Life of a Can

The Never-Ending Story

Classroom Activity

Novelis

Pop!

Overview

Did you know that during the process of recycling an aluminum can, we use electricity to "pop" the can from one conveyor belt to another?[1] This works because aluminum is a great conductor of heat and electricity. Students will experience this phenomenon in real-time with this classroom experiment. Students will create static electricity by rubbing a piece of wool fabric against a balloon. They will set a can on its side and hold the energized balloon nearby. The can will roll towards the static energy of the balloon! This experiment will demonstrate the powerful conductive qualities of aluminum.

Activity Duration: 1 class session, 45-60 minutes
Grade Level: Grades 3–5

Background Information

Static electricity is the result of electrons jumping from one atom to the next. When electrons jump from the balloon to the wool fabric, it leaves the balloon negatively charged. The positive ions in the aluminum can are attracted to this negative charge and that attraction causes the can to roll towards the balloon.[2] Aluminum is a strong conductor, which means that its atoms are arranged in a way that allows electricity to pass through easily. That is why aluminum is an optimal material for use in many electronic devices. It even explains why you can pop a ball of aluminum foil in the dryer in order to protect your clothes from dreaded static cling!

Key Vocabulary

Static electricity: an electrical charge that is produced by the interaction between a positively-charged ion and a negatively-charged ion
Friction: the force between two objects that prevents them from moving towards one another [3]
Conductor: a substance that allows heat and electricity to flow through easily
Ions: an atom with an electric charge (either positive or negative)
Electrons: the outermost particles of an atom that have the ability to jump from one atom to the next

Materials

Each student will need the following materials:

- Balloon
- Piece of wool fabric
- Aluminum beverage can
- Yardstick
- Masking tape
- "Pop!" Capture Sheet

Pop!

Procedure

Background (10 minutes)

1. Begin by asking students to raise their hands if they have ever experienced the following:
   a. Gotten a "zap" of electricity when touching a doorknob?
   b. Had two pieces of clothing stick together?
   c. Seen lightning during a thunderstorm?
   d. Wrapped a piece of plastic wrap around food?
   e. Taken papers out of the printer or copier and had to peel them apart?

   Explain that in each of these scenarios, the student interacted with static electricity. This electricity is formed when a positively-charged ion interacts with a negatively-charged ion.

   Extension: Review the structure of an atom—a nucleus formed of positively-charged protons and neutral neutrons. Around the nucleus, negatively-charged electrons swirl and jump from one atom to another. As electrons jump, they sway the balance of the atom's charge. Atoms with a positive or negative charge are called ions. When two ions with opposing charges interact, the resultant force is static electricity. So, your clothes stick together because electrons from one piece of fabric are attracted to the protons in another. When you rip the pieces apart and see sparks, you're seeing static electricity in action!

2. Explain that some materials are more receptive to the forces of electricity than others. Materials that help electricity to travel are called conductors and materials that stop electricity are called insulators. Aluminum is a very good conductor of electricity.

   Extension: Share that aluminum has many free electrons that can move from atom to atom, carrying electricity along with them. This makes aluminum an effective conductor of electricity.[4]

3. Instruct students that in this lesson they will test the conductivity of an aluminum can by measuring how far it can roll towards a balloon with a negative electric charge.

Pop!

Experiment (30 minutes)

1. Distribute materials to students.
2. Ask students to blow up their balloons and tie them.
3. Have students rub the piece of wool fabric on the balloon for 10–15 seconds, being careful not to pop the balloon.
4. Once they have charged the balloon, have students tape the balloon to the floor and place the yardstick on the floor next to it.
5. Ask students to place their cans 6 inches from the balloon and observe if the can rolls towards the balloon. Have students use their yardstick to measure the following distances from the balloon, putting a piece of masking tape on the floor in order to note each distance measurement: 12 inches, one foot, three feet, six feet and nine feet, recording their observations on the Pop! capture sheet.

Reflection (5–10 minutes)

When each student has completed their capture sheet, ask the class the following critical questions:

a. What did you notice as you moved the can further and further away from the balloon?
b. What can materials like aluminum, which are strong conductors of heat and electricity, help us to do?
c. How do you think the experiment would change if you swapped out the can with a foil ball? How about a thick sheet of aluminum? What factors contribute to the attraction between the balloon and the can?

Pop! Capture Sheet

Name_____

We interact with static electricity every day. It's why we see lightning during a storm, and why our clothes sometimes stick together when we take them out of the dryer. In this experiment, you will observe how aluminum, a metal with strong conductive properties, is so sensitive to static electricity that a balloon with a negative charge will make an aluminum can roll in its direction. We will measure the strength of the static electricity by observing how far we can remove the can from the balloon before the static force is too weak to roll the can.

Can Distance	What Happens?
6 inches	
1 foot	
3 feet	
6 feet	
12 feet	

Pop!

Standards

Next Generation Science Standards

4-PS3-2 Energy

Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

Works Cited

[1] Department of Environmental Protection: Montgomery County, MD. 2017. *How the Recycling Center Works.* ***https://www.montgomerycountymd.gov/SWS/facilities/rc/how.html***

[2] Australian Government: Department of Industry, Innovation and Science. Commonwealth of Australia. 2017. Aluminum Can Static Roll.
https://www.questacon.edu.au/outreach/programs/science-circus/videos/aluminium-can-static-roll

[3] Ghose, Tia. June 4, 2013. *What is Friction?* Livescience.
http://www.livescience.com/37161-what-is-friction.html

[4] BBC. 2014. GCSE Bitesize: Metal Structure and Properties.
http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_gateway/periodic_table/metalsrev1.shtml