

CONCEPTUAL PHYSICS**Activity**

32.1 Electrostatics: Electric Forces and Charges

A FORCE TO BE RECKONED**Purpose**

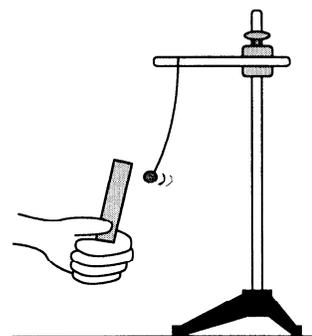
In this investigation, you will explore the nature of a force. You will determine whether or not the force is distinct from other known forces.

Required Equipment and Supplies

a pith ball suspended from a support rod
vinyl and acetate strips or tubes
wool and silk cloth swatches (2" × 2")
brick (or a heavy book)
bar magnet

Procedure

Step 1: Generate an attractive force. Rub the vinyl with the wool. Hold the vinyl near the pith ball and see if the strip will attract the pith ball to it as shown. If it won't, try rubbing the vinyl more vigorously, or try using the acetate rubbed with silk. If you continue to have difficulty, ask your teacher for assistance.

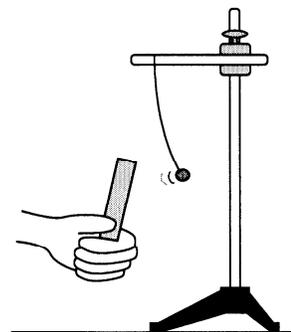


Once you have seen the plastic strip (vinyl or acetate) attract the pith ball, set the plastic aside and discharge the pith ball by gently touching it.

Consider the suggestion that the attraction you observed is simply the result of *gravitational* force. After all, gravitational force causes any two things with mass to be attracted to each other. Recall that the force of attraction is proportional to the amount of mass involved.

Step 2: Hold the brick close to the pith ball. The mass of the brick is much greater than the mass of the plastic strip. What—if anything—does the brick do to the pith ball? What does this tell you about the suggestion that the attraction between the plastic strip and the pith ball is *gravitational*?

Step 3: Generate a repulsive force. Using the plastic strip (rubbed with the cloth as was done in Step 1), try to repel the pith ball as shown. Does the observation of repulsion support or contradict the suggestion that the attraction between the plastic strip and the pith ball is gravitational? Why?



Once you have seen the plastic strip (vinyl or acetate) attract the pith ball, set the plastic aside and discharge the pith ball by touching it.

Consider the suggestion that the attraction and repulsion you observed are simply the result of *magnetic* force. After all, magnets can both attract *and* repel.

Step 4: Hold the bar magnet close to the pith ball. What does the magnet do to the pith ball, and what does this tell you about the suggestion that the attraction and repulsion between the plastic strip and the pith ball are magnetic?

Summing Up

The force between the plastic strip and the pith ball is different from gravitational force and different from magnetic force. It is called *electrostatic* force, and is a force between any two objects that are electrically charged.

1. When the vinyl is rubbed with wool, the vinyl gets a *negative* charge. What kind of charge is on the pith ball when the charged vinyl repels it?

2. Does electrostatic force get stronger or weaker with distance? Does the interaction become stronger when charged objects get closer together or when they get farther apart?
