Electricity: Static And Current

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Objectives:

The students will be able to:

1. Explain that electrons are the things that make electricity work.
2. Name and define the two basic kinds of electricity as static and current.
3. Compare conductors and insulators and explain how they are used.
4. Construct a battery to show the electrical flow in order to demonstrate the proper use of electricity.
5. Develop an awareness of the potential hazard from improper use of electrical appliances.
6. Develop an awareness of the potential danger from floods, fallen power lines, etc.

Materials needed:

CLASS DEMONSTRATION:

1. Ring and ring stand
2. Glass beaker
3. Pointer
4. Nylon string (approx. 4 feet)
5. 2 balloons
6. Pieces of wool and silk
7. Set of red and black wires with alligator clips
8. 3-8"x 12" sheets yellow paper
9. plastic wrap
10. 1-8"x 12" sheet orange paper
11. Rope (approx. 8 feet)
12. Tape
13. Variety of batteries
14. 6 volt lantern battery
15. Flash light with batteries
16. Battery operated toy
17. Two potato clock
18. 2 potatoes
19. 1-1.2 volt bulb
20. 1-E10 bulb base
21. 1-6 volt buzzer
22. 1 Deli style pickle
23. Old electric cord with plug on one end and other end split (cut off socket) and taped, allowing 1" of bare wire at both terminals
24. Distilled and tap water
25. Hydrochloric acid (HCl)
26. 2 graphite rods or pencils with wood removed to expose lead

GROUP ACTIVITIES (per group of 3 to 5 students):

1. 2 newspaper strips (1"wide x 20" long)
2. Piece of plastic wrap
3. Piece of aluminum foil
4. 1 pencil
5. 1 penny
6. Piece of paper
7. 1 glass rod
8. 1 plastic rod
9. 1 plastic toy
10. 1 paper clip
11. 1 rock
12. 1 wooden yardstick or ruler
13. Small paper cup tap water
14. Small paper cup distilled water
15. Small paper cup distilled water with sugar
16. Small paper cup distilled water with salt
17. Small paper cup vinegar
18. Conductivity tester
19. 1 Digital multimeter
20. Set of red and black wires with alligator clips
21. 1 dime and 1 penny
22. 1 lemon
23. 1 orange
24. 1 tomato
25. 1 grapefruit

Strategy:

INTRODUCTION:

Review previous lesson about basic structure of an atom being comprised of protons, neutrons, and electrons. Explain that electrons are the things that

make electricity work. That sometimes an electron goes flying off one atom and joins another. Describe first kind of basic electricity as static and define it for students.

DEMONSTRATION #1: BREAKING UP A FRIENDSHIP BETWEEN 2 BALLOONS

Display a ring and ring stand with a pointer tied to the ring holder. Take the 2 inflated balloons and tie 1 to either end of the nylon string. Hang this from the pointer. Ask the students to observe how the balloons are hanging "at rest". Rub 1 balloon with a piece of wool and the other balloon with a piece of silk. Observe and discuss results. (The balloons will repel each other and fly apart.) Rubbing the balloons charges each with the same negative charge. Display picture you made on yellow paper which shows 2 electrons with the same negative charge repelling each other. Tell students that repel mean to push away just like the balloons.

DEMONSTRATION #2: BRINGING TWO BALLOONS BACK TOGETHER

Follow same procedure as above only this time rub balloons with wool and plastic wrap. This time the balloons will be strongly attracted to each other and will touch. Put up picture you made on orange construction paper showing two electrons with different charges being attracted to each other. Tell students that attract means to want to be close together.

GROUP ACTIVITY #1: LIKE CHARGES REPEL

Distribute 2 newspaper strips to each group. Hold them at one end and let them hang. Stroke several times lengthwise from top to bottom with thumb and forefinger. They will fly apart. Prompt students to say that same charges repel. Stroke again using a piece of plastic wrap. This should produce greater negative charges faster, and show a more dramatic repulsion. Again elicit from students that these strips have the same charge and therefore repel each other.

DEMONSTRATION #3: NEGATIVE ELECTRON TRAIN

Have 6 to 8 students stand in a line at the front of the room. Tape a small piece of yellow paper displaying a negative electron to each student's arm. Have them carry a rope which represents the wiring and gently push each other on the back causing them to move around the room. They are the electrons pushing each other through a wire.

GROUP ACTIVITY # 2: LET'S FIND GOOD CONDUCTORS

Distribute worksheet to each student. Take turns reading list of items. Explain to students about conductors and insulators. Show them each item listed and how to test using Conductivity Tester. They should record results on worksheet. Draw out from them the kinds of things that were conductors and insulators.

GROUP ACTIVITY # 3: MAKING NATURE'S BATTERIES

A. Display a variety of batteries and things powered by batteries. Show the "Two Potato Clock". Ask the students how the clock is working. When they tell you the potatoes are powering it, explain that they are going to test other fruits and vegetables. Show the assembled Digital Multimeter and how to use it. Complete test and record results. Ask what must be happening. Draw out response that negative electrons must be moving freely.

B. Try to link up several lemons in a circuit, to see if they can light up a 1.2 volt bulb. How many lemons were required to get the bulb to light?

DEMONSTRATION #4: SAFETY

Lead discussion on the possible dangers from electricity.

A. Attach ends of old electric cord to a pickle and plug in to socket. Observe and discuss results. This is very dramatic! The pickle burns, glows and smells but is also very dangerous. Make **certain** that students understand that they are never to try this themselves.

B. Continue discussion of the hazards. Ask why we should never use

electrical appliances in bath or shower. Ask why we shouldn't go into a flooded basement. Set up display of Electrolysis of Water. First attach wires to a 6 volt buzzer and/or the 1.2 volt bulb. Electricity is flowing from the 6 volt battery through the wires, through the graphite rods and liquid, making a complete circuit. Remove the bulb and/or buzzer and reconnect the wires. Bubbles will begin to form on the rods proving that the electricity is flowing. Point out that if the graphite rods were two legs, the person would be electrocuted.

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