Science

Experiment with Static Electricity

Purpose:

- Learn about static electricity
- Conduct science experiments by generating static electricity
- Demonstrate that science is fun

Background:

Have you ever shuffled your feet across a carpet and received a shock by touching a doorknob? Perhaps you have rubbed a balloon on your head to make your hair stand up. These are examples of static electricity.

All objects consist of atoms. An atom consists of positively charged protons, neutral neutrons, and negatively charged electrons. Usually atoms have protons and electrons in balance so there is no charge on an object (neutral). However, if an object losses some electrons, it becomes positively charged. If an object gains extra electrons, it becomes negatively charged. Rubbing one object onto another can cause this imbalance to occur. Objects that are charged in this way are said to have static electricity.

In static electricity terms, opposites attract. Objects with negative charges and objects with positive charges attract each other. Rubbing a balloon on your head to make your hair stick to the balloon is a good example of this attraction. The negatively charged balloon and positively charged hair are attracted to one another. On the other hand, objects that are similarly (either positively or negatively) charged repel one another. Neutral objects always attract charged objects (whether they have positive or negative charges). In the following set of activities, we will experiment with static electricity attraction and repulsion.

Activity 1: Play with Charged Balloons

Supplies (for each group):

- Two latex balloons, inflated
- Two strings, cut into 12-inch lengths
- Wool
- Tape
- Piece of paper
- Desk or table

Work in groups of two. Tie a piece of string (approximately 12 inches long) around the knot of two inflated balloons (one string for each balloon). Attach one balloon by the string to the underside of a desk or table with tape. Ensure that the hanging balloon is not touching anything. Rub wool on the hanging balloon to generate a charge. Charge the second balloon with the wool and hold it by its string. Bring the free balloon close to the hanging balloon and make observations. Put a piece of paper between the balloons and observe what happens.

Discussion:

1. What happened when you moved the charged balloons closer together? What does this tell you about the charges on the balloons?
   Answer: The balloons repel one another as they are similarly (both negatively) charged.

Adapted from: Wonders of Our World http://wow.osu.edu/experiments/electricity/staticelec.html and Exploratorium http://www.exploratorium.edu/science_explorer/roller.html

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2. What happened when the piece of paper was placed between the two balloons? Does the piece of paper have a positive or negative charge?
   Answer: The negatively charged balloons quickly come together (with the paper in between them) as they are both attracted to the neutral piece of paper.

Activity 2: Separate Salt and Pepper

Supplies (for each group):

- Latex balloon, inflated
- Wool
- Paper plate
- Mixture of salt and pepper

Sprinkle a mixture of salt and pepper on a paper plate. Charge an inflated balloon by rubbing it on wool. Slowly bring the balloon close to the salt and pepper mixture (do not move too fast or get too close to the mixture, or both the salt and pepper will attach to the balloon). Note which part of the mixture attaches to the balloon and which part remains on the paper plate.

Discussion:

1. What happened when you moved the balloon close to the salt and pepper mixture?
   Answer: The neutral pepper attached to the negatively charged balloon, separating from the salt.

2. If the salt is neutral like the pepper, why did the salt not attach to the balloon?
   Answer: The salt remains on the plate because it is heavier.

Activity 3: Bubble Fun

Supplies (for each group):

- Plastic comb
- Wool
- Bottle of play bubbles

Rub wool on a plastic comb to create a charge. Blow some bubbles and bring the comb close to one of the bubbles. Observe what happens. By using the comb, see how long you can keep the bubble in the air without popping it.

Discussion:

1. Based on your observations, were you able to keep the bubbles up in the air by using the forces of attraction or repulsion?
   Answer: The bubbles are kept in the air by the forces of attraction (bubbles are attracted to the comb).

Activity 4: Soda Can Roll

Supplies (for each group):

- Latex balloon, inflated
- Wool
- Empty soda can

Place an empty soda can on a table or the floor (any smooth, flat surface). Charge an inflated balloon by rubbing it on wool. Hold the balloon about one inch away from the soda can. Move the balloon slowly away from the can and make observations. Using the balloon, see how fast you can make the can roll. Find some other participants and conduct a soda can race.

Discussion:

1. Based on your observations, did the soda can and balloon have the same or opposite charges?
   Answer: The soda can is attracted to the balloon because they have opposite charges.

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