The Magic of Static

Science, Physical Science

Grade 2- 5

Objective

Students will have fun investigating the magic of static electricity.

Directions

Lesson Preparation

- Set up stations for students to rotate through using the information on the data sheets. If possible, set up duplicates of each station to have fewer students at each of them.
- Test each of the stations and adjust the setup as needed to match the students' ability levels.
- Establish a rotation system which will allow at least 15 minutes at each station.
- Arrange for adult or older student volunteers to be assigned to each station to assist the students as needed, if they are not able to do the work alone.

Activity

1. Introduce the students to each of the stations. Explain the instructions which they are to follow as they work at each of them. Demonstrate how they are to use the materials at the various stations.
2. Divide the students into groups of three or four students and assign each group to begin at a different station. Allow sufficient time for each group to explore the materials at their station before moving them on to the next. This lesson should be spread over more than one day to enable the students to benefit from experimenting with the materials and sharing their ideas.

Closure

- When all students have visited each of the stations, have each group demonstrate one of the exciting new discoveries they made as they investigated static electricity.
- Invite another group of students to visit the classroom and have your students show them the discoveries they made about static electricity.
- Use the transparency (page 20) to review the lesson.

Particles and Electric Fields

Normally, an atom has an equal number of electrons and protons, and so it is electrically neutral. If an atom gains some electrons, it becomes negatively charged. If an atom loses some electrons, it becomes positively charged. Atoms that have an electric charge--either positive or negative--are called ions.
Every particle is surrounded by an electric field. Charged particles exert a force on one another, even when not touching, because each electric field extends into the space around each particle.
Uncharged Particles
If two balloons are uncharged, they do not exert any force between them.
Particles with Unlike Charges
If one balloon is charged positively and the other negatively, their electric fields interact and pull them together.
Particles with Like Charges
If two balloons are each negatively (or each positively) charged, their electric fields interact and cause them to move apart.

Resources

- balloons
- small wool duster or piece of wool cloth
- 8'' x 10'' (20 cm x 25 cm) clear plastic boxes used for pictures (available where picture frames are sold)
- paper circles from a hole punch (optional: confetti)
- Styrofoam packing peanuts or pieces
- bottles of water
- buckets or basins
- data sheets and instructions for each workstation (pages 22-25)

The Magic of Static

Teacher Information

Static electricity can be investigated using a variety of materials which can be given a static charge. This is most effective during dry weather or in a room which is being heated or air conditioned and, therefore, has less moisture in the air.

Overview: *Students will have fun investigating the magic of static electricity.*

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- transparency of page 20

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The Magic of Static *(cont.)*

Particles and Electric Fields

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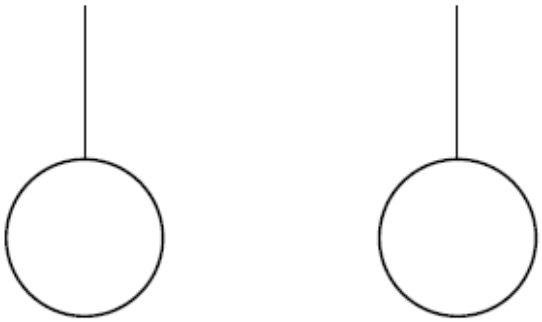
Every particle is surrounded by an *electric field*. Charged particles exert a force on one another, even when not touching, because each electric field extends into the space around each particle.

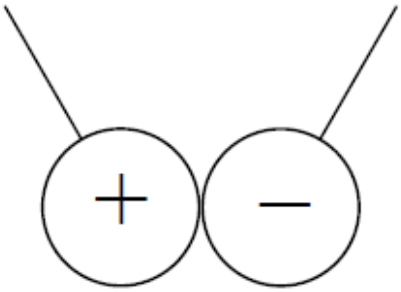
Uncharged Particles

If two balloons are uncharged, they do not exert any force between them.



Particles with Unlike Charges

If one balloon is charged positively and the other negatively, their electric fields interact and pull them together.



Particles with Like Charges

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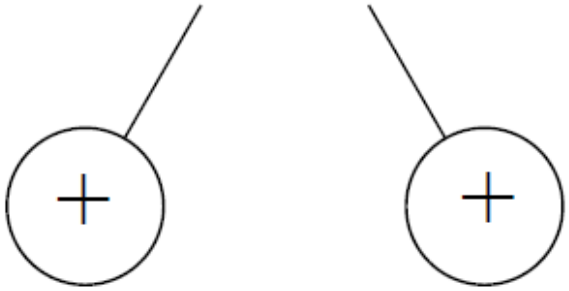


The Magic of Static *(cont.)*

Answer Key

Station 1

Popping Paper

Some of the circles jump from the paper to the plastic box. Others jump back and forth, while still others remain on the paper but stand on edge. There is a popping sound made as the circles hit the plastic box. If left alone for a while, the circles lose the static charge but can be reactivated by rubbing the box again.

Station 2

Jumping Peanuts

If the charged balloon is held about three inches (7.5 cm) above the Styrofoam peanuts, they will leap up and cling to it. When shaken gently, the peanuts continue to adhere to the balloon. They can be chased around the balloon when another charged peanut on the balloon is pushed toward them.

Station 3

Weird Water

The stream of water will bend away from the charged balloon when it is held about one inch (2.5 cm) from it.

Station 4

Dancing Balloons

When both hanging balloons are charged with the duster, they will repel each other. If a hand is placed between the balloons, they will be attracted to the hand but will move away (repelling) from each other when the hand is removed.

The Magic of Static *(cont.)*

Station 1: Popping Paper

Materials

- clear plastic box
- about 40 paper circles from a hole punch

Setup

- Put the paper circles on the table top and put the clear plastic box over them.

How to Do the Test

1. Have one person hold the plastic box down over the paper circles.
2. Rub the top of the plastic box with your hand as fast as you can.

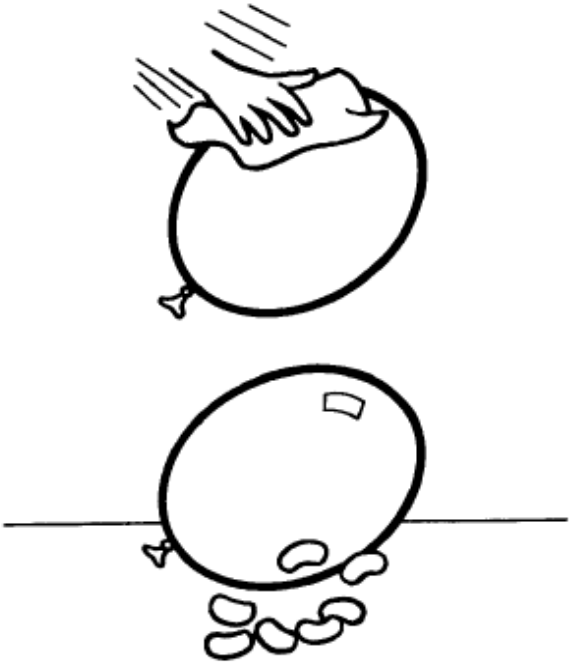
Watch to See What Happens

1. Do any circles begin to jump?_____
2. Are there any circles standing on edge?_____
3. Do any circles leap up and hang from the box?_____
4. Are there any sounds being made?_____
5. If you heard sounds, what did they sound like?_____

Try something new and then make a picture of what you discovered.

The Magic of Static *(cont.)*

Station 2: Jumping Peanuts



Materials

- inflated balloon
- handful of Styrofoam packing peanuts
- wool duster or wool cloth

Setup

- Put a balloon, wool duster or cloth, and Styrofoam packing peanuts on the table.

How to Do the Test

1. Rub the balloon with the wool duster.
2. Hold the balloon near the peanuts.

Watch to See What Happens

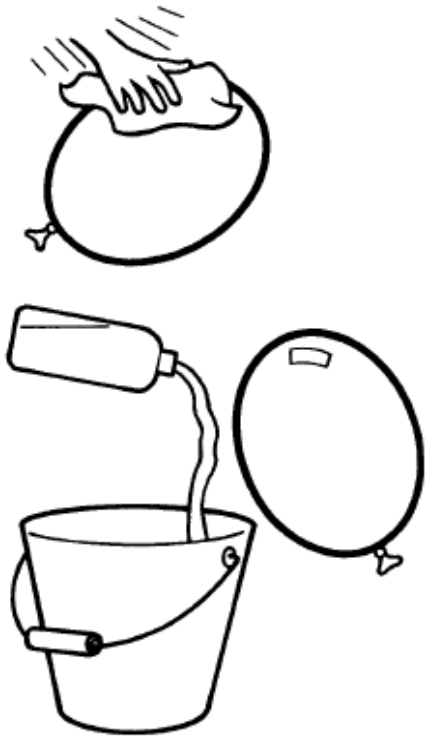
1. Do the peanuts jump on the balloon?_____
2. Shake the balloon gently. Do the peanuts stick to it?_____
3. What happens if you pull or push the peanuts around on the balloon?

_____

Try something new and then make a picture of what you discovered.

The Magic of Static *(cont.)*

Station 3: Weird Water



Materials

- inflated balloon
- wool duster or wool cloth
- bottle of water
- bucket or basin
- towels

Setup

- Put all the materials on the table.

How to Do the Test

1. Rub the balloon with the wool duster.
2. Pour the water slowly into the bucket. Hold the balloon near the water.

Watch to See What Happens

1. Did the water run straight down from the bottle?_____
2. Do this same test two more times and see what happens. Be sure to refill the bottle and to rub the balloon with the duster each time. Tell what happens each time.

_____

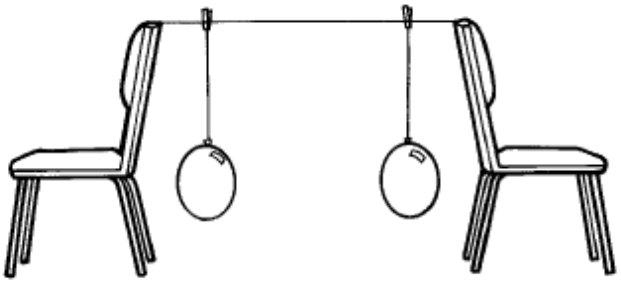
Try something new and then make a picture of what you discovered.

The Magic of Static *(cont.)*

Station 4: Dancing Balloons

Materials

- 2 inflated balloons of different colors, each on a string
- wool duster or wool cloth
- 3 feet (90 cm) string
- 2 clamp-on clothespins
- 2 chairs



Setup

- Place the chairs close together and stretch the string taut between them. Put the clothespins on it two feet (60 cm) apart. Hang the balloons from the clothespins so they are level with each other.

How to Do the Test

1. Rub one balloon with the wool duster.

Watch to See What Happens

1. What happens after only one balloon was rubbed with the duster?

   _____

2. What happens if both balloons are rubbed?

   _____

3. What happens when you put your hand between the balloons?

   _____

Try something new and then make a picture of what you discovered.