

## ELECTROPHORUS ACTIVITY

### Materials:

styrofoam square  
aluminum pie plate (with 'coffee cup' insulating handle)  
piece of wool or fur  
neon bulb with exposed wires  
tape test strips

### PART A

1. Tape the open end of a Styrofoam cup to the inside center of an aluminum pie plate. In the following activities, use the Styrofoam cup as a "handle". Do not touch the aluminum plate with your hands unless specifically directed to do so.
2. Make sure that the pie plate is uncharged initially. How can you test this?
3. Place a neutral foam square flat on a table. Place the neutral pie plate 'handle up' on top of the neutral square. Now slowly lift the plate from the square, noticing if there is any detectable interaction between the plate and the square.
4. Remove the plate from the foam. Rub the top surface of the square of foam insulation vigorously with a piece of fur. Put the fur aside.  
Place the neutral pie plate 'handle up' on top of the charged square. Now slowly lift the plate from the square, noticing if there is any detectable interaction between the plate and the square. Describe what you feel. Test the plate to see if it is charged. Is it?
5. Replace the neutral pie plate on top of the charged square. Bring your finger near to the rim of the plate until something interesting happens. Yes! Something should happen! Describe what happens and why.
6. Now gently lift the plate from the square, noticing if there is any detectable interaction between the plate and the square. Describe what you feel. Is this any different from part 4? Why?  
Test the plate to see if it is charged. Is it? Should it be?  
Explain your observations in words and diagrams.

7. Now bring the plate near to your finger. What happens?  
Test the plate to see if it is charged. Is it? Should it be?  
Explain your observations in words and diagrams.
8. Put the plate back onto the charged square (You may have to recharge the square first). Repeat the actions in steps 5-7. See how many times you can repeat the sequence and still get sparks.

## PART B

Always hold the plate by its insulating 'coffee cup' handle.

The Styrofoam square only needs to be rubbed at the beginning of these exercises. It will not lose its charge easily and may not need to be 'recharged' for the remainder of the class.

1. After 'charging' the Styrofoam square by rubbing it with the wool or fur, place the pie plate on top of it. Hold the neon bulb by its short wire and touch the long wire to the edge of the plate. Carefully watch the glass bulb while touching the pan's rim with the wire.  
Next, remove the bulb from the pan, lift the plate off of the Styrofoam, and again touch the elevated plate rim with the bulb's long wire.  
Repeat the rim touching with the plate in the down position and also in the up position. Watch the bulb flash in each position.
2. Now look closely at the glass bulb that contains the neon gas. Inside the bulb you see two thin metal rods (called electrodes), each attached to one of the external wires. Note that there is no fine filament connecting these rods. (Most 'normal' light bulbs have a fine, coiled tungsten filament that glows to produce light.) These neon bulbs glow when an electron 'falls into' an incomplete electron shell, creating a neutral, noble gas atom and releasing a photon of light. The color of the emitted light is characteristic of the gas that fills the glass globe.

Make a mental note of which electrode is attached to the short wire (held in your fingers) and which is attached to the long wire and is touched to the plate rim. (You might notice that the short wire of your neon bulb may also be

attached to a small device called a resistor, which has absolutely NO effect on these exercises.)

Watch the bulb closely while it flashes and you will be able to see that the orange glow is always closer to one of the two electrodes: one when the plate is down and the other when the plate is lifted.

Indicate the correct choice in each case:

(A) When the plate is ON the Styrofoam the (finger / pan) electrode glows.

(B) When the plate is LIFTED the (finger / pan) electrode glows.

The glow always occurs near the electrode that is receiving negative charges (electrons) from the wire and delivering them to the neon gas in the bulb. Does this statement make sense in terms of the type of charge that we know is put onto the Styrofoam when it is rubbed with the fur (or wool)? Explain.