

Electroscope

Overview: Learn how to build a simple instrument for detecting electrostatic charge, either positive or negative, so you'll always have a way to know if you're in an electric field.

What to Learn: When high energy radiation strikes the Earth from space, it's called *cosmic rays*. To be accurate, a cosmic ray is not like a ray of sunshine, but rather is a super-fast particle slinging through space. Think of throwing a grain of sand at a 100 mph... and that's what we call a 'cosmic ray'.

Materials

- 1 large paperclip
- 1 piece of aluminum foil
- Tape
- Index card
- Small glass jar (like a pickle or jam jar) with lid
- 1 balloon and/or other items to build up a static charge from previous lessons
- Scissors

Lab Time

1. Take foil and cut a ½" strip. Fold it in half and snip the corners on both sides of the fold. Flatten well.
2. Open the paperclip to make an L-shape with a small hook on the end (to keep the foil from sliding off).
3. Trace the opening of the jar onto the index card and cut out the circle, making it a smidge larger than the jar (so it doesn't fall in when placed on top). Poke a hole in the center with the paperclip.
4. Drape the foil strip over the short end of the L-shape.
5. Insert the long end of the L-shape up through the hole in the index card.
6. Tape the index card to the jar opening, foil leaves dangling inside, not touching the bottom or sides of the jar.
7. Wad up a loose ball of foil and stick it on the end of the paperclip that is poking out of the top.
8. How will you test your electroscope? Explain:
9. How will you discharge your electroscope?

Electroscope Data Sheet

Static Charge Source	What did you observe with the electroscope?
<i>Hair-Balloon</i>	

Reading

This device is known as an *electroscope*, and its job is to detect static charges, whether positive or negative. When a static charge is brought close to the foil ball, the connected foil strips (“leaves”) spread apart because like repels like charges.

The easiest way to make sure your electroscope is working is to rub your head with a balloon and bring it near the foil ball on top – the foil “leaves” inside the jar should spread apart into a V-shape.

If this doesn’t happen (no V-shape), here are a few things to check into: It may be too humid of a day (close your windows and crank on the heat), there’s not a good electrical connection between the foil ball and the foil leaves, or sometimes using a metal lid causes the charge to dissipate too quickly (use a cork and stick your wire through, or tape an index card over the mouth of the jar and glue the wire to the card).

Exercises

1. Why do the foil strips spread apart?
2. How do you discharge the electroscope?
3. Why did we use a glass jar?
4. Does the electroscope react the same way whether it’s exposed to a positive or negative charge?
5. List four ways to charge the electroscope.