Static Electricity

The Structure of Atoms

We will develop as a group our ideas of the structure of atoms, including neutrons, protons, and electrons**.**

Materials Needed

wool
balloons
plastic rulers
bits of paper
bits of plastic
hair
aluminum foil
scissors
thread/string
other items that students may bring to your
tape
glass rod
piece of silk
rubber bands
fine steady stream of water or other liquids such as soda or kool-aid
(You can create the stream of water using two paper cups, an eye dropper, and bathtub sealer.)
comb
electroscope kit: two pieces of cardboard, a wood block, a needle, thumbtacks, a ruler, a pencil, aluminum foil, a paper hole puncher, a balloon, and a soda straw
"real" electroscope

Sample Curriculum

First: Identify the direction an object will move when it is pushed or pulled; draw conclusions based on observed evidence.

Third: Predict the direction an object will move when it is pulled or pushed; distinguish between gravity, magnetism, and friction as kinds of forces.

Fourth: Classify objects according to two or three properties.

Sixth: Name, draw and describe the components, parts and structure of a model of an atom; identify the number of neutrons, protons and electrons of a common element.

Static Electricity Experiment #1

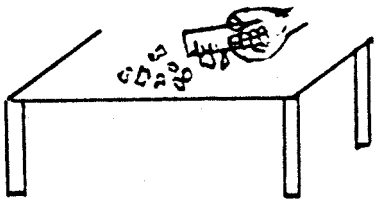
Scientific Concept Involved:

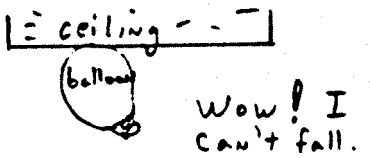
We will try to show students that electrical charges can be created by friction on certain types of material.

Equipment Needed:

Balloons, plastic ruler, bits of paper, wool, bits of plastic, hair, aluminum foil, scissors, thread/string, other items that students may bring to your classroom.

Procedure:





Cut very small pieces of the test materials. Rub the plastic ruler on a piece of wool and then bring the plastic ruler near each of the test items. Record whether the item is attracted to the ruler or repelled by the ruler.

Vocabulary Development:

attracted
repelled
friction

Data Collected:

Material Used	Attracted	Repelled	No Effect
Rubber Balloon			
Paper			
Plastic			
Hair			
Aluminum Foil			

Questions:

1. What types of material developed static charges?

2. What was necessary before a charge could be created?

3. What type of material was not attracted to the plastic ruler?

4. Was there anything common to the materials which developed a static charge?

Conclusions:

A. Application to everyday life and to other disciplines:

B. Pitfalls to avoid when doing the experiment:

C. Comments:

D. Best grade level?

Static Electricity Experiment #2

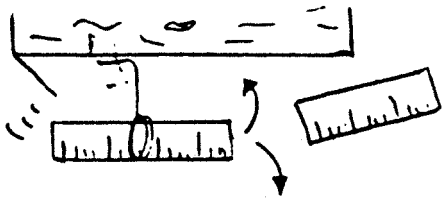
Scientific Concept Involved:

We will try to show students that electrical charges have an effect on each other: like charges repel and unlike charges attract.

Equipment Needed:

Two plastic rulers, thread, tape, a balloon, a glass rod, a piece of silk, and a rubber band.

Procedure:



Using a rubber band, secure the thread to the center of the ruler so that the ruler is perfectly balanced when suspended from the edge of a desk or a table. Now statically charge this ruler and an identical one. Bring the two rulers together and observe what happens. Rub the balloon in your hair and bring it close to the suspended ruler. Record what happens. Next charge a glass rod with a piece of silk and bring it near the suspended ruler. Again record your observations.

Vocabulary Development:

Attract
Repel
Balance
Charge

Data Collected:

Questions:

1. Do the rulers attract or repel?

2. What can you say about objects which have a like charge?

3. What can you say about objects which have unlike charges?

4. How does the distance between the two rulers affect the force of attraction?

Conclusions:

A. Application to everyday life and to other disciplines:

B. Pitfalls to avoid when doing the experiment:

C. Comments:

D. Best grade level?

Static Electricity Experiment #3

Scientific Concept Involved:

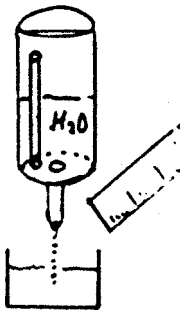
We will try to show students that certain liquids are attracted to charged bodies.

Equipment needed:

Fine steady stream of water or other liquids such as soda or kool-aid, comb or balloon. You can create the stream of water using two paper cups, an eye dropper, and bathtub sealer.

Procedure:

If you do not have a water faucet in your room, you can create a stream of water by using a cup with an eye dropper pushed through the bottom of the cup. You may have to seal the base of the dropper to the bottom of the cup to prevent water leakage. Next, have a student comb her hair and position the comb near the running stream of water. Observe and record what happens.



Vocabulary Development:

Molecule

Polar

Static charge

Data Collected:

Questions:

1. Which liquids were attracted to the charged body?

2. Do these liquids share a common material? What?

Conclusions:

A. Application to everyday life and to other disciplines:

B. Pitfalls to avoid when doing the experiment:

C. Comments:

D. Best grade level?

Static Electricity Experiment #4

Scientific Concept Involved:

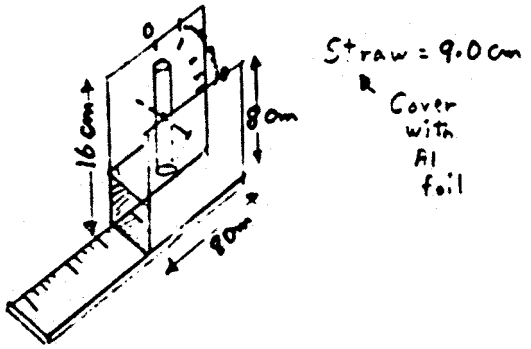
We will try to show students how the distance between charged bodies affects the strength of the force between these charged bodies.

Equipment Needed:

Two pieces of cardboard, a wood block, a needle, thumbtacks, a ruler, a pencil, aluminum foil, a paper hole puncher, a balloon, and a soda straw.

Procedure:

Construct the elementary electroscope shown in the diagram. After constructing the electroscope, bring a charged balloon near the straw until the straw is almost horizontal. Record the distance of the balloon from the electroscope and then record the angle of deflection of the straw. Now move the balloon away from the electroscope, again recording the balloon's position and the straw's deflection.



Vocabulary Development:

Deflection
Centimeter
Graph

Data Collected:

Trial #	Distance of Ruler from Electroscope	Deflection
1		
2		
3		
4		
5		
6		

Questions:

1. At what distance, near or far, is the force stronger?

2. How does the amount of combing affect the strength of the charge?

Conclusions:

A. Application to everyday life and to other disciplines:

B. Pitfalls to avoid when doing the experiment:

C. Comments:

D. Best grade level?

Static Electricity Experiment #5

Scientific Concept Involved:

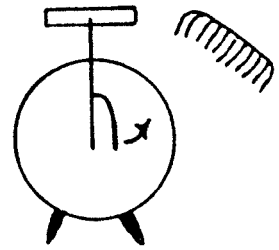
We will show students how to charge an electroscope by contact and by induction.

Equipment Needed:

Electroscope, comb, glass rod, silk, wool.

Procedure:

Participants and instructor will develop the rules for static electricity.



Vocabulary Development:

Data Collected:

Determine the order in which things are done to properly charge an electroscope.

Questions:

1. Did the charged comb ever touch the electroscope plate?

2. What was the charge of the electroscope?

3. In which direction did the electrons move? (Into the electroscope or out of the electroscope?)

4. How did the electroscope become charged?

Conclusions:

A. Application to everyday life and to other disciplines:

B. Pitfalls to avoid when doing the experiment:

C. Comments:

D. Best grade level?

Static Electricity Experiment #6

Scientific Concept Involved:

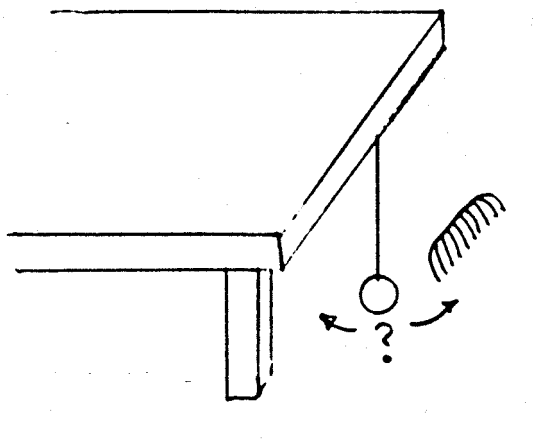
Solving the mystery of the metal coated pith ball.

Equipment Needed:

Piece of styrofoam, aluminum foil, thread, comb or balloon, and tape.

Procedure:

Recreate the diagram at the right. After doing so, rub the comb and bring it near the pith ball.



Vocabulary Development:

Data Collected:

Record your observations in the correct order.

Questions:

1. What charge did the pith ball initially appear to have? Why?

2. Where does the charge on the pith ball seem to be located?

Conclusions:

A. Application to everyday life and to other disciplines:

B. Pitfalls to avoid when doing the experiment:

C. Comments:

D. Best grade level?

Some Rules Governing Static Charges

1. A negative charge is placed on a plastic ruler or comb if the ruler or comb is rubbed with a piece of wool.

2. A positive charge is placed on a glass rod if the rod is rubbed with a piece of silk.

3. Unlike charges attract.

4. Like charges repel

5. Positively charged bodies result when electrons are removed from them.

6. Negatively charged bodies result when electrons are added to them.

7. The two rules immediately above emphasize that static charges result when electrons move. ***Remember, only electrons move!***

8. The strength of a static field is determined by using this formula: $F=Q_1Q_2/d$, where F is the force of attraction or repulsion, Q_1 and Q_2 are the magnitudes of the charge on the two bodies of matter, and d is the distance between the two bodies.

9. Electrons move from a place of high concentration to a place of lower concentration.

10. The earth acts as an infinite absorber of electrons or as an infinite donor of electrons.