

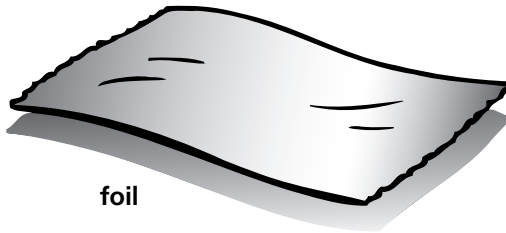
Making an Electroscope

Begin this activity on a very dry day.

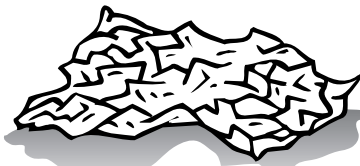
WHAT YOU NEED



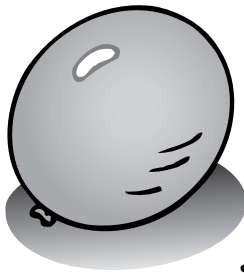
small glass jar



foil



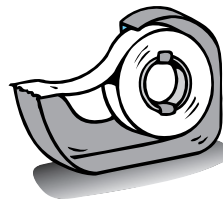
foil wrapper



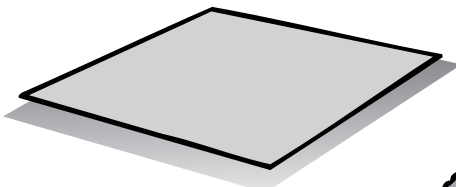
balloon



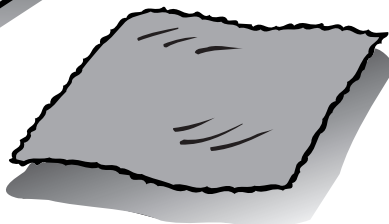
plastic pen



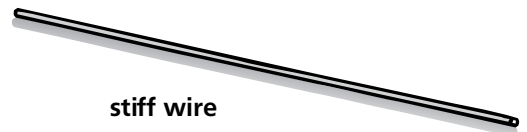
tape



heavy cardboard



a piece of silk or wool



stiff wire



scissors

Find Out

Do this activity to learn how an electroscope can detect static charge.

Process Skills

Observing
Predicting
Defining Operationally
Hypothesizing
Experimenting

Time

- 45 minutes on a dry day
- 15 minutes on a humid or rainy day

WHAT TO DO



1. Turn the jar over and trace the opening of the jar on the cardboard. Cut around your marks to make a cardboard lid for the jar. Make sure the lid is a little bigger than the jar opening so it will not fall into the jar.
2. Push the wire through the center of the cardboard lid. Bend the bottom of the wire over to make a hook at the end. Wrap several layers of tape around the wire just above the cardboard lid so the wire cannot move

down through the lid. Cut to fit and tape a foil wrapper over the bent end of the wire. Use a foil gum or candy wrapper.

3. Put the bent end of the wire in the jar and tape the cardboard lid to the jar.
4. Crumple the foil into a ball and stick it on the top end of the wire.
5. Place the pen near the foil ball.
Observe what happens.
Use a plastic pen.
6. Now, charge the pen by rubbing it with a piece of silk or wool. Place the pen near the foil ball. **Observe** and **record** what happens to the wrapper.
7. **Predict** what will happen if you charge the balloon and put it near the foil ball. **Test** your prediction.
8. Write a **hypothesis** about what will happen to the wrapper if you repeat this activity on a rainy day. **Test** your hypothesis on a rainy or a humid day.



Hypothesis: _____

Detecting Static Charge		
Variables	On a Dry Day	On a Humid Day
What happened when the pen was placed near the foil ball?		
What happened when the pen was charged and then placed near the foil ball?		
What happened when the balloon was charged and placed near the foil ball?		

Conclusions

1. How do you know when the pen is electrically charged?

The aluminum wrapper sides should repel each other.

2. Did the foil wrapper react differently at different times?

Describe.

The foil wrapper should not move when the pen is not electrically charged. It might move more if the balloon is large and is very charged. It should not move as much or at all on a rainy or humid day even after the pen and the balloon are rubbed with the cloth.

3. Describe how the electroscope reacted on a wet day. Try to explain why this happens.

The foil wrapper will probably not move at all or not as much. When it's rainy or humid, there are more water molecules in the air. The electrons move from the objects to the water molecules in the air so no static electricity builds up between the objects.

New Questions

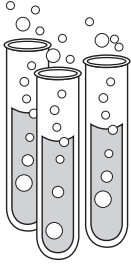
1. Imagine it is a very dry day, and when you comb your hair, static electricity makes your hair stand up. How could you stop this from happening?

Answers will vary. Possibilities include: wet the comb or your hair, spray water mist into the air while combing, or don't comb too much.

2. Why might someone use an electroscope?

Answers will vary. Possibilities include: testing materials for electric charge that could damage a device, such as a computer; testing for the humidity levels in a climate-controlled space, such as an office.





ACTIVITY

Opposites Attract, Likes Repel

What happens when you bring balloon 1 near balloon 2?

nothing

After rubbing both balloons with a wool cloth, what happens when you bring balloon 1 near balloon 2?

The balloons will move away from one another.

Why do you think the balloons acted this way?

Answers will vary. Both balloons have the same electrical charge.

What do you **predict** will happen if you bring the wool cloth near the balloons?

Answers will vary.

What happened when you brought the wool cloth near the balloons?

The balloons were attracted to the wool because they have opposite charges.

Record what happens when you rub the balloons with wool and move them toward these objects:

Bits of paper

Your hair

The wall

In each case, the charged balloons will be attracted to the object. The balloons should stick to the wall.

Why did the objects act this way?

The objects have opposite charges so they attract.

Name _____

Conclusions

- ① Did the balloons act the same every time? No. If not, why do you think they sometimes acted differently?

Answers will vary. When objects are electrically charged, they can attract or repel other charged objects.

- ② Think about the objects that moved. Did you have to touch the objects together to make them move? Why? No. They moved because the electrical fields around them exerted force.

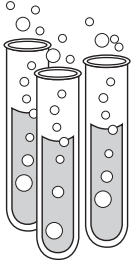
Asking New Questions

- ① How did you make electrons move from one type of matter to another in this activity?
by rubbing objects together

- ② Thales and William Gilbert inferred that static electricity existed, based on their observations. List one **observation** and one **inference** you made in this activity.

Observations include all the balloons rubbed with wool repel each other. Inferences include all the balloons rubbed with wool have the same charge.

Name _____



ACTIVITY

Magnetic Fields

Draw the combinations of magnets that worked in Step 1.
Student drawings will differ.

What happens when you place iron filings on the paper?

Sketch what you see.

The filings should gather around either end of the magnet.

What happens to the iron filings when you use two magnets?

Sketch the different combinations you use and the results.

If opposite poles are end to end, the filings will gather between the two poles. If like poles are together, the filings will curve away from the poles.

Name _____

Conclusions

- 1** Which ends of the magnets pulled toward each other?
Which ends pushed away?
The opposite poles of the magnets pulled together. The like poles of the magnets pushed away from each other.
- 2** Where did most of the iron filings clump together? What does this show about the magnet?
at the poles; the poles have the strongest pull
- 3** Which parts of the magnet would be best for picking up paper clips?
the poles

Asking New Questions

- 1** **Look** at your sketches of the iron filings. How do you think the magnets pushed or pulled each other without touching?
Answers will vary. The magnetic fields were exerting force.
- 2** Suppose that you have one bar magnet with marked poles and one with unmarked poles. How could you find out which pole on the unmarked magnet is *N*?
Use a marked magnet to attract the unmarked magnet. The unmarked pole that is pulled toward the north pole is the *S* pole. The other unmarked pole is the *N* pole.