

# PhyzLab: Charge It I

an investigation of static electricity  
using the pith ball power pole

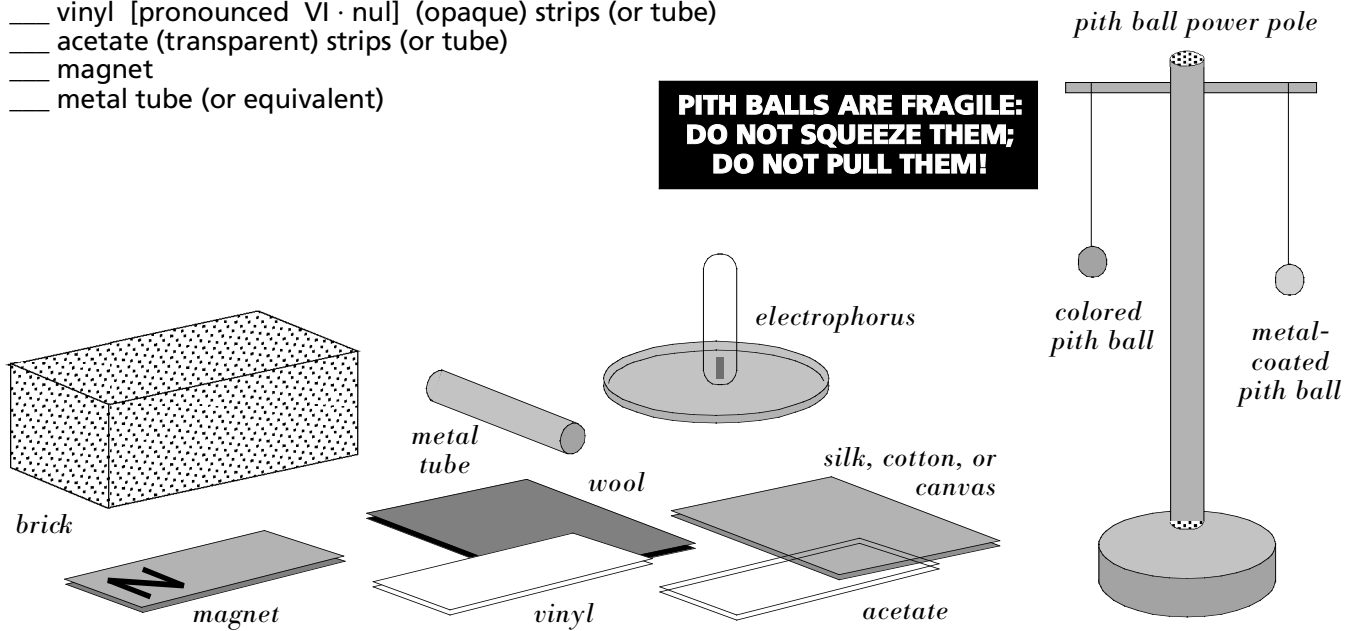
PERIOD	1.		
	2.		
GROUP	3.	<b>Scoring Key</b>	
	4.		

## • Purpose •

In this investigation, you will explore a mysterious force. You will determine whether or not the force is distinct from other known forces. You will also investigate a few specific characteristics of this force.

## • Apparatus •

- \_\_\_ pith ball power pole  
(Pith is a delicate, woody material found at the center of tree branches.)
- \_\_\_ electrophorus [pronounced eh · lek · TRAH · fer · us]  
(aluminum disc with clear plastic handle)
- \_\_\_ brick (or book, or other object having significant mass)
- \_\_\_ wool (dark) cloth square
- \_\_\_ silk, cotton, or canvas (light) cloth square
- \_\_\_ vinyl [pronounced VI · nul] (opaque) strips (or tube)
- \_\_\_ acetate (transparent) strips (or tube)
- \_\_\_ magnet
- \_\_\_ metal tube (or equivalent)



## • Procedure •

### 1. CAN YOU GENERATE AN ATTRACTIVE FORCE?

*With the materials you have been given, can you demonstrate electrostatic attraction?*

- a. Rub the vinyl with the wool as if you were polishing the vinyl. Fold the cloth, hold it between your thumb and forefinger and pinch the plastic strip in the cloth. Rub vigorously. Bring the vinyl close to the colored pith ball. Describe what happens in words and pictures.

[The ball jumps onto the vinyl and sticks or hits the vinyl and repels. Diagrams will vary.]

Note: to “reset” (neutralize) a pith ball at any time, simply touch it with a finger. This will restore it to its original condition.

b. If someone suggested that what you are seeing is a gravitational effect, how could you demonstrate—using only the apparatus supplied—that the force you are seeing is not gravity? Remember, you must formulate an argument based on something that you can **show**. Describe your argument in words and pictures.

[The brick does not attract the pith ball although it is more massive than the vinyl. Other arguments are possible. Diagrams will vary.]

c. i. Can you get effects similar to those described in step a above using the acetate? Be sure to try the silk/cotton/canvas if you don't get results with the wool. Describe your results.

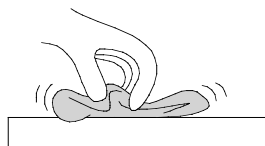
[Acetate rubbed with silk produces a result.]

ii. Can you get effects similar to those described in step a above using the metal tube? Be sure to try the silk/cotton/canvas if you don't get results with the wool. Describe your results.

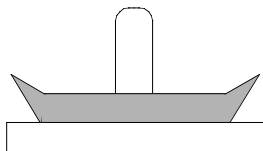
[Metal tube does not produce a result.]

## 2. THE ELECTROPHORUS AND REPULSION

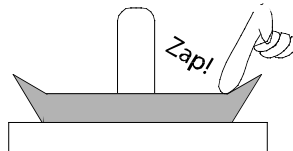
a. Charge the electrophorus: READ INSTRUCTIONS CAREFULLY AND FOLLOW THEM EXACTLY!



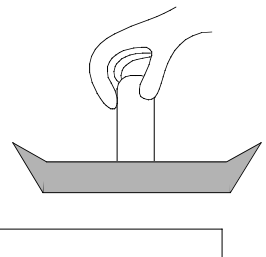
i. Rub the square acrylic electrophorus base with silk (or cotton or canvas) OR rub a chair seat with wool. (Plastic seats often work better than acrylic bases.)



ii. Set the electrophorus on the acrylic base OR the chair seat. Avoid the metal rivets in the seats.



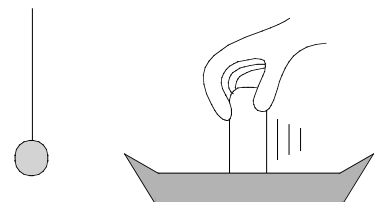
iii. Touch the top of the metal electrophorus disc. You **may** feel a shock. This shock is rarely fatal.



iv. Pick up the electrophorus holding only the plastic handle. Do not allow the disc to touch anything before bringing it to the pith ball.

b. Bring the electrophorus (with the aluminum disc **horizontal**) closer and closer to the metal coated pith ball. Describe what happens in words and pictures.

[The ball is attracted to the electrophorus, touches the electrophorus, then is repelled. Diagrams will vary.]



c. Gravitational forces are always (as far as we know) attractive. You could argue that since this new force can be repulsive as well as attractive, it cannot be gravity. However, magnetism can be repulsive and attractive. How could you demonstrate—using only the apparatus supplied—that the force you are seeing is not magnetism? Remember, you must formulate an argument based on something that you can **show**. Describe your argument in words and pictures.

[The magnet does not attract or repel the pith ball. Other arguments are possible. Diagrams will vary.]

d. Repeat steps a and b above. Once you have repulsion between the electrophorus and a pith ball,  
i. charge a piece of acetate and check for interaction between the pith ball and **charged** acetate. What did you find?

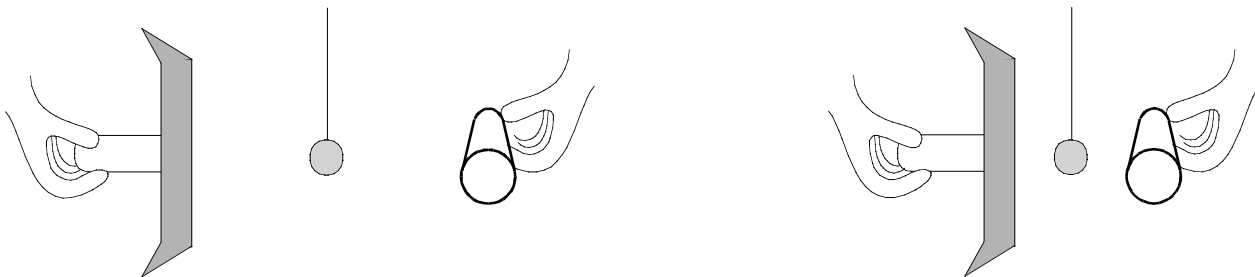
ATTRACTION —OR— REPULSION.

ii. charge a piece of vinyl and check for interaction between the pith ball and **charged** vinyl. What did you find?

REPULSION —OR— ATTRACTION. MUST BE OPPOSITE OF PREVIOUS ANSWER

### 3. PITH BALL PING PONG

a. Charge the electrophorus. Hold the charged electrophorus in one hand and the metal rod in the other. Hold the electrophorus and metal rod on opposite sides of the metal-coated pith ball. Slowly move the electrophorus and the metal tube inward toward the pith ball. See the diagram below.



b. After playing the game with the metal ball, play the game with the colored ball. Is the action faster or slower with the colored ball?

*Game is slower with colored ball.*