

## Static Electricity

**Lesson Concept** Magnetism and electricity are related effects. Static electricity is the build up of electrons or electric charge. Electrons are parts of atoms and have a negative charge. Like electrical charges repel each other, while opposite electrical charges attract. Lightning is an example of the discharge of static electricity.

**Link** In the last lesson, students learned that magnetism is a force that exerts a push or a pull, and that opposite poles attract while like poles repel. In this lesson, students learn that like charges repel each other, while opposite charges attract.

**Time** 55 minutes

**Materials**

Whole class

- 2 Inflated balloons
- 2 (30 cm) Pieces of string
- 2 (5 cm) Pieces of clear tape
- 1 Piece of wool cloth or sweater

Per Group (groups of 2)

- 2 Inflated balloons
- 2 (30 cm) Pieces of string
- 1 Piece of wool cloth or sweater
- 1 tsp. Puffed rice cereal
- 1/8 tsp. Salt
- 2 Snack sized zip-top plastic bags
- 2 Small paper plates

Individual

- Science Notebook

**Advance Preparation**

1. Measure the cereal and salt. Place in zip-top plastic bags.
2. Inflate balloons.
3. Cut string.

## Procedure:

**Engage** (5 minutes) *Static electricity is the build up of electrons or electric charge.*

1. Ask students to think about a time they have dragged their shoes across a carpet and then touched a metal doorknob. Ask, "What happened?" [Expected Student Response (ESR): "I was shocked!"] Have students think-pair-share other times they have had experiences similar to this. Ask, "What did your experiences have in common?" (ESR: I dragged feet/shoes across a carpet and shocked another person. Objects were attracted to each other, e.g., socks stuck together in the dryer. I pulled apart the socks from the dryer that were stuck together and saw a spark. Objects were repelled from each other, e.g., hair standing on end when a hat is removed.)

*Teacher Note: A spark is caused by a discharge of static electricity.*

2. Point out to students that all of their experiences are related to static electricity and that in this lesson they are going to continue to investigate static electricity.
3. Gently rub an inflated balloon on a student's head for about 15 seconds to charge the balloon. Lift the balloon about 6 inches above the student's head. Have students observe what is happening to the student's hair. Repeat lifting the balloon from the student's head. Ask, "Why is his/her hair following the balloon?" (ESR: The hair is attracted to the balloon.)

*Teacher Note: This demonstration works best with medium to long hair that is free from hair gel. Fine hair also works better than coarse hair.*

**Explore** (10 minutes) *Static electricity is the build up of electrical charge.*

4. Display 2 balloons labeled #1 and #2. Rub the first balloon with a piece of wool cloth or sweater. Demonstrate how the balloon can "stick" to a vertical surface, such as a wall or cabinet. Attempt to "stick" a balloon that has not been charged to the same surfaces. Ask students to compare what they observe about the two balloons. Ask, "Why do you think the first balloon is attracted to this surface and the second balloon is not attracted?" (ESR: The first balloon was rubbed with the cloth to make it stick. The second balloon was not rubbed with the cloth so it did not stick.)
5. Distribute a balloon and wool cloth to pairs of students. Have students use the wool cloth to charge their balloons. Have students explore the surfaces in the room to which their balloon will stick.
6. Distribute science notebooks. Explain to students that they will soon have salt and cereal to investigate. Remind students that they will not be able to taste the salt nor the cereal. Ask students to make a prediction about what they think will happen when a charged balloon is placed near the salt/cereal. Have students write their predictions in their science notebooks.
7. Distribute the paper plates, salt and cereal to each group. Have students sprinkle the salt and cereal on separate paper plates. Have students charge their balloons and hold

them close to the salt/cereal, being careful not to touch the balloons to the salt/cereal. Have students record their observations in their science notebooks using words and pictures.

8. Ask students why they think these materials are attracted to the balloon even if they are not magnetic. Ask, "Why did we rub the balloon first? What effect did that have on the balloon?" (ESR: Rubbing the balloon made it stick to materials.) Point out to students that rubbing the balloon charged the balloon.

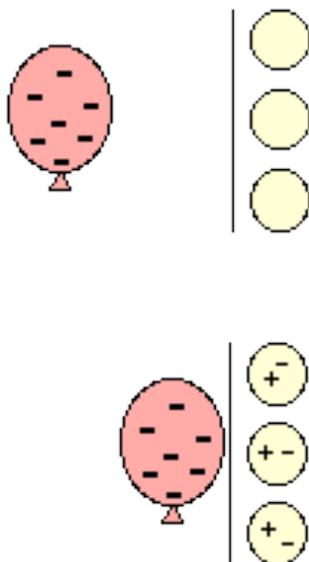
**Explain (20 minutes) Electrons are parts of atoms with a negative charge. Electrons can move or transfer from one material to another.**

9. Have students write the following question in their science notebooks: How can rubbing a balloon charge the balloon? Refer to **R1 (Static Electricity Diagram)** to illustrate for students how electrons move to the balloon. As the balloon adds electrons it becomes negatively charged. Have students draw the diagram on R1 in their science notebooks.

**Extend/Evaluate (10 minutes Extend, 10 minutes Evaluate) Static electricity is the build up of electrical charge. Lightning is an example of the discharge of static electricity.**

10. Extend. Distribute another balloon and 2 pieces of string to each pair of students. Have students tie one piece of string to each balloon. Demonstrate how to suspend each balloon from a string. Ask students to predict what will happen when a positively charged balloon is suspended near a neutral balloon. Help students position the charged balloon so that it will repel the neutral balloon.
11. Have students charge the second balloon. Ask students to predict what will happen when both balloons are negatively charge (ESR: The balloons will repel each other because they have the same charge.)
12. Have students draw a diagram of the two balloons in their science notebooks. Remind student to label their diagrams with the words: negative charge like, like charges repel, and opposite charges attract.
13. Evaluate. Have students to write the following question in their science notebooks: Why does a charged balloon attract or repel another balloon? (ESR: The balloons attract each other when their charges are opposite, The balloons repel each other when their charges are alike.)
14. Optional Extend. Visit <http://www.weatherwizkids.com/weather-lightning.htm> and read about lightning. (The beginning section is most pertinent to this lesson).
15. Remind students about their earlier conversation about "getting shocked" from the beginning of the lesson.
16. Explain that lightning is an example of static discharge. Clouds become negatively charged as ice crystals inside the clouds rub up against each other. Meanwhile, the positive charge on the ground increases. The clouds get so highly charged that the electrons jump from the ground to the cloud, or from one cloud to another cloud. This causes a huge spark of static electricity in the sky that we call lightning.

## Static Electricity Diagram



The balloon is negatively charged and is attracted to positively charged materials.