



Static and Current Electricity

Suggested Time: 1.2 Hours

What's important in this lesson:

- explain common electrostatic phenomena (e.g., clothes that “stick” together, attraction of hairs to combs);
- compare static and current electricity (e.g., a charge on a charged electroscope and the charge in an operating circuit);

Complete these steps:

1. Complete the Diagnostic/Introductory Activity. Get this checked as being completed on your Course Checklist.
2. Get a either *Science 9*, *Science Power*, or *Science 9 Concepts and Connections* and get started on the student handout. If you are having difficulty with a section, note this in the section below: Questions for teacher and move on to the next activity in your student handout.
3. Once the student handout is complete check your answers or your teacher will with the Answer Key. Get this checked as being completed on your Course Checklist.
4. You'll need at least 10-15 minutes to complete the quiz on the material you've reviewed today. If you've got at least that much time ask your teacher for the quiz and hand the quiz in when you're done. If you don't have enough time move on to the Reflective Activity and try the quiz next day.
5. Complete the Reflective Activity. Get this checked as being completed on your Course Checklist.

Hand-in the following to your teacher:

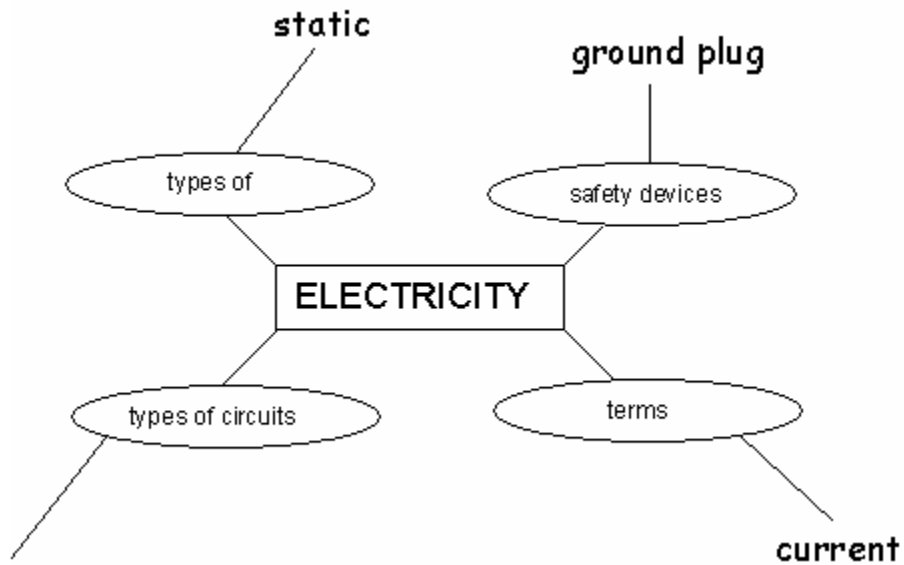
1. The lesson quiz.

Questions for the teacher:

Diagnostic/Introductory Activity: Unit 3 Lesson 1



Using the concept map below as a starting point add to it some of the ideas you remember from your past course. A few words have been added to help you get started.





Static and Current Electricity

Electrostatics

Objects become electrically charged when they gain or lose negatively charged particles called electrons. For instance if you rub a rubber balloon against a wool sweater, the rubber takes electrons from the wool. Since the rubber gains negative electrons it becomes negative (-), while the wool loses negative electrons and becomes positive (+). Since the charges stay where the rubbing took place we call it static electricity (*static* comes from *stationary*).

In order to decide which substance wins the “tug of war” for electrons, scientists have developed the electrostatic series. Substances that have a “strong hold on electrons” gain electrons and become negative, while the weaker substance loses electrons and becomes positive.

Table 1 Electrostatic Series

Weak hold on Electrons	Lucite	
	Acetate	
	Glass	
	Wool	
	Fur or hair	
	Cotton	
	Paraffin wax	
	Strong hold on electrons	Ebonite
		Plastic (polyethylene)
		Rubber

For instance, if glass and wool are rubbed, the wool has a stronger hold on electrons so it takes negative electrons from the glass and becomes negative (-), while the glass which is weaker loses negative electrons and becomes positive (+).

+ -
Glass / Wool

1. Identify the electrical charge that would develop when the following pairs of substances are rubbed together as in the example above

hair/cotton

rubber/cotton

plastic/acetate

fur/ebonite

wool/cotton

Law of Electric Charges

1. Like charges repel
2. Unlike charges attract
3. Neutral objects can be attracted to charged objects



2. Identify the type of charge on the object in the left column. For instance, in the first pair, the objects are being attracted or pulled together. This suggests the object on the left is either positive or neutral.

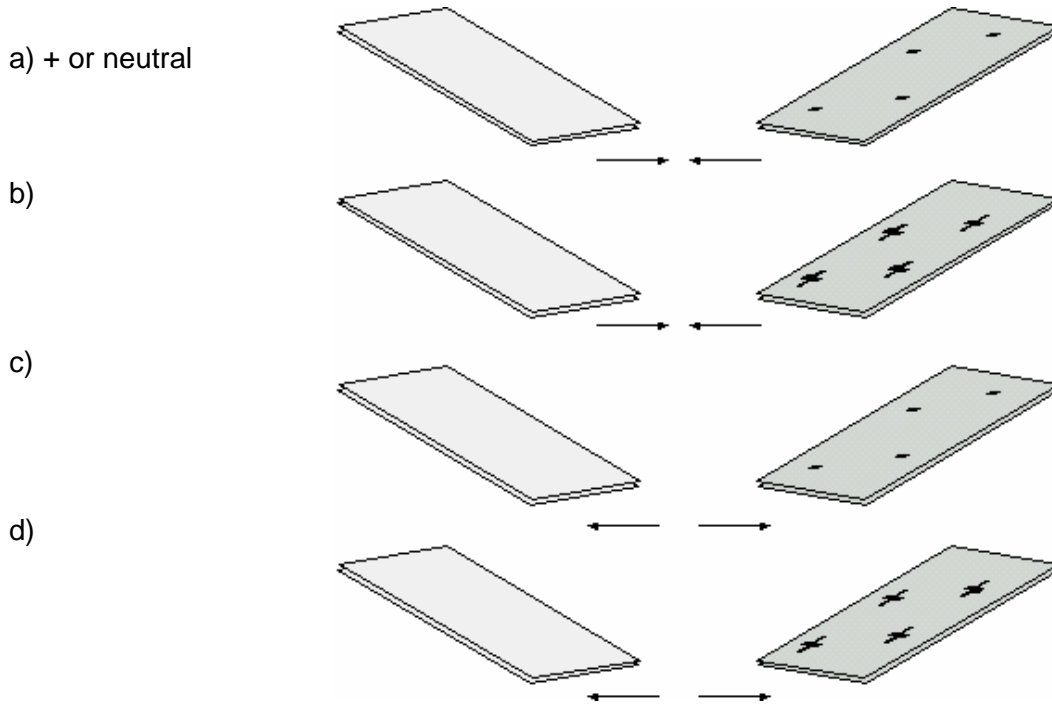


Figure 1 Attraction and Repulsion

Current Electricity

Static electricity is electricity that does not move, and if it does move as in lightning or a spark it is not along a “controlled” or planned path.

Current electricity is the movement of electrical energy along a controlled path such as a wire in Figure 2.

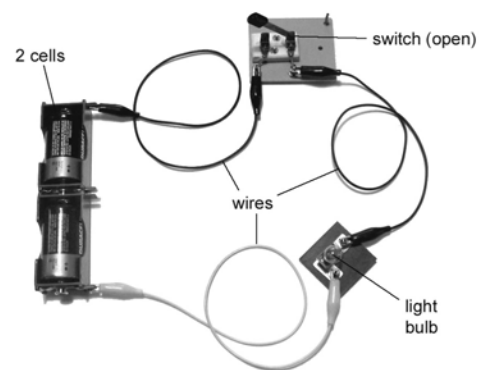


Figure 2 Current Electricity

Student Handout: Unit 3 Lesson 1



3. Consider the following examples of electricity. Decide whether the example is static or current electricity. Provide a reason.

Example	Type	Reason
A lightning strike	static	Charges don't move in a controlled path like a wire
Wool socks cling to a cotton shirt		
A microwave warms a meal		
A "swiffer" dust mop attracts dust		
A battery operates a wrist watch		

Electric Circuits

Current Electricity requires the movement of electrical energy in a controlled path. This controlled path is called an electric circuit. The 4 basic parts of a circuit are given below:

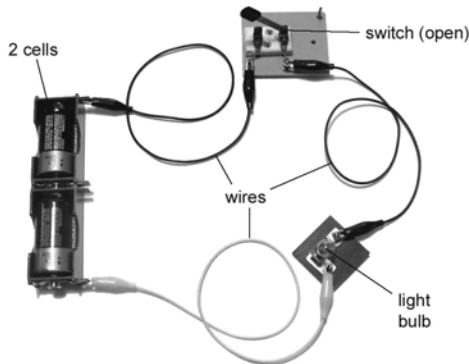


Figure 3 Electric Circuit

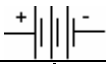


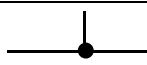
Table 2 Circuit Parts

Source	Provide electrical energy (e.g. Batteries)
Control Device	Control operation of circuit (e.g. switch)
Loads	Convert electrical energy into other forms of energy (e.g. Light bulb)
Connectors	Provide a controlled path for flow of electrical energy (e.g. Wires)

Student Handout: Unit 3 Lesson 1



4. Complete the table below using pg 263 of *Science 9 Concepts and Connections* or pg 545 of *Science 9*. The first one has been done for you.

Circuit Part	Symbol	Meaning
source		3 cell battery
		
		light bulb
		
		switch
		
		push button
		heating panel

5. Look at the diagram below and list the equipment you would need to make this circuit.

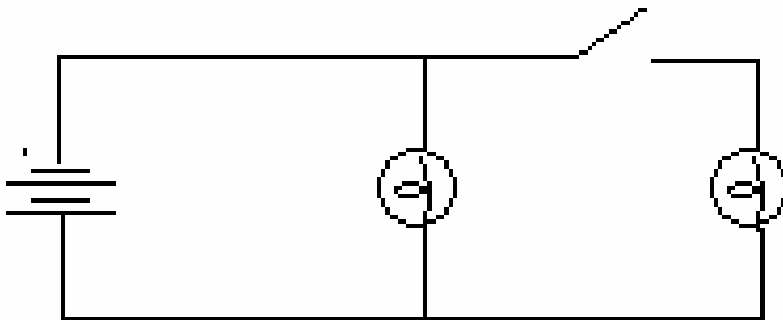


Figure 4: An Electric Circuit



Modified True/False

Indicate whether the sentence or statement is true or false. If false, change the identified word or phrase to make the sentence or statement true.

- ___ 1. Neutral objects are attracted to charged objects.
- ___ 2. Like charges repel and opposite charges attract.
- ___ 3. When a wool sweater rubs against a cotton shirt (that has a stronger hold on electrons) the sweater becomes negative and the cotton shirt positive.

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- ___ 4. The term "static", in referring to static electricity, means
 - a. not staying still
 - b. not moving
 - c. clinging
 - d. causing trouble

- ___ 5. When ebonite is rubbed with fur (which has a weaker hold on electrons), what charge does ebonite take on?
 - a. negative
 - b. positive
 - c. neutral
 - d. no charge

- ___ 6. Current electricity is:
 - a. electricity at rest
 - b. stagnant electricity
 - c. created by rubbing an ebonite rod with fur
 - d. electricity in motion

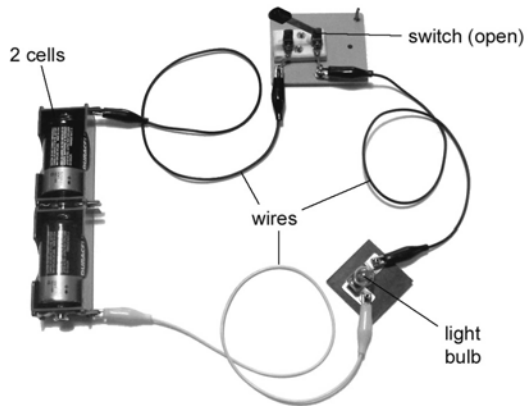
- ___ 7. The "load" is
 - a. anything that takes up space and has mass
 - b. anything that will be lifted by the electricity
 - c. anything that converts to electrical energy into other forms of useful energy
 - d. only things that heat up when electricity flows

- ___ 8. Connectors
 - a. are the same as conductors and insulators
 - b. are the "load" when placed in series
 - c. are used to join two wires together
 - d. provide a controlled path for electric current to flow to each part of the circuit

Assessment and Evaluation: Unit 3 Lesson 1



9. Convert the following picture into electrical symbols and draw a circuit diagram.



Reflection Activity: Unit 3 Lesson 1



What happens when hair rubs against a rubber balloon? Explain your answer by referring to the movement of electrical charges by using the electrostatic series below.

Weak hold on Electrons	Lucite
	Acetate
	Glass
	Wool
	Fur or hair
	Cotton
	Paraffin wax
Strong hold on electrons	Ebonite
	Plastic (polyethylene)
	Rubber