

Electric Vocabulary

- Author(s):** Helen Dole
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Subject: Physics / General Science
Grade Level: Middle School
Standards:
- *New York State – Intermediate Level*
<http://www.p12.nysed.gov/ciai/mst/sci/documents/intersci.pdf>
 Standard 1 – Analysis, Inquiry, and Design
 Standard 4.4 - Observe and describe the properties of sound, light, magnetism, and electricity.
 Standard 4.4e - Electrical circuits provide a means of transferring electrical energy.
 Standard 4.4f - Without touching them, material that has been electrically charged attracts uncharged material, and may either attract or repel other charged material.

Schedule: 35-45 minutes

Objectives:

Learn about the history of common vocabulary such as “battery” and “electron.” Use this vocabulary to describe what is going on in a simple circuit.

Students will:

- Test the level of Vitamin C in a variety of fruit juices
- Record data for Vitamin C solution and different fruit juices
- Conduct a quantitative analysis of the fruit drinks
- Gain an understanding of the Chemical Equilibrium Calculations and answer follow up questions on Vitamin C properties
- Summarize the results from their analysis

Vocabulary:

Battery	Electrical current
Charging	Electron
Elasticity	Positive charge
Electricity	Positively charged
Electric	Negatively charged

Materials:

For Each Pair:	For Teacher:
Set of Matching pictures and words	Digital projector
Miniature lamp	Sound
Battery (AA or C or D is fine)	Internet access
Two insulated wires with exposed ends	

Safety:

Students should follow general laboratory procedures.



Science Content for the Teacher:

Current electricity is a movement of charge. The charge carriers are usually electrons. Electrons are negatively charged particles. Under normal conditions the number of electrons (-) is equal to the number of protons (+), so the net charge of the atom is neutral. But atoms are often not neutral. Actions as simple as rubbing a glass rod with a piece of silk can “steal” some electrons from their atoms. They leave the glass and attach to the silk. Thus the glass ends up with more protons than electrons and the silk with more electrons than protons. This separation of charge results in a positive electric charge for the glass rod and a negative electric charge for the silk.

Electrons tend to move instantaneously to areas of positive electric charge until balance is achieved.

Portable radios, car horns, flashlights, and all other familiar electric devices used a different form of electricity: current electricity. The simplest source of electric current is the familiar dry cell usually called a battery. Inside are carefully selected chemicals. The chemicals have a predisposition to react with one another, a process that involves the transfer of electrons. To react they must pass electrons from the electron-donor to the electron-receive chemical through an external pathway (such as a wire!) If a continuous pathway connects the ends of the battery, the battery will push electrons through the material. The number of electrons actually moving along is current. The pathway is a circuit.

In about 600BC the Greek philosopher Thales noticed that amber rubbed with wool somehow acquires the power to attract light objects such as straw and feathers. Over 2,000 years later in 1600, William Gilbert, physician to Queen Elizabeth I of England, called this power electricity after the Greek word for amber. It was not until the 1700s that scientists began to learn more about the nature of electricity, and one of the pioneers of the field was Benjamin Franklin, who was an intrepid investigator. Franklin postulated that electricity consists of two varieties of “fluid,” one positive and one negative. We now know that the fluid is a stream of negative electrons, which were discovered by the British Scientist J.J. Thompson in 1897.

(Sources: *Foss Kit: Electricity and Magnetism* and *The Way Things Work* by David Macaulay)

Preparation:

1. Make sure that the video loads and that the sound is working on the computer/digital projector system.
2. Make sure that there are enough bags of materials for each partner group.
3. Each student needs his or her own Activity Sheet #1.



Classroom Procedure:

Warm-up (4 min)

1. What are three ways that you use electricity in your everyday life?
2. In your own words, what do you think electricity is?

Share out (2 min)

Students share out their answers with one another and record each other's ideas.

Explain Expectations (3 min)

Reiterate that electricity is central to our everyday lives. Tell the students that today they'll be listening to and watching an animation that explains how scientists came to discover how electricity works.

Electric Vocabulary Animation (7 min)

<http://ed.ted.com/lessons/electric-vocabulary>

The first time through, students will start to match the terms with the pictures. Or, if they prefer, they can just watch it straight through, and match after.

*Depending on the level of the class, the teacher can assess whether the animation needs to be shown once or twice. Ultimately, students should match each vocabulary term with the image/phrase associated with it in the animation. They should spread them out on their desk.


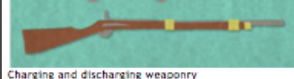

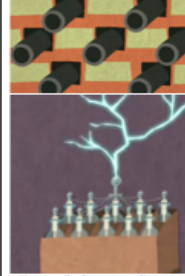
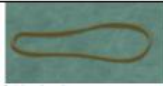


The animation should be paused at critical points to check for understanding. Some key questions that are recommended:




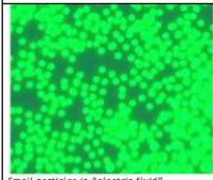
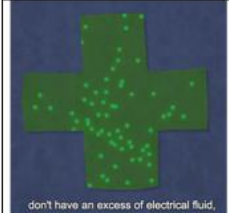
- How did observations about the world around them lead to new discoveries and understandings?
- Give examples of how science knowledge changes over time.
- Are scientists "100%" sure that their explanations are correct? Explain.

Checking Answers (5 min)

Encourage students to raise their hand and share out explanations. The answers are provided below.



 Amber with straw in hand	ELECTRON	 Charging and discharging weaponry	CHARGING
 Rubbed gem attracting objects to it	ELECTRIC	 A "battery" of weapons fires simultaneously; A battery will discharge simultaneously	BATTERY
 Rubber band	ELASTICITY		
 Crystal and cloth rubbing it	ELECTRICITY	 An excess or extra amount of "fluid"	POSITIVELY CHARGED "OLD THINKING"

 A lot of electrons!	NEGATIVELY CHARGED "NEW THINKING"	 Lacking extra "fluid"	NEGATIVELY CHARGED "OLD THINKING"
 Flow of electrons	CONVENTIONAL CURRENT	 Small particles in "electric fluid"	ELECTRON
		 don't have an excess of electrical fluid, Few electrons	POSITIVELY CHARGED "NEW THINKING"

Make Circuits (5 min)

Pairs of students are given a bag containing a battery, 2 insulated wires with stripped ends, and a light bulb. They build a circuit.

Assessment (5 min)

Students use vocabulary from the animation to explain what is happening in the wires in their circuit.

Assessment:

Electric Vocabulary

CATEGORY	Meets Expectations (2 points)	Approaches Expectations (1 point)	Below Expectations (0 points)
Uses 3 or more vocabulary words	Student uses 3 or more terms from the Word Bank.	Student uses 1 or 2 terms from the Word Bank.	Student does not use words from the Word Bank.
Uses terms accurately	All Word Bank terms are used accurately in the context of the circuit.	Most Word Bank terms are used accurately in the context of the circuit.	The student struggles to use the words in a way that is coherent.
Underlines vocabulary words	Student underlines all Word Bank words.	The student underlines some of the Word Bank words.	The student does not underline any of the words.

Total: _____ out of 6 possible points

Acknowledgements:

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