

E & M 1 - ACTIVITY: Beyond Sticky Tape

Introduction

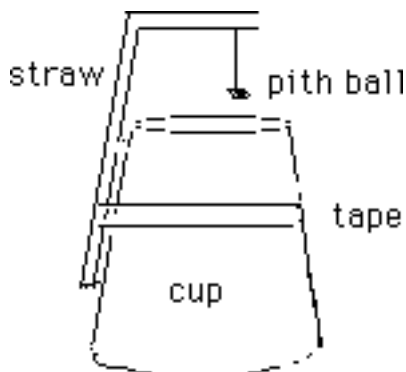
In this activity you will put to work the information you got from the sticky tape lab to construct a simple device known as an electroscope that can be used to test for the presence and type of charge. (This exercise is adapted from PRISMS)

Materials

Styrofoam cup, plastic straw with flexible elbow, tape, pith ball, aluminum pie pan, foam meat tray, wool cloth or fur, glass rod, silk cloth or a substitute for the glass rod and silk a plastic "thermometer case" and a piece of cotton cloth. Throughout the instructions a plastic tube and cotton cloth can be substituted for the glass rod and silk.

Procedure

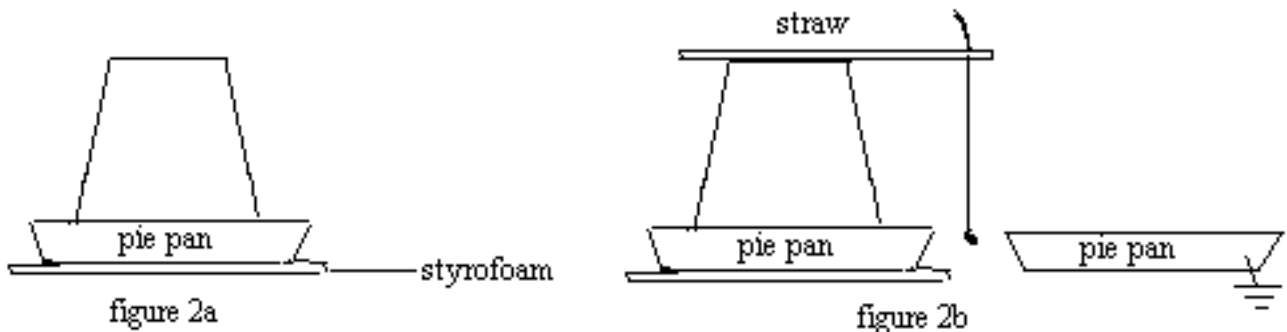
Tape the straw to the foam cup as shown in figure #1 and suspend the pith ball from the straw. You can attach the thread of the pith ball to the straw by cutting a small vertical slit in the end of the straw to slide the thread into the slit.



1. Rub the glass rod with the silk and bring it close to but not touching the pith ball. Is there evidence of an interaction? Draw a simple force diagram that would help explain your observation below.

2. Now touch the pith ball with the glass rod. When you bring the rod back close to the pith ball is there evidence of an interaction? Draw a simple force diagram below to support your observation. *Remember that when Benjamin Franklin did this experiment he called the charge on the glass rod positive (+), so to be consistent with history, we will do the same.*

3. Touch the pith ball with your finger. What effect does this have on the charge? This process is called grounding.
4. Try charging different objects and test which charge you placed on the objects. Record your observations by listing the objects, what you did to charge the objects, and which charge was in excess on the object.
5. Charge your electroscope with a positive charge. Now rub the foam tray with wool or fur. Which kind of charge does the tray have?
6. Tape the foam cup to the inside of the pie pan as shown in below in figure 2a. Recharge the foam tray and hold the pie pan close above the top of the foam tray. Now touch the rim of the pie pan momentarily with your finger. After removing your finger, remove the pie pan from the foam tray by only touching the foam cup. Which charge is in excess on the pie pan? How do you know?



Now place the straw with the pith ball on top of your foam cup hanging between the pie pan and a second really close pie pan which you touch, grounding it as shown in figure 2b. Adjust the position of the straw so that the pith ball just touches the outside edge of the rim of the first pie pan then tape the straw in place. Observe the behavior of the pith ball. Explain these observations with the use of diagrams.