# ENERGY SAFETY TEACHER ACTIVITY SHEET

Imperial Irrigation District is sharing this activity sheet with teachers to utilize in their classrooms to help their students continue to learn about electrical safety. For more information and experiments please visit www.dippyduck.com.

## Flying Tinsel

Hone your electrostatic levitation skills and fly some tinsel.

### Tools and Materials

- Tinsel—a thin strip of aluminized Mylar that is approximately 12 inches (30 centimeters) long
- Aluminum pie pan — at least 9 inches (20 centimeters) in diameter
- Wool—use a piece of clothing or fabric; be sure to wash and dry it well
- Styrofoam — a thick piece that's larger than your pie plate
- Styrofoam cup
- Tape

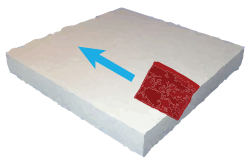
### Assembly

1. Make a large loop with the tinsel and tie a knot, leaving the ends long so there are two "legs" sticking out from either side of the knot.

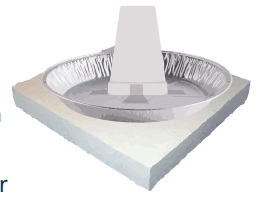
2. Place the Styrofoam cup mouth-side-down in the middle of the pie pan (see photo below), and tape it in place. This forms your Styrofoam handle. Note: Tape is better than glue, as solvent-based glues will dissolve Styrofoam. If you want to use glue, use either hot-melt or water-based glue.

### To Do and Notice

Charge the large piece of Styrofoam by rubbing it with wool for at least 30 seconds. To test that it's charged, hold the Styrofoam near the hairs on your arm—if you feel them wiggling, then it's charged. This wiggling feeling is known as formication—the feeling of ants crawling on your skin.



Next, to positively charge your pie pan, place the pan on top of the large piece of charged Styrofoam and touch the edge of the pan with your finger. Notice that as you move the tip of your finger to within a centimeter of the pie pan you will hear a snap, feel a shock, and—in dim light—see a spark. Now you're ready to fly some tinsel!



Once the pie pan is charged, be sure to handle and move it only with the Styrofoam cup. Avoid any part of your body touching—or even coming near—the metal.

Using the Styrofoam handle, pick up the charged pie pan and turn it upside down so the cup is underneath the pie plate and the flat bottom of the pie pan is pointing toward the ceiling.

With your other hand, hold the loop of tinsel over the pie pan with the two "legs" drooping down towards it. Hold the tinsel near but not touching the pie pan—about 3 in (10 cm) away. The tinsel will be attracted to the pie pan.

Release the tinsel and quickly move your hand away. The tinsel will drop toward the pie plate and then the magic happens. Be sure to keep the pie pan directly under the tinsel and you'll see the tinsel fly! This flying happens because the electrostatic repulsion from the pie pan pushes it up and holds it in the air even though gravity is pulling it down.

You might also notice that the loop of tinsel opens up into a circle as it floats.

Watch out! The tinsel will also be attracted to your hand and your body. Keep away from it because if it touches you, it will lose its charge and won't fly.

## Remote-Control Roller

Wield electrons and protons to roll a can.

### Tools and Materials

- Empty soda can
- A balloon
- Your hair (dry, not-too-short hair with no hair products in it works best)
- A flat surface such as a table or a floor

### Assembly

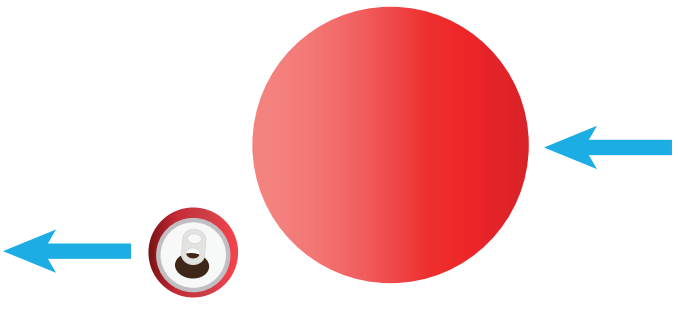
1. Inflate the balloon and tie it off.

### To Do and Notice

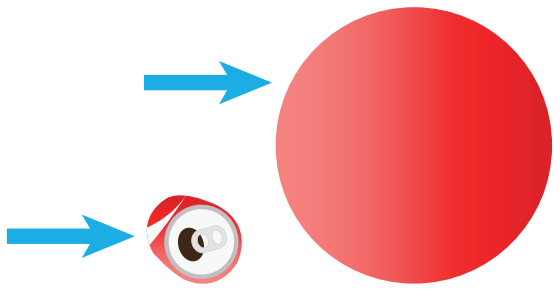
Put the can on its side on a table or the floor—any place that's flat and smooth. Hold it with your finger until it stays still.

Rub the balloon back and forth quickly on your hair.

Hold the balloon about an inch (2.5 cm) from the side of the can. The can will start to roll, even though you're not touching it.



Move the balloon away from the can—slowly—and the can will follow the balloon. If you move the balloon to the other side of the can, the can will roll in the other direction.



How fast will the can roll? How far can you roll the can before it stops? Will it roll uphill?

Invite some friends over—have them bring their own cans and balloons—and have a race across the room or down the sidewalk.

*Activities from Education.com

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## Charge and Carry

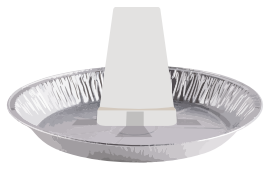
Store up an electric charge, then make sparks.

### Tools and Materials

- Tape
- Styrofoam cup
- Disposable aluminum pie pan
- Styrofoam dinner plate or flat sheet of Styrofoam packing material (the kind used to pack electronic devices) the thicker, the better
- Piece of wool or acrylic cloth (other fabrics may work, but wool and acrylic will definitely work)

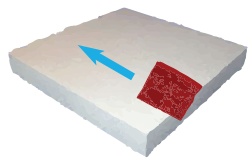
### Assembly

1. Tape the foam cup mouth-side down in the middle of the pie pan. Note: Tape is better than glue, as solvent-based glues will dissolve Styrofoam. If you want to use glue, use either hot-melt or water-based glue.
2. If you're using a foam dinner plate, turn it upside down. Place your pie pan on top of the upside-down plate or the piece of foam packing material.

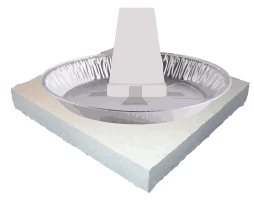


### To Do and Notice

Rub the foam plate or the sheet of foam with the wool cloth. If this is your first time using the foam in an electrostatic experiment, rub it for a full minute. Then charge the pie pan by following the next steps exactly:

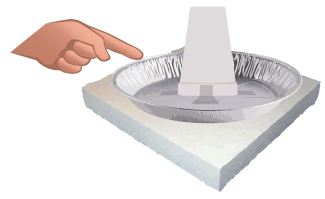


Using the foam-cup as a handle, place the pie pan on top of the charged foam plate.

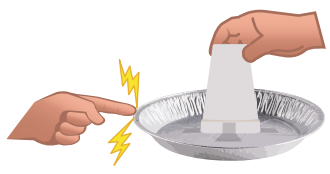


To make the largest spark when discharging, keep the pie pan at least 12 inches (25 centimeters) away from the foam plate.

After charging the foam plate or the sheet of foam once, you can charge the pie pan several more times without recharging the foam.



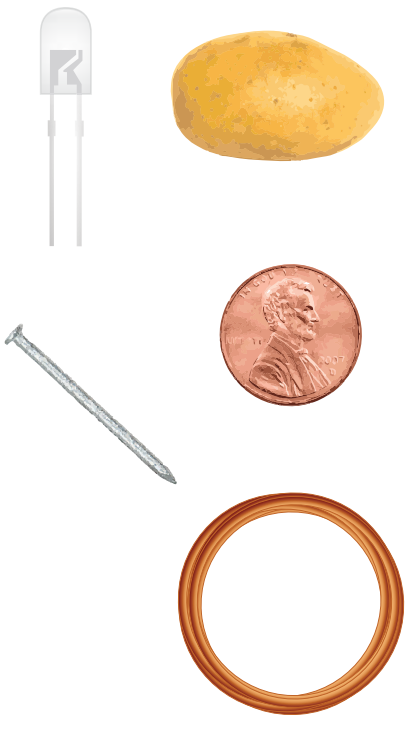
The pie pan is portable and can be used for many electrostatic experiments.



## Vegetable Power

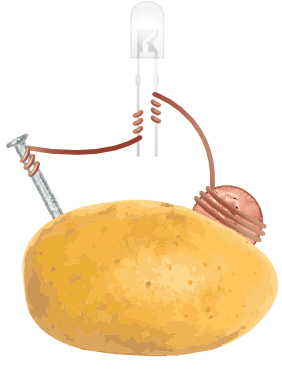
### Tools and Materials

- LED light bulb
- Assorted fresh fruits and vegetables (i.e. carrot, apple, pear, squash, lemon)
- 1 potato
- 1 shiny penny
- 1 galvanized steel nail
- 2 eight inch lengths of copper wire
- A knife



### Assembly

1. Begin by constructing a potato light. Potatoes can be used to power LED lights. Setting up a working light in a potato will help you determine whether you are constructing the vegetable powered light correctly.
2. Make an incision in one side of the potato just large enough for the penny to fit inside.
3. Wrap one end of a piece of copper wire around the penny.
4. Wrap one end of another piece of copper wire around the nail.
5. Insert the penny into the slit you created for it, with the loose end of wire hanging out.
6. Insert the nail into the other side of the potato with the loose end of wire hanging out.
7. Do not allow the penny and nail to touch.
8. Wrap the copper wire coming off the penny to the longer leg of the LED.
9. Wrap the copper wire coming off the nail to the short leg of the LED.
10. Observe the results.
11. Repeat steps 2-10 with other vegetables or fruits.



### To Do and Notice

The purpose of this experiment is to determine whether there is enough energy stored in a fruit or a vegetable to power an LED light. This experiment can be taken further to determine how long a fruit or vegetable can power an LED for.

- How is energy stored in a fruit or vegetable?
- How to we measure this type of energy?
- How do we usually use the energy stored in plants?
- Where do plants get their energy from?
- How much energy is stored in a typical potato?
- How much energy is stored in the other fruits or vegetables you are using?

With the help of a few household items, a potato can be used to power a light bulb. All living organisms contain energy and it may be possible to tap into and use some of that energy in our everyday lives. Given that our main source of energy, fossil fuel, is in limited supply, it is important for scientists to explore the use of alternative energy sources. Many natural, green energies are already being used around the world, but there is still a lot to learn about utilizing alternative energy sources. By developing planet-friendly ways to draw energy from the world around us, we can decrease our use of polluting energy sources which will help keep the air, water and soil clean for future generations.

The materials needed for this experiment can be found at the grocery store and at the hardware store.