Static Electricity

Overview

Have you ever touched something or someone and …ZAP…gotten a static shock? In the winter when you walk inside and pull your hat off, why does your hair stand straight up? Scientists, this week we are going to solve some of these great mysteries! What is static electricity and where does it come from?

Background Information

Everything around you can be broken up into teeny, tiny particles called atoms. An atom is the smallest possible piece of something. For example, a gold ring could be broken down into smaller and smaller pieces of gold. But an atom of gold is the smallest piece of gold possible. If you broke it down any more, it would not be gold.

Atoms look something like this. (Show the diagram of an atom). They have a center and then they have tiny particles called protons, neutrons and electrons that go around that center. Protons have a positive charge (+), electrons have a negative charge (-) and neutrons have no charge. Atoms hold on to their protons and neutrons very tightly. But some types of atoms hold on to their electrons (-) very loosely. These electrons can jump from one atom to another, especially if those atoms are rubbing against each other. If electrons can move through a certain material easily, we call that material a conductor. We say that an object or atoms are charged if they have lost electrons (positively charged) or gained extra electrons (negatively charged).

Opposites attract. A positively charged atom and a negatively charged atom will pull towards each other. The same type of atoms will pull away from each other.

Main Ideas

- Everything around you can be broken up into teeny, tiny particles called atoms.
- Atoms contain protons that have a positive charge (+) and electrons that have a negative charge (-).
- Electrons can jump from one atom to another, creating a positively or

negatively charged atom.
- Opposites attract and likes repel.

Materials Needed

- *What's Smaller Than A Pygmy Shrew?* by Robert E. Wells
- Balloons
- Salt & Pepper shaker
- Plastic Spoon
- Wool Sock
- Paper plates
- Positive and negative signs

Preparation

1. Read "Background Information" to become more familiar with the properties of static electricity.
2. Read through *What's Smaller Than A Pygmy Shrew?* by Robert E. Wells. Prepare questions that you can ask along the way.
3. Make sure that you have all the supplies that you will need for each day's experiment.

Opening

Have you ever touched something or someone and …ZAP…gotten a static shock? In the winter when you walk inside and pull your hat off, why does your hair stand straight up? Scientists, this week we are going to solve some of these great mysteries! What is static electricity and where does it come from?

Balloon Experiment
Have two volunteers each blow up a balloon. Help them tie the balloons. **Have kids take turns rubbing the balloon against their heads.** What happens to their hair? Take student hypothesis on why their hair stands up when it comes into contact with a balloon.

Introduce the concept of negatively and positively charged atoms (**show the diagram**). Explain that electrons can jump from one atom to another,

creating a positively or negatively charged atom.

Have students rub the balloon against their head and then see if the balloon will stick to their head. Have them see if the balloon will stick to any other surface in the room.

When you rub a balloon against your head, your hair loses electrons and the balloon gains them. All of the hairs that the balloon touched are now positively charged. Your hair looks crazy because each positively charged hair repels the others. They want to get away from each other.

The balloon now has a negative charge. That is why it will stick to your hair and to other neutral objects like a wall. Since the balloon is so light, it should stick to the wall. However, over time, the balloon will eventually fall because static electricity runs out or dissipates over time.

Have a volunteer blow up one more balloon. Do not rub it against anything. Will this balloon stick to a negatively charged balloon? Rub both balloons on your hair. Will two negatively charged balloons stick to each other?

A charged balloon will also stick to an uncharged balloon. However, two negatively charged balloons will repel each other.

Further Exploration

What is the quickest way to separate salt and pepper?

Have students divide into partners and pass out one paper plate and one plastic spoon per partner. Help students to pour about half a teaspoon of salt and half a teaspoon of pepper onto their plates. Have them mix them together well with their fingers.

What do you think is the best way to separate the salt and the pepper back out? See if you can do it. Can you do it with your spoon?

Come around with the wool sock. Have them rub the spoon on the sock. This gives the plastic spoon a negative charge.

Now, hold the spoon about an inch above the pile of salt and pepper. Both the pepper and the salt will be attracted to the spoon. However, pepper is lighter. So, if they hold the spoon in the right place, the pepper will jump up and cling to the spoon.

Note: After you are done, please have them dump the salt and pepper, but keep the plates and spoons.

Wrap Up

- Have students draw their own diagram of an atom.
- Have students explain to a friend why their hair stands up when they take off a hat.
- Place students in groups as atoms. Give some a positive sign (protons) and some a negative sign (electrons). Start off with an equal number in each atom. Move an electron to a different atom and have students tell you if the electron is positively or negatively charged.
- Remind students that everything around them can be broken down into teeny, tiny particles called atoms. Positively and negatively charged atoms are responsible for static electricity and lightning.

Signs of Success

The student will…

- Demonstrate engagement and curiosity by performing the static electricity experiments.
- Describe what they have seen or done, explain what they still want to try, and make predictions for outcomes for new ideas.
- Correctly draw their own atom and explain how electrons can jump from atom to atom.
- Explain to a friend why their hair stands up when they take off a hat.

Other Books to Explore

Bains, Rae. **Discovering Electricity.** *Troll Associates, 1992.* ISBN 978- 0893755652.

Birch, Beverly. **Benjamin Franklin's Adventures with Electricity**. *Orion Children's Books, 1995.* ISBN 978-0575060067.

Bridgman, Roger. **Eyewitness Electronics.** *DK Children, 2000.* ISBN 978- 0789467249.

Carlson, Laurie. **Thomas Edison for Kids: His Life and Ideas, 21 Activities.** *Chicago Review Press, 2006*. ISBN 978-1556525841.

Johnstone, Leslie and Levine, Shar. **Shocking Science: Fun & Fascinating Electrical Experiments.** *Sterling, 2000.* ISBN 978-0806922713.

Cole, Joanna. **The Magic School Bus and the Electric Field Trip**. *Scholastic, Inc.*, 1997. ISBN 0-590-44682-7.

Harlow, Rosie and Morgan, Sally. **Energy and Power (Young Discoverers: Environmental Facts and Experiments).** *Kingfisher, 2002.* ISBN 978-0753455029.

Pennsylvania Educational Standards

Reading 1.2.3 A, D, E
1.6.3 A, B
1.8.3 A, B

NRC National Science Educational Standards
Content Standard A: Science as Inquiry
Content Standard B: Physical Science

AAAS Benchmarks for Science Literacy
12A Values and Attitudes
12D Communication Skills

Sample Schedule For Making It A Week Long Unit

Day 1:
Introduce the idea of static electricity and atoms.
Show students the diagram of an atom.
Have students perform the balloon experiment.

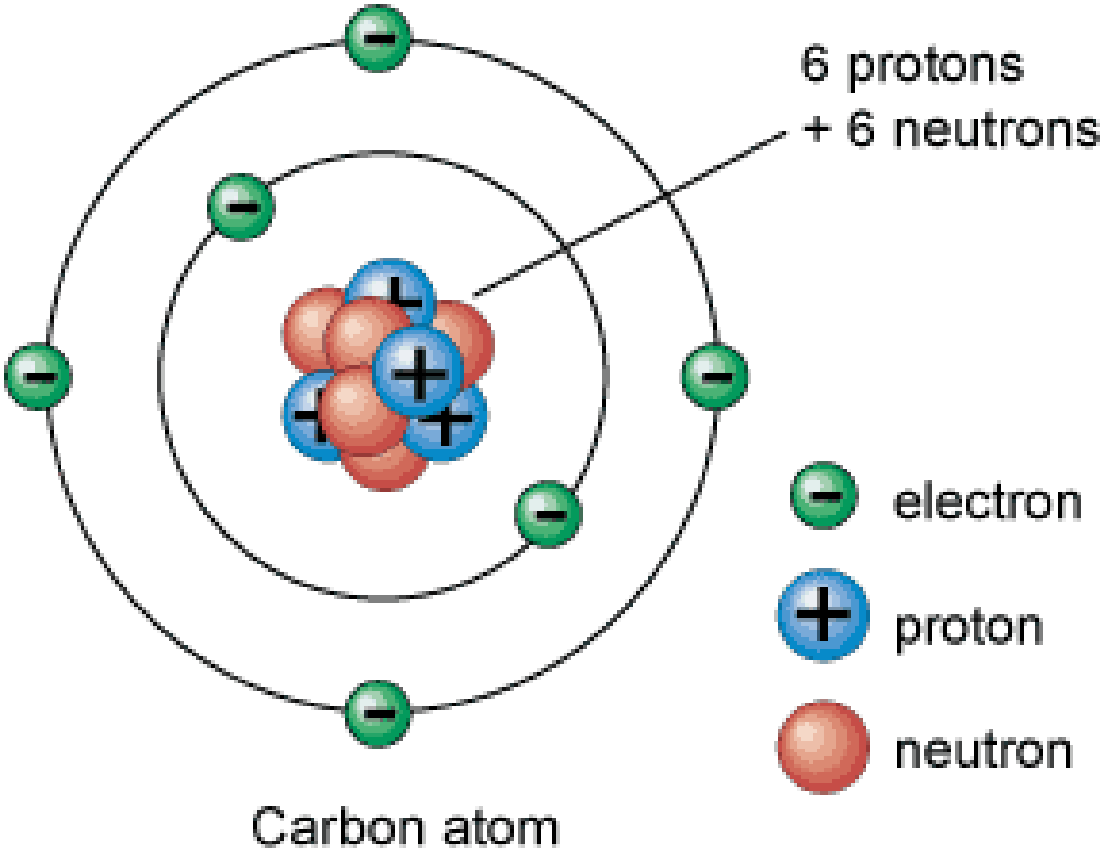
Day 2:
Have students review the concepts of static electricity and atoms.
From memory, have students draw their own diagram of an atom.
Read *What's Smaller Than A Pygmy Shrew?* by Robert E. Wells.

Day 3:
Have students review the concepts of static electricity and atoms.
Place students in groups as atoms. Give some a positive sign (protons) and some a negative sign (electrons). Start off with an equal number in each atom. Move an electron to a different atom and have students tell you if the electron is positively or negatively charged.
Read *Electricity* by Ian F/ Mahaney.

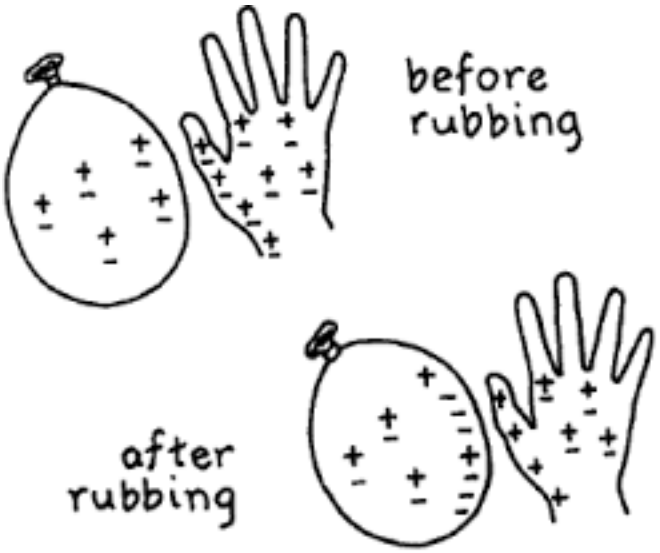
Day 4:
Have students review the concepts of static electricity and atoms.
Perform the salt and pepper experiment.

Day 5:
Have students review the concepts of static electricity and atoms.
Discuss how static electricity causes lightning.
Show students the chart.
Read *Thunderstorms* by Matt Doeden.
OR
Discuss Benjamin Franklin and his experiments with electricity.
Read *Benjamin Franklin from A to Z* by Laura Crawford.
Review all that we have learned this week.

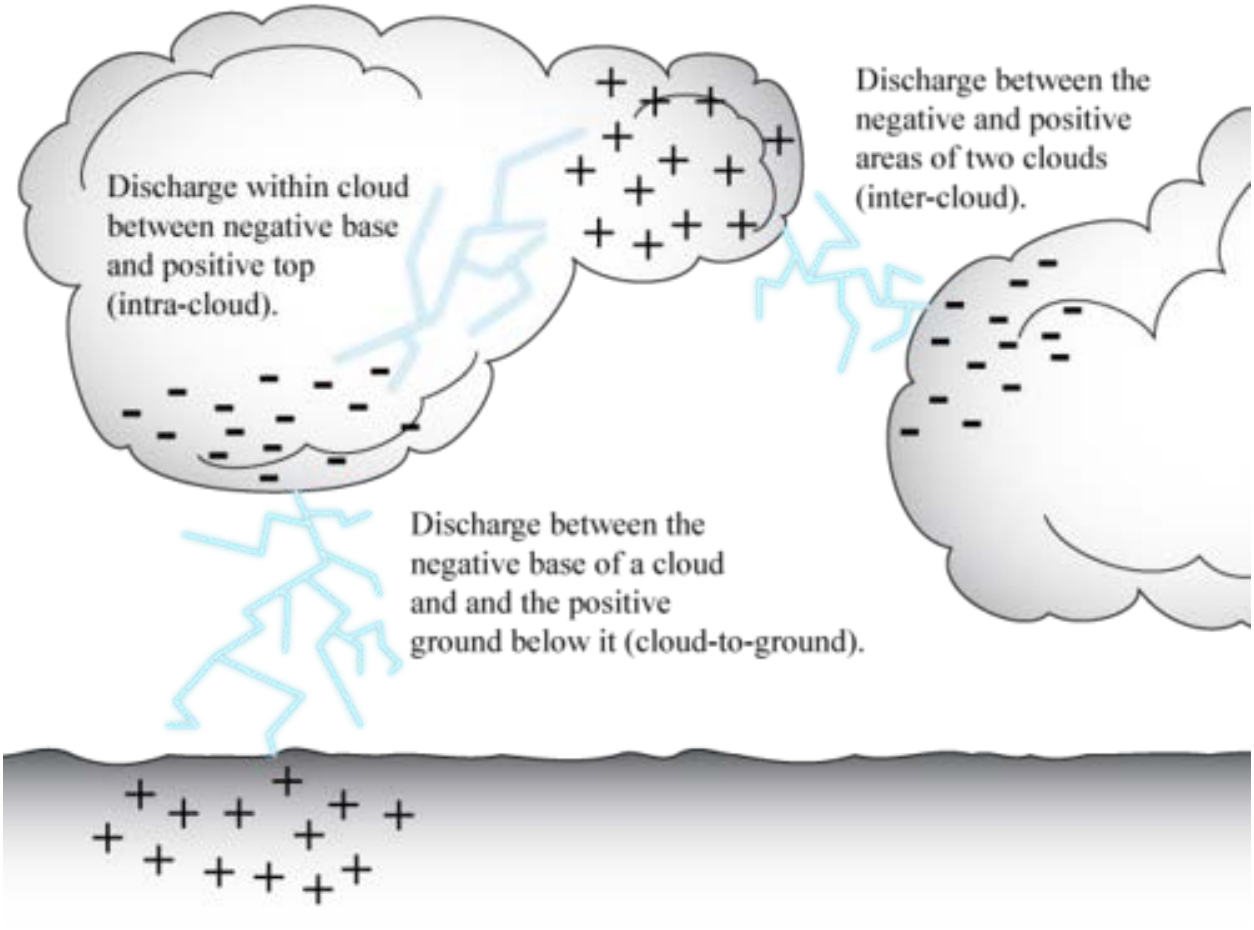
An Atom



Carbon atom



Lightning



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