Follow Up Activities to *Giants of Electrical Science*

Provided by the Adventure Science Center of Nashville

Here are some activities you may wish to use after your class has attended the ***Giants of Electrical Science*** presentation.

Scientists and Their Inventions

List a group of everyday objects that use electricity. Ask students to choose one object and determine when it was originally invented, by whom, and under what circumstances was it necessary to invent this object, how it worked, and how the invention of this object changed everyday life. For example, what impact did streetlights have on cities? How did the early washing machine work? For a timeline of technology that reveals the inventor and the time, go to:

http://www.pbs.org/wgbh/amex/telephone/timeline/timeline_text.html.

EXPERIMENT: Making a Home Made Battery

Purpose: This activity shows you how to build and test a simple homemade battery to better understand electricity.

Materials:

lemon
lamp (bulb holder)
knife
hammer
copper strip
zinc strip (zinc coated bolts will also work)
2 copper wire leads
penny nail
galvanometer or 0.2 volt bulb
science journal

Procedure:

1. Roll the lemon a few times on a counter to get the juices flowing.
2. With adult supervision: Use the knife to make two parallel (side by side) slits 2 cm apart in the lemon.
3. Make a small nail hole in the end of the metal copper and zinc strips.

4. Insert the copper strip into one slit and the zinc strip into the other slit so that they stay 2 cm apart.
5. Connect the wire leads to the copper strip and the zinc strip by looping the wires through the holes made by the nail.
6. Connect one of the ends of the wire to the terminals on a lamp (bulb holder) or on one end of the galvanometer.
7. Predict what will happen when the loose wire touches the lamp terminal or the galvanometer.
8. Take the other loose wire end and touch it to the open terminal of the lamp or galvanometer to complete the circuit in short intervals.

The current is too weak to electrocute anyone!

If the galvanometer is used as the load, record the reading.

If the lamp with a bulb in it is used, note the brightness of the bulb.

Conclusion:

1. What is the power source?
2. Would two strips of the same metal produce electricity?
3. What other fruit can be used to make an electroscope instead of the lemon?

EXPERIMENT: Creating Static Electricity

Purpose: To demonstrate that "static" is a true form of electricity and to show that electricity flows when there is a large enough charge imbalance

Materials:

- balloon
- fluorescent light
- dark room or area
- science journal

Procedure:

1. Hold up the fluorescent bulb and ask students how you can get it to glow without putting it into a lamp or socket.
2. Have students discuss what they know about static electricity.
3. Make the room as dark as possible.
4. Invite a student to rub the balloon against his/her head. While you are holding the bulb, have the student touch the balloon to the metal contact at one end of the bulb.
5. Observe and record what happens in your science journal.

6. Discuss what happened and why.

Conclusion:

1. Why did the bulb glow?
2. How could you make the bulb glow longer? Brighter?
3. In your science journal, write a brief explanation of what happened in this experiment. Share your ideas with a classmate.

What's Happening?

Fluorescent tubes are filled with a gas that gets "excited" when even a small amount of electricity is applied to it. When you touch the end of the tube with the balloon, electrons jump from the balloon to the metal conducting tip of the bulb. These electrons hit low pressure mercury gas in the bulb. When the gas molecules become excited, they give off ultraviolet rays. These rays excite the phosphorus coating on the inner surface of the glass tube, which, in turn, gives off white light.

EXPERIMENT: Make a Static Detector

Purpose: This activity helps you learn about static charge or static electricity and shows you how to construct a device that will check whether an object has a static charge.

Materials:

- insulated piece of electrical wire
- Christmas tree icicle (2) or gum wrapper
- glass jar with a narrow neck (12-oz. glass soda bottle)
- modeling clay
- wire strippers
- plastic comb
- balloon
- wooden spool
- pencil
- scissors
- science journal

Procedure:

1. Strip 3 cm off the ends of a piece of insulated wire.
2. Make a J-like hook out of the uninsulated electrical wire.

3. Place a Christmas tree icicle aluminized (shiny) side down over the hook. Make sure there is an even amount of material hanging on each side of the hook.
4. Lower the hook with the icicle into the jar. There should be about 5 cm of wire sticking out of the jar.
5. Seal the jar top with a rubber stopper or carefully pack modeling clay around the wire to cover the top of the jar.
6. Do not open the bottle to reposition the icicle once it is inside the jar.
7. Create a charge on a comb by combing through your hair three times or by rubbing it with a piece of wool once.
8. Slowly bring the comb near the uninsulated wire at the top of the electroscope. Do not touch the wire with the comb!
9. Record what happens in your science journal.
10. Remove the comb and again record what happens in your science journal.
11. Repeat steps 8-11 using a balloon. Rub the balloon against your head five times and record your observations in your science journal.
12. Repeat steps 8-10, rubbing the balloon against your head ten times. Record your observations in your science journal.
13. Repeat steps 8-10, rubbing the balloon only once against your head. Record your observations in your science journal.

Conclusion:

1. If both icicles had a negative charge, what would happen?
2. Is there a difference in the distance the icicles moved apart from one another when the balloon or the comb was rubbed on the head a greater number of times?
3. What scientific generalizations can you make about how positive and negative charges relate to one another after conducting this investigation?

Extension
1. Investigate the following questions by first recording a prediction in your science journal:
    What happens when the comb actually touches the wire?
    What happens when you touch the exposed wire with your finger?
2. Try to charge other objects by rubbing them together. Bring the charged item next to the wire tip so that the icicles move apart.
3. Touch the wire with different objects (ex. Scissors, wooden spool, pencil) to see which objects conduct (transfer) the static electric charge and which items have no effect (insulate). Record your observations.

These experiments are from The NASA "Why?" Files. To download units and order video to use in the classroom, go to:

http://scifiles.larc.nasa.gov/.sed.