

DIY Electroscope

Opposites attract! Discover how electron transfer causes positive and negative charges while creating an electroscope from straws and tape.

TEKS:

SCI 4.6 D: The student is expected to design a descriptive investigation to explore the effect of force on an object such as a push or a pull, gravity, friction, or magnetism.

SCI 8.5 A: The student is expected to describe the structure of atoms, including the masses, electrical charges, and locations, of protons and neutrons in the nucleus and electrons in the electron cloud.

Materials:

- Clear tape
- Modeling clay
- 4 plastic bendy straws
- 2 small paper cups (3-5oz)

How To:

1. Fill two small paper cups $\frac{1}{4}$ full of modeling clay.
2. Stick the non-bendy ends of two drinking straws into each paper cup.
3. Bend the bendy ends of each straw so that the ends are parallel to the ground and facing away from each other.

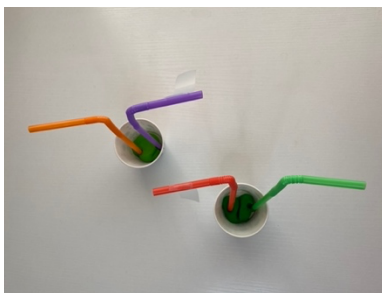


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4. Tear off two four-inch pieces of tape and press them firmly to a flat surface. Leave one small end sticking up on each piece.
5. Using the non-stuck ends as handles, quickly pull up on each piece of tape.
6. Stick one piece of tape onto a parallel piece of straw from one cup, and the second piece of tape onto a parallel piece of straw from the other cup.
7. Move the paper cups so that the two pieces of tape are approximately six inches apart.



8. Then, move the paper cups closer together and notice what happens! (The two pieces of tape should repel each other.)
9. Tear off two more four-inch pieces of tape and stick the sticky side of one to the non-sticky side of the other. Leave one small end sticking up on each piece.
10. Using the non-stuck ends as handles, quickly pull the two pieces of tape apart and stick them to the two remaining parallel pieces of straw.
11. Move the paper cups so that these two arms are close together and notice what happens! (The two pieces of tape should attract each other.)
12. Experiment with your electroscope! Stick and remove pieces of tape to various household items and see if they attract or repel other objects or pieces of tape.

STEM Explanation:

Everything in the world is made up of tiny things called atoms, and atoms are made up of even tinier things called particles. There are three basic types of particles that make up atoms: protons, neutrons, and electrons. Protons have a positive charge, neutrons have a neutral (neither positive nor negative) charge, and electrons have a negative charge. Sometimes, when you stick tape to a surface and then rip it off, electrons can move between the tape and the surface! The tape either takes electrons from the surface or leaves some electrons behind. If the tape takes electrons, it becomes negatively charged. If the tape loses electrons, it becomes positively charged.

The tape-straw contraption you just created is called an electroscope. This is a scientific instrument that can detect electrical charge. When you pull two pieces of tape from the same surface, both pieces of tape end up with the same charge. And when you bring two negative or two positive charges together, they repel each other. When you pull two pieces of tape apart, one piece of tape takes electrons from the other. This means that one tape is negatively charged and one is positively charged. Opposite charges attract, so the two pieces of tape attract each other! See what happens when you pull other types of tape from different surfaces, or if you move different objects near the tape on your electroscope.

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Career Connection:

Chemists study the properties of matter at the level of atoms and molecules. Their research includes understanding the structure and composition of many different chemicals and even creating new substances that help our lives!

Resources:

https://www.education.com/science-fair/article/physics_making-electroscope/

<https://www.exploratorium.edu/snacks/electroscope>

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