

Static Electricity

Date: \_\_\_\_\_

Name: \_\_\_\_\_

Period: \_\_\_\_\_



# Electrophorus



**Objective:** To demonstrate charging by friction, conduction and induction.

**Procedure:** Complete the following steps and questions in your lab group.

Collect three of the Electrophorus apparatuses, 2 Styrofoam plates, and a neon bulb

## Part 1: Charging by Friction

- Charge your Electrophorus with the Styrofoam plate. Do this by rubbing the plate vigorously over the flat area of Electrophorus.
- Determine whether the Electrophorus is charged. Touch one connector from the neon bulb to the any point on the rim of the Electrophorus. When holding the neon bulb, try to keep your fingers on the resistor.

**Closure:**

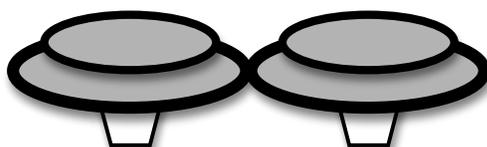
1. Did you feel any forces between the Electrophorus and the foam plate?
2. Was the Electrophorus charged? How did this happen? Discuss electron transfer in your explanation.
3. The Styrofoam plate is an electron taker, which means it strips electrons from the Electrophorus when they are rubbed together. After charging the Electrophorus, what are the net charges on each?

## Part 2: Charging by Conduction

- Charge an Electrophorus with the Styrofoam plate.
- Bring the charged Electrophorus in contact with an uncharged Electrophorus.
- Test to see if the uncharged Electrophorus is now charged. Bring one connector of the neon bulb in contact any part of the uncharged Electrophorus.

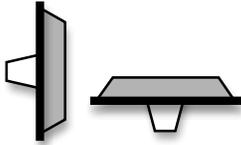
**Closure:**

1. Why is conduction called charging by contact?
2. Assuming that a charged Electrophorus has a net positive charge, sketch the charge pattern that was produced when the two were in contact.



### Part 3: Polarization of Charge

- Charge an Electrophorus with the Styrofoam plate.
- Bring the charged Electrophorus very close to but not touching another Electrophorus as shown below. Make sure that the Styrofoam cup is the only thing making contact with the table.



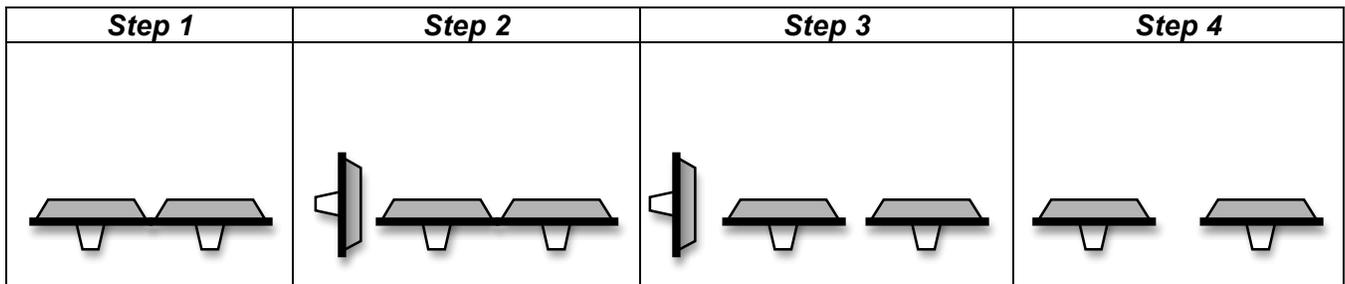
- Test to see if the uncharged Electrophorus is polarized. Bring one connector of the neon bulb in contact with the uncharged Electrophorus on the side away from the charged Electrophorus.

#### Closure:

1. Was the Electrophorus polarized? How did this happen?
2. Assuming that a charged Electrophorus has a net positive charge, sketch the charge pattern that was produced in the diagram above.

### Part 4: Charging by Induction I

- Charge an Electrophorus with the Styrofoam plate.
- Place two uncharged Electrophorus in contact with each other as shown in *step 1*.
- Bring the charged Electrophorus near but not in contact with one of the uncharged ones as shown in *step 2*.
- While still keeping the charged Electrophorus near, separate the two uncharged Electrophorus, by touching the insulating region only as shown in *step 3*.
- Once the two uncharged Electrophorus are separated remove the charged Electrophorus *step 4*.



- Test to see if two uncharged Electrophorus are now charged.

#### Closure:

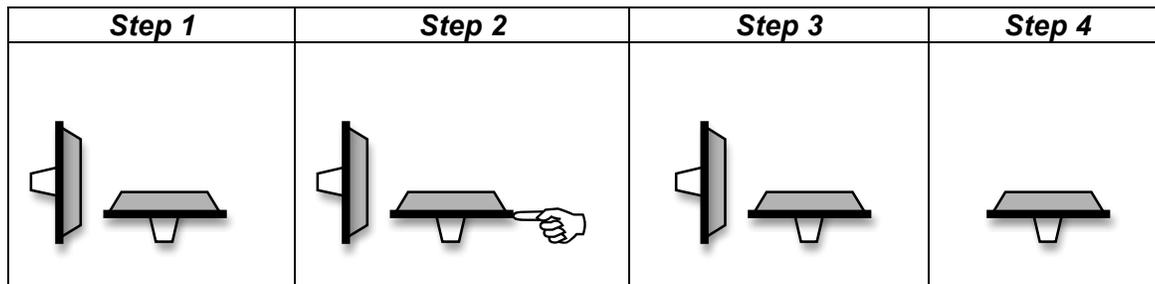
1. Did the neon bulb light up for either of the uncharged Electrophorus?
2. Assuming that a charged Electrophorus has a net positive charge, sketch the charge pattern that was produced in the diagram above.

3. What types of charge did you produce in each Electrophorus? How do they relate to each other?

4. Which charge (positive or negative) seems to produce more light from the neon bulbs?

### Part 5: Charging by Induction II

- Charge an Electrophorus with the Styrofoam plate.
- Place the charged Electrophorus next to an uncharged Electrophorus as shown in **step 1**.
- While still keeping the charged Electrophorus near, touch the uncharged Electrophorus on the other side than the charged Electrophorus, as shown in **step 2**.
- Remove your hand, **step 3**, then remove the charged Electrophorus as shown in **step 4**.



- Test to see if the uncharged Electrophorus is now charged.

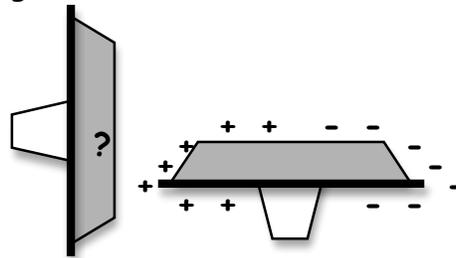
#### Closure:

1. What was the purpose of touching the uncharged Electrophorus on the far side?  
*Hint: Think polarization of charge and what type of charge will get away from the positively charged Electrophorus.*
2. Why would the finger touching the Electrophorus be considered "grounding"?
3. Assuming that a charged Electrophorus has a net positive charge, sketch the charge pattern that was produced in the diagram above.
4. What are the main differences between the two types of induction?

**Individual Closure:** Demonstrate what you learned by completing the following questions on your own.

1. What type of charging occurs when one object is rubbed against another and electrons are transferred?  
a. Conduction                      b. Friction                      c. Induction                      d. Answers (a) and (c)
2. When one object charges another through conduction, the charges on both objects must now be...  
a. opposites.                      b. the same.                      c. neutral                      d. Answers (a) and (c)
3. Charging by conduction will occur more easily in...  
a. conductors.                      b. insulators.                      c. metals.                      d. Answers (a) and (c)
4. A polarized object is electrically...  
a. positive.                      b. negative.                      c. neutral.                      d. frozen.
5. What type of charging can be done without electrons moving from one object to another?  
a. Conduction                      b. Friction                      c. Induction                      d. Answers (a) and (b)
6. If a charged Electrophorus is brought near but not in contact with an uncharged Electrophorus and it produces the charge distribution shown below, what is the unknown charge?

- a. Positive
- b. Negative
- c. Neutral
- d. Polarized



7. Charge flows due to a difference in charge. **True or False: Circle one**
8. Since it is known an infinite source of charge, all charge wants to flow to...  
a. regions of negative charge.                      b. the ground.  
c. regions of positive charge.                      d. regions of equal charge.
9. Why would the polarization of two connected objects be useful?  
a. The two objects can be separated and one will be positive and other negative.  
b. The two objects can be separated and they will both be positively charge.  
c. The two objects stay joined and they will both be negatively charge.  
d. The two objects stay joined and one will be positive and other negative.
10. What type of charge will flow to the ground if Part 5. Charging by Induction II is redone with negatively charged Electrophorus?

- a. Positive
- b. Negative
- c. No charge
- d. Both positive and negative

