IMHOTEP'S LEGACY ACADEMY

8.5 Snake Charming & Making an Electroscope
(Static Electricity)

Grade 8 Activity Plan

Reviews and Updates

8.5 Snake Charming and Making an Electroscope

Objectives:

1. To demonstrate the attraction that drives static electricity by charging an object by friction
2. To demonstrate the induction of electrical charge and observe its effects
3. To be able to differentiate between conductors and insulators.

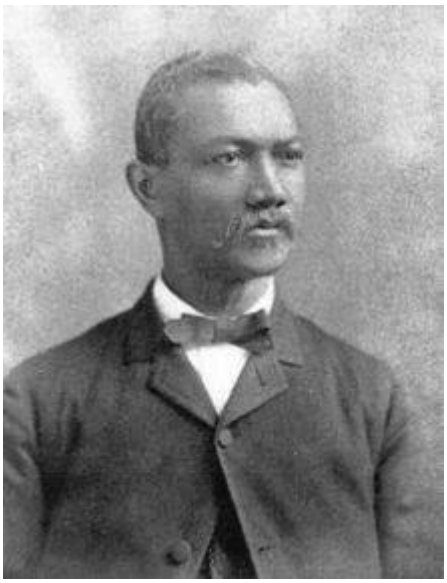
Keywords/concepts: attraction, repulsion, static electricity, force field, charges, electroscope, conductors, insulators.

Take-home item: electroscope.

Segment	Details
African Proverb and Cultural Relevance (5 min.)	"Listening accumulates power." **Ethiopia**
Pre-test (10 min.)	Inflate a balloon, rub it against a piece of wool and stick it to a nearby wall. Ask students questions to assess their knowledge of static electricity and introduce the concept of static electricity. Mention some day-to-day examples of the effects of static electricity.
Background (15 min.)	Strive to answer the following questions: What is static energy? Static electricity is the imbalance of positive and negative charges. Why is it called static energy? Explain the concept of electrical charges (Use 2 magnet to show how attraction and repulsion forces work)
Activity 1 (15 min.)	Applying the concept of attraction between unlike charges; use a charged pen to pick up an uncharged tissue paper.
Activity 2 (25 min.)	Making a simple electroscope to measure electric charges.
Follow-up (10 min.)	Have all students reconvene. Discuss the activity and encourage student to discuss their difficulty and success in carrying out the activity. Quiz student on discussed concepts.
Post-test (10 min.)	Fill in the blanks on the crossword puzzle

Possible interpretation of proverb: as one listens, knowledge is acquired and it is said that knowledge is power; therefore the more one listens, the more knowledge one acquires hence the more powerful one becomes.
In this activity, it discovered that the more some certain materials are rubbed against each other, the more charged they become.

Cultural Relevance



Alexander T. Augusta (1825-1890). Born in Norfolk, Virginia, and educated in Baltimore, Philadelphia, California, and Canada, he eventually received a medical degree from Trinity Medical College in Toronto in 1860. While practicing his profession in Washington DC, he was appointed surgeon of the Seventh U.S. Coloured Troops, which was part of the expedition to Beaufort, South Carolina. Later he was in charge of an army hospital in Savannah, Georgia. At the end of the war he was breveted a lieutenant colonel for meritorious and faithful service, one of the few blacks to achieve field grade rank in the Civil War. He later practiced medicine in Washington D.C. and served on the faculty of Howard University Department of Medicine.

Major Alexander T. Augusta was both the first black surgeon in the Union Army and the first black officer-rank soldier buried at Arlington. Despite his rank, he was only paid black-enlisted wages for most of his duty.

Mr. A.T. Augusta, opened and operated his own pharmacy on Yonge Street in Toronto in the mid 1850s

BACKGROUND INFORMATION

Static electricity is the imbalance of positive and negative charges.

Static electricity can build up in our bodies and cause a spark to jump from our bodies to pieces of metal or other people's bodies. We can see, feel and hear the sound of the spark when it jumps. You can create static electricity by rubbing a glass rod with a silk cloth the glass will develop a static charge that can attract small bits of paper or plastic.

To understand what is happening when your body or a glass rod develops a static charge, you need to think about the atoms that make up everything we can see. All matter is made up of atoms, which are themselves made up of charged particles. Atoms have a nucleus consisting of neutrons and protons. They also have a surrounding "shell" that is made up electrons. Typically, matter is neutrally charged, meaning that the number of electrons and protons are the same. If an atom has more electrons than protons, it is negatively charged. If it has more protons than electrons, it is positively charged.

Glass rubbed by silk causes a charge separation. One material may "capture" some of the electrons from the other material. If the two materials are now separated from each other, a charge imbalance will occur. The material that captured the electron is now negatively charged and the material that lost an electron is now positively charged. This charge imbalance is where "static electricity" comes from. The term "static" in this case is deceptive, because it implies "no motion," when in reality it is very common and necessary for charge imbalances to flow. The spark you feel when you touch a door knob is an example of such flow.

Two things with opposite, or different charges (a positive and a negative) will attract, or pull towards each other. Things with the same charge (two positives or two negatives) will repel, or push away from each other. A charged object will also attract something that is neutral. Think about how you can make a balloon stick to the wall. If you charge a balloon by rubbing it on your hair, it picks up extra electrons and has a negative charge. Holding it near a neutral object will make the charges in that object move. If it is a conductor, many electrons move easily to the other side, as far from the balloon as possible. If it is an insulator, the electrons in the atoms and molecules can only move very slightly to one side, away from the balloon. In either case, there are more positive charges closer to the negative balloon. Opposites attract. The balloon sticks. It works the same way for neutral and positively charged objects.

Activity 1: Snake Charming

Purpose: To demonstrate attraction that drives static electricity by charging an object by friction

Suggested format: provide students with materials and guide them to perform activity.

Item	**Quantity (10 students)**
Plastic pen	10
Metal plate or tray	10
Tissue paper	10
Silk handkerchief	5
Scissors	5

Procedure:

1. On the tissue paper provided cut out a circle, use a pen to draw a spiral on the circle.
2. Cut out the spiral drawn on the tissue paper with a pair of scissors.
3. Carefully place the cut out spiral on the metal plate provided.
4. Rub the plastic pen vigorously with the silk handkerchief.
5. Use the charged pen to draw the centre of the spiral off the metal plate into the air.

Activity 2: Making an Electroscope

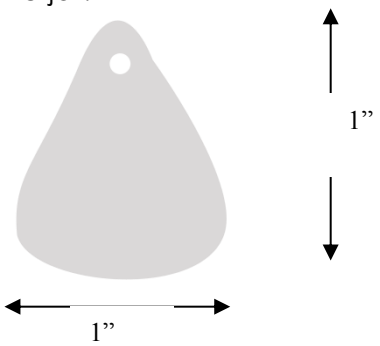
Purpose: To demonstrate the induction of electrical charge and observe its effects

Suggested format: students should have their individual setups but should be encouraged to work in groups

Item	**Quantity (10 students)**
Small glass jar	10
Aluminium foil	$3ft^2$
Thin candy wrapping paper	10
14 Gauge Copper wire	8 ft
Thin Cardboard	10
Electrical tape (Black)	1 roll
Magnets	2
Thin straws (from candy)	10
Balloons	10

Procedure:

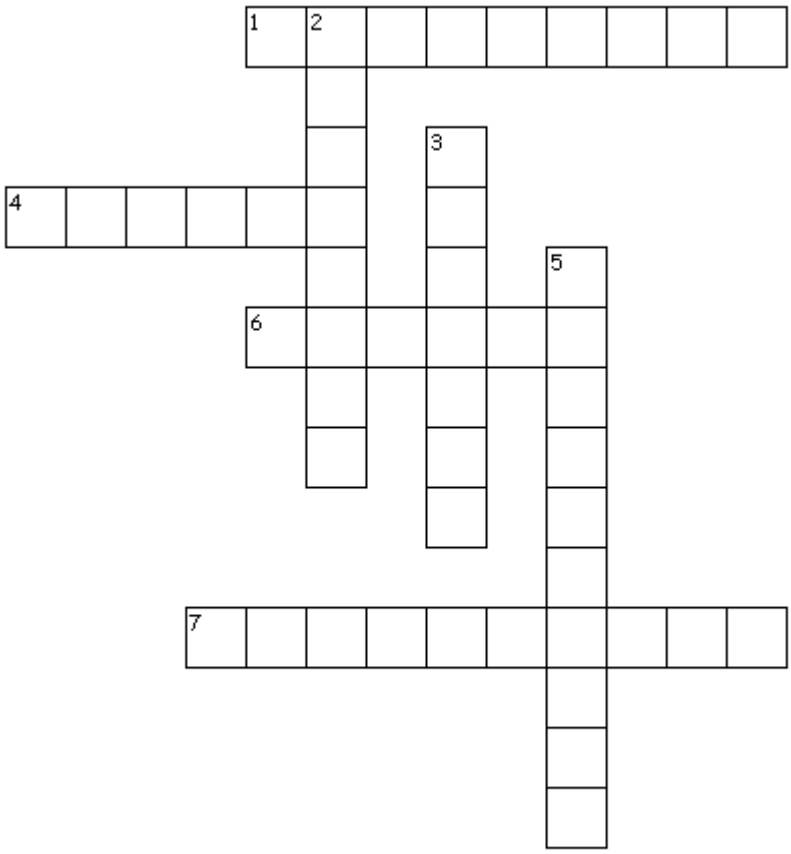
1. Draw a circle on the card paper provided using the lid of the jar as guide. Cut the circle out with a pair of scissors.
2. Cut a piece of the thin wire about 12" long, at one end, measure 6" and make a spiral,
3. Use the wire to poke a hole through the middle of the cardboard circle. Push the straw through the card leaving about half the straw up and the other half below the card.
4. For firmness, be sure to glue the straw to the cardboard.
5. Pass the straight end of the wire through the straw, when 2" of wire comes through at the bottom end of the straw, bend the wire about 1" from the other end to form a hook.
6. Attach two thin pieces of aluminium foil (cut to the shape below) to the bend of the wire. Use tape to seal the cardboard to the mouth of the jar.



7. Charge the balloon with the silk handkerchief. Hold the pen near the foil ball and observe what happens.

Video demo of activity: http://www.youtube.com/watch?v=2PmWlPjV6n0

Static Electricity



Clues

Across
1. Action that occurs when two like charges are placed together
4. Type of electricity produced from an imbalance of charges
6. Name given to positively charged part of an atom
7. Most metals are excellent examples of this

Down
2. Negatively charged part of an atom
3. An atom is said to be this, when the number of protons equals the number of electrons in an atom
5. Allow little or no movement of electrons

Answers

Across
1. repulsion
4. static
6. proton
7. conductors

Down
2. electron
3. neutral
5. insulators

Useful links:

- http://www.eon-uk.com/distribution/437.aspx
  Instructions how to make an electroscope. Printout instructions are available.
- http://www.sparkmuseum.com/ELECTROSCOPE.HTM
  A brief history of electroscopes and electrometers dating back to the 1500's. Also Includes various pictures of early devices