Grade Level/Course: Grades 3-5 Physical Science: Static Electricity

Lesson/Unit Plan Name:
What's the Static?

Rationale/Lesson Abstract:
Through hands on activities, students will understand that static electricity is created when an object becomes positively or negatively charged by rubbing up against another object. They will understand how insulators lead to an imbalance of electrons causing a shock or electrical charge.

Timeframe:
1 classroom session

Common Core Standard(s):

Mathematics

3.MD Measurement and Data
3.MD.4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch.

4.MD Measurement and Data
4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec.

5.MD Measurement and Data
5.MD.1 1. Convert among different-sized standard measurement units within a given measurement system.

Next Generation Science Standards

3-PS2 Motion and Stability
3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
3-PS2-3. Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.

4-PS3 Energy
4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.
4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

5-PS1 Matter and Its Interactions
5-PS1-3. Make observations and measurements to identify materials based on their properties.

Instructional Resources/Materials:

For the teacher:
Computer or tablet
LCD projector
Access to ed1stop – BrainPop video on Static Electricity
(the url will work after you have logged on through ed1stop)
https://www.brainpop.com/science/energy/staticelectricity/

For each group of 4 students:
Science notebooks and pencils
2 balloons
Students' hair or piece of felt or thick cotton
(for rubbing balloon on)
2 rulers or tape measures

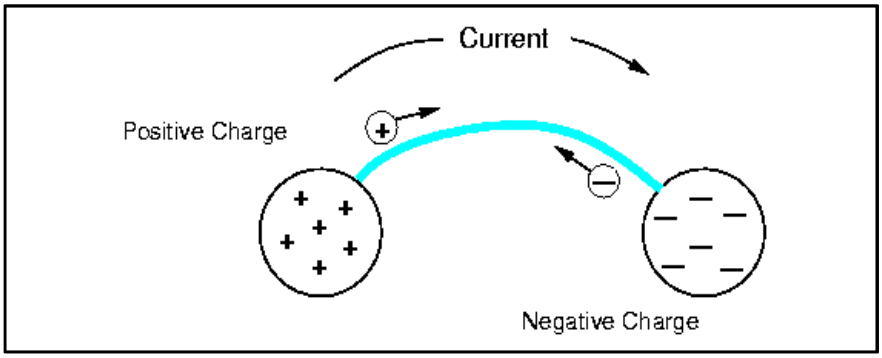
Suggested materials for testing:
Paper towel
Paper clip
String
Piece of aluminum foil
Plastic wrap
empty soda can
straw

Before the Lesson/Activity:
Everyone has experienced getting a shock when touching a doorknob or another object that conducts electricity. In this activity, students will begin to understand where the shock comes from.

Warm-up
Have students take out their science notebooks and make a K-W chart. The simplest way is to divide a notebook page vertically in half and label the left column "What I know about static electricity" and label the right side "My Questions about static electricity". Students should be directed to do a quick write recording their ideas and questions. They should be encouraged to talk with their seat partners about this after they have recorded their thoughts.

Next, teacher should show either the BrainPop video on static electricity or a comparable video from the internet that explains the science behind static electricity. Teachers in West Contra Costa Unified have free access to BrainPop through ed1stop with their password.

It would be helpful if students already had a basic understanding of what an electric current is – the flow of electrons between atoms. They should also understand that this current occurs because of the balanced interaction between protons (which are positive) and electrons (which are negative).



For the purposes of this lesson, it would be helpful if students understood what conductors and insulators are. A conductor is an object that allows an electric current to flow through it (different metals). An insulator is an object that stops the flow of the electrons. Because the insulator does not allow electrical energy to continue on – it creates an electrical imbalance. When two insulators rub up against each other, the electrons build up and a charge imbalance is created. The two insulators act like opposite poles of a magnet and are attracted to each other. If the insulators come in contact with a conductor like a doorknob, the electrons jump from the insulator to the conductor to reach a balance again and there is a shock or spark from the action.

Have students record definition of conductor and insulator in their science journals. After watching the video, conduct a short class discussion about what students have learned so far about static electricity.

Activity/Lesson:

In this lesson, students will work in pairs within a group of 4 students. All of the materials should be placed on trays for each table group including the balloons.

1) Students will fill their balloons and tie them off.

2) Students will work with their science partner to rub the balloons against their head until their hairs starts to stick up. (Please note that some types of hair do not effectively conduct static electricity – in that case, have students rub their balloons on pieces of felt or other heavy cotton material). Give students ample time to do this activity with each member of their table group. Have them notice which kind of hair seems to have the biggest attraction.

3) Students will investigate their materials to discover whether or not the balloon will be attracted to it. Students will make a prediction as to whether or not the object is an insulator and it will be attracted to the balloon. You may want to add some more materials to the list.

4) Students will work with their partner and test each object by rubbing the balloon first on their hair or material and then placing the balloon with two inches (or 5 centimeters) of their object. They will have repeat this process each time to test each object. Students will record their data in their chart.

Second Activity: Soda Can Race

When students are testing their balloons with the soda cans, they will notice that the cans (assuming they are still in cylindrical form) actually roll back and forth. Table groups of 4 students can conduct soda can races on a flat surface like the floor. Students should see how long it takes for the balloon to lose its charge and be grounded. Students should measure the distance travelled by the soda can in both inches and centimeters. This information should also be entered onto their data charts.

When pairs of students have completed their testing, have them check with the other two members of their group to see what their data chart looks like. Students should retest materials so that they can reach an agreement.

Then conduct a full class discussion about which materials were attracted to the balloon and which were not. Follow-up with group discussions on several questions. Share out and then have students record their responses in their science journals.

1. What are the similarities between the objects that are attracted to the balloon? Why do they attract?
2. How can we get rid of static electricity?
3. Is lightning static electricity? Why do you think so?

(*This lesson is adapted from the 2007 Teacher Resource Guide Book; Northern California PEAK Student Energy Actions, Unit 7 – Sticking with Static.) For more information visit www.peakstudents.net*

Names _____ Date: _____

"What's the Static" Data Chart

Object	Prediction	Result
Paper towel		
Paper clip		
String		
Piece of Aluminum Foil		
Piece of Plastic Wrap		
Soda can		
Straw		

How far did your soda can travel? _____

Names _____ Date: _____

"What's the Static" Data Chart

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Paper towel		
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Piece of Plastic Wrap		
Soda can		
Straw		

How far did your soda can travel? _____

Assessment:

Completed data charts and group and class discussions will be used for assessment. Also discussion and science journal responses to questions about static electricity (see above.)

Teacher may also use the online quizzes about static electricity on the BrainPop site for further assessment.