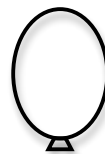




# Balloon Charges



**Objective:** To develop an understanding of static electricity, polarization of charge, and charge interaction.

**Materials:** Empty soda-can, inflated balloon, Styrofoam packing peanuts, permanent marker, tape, string, and your hair.

**Procedure:** *In your lab group, answers the questions in the space provided.*

## PART 1: Static Roller

- ☐ Place the soda can on its side on a flat, smooth surface. Hold it until it stays still.
- ☐ Rub the balloon back and forth on your hair really fast for thirty seconds.
- ☐ Hold the balloon about an inch in front of the can. What happens?
  
- ☐ Move the balloon **SLOWLY** away from the can. What happens?
  
- ☐ Move the balloon to the other side of the can. What happens?
  
- ☐ Whose hair at the table can get the soda can rolling the fastest? Why does their hair work better?
  
- ☐ If you put the soda can on the floor, how far can you get it to roll it before it stops? Why do you think it eventually stops?

## PART 2: Your New Best Friend

- ☐ Draw a face on your balloon (the nozzle of the balloon should be where the hair goes).
- ☐ Tie the string to the nozzle of the balloon and use the tape to suspend it from the ceiling. The balloon should hang so you will be eye to eye with your new best friend.
- ☐ Rub the face of the balloon with your hair. Be careful not to pull the tape off the ceiling.
- ☐ Stare into the eyes of your new best friend. Try moving to the left and then to the right. What happens?
  
- ☐ Your new best friend seems to be attracted to you... it will now face you and move toward you whenever way you go. Is there a limit to this attraction? Roughly, at what distance does your new best friend stop paying attention to you?
  
- ☐ Does your new best friend pay attention to other members of your team if they are near?

- ❑ How does your new best friend react to your teammate's best friend? Move a teammate's balloon near close to yours and rub both of their faces with your hair. Describe the way they interact with each other.

### PART 3: Magic Peanuts

- ❑ Take down your best friend and untie the string.
- ❑ Collect a handful of Styrofoam packing peanuts and put them on the table.
- ❑ Rub the balloon with your hair and bring the balloon near the Styrofoam packing peanuts. What happens (give it a few minutes before recording your results)?

### Part 4: Things to Try At Home!

- ❑ Turn on the kitchen faucet. Don't run the water too hard, but more than a little trickle. Now rub a balloon with your hair and hold it near the stream of water. With enough charge build up on the balloon, you can get the stream of water to bend!
- ❑ Find a hole puncher and empty out all the little pieces of paper onto a table. Take a plastic comb and rub/comb your hair vigorously. Bring the comb near the paper pieces and enjoy the show!

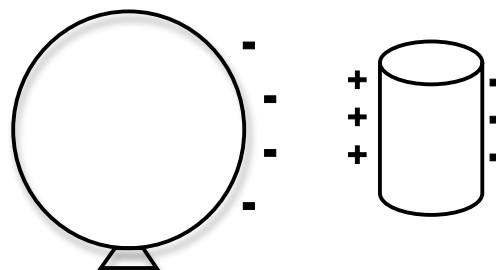
**Discussion:** *As a group, read the following and highlight/underline the most important parts.*

We remember that matter is composed of atoms, and atoms are composed of protons, neutrons and electrons. The only one of the two charged subatomic particles, protons (+) and electrons (-), that has the ability to move are the electrons. Objects with an excess of electrons are negatively charged, while objects with a shortage of electrons are positively charged, and objects with an equal number of protons and electrons are electrically neutral. Electrons may transfer from one object to another when they come into close contact, for example, a balloon rubbing electrons away from your hair. This rubbing away of electrons is also called charging by **friction**. This is also how charge builds up in clouds and results in lightning. The accumulation of unbalanced charge in objects is referred to as static electricity.

Objects that have opposite net charges will attract each other and actually stick together. If there is a large enough difference in charge between two objects, the force of attraction can be so great that a spark may jump across the space between them.

Hair, human or animal, readily gives up electrons and can be used to accumulate negative charge on a neutral object. Rubber, an insulator, does not allow charge to move through it. If a balloon is rubbed with hair, the hair gives up electrons, making that part of the balloon that was rubbed negatively charged even though the rest of the balloon remains neutral.

When an object with a net charge is brought near a neutral object, the charge in the neutral object will be **polarized**. Polarization of charge is the redistribution of charge in an electrically neutral object. For example, a balloon rubbed with hair will have an excess of electrons and an overall negative net charge. If the negatively charged balloon is brought near an uncharged soda can, the electrons in the soda can will be driven away from the balloon, making the part of the soda can near the balloon positive and away from the balloon negative.

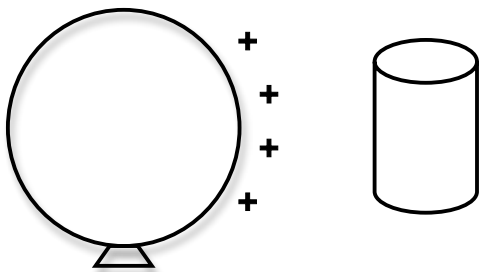


If charge can move easily (conductors) in the uncharged object, the more complete the polarization of charge. This is also known as charging by **induction** (even though the can is still uncharged).

If a negatively charged balloon is brought near a very light uncharged object like Styrofoam packing peanuts, they may actually jump and stick to the balloon. The packing peanuts are insulators, but there is enough movement of electrons to polarize the charge and produce the attraction.

**Closure:** *Demonstrate what you learned by completing the following questions on your own.*

1. Like charges attract. **True or False: Circle one**
2. Materials that easily transfer charge are called...  
a. non-metals.      b. insulators.      c. conductors.      d. noble gases.
3. Subatomic particles that can transfer from one object to another are called...  
a. protons.      b. electrons.      c. neutrons.      d. fish sticks.
4. What is a good example of an insulator?  
a. Metals      b. Rubber      c. Styrofoam      d. Answers (b) and (c)
5. Rubbing a balloon against your hair gives the balloon a net negative charge, because your hair transferred...  
a. protons.      b. electrons.      c. neutrons.      d. elements.
6. Rubbing the balloon against your hair was charging by...  
a. conduction.      b. friction.      c. induction.      d. Answers (a) and (c)
7. A polarized object is electrically...  
a. positive.      b. negative.      c. neutral.      d. frozen.
8. Charging by induction is really not charging at all. **True or False: Circle one**
9. A positively charged balloon is brought near but not in contact with a soda can. Draw the charge distribution of the polarized soda can. **Note: A balloon cannot be positively charged by rubbing it against your hair, but for this problem, lets assume you can.**



10. When you rub the balloon with your hair, your hair stands up on end. How can a single piece of hair be attracted to the balloon and be repelled by other strands of hair? Include a charge diagram with your answer.

