Name:_____ Date;_____ Pd._____

Electroscope Lab

Objectives:

- Understand which charges move, which charges do not move, and why.
- Identify when an object is being charges through induction, conduction, or friction.
- Draw the movement of charges on an object that is being charged.
- Apply the golden rule of electrostatics to explain attraction and repulsion of charged objects.

Pre-Lab:

1. Which type of charge can move? Why?

2. Golden Rule of Electrostatics:

3. Polarization is _____
   _____

Make your own electroscope!

Materials:

- ~10 cm x ~30 cm piece of foil
- 1 paperclip
- 1 plastic cup with a hole
- ~3 g of clay

Procedure:

1. Cut a piece of foil ~2 cm x ~4 cm.
2. Fold the foil in half (hot dog style) and fold one end over 0.5 cm.
   Cut a small triangle along the edge to create a diamond-shaped hole after unfolding it.
3. Carefully unfold the foil and cut into two separate leaves.
4. Unfold one end of paperclip and hang the leaves on the loop.
5. Insert the paperclip into the cup and secure it with the clay.
6. Ball up the remaining foil and place on the straight end of the paperclip.
7. Write your name on the cup.

Thinking about electrostatic forces, what would cause the leaves to separate?

Part 1: Charging by Induction

1. To charge an object by *induction* means_____
   _____

2. Bring a charged balloon near (but don't touch!) the foil ball at the top of your electroscope.

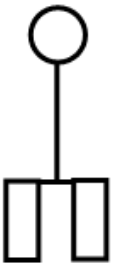
Let's make sense of your observations:

3. What type of charges *can* move?_____
   What type of charges can *not* move? _____

4. Draw the charges on your electroscope.

Initial

Electroscope
Total Pos _____
Total Neg _____
Net Charge _____

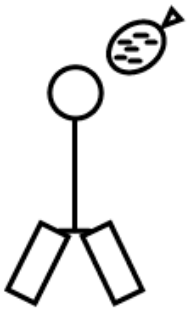


Left Leaf
Total Pos _____
Total Neg _____
Net Charge _____

Right Leaf
Total Pos _____
Total Neg _____
Net Charge _____

Final

Electroscope
Total Pos _____
Total Neg _____
Net Charge _____



Left Leaf
Total Pos _____
Total Neg _____
Net Charge _____

Right Leaf
Total Pos _____
Total Neg _____
Net Charge _____

5. a) What *do* you notice about the <u>total number of positive charges</u> on the *electroscope*?

   b) What *do* you notice about the <u>total number of negative charges</u> on the *electroscope*?

   c) What *do* you notice about the <u>net charge</u> on the *electroscope*?

6. a) What *do* you notice about the <u>total number of positive charges</u> on the *left and right leaves*?

   b) What *do* you notice about the <u>total number of negative charges</u> on the *left and right leaves*?

   c) What *do* you notice about the <u>net charge</u> on the *left and right leaves*?

7. Write 2-3 sentences explaining your observations.

Part 2: Charging by Conduction

1. To charge an object by *conduction* means_____
   _____

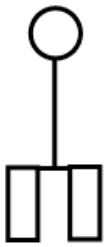
2. Recharge the balloon. Bring the balloon near again, and DO touch your electroscope with the balloon.

Let's make sense of your observations:

3. Draw the charges on your electroscope.

Initial

Electroscope
Total Pos _____
Total Neg _____
Net Charge _____

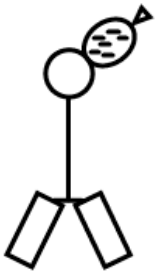


Left Leaf
Total Pos _____
Total Neg _____
Net Charge _____

Right Leaf
Total Pos _____
Total Neg _____
Net Charge _____

Final

Electroscope
Total Pos _____
Total Neg _____
Net Charge _____



Left Leaf
Total Pos _____
Total Neg _____
Net Charge _____

Right Leaf
Total Pos _____
Total Neg _____
Net Charge _____

4. a) What *do* you notice about the <u>total number of positive charges</u> on the *electroscope*?

   b) What *do* you notice about the <u>total number of negative charges</u> on the *electroscope*?

   c) What *do* you notice about the <u>net charge</u> on the *electroscope*?

5. a) What *do* you notice about the <u>total number of positive charges</u> on the *left and right leaves*?

   b) What *do* you notice about the <u>total number of negative charges</u> on the *left and right leaves*?

   c) What *do* you notice about the <u>net charge</u> on the *left and right leaves*?

6. How are induction and conduction different?
   (Hint: What happens to the <u>total number of negative charges</u> on the *electroscope* for each?)

7. Write 2-3 sentences explaining your observations.

Part 3: Discharging

1. To discharge an object means _____
   _____
2. How can you discharge your electroscope? Why does this work?

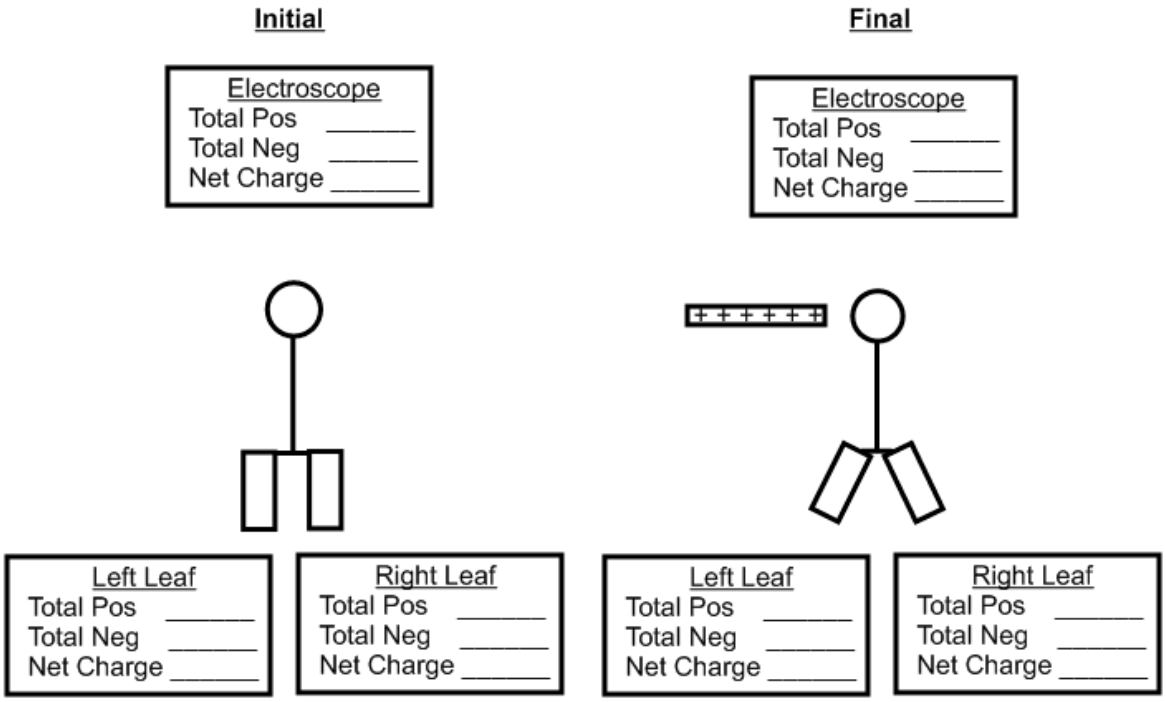
Part 4: Charging by Friction

1. To charge an object by *friction* means_____
   _____
2. Write 2-3 sentences explaining how you've been giving the balloon a net negative charge.

Wrap Up:

What would happen if you brought a positively charges object near a neutral electroscope?

1. State your hypothesis.
2. To support your hypothesis, draw the charges on the electroscope.



3. Is this an example of charging by *induction* or *conduction*? How do you know?