Shocking Static Electricity	Grade 6 Electricity and Electrical Devices

Lesson Plan

Safety Notes: Please don't shock others using static electricity.

Description

In this lesson, students will learn about static electricity by following three hands-on experiments and designing one of their own.

Materials

- Fleece blankets (or pyjamas)
- Handout
- Crayons, pencils, pens.
- Comb
- 2 or more balloons
- Empty pop can
- Salt or puffed cereal like rice or millet

Science Background

All matter is composed of atoms. All atoms are composed of protons that carry a positive charge and electrons that carry a negative charge. Normally, objects carry an equal number of electrons (-) and protons (+) and are said to have a neutral charge (positive charge is equal to the negative charge).

Sometimes, when two different materials come into close contact (e.g., rubbing wool on a balloon) some electrons (-) rub to the surface more than the other. The negative charges may be transferred from one material to the other. When this occurs, one material ends up with an excess of negative electrons therefore becoming negatively charged. The other material ends up with a deficiency of negative electrons and becomes positively charged. The electrons can move easily, while protons cannot. So negative charge can move around while positive charge cannot.

This accumulation of imbalanced charges on objects results in the phenomenon referred to as **static electricity**. A discharge (shock) will happen rapidly if the excess negative charges are given a path to the ground. For example, when you touch a doorknob after walking on a carpet, the excess electrons will leave you through your hand, via the doorknob.

Materials with like charges (both positive or both negative) move away from each other; those with opposite charges attract one another.

Activity Procedure

"Sticky" Balloons:

1. Inflate a regular balloon and tie it off with a knot.
2. Rub the balloon against your hair or clothing.
3. Place the balloon against the wall.
4. What did you observe? Make a diagram on your handout and show where the negative charges should be on the balloon and on the wall.
5. When you are finished, you can bring the balloon back to neutral by rubbing it with a damp cloth. Moisture in the cloth gives the negative charges (electrons) a path back to ground, and there is no longer a build up of negative charges on the balloon.

"Attractive" Water:

1. Charge a plastic comb with excess electrons by rubbing in through your hair.
2. Turn on your tap so that a steady, smooth stream of water is flowing. It doesn't need to be very strong.
3. Bring your negatively-charged comb close to the stream of water without touching it.
4. What did you observe? Make a diagram on your handout and show where the negative charges should be on the comb and in the stream of water.

"Repelling" Balloons:

1. Inflate two regular balloons and tie them off with knots.
2. Rub both balloons against the same type of material, for example your hair or a wool toque/scarf.
3. Carefully, hold both balloons by the knots so that they dangle.
4. Approach your balloons together and observe what happens.
5. What did you observe? Make a diagram on your handout and show where the negative charges should be on two balloons.

Design your own experiment:

1. Create your own experiment as to how to move something or pick up something using static electricity.
2. Write a hypothesis on your handout. Complete the procedure. Fill in the data table with your results.
3. You can use things like salt, puffed rice or millet cereal, an empty pop can, balloons or other things you think might be useful in your experiment.

Debrief

"Sticky" Balloons

Rubbing a balloon on hair causes electrons in the hair to rub on to the balloon, making it negatively charged. The wall is neutrally charged. But, when the negatively charged balloon comes close to the wall, the electrons in the wall are repelled- like they are scared of the balloon. This leaves the surface of the wall to be positively charged. The negative balloon is attracted to the positive wall. The balloon is very light, so the attraction is strong enough to hold the balloon against the wall.

"Attractive" Water

Water is a pretty special molecule. Water is also called H_2O, it is made of two hydrogen atoms and one oxygen atom. Water overall has a neutral charge but the area around the oxygen atom has a negative charge and the area around the hydrogen atoms have a positive charge. Because of this, the positive region of the water molecules are attracted to a negatively charged balloon. This is what causes the water to bend.

"Repelling" Balloons

Remember that similar charges repel each other. Both of the balloons have a negative charge. This means that they repel each other.

Your Own Experiments

There are so many different things that you could try, get creative!
When analyzing your results remember the following:

- Negative electrons can move.
- Positive protons cannot move.
- Negative charges are attracted to positive charges.
- Negative charges repel each other. Positive charges also repel each other.
- Electrons will try to move to create a neutral charge.

Troubleshooting

Sometimes static electricity is tricky. Here are some tips:

1. Humidity- moisture in the air can make the air conductive. This means that the charged object will lose its charge to moisture in the air over time. Dry air is less conductive so objets will hold a charge for longer. This is also why we notice static electricity more in the winter, when the air is usually less humid. So on humid days, these experiments might not work as well as on dry days.

2. Hair oil- some people have a hard time charging a balloon by rubbing on their head. This is because some people have more natural oil in their hair and this oil protects the hair and prevents it from drying out. This hair oil can get on to the balloon when you rub it on your head. Between oil in the hair and oils on the balloon, it can be difficult for the balloon to hold a charge. Rubbing a balloon on a cloth such as wool, polyester or nylon might work better to create charge than hair. However, you probably have fantastic hair!

What is Static Electricity?

1. Define static electricity:

"Sticky" Balloon	"Attractive" Water	"Repelling" Balloons
Draw your observations. Where are the negative charges?	Draw your observations. Where are the negative charges?	Draw your observations. Where are the negative charges?

2. How can I return my balloons/comb to a neutral state? Hint: how do you fix staticky hair?

Create Your Own Experiment

Hypothesis:

Procedure:

Observations:

Test	Movement of Objects
1	
2	
3	

Results:

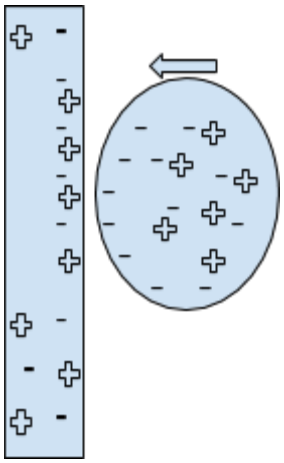
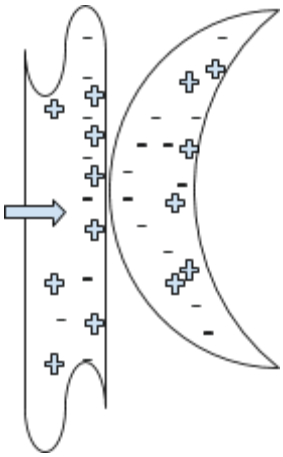
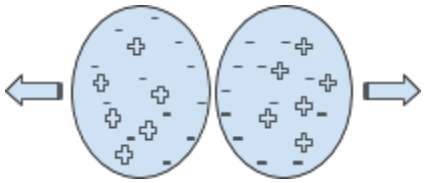
What did you observe about the effect of charges on the movement of objects?

Conclusion:

What is Static Electricity?

1. Define static electricity:

Static electricity is the result of an imbalance between negative and positive charges in an object. These charges can build up on the surface of an object until they find a way to be released or discharged.

"Sticky" Balloon	"Attractive" Water	"Repelling" Balloons
Draw your observations. Where are the negative charges?	Draw your observations. Where are the negative charges?	Draw your observations. Where are the negative charges?
		

2. How can I return my balloons/comb to a neutral state? Hint: how do you fix staticky hair?

Rub the balloon with a damp washcloth or touch the comb to the water. The excess negative charges will flow from the balloon or comb through the cloth or water to the ground. If you dampen your hair, you will have hair less staticky.

Create Your Own Experiment

Hypothesis: Filled in by student

Procedure:

Filled in by student

Observations:

Test	Movement of Objects
1	Completed by student
2	Completed by student
3	Completed by student

Results:

What did you observe about the effect of charges on the movement of objects? Opposite charges attract and like charges repel. Substances of similar materials or materials that have similar charges will move away from each other. Substances with different charges will move towards each other.

Conclusion:

Substances of similar materials or materials that have similar charges will move away from each other. Substances with different charges will move towards each other.