy is increased (increase in voltage) and there is less resistance (friction) in the hose; therefore the flow of water (electric current) is greater.

Comparing Series & Parallel

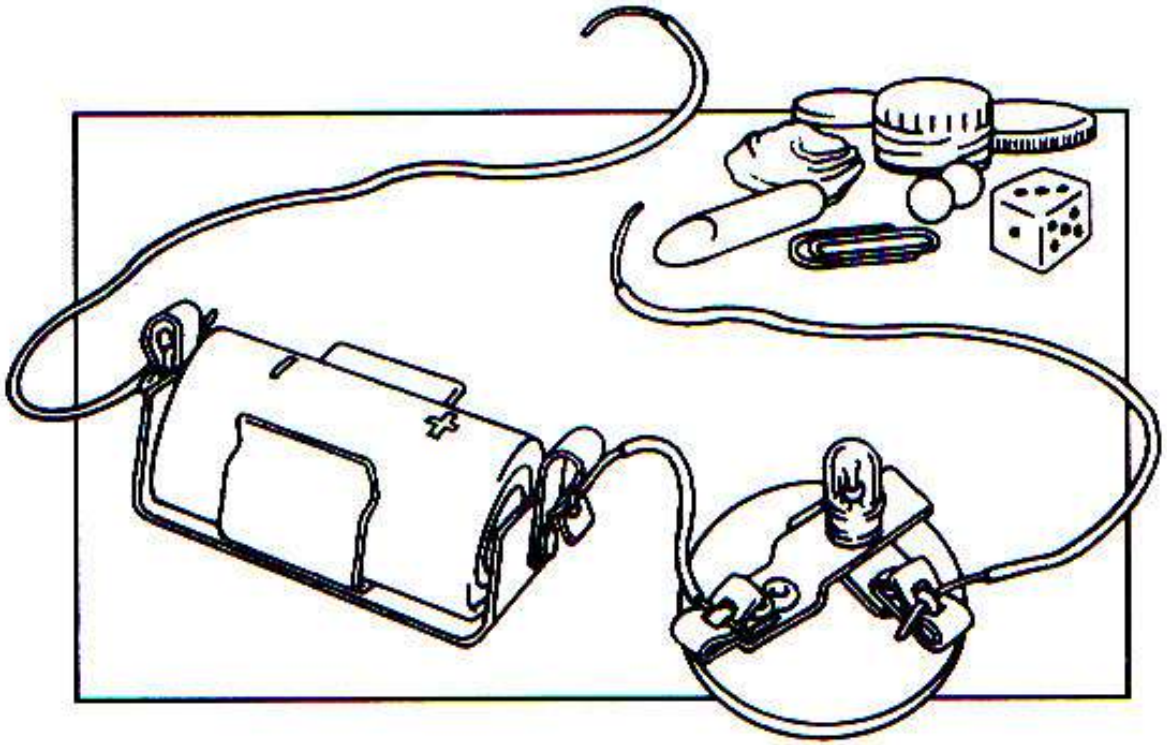
Another advantage of a Parallel circuit is that you can connect loads that need different currents to the same parallel circuit.

For example, you can connect a hair dryer, which needs a high current to run, to the same circuit as a lamp, which needs less current to run.

Circuit Activities

- Electricity Song
- Design a Circuit Board
- Build Series and Parallel Circuits [see resources for examples]

Look at the picture below. What does it mean if the bulb lights when you touch the wire to the ends of the paper clip?

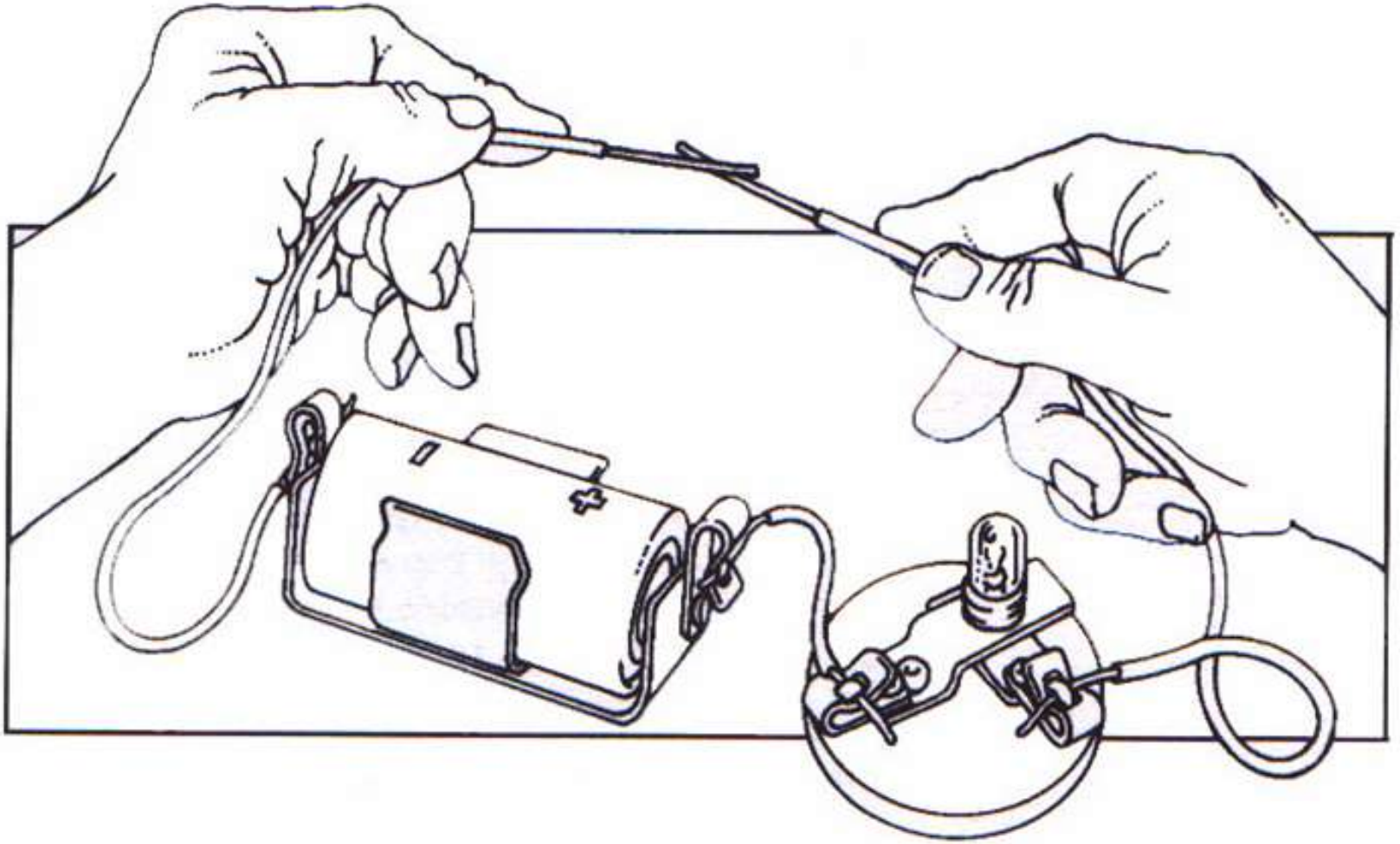


What about one of the other items like a piece of chalk?

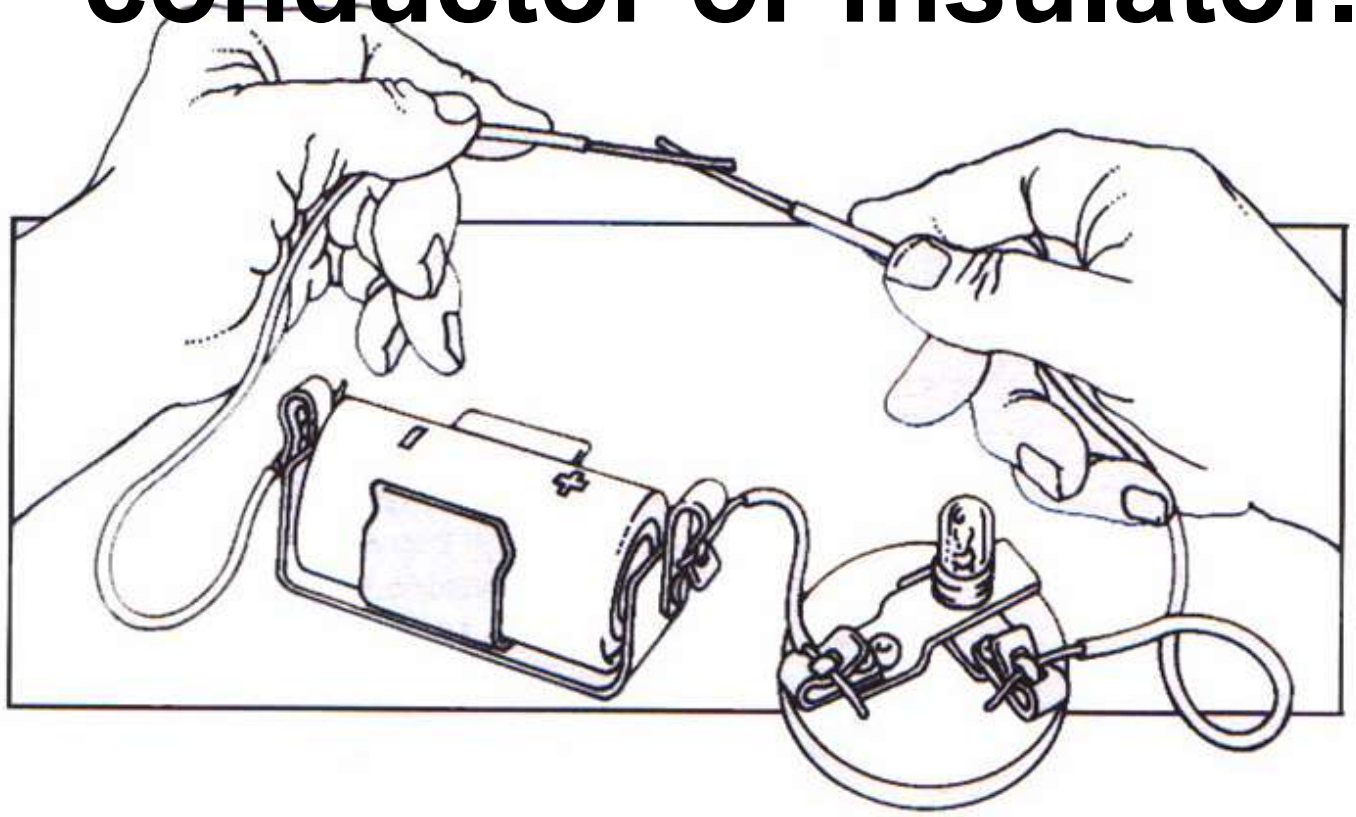
Recall that an electrical conductor is a material in which charges can move easily (electrons flow freely).

An electrical insulator is a material in which charges cannot move easily (their electrons cannot flow freely).

An open circuit can be used to test whether an object is a conductor or an insulator.



Look at objects on the next two slides and identify whether the object is a conductor or insulator.



Can electricity flow through this material?		HYPOTHESIS		ACTUAL RESULTS (Conductor or Insulator?)
		YES	NO	
1	Golf Tee			Insulator
2	Straw			Insulator
3	Brass Screw			Conductor
4	Paper Clip			Conductor
5	Aluminum Screen			Conductor
6	Plastic Screen			Insulator
7	Chalk			Insulator

Can electricity flow through this material?		HYPOTHESIS		ACTUAL RESULTS (Conductor or Insulator?)
		YES	NO	
8	Pencil			Lead to lead-conductor Wood- Insulator
9	Brass Paper Fastener (brad)			Conductor
10	Finishing Nail			Conductor
11	Aluminum Nail (flat head)			Conductor
12	Marble			Insulator
13	Pipe Cleaner			Metal to metal -conductor Brush- Insulator
14	Copper Wire			Conductor
15	Aluminum Rod			Conductor

Circuits Summarizer

Name _____ Date _____ Period ____

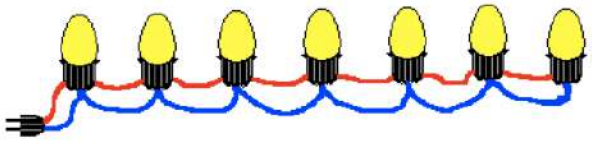


Figure 1

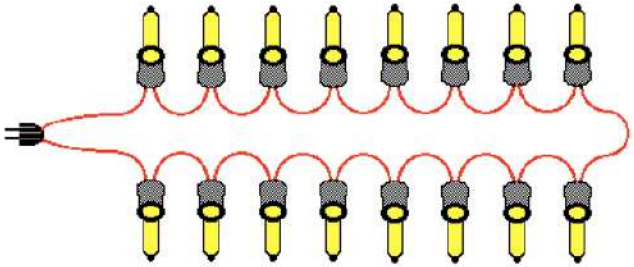


Figure 2

The figures above illustrate two types of Christmas lights. Based on what you have learned about series and parallel circuits, answer the following questions:

1. Which figure illustrates a parallel circuit?

2. Compare and contrast how figure 1 and figure 2 transfer electrical energy.

3. Which type of Christmas lights would be the best to use? Explain your reasoning.