
ACTIVITY - GET A CHARGE OUTTA THIS!

BACKGROUND

Matter Is Made Up of Charged Particles. Matter is made up of particles having positive charges and negative charges. The negative particles are called electrons. Matter is neutrally charged when there are just as many positive charges as there are negative charges. Neutral matter can become charged by removing or adding electrons.

PROBLEM PRESENTATION / EXPLORATION

A. Balloons

1. Rub a balloon against your hair. Try to stick it to the wall. What happens?
2. List some reasons to support your observations.
3. Predict which kind of substances a balloon should be rubbed to make it stick. Try some.
4. As time goes on your balloon falls to the floor. Explain this behavior.

B. More Balloons

1. Blow up two identical balloons and tie a thread to each. Hold them together by the two threads and show that the balloons will hang down against each other. (Do not rub the balloons beforehand.)
2. Take two balloons and rub them with wool. Predict what will happen when they are brought side by side.

What really happens?

What happens when you bring the wool close to the balloons? Explain this using the idea of Conservation of Charge and Coulomb's Law.

3. Take a glass rod and rub it with silk. Place it near the balloons. What happens? What can you deduce about the charge on the glass rod?

C. The Confused paper filings

1. Tear a piece of paper into tiny bits.
2. Rub a comb with fur (or in your hair) and approach the paper scraps. Will they be repelled or attracted? Explain...
3. What happens (record your data). Can you explain why the scraps seem to jump off the comb after a while?
4. After the scraps have settled down approach them with your finger. Finally, touch them with your finger. What happens?

D. Electroscope

1. An electroscope is a device that detects charge. It is made up of a conducting rod, ball, and metal "arms". Identify all the pieces of your electroscope.



2. Ground your electroscope by plugging in a banana clip to the grounding hole at the bottom (front) and clip the alligator clip on the other side to a grounded object. This is done so that the metal cylinder around the scope does not hold a charge and affect the deflecting arm.
3. When a charge is placed on the scope, the arms receive the same charge and repel (Why?). So you can use it to detect the *presence* of charge.
4. During the use of the electroscope never touch the arms in an effort to adjust their position.
5. Test the electroscope by rubbing a comb through your hair or rubbing a plastic rod with some wool or fur and slowly bringing it near the ball at the top of the electroscope. Do not touch the ball with the comb. What do the arms do?

Upon removing the comb, what do the arms do?

6. Predict and explain the following:
- a.) What happens when the comb or plastic rod comes close to the ball and actually touches it?
 - b.) How could you put a *positive* charge on the electroscope so that the arms remain spread apart without touching the ball with the charged comb. This is called "charging by induction".
 - c.) What would happen if you now touched the ball at the top of the charged electroscope with your finger?
 - d.) Rub a glass rod with silk fabric. Put it near the ball of the scope. What happens? How does this charge differ from that of wool and a comb? How could you tell?
 - e.) How could you put a *negative charge* on the electroscope so that the leaves remain spread apart without touching the ball with the charged glass rod
 - f.) What would happen if you now touched the ball at the top of the charged electroscope with your finger? Explain.
 - g.) How can you use an electroscope to determine *which type* of charge is present or *how much* charge is present?

CONCEPT EXTENSION

- A. Lightning
 1. In many ways the discharge we saw from the fluorescent tube to the pie pan is the same thing that happens when lightning occurs.
 2. Lightning is a rapid discharge of electrons through the air that can release as much as

3,750,000,000 kilowatts of power. The interaction of the electrons with the air causes the glowing spark we call lightning. The temperature of the air can rise 30,000 degrees. This tremendous change in temperature causes the air to expand rapidly resulting in what we call thunder.

3. Although lightning is not fully understood, some things are clear. During a thunderstorm the charge distribution in clouds is arranged so that the bottoms of clouds become negatively charged. They in turn induce a positive charge on the surface of the earth below. When the difference in charge is great enough the air becomes a conductor. The kind of discharge with which we are most familiar is that between the clouds and the oppositely charged ground below. But the more frequent type of discharge is between oppositely charged parts of different clouds.

C. Can you explain the following?

1. What makes plastic wrap such as Saran Wrap stick to food storage containers? Is it due to static electricity? How would you go about testing to see if this is plausible?

2. What causes clothes in a clothes dryer to get all mixed up and stick together when you take them out of the dryer?

How does anti-static-cling products that we put in our dryer work? Research tis on the internet.

3. Picture the following. A boy and girl are on opposite sides of the front seat of the car. After awhile he scoots across the wool seat cover towards the center. She also scoots toward the middle. Still more time goes by, he scoots, she scoots. Slowly their lips are approaching each other, and SNAP, CRACKLE, POP they undergo an electric experience. What happened??