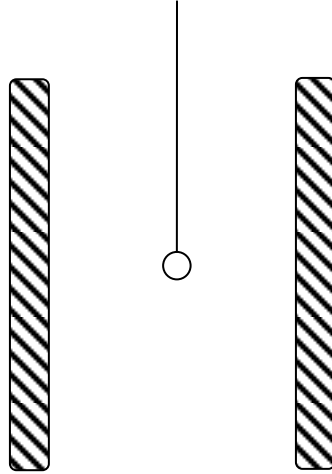


NAME _____

DATE _____

Physics 251 Pre-Lab 2

Suppose you have a small, light-weight positively charged object suspended by a long massless, non-conductive string. On either side of the small object is a relatively large metal plate. The charge is exactly in the middle of the two metal plates. Neither plate is charged.



A positively charged rod is brought in contact with the left plate. What, if anything, happens to the charged particle? Explain your answer completely in excruciating detail.

Two negatively charged rods with equal charge are simultaneously touched to the two plates. What, if anything, will happen to the charged particle? Explain.

Physics 251 Lab Activity 2

Conductors, Insulators and electrical polarization or how a charged object can attract a Neutral object.

Two students in physics laboratory are examining the charge of an object. They have two pieces of tape: top and bottom type with which they are testing the charge of various objects. The students then bring the a piece of top tape close to a pop can and find that the top tape is attracted to the can. Their conclusion is that the can must have the same charge as bottom tape. Do you agree or disagree with the student's conclusion? Explain.

Perform the test and reconcile your answers with your observations.

What must you observe in order to conclusively decide that an object is charged? Explain.

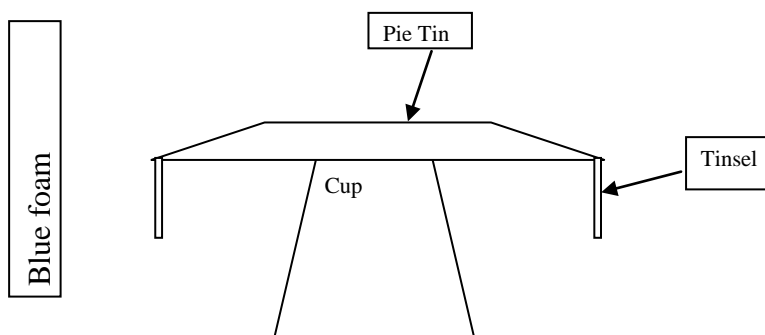
If you were to place a T-type charge, charged insulator into momentary contact with a neutral insulator, and then brought this insulator close to a piece of T-type and B-type tape, what would you expect the tape to do? Explain.

Perform the test and reconcile your answers with your observations.

If you were to repeat the experiment, but the charged rod was a conductor, how would your results change? Explain.

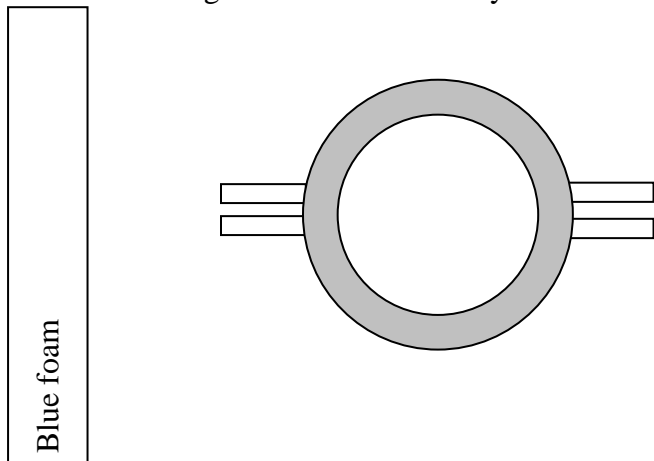
Take the large blue piece of foam and rub it vigorously with a cotton cloth. Bring it near to the top and bottom type tape and determine whether it is of T or B-type charge.

Set the pie tin with tinsel upon the foam cup. Imagine that you were to bring the foam board near to one of the tinsel ends of the pie tin. What do you predict the tinsel on both sides of the pie tin would do? Explain.



Now try the experiment. What do you observe? Explain any differences between your observation and prediction.

Sketch the charge distribution in the system shown below.

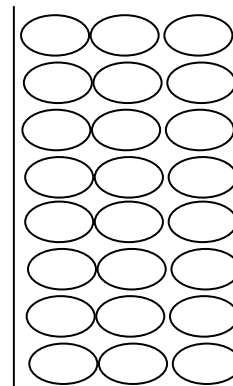
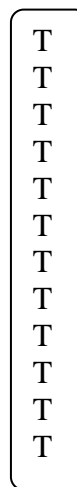
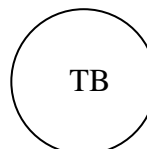


Is the pie tin electrically neutral? How do you know?

In the experiments last week involving the pop can and the paper roll, were these items electrically neutral? How do you know?

There are conductors and insulators. Both can experience what could be called polarization of charge meaning a redistribution of charge from a normal distribution by the presence of a charged object. While in the case of a conductor, one type of charge is free to move throughout the entire conductor, this is not true of an insulator. An insulator is defined as having the charges localized – they cannot move from one location to another through the insulator. What experiments did you do that give evidence of this effect?

Since the charges are fixed, then the only way a charged object could exert a force on an insulator would be by changing the molecules, by distorting the molecules. This happens in polarizable insulators. Ordinarily, the average location of the T and B charges within a molecule are at the center of each molecule. However, when a charged object is brought near to the object, the molecules near the surface distort so that one side of the molecule becomes one type of charge and the other side takes on the opposite type of charge. Since this separation of charge is induced by the presence of a charged object and the electric force exerted by a charged object _____ as you get farther away, the polarization of the material must _____ as you get farther inside the material. Diagram the polarization of an insulator in the presence of a T-type charged object.



Based on this and your observations, which do you think would exert a stronger force, a charged object near a conductor or a charged object near an insulator. Explain your answer.

Summary

1. We know an object is electrically charged IF
2. How do we know there are two types of electrical charge?
3. Electric charge is a _____ of an object and is introduced to help explain the _____ that one object exerts on another that it does not touch.
4. Name three types or experiments that indicate that electric charge can move about.
5. In an electrical conductor, electric charge can
6. In a polarizable electrical insulator, electric charge can
7. Explain how a positively charge object can exert an electrical force on an uncharged electrical conductor.
8. How can a balloon that has been rubbed on a person's hair stick to a wall?
9. Would this balloon stick to a piece of aluminum foil? Explain.

In a darkened room, use two wires attached to a small neon bulb with alligator clips to a foil plate as shown in the figure below. If you were to bring the charged blue foam rapidly towards one of the wires, what would you expect to happen? Explain.



Vigorously rub the blue foam and try waving the foam above one of the foil plates. Reconcile the differences between your previous answer and your observations.

Place the blue foam close to the bulb and vigorously rub the piece of blue foam what does the bulb do while you are rubbing the foam? If you rub the foam perpendicular to the wires what does the bulb do? Try to explain what you observe.

After rubbing the foam, touch one of the alligator clips to the foam in (move the clip around until you see a small spark. When you see a spark, what does the bulb do? Explain your observations.

Replace the bulb with a analog multi-meter. Adjust the meter “zero” until the needle is in the center of the display. As you bring the foam close to the meter, what direction does the needle move?

As you take the foam away from the meter, what direction does the needle move?

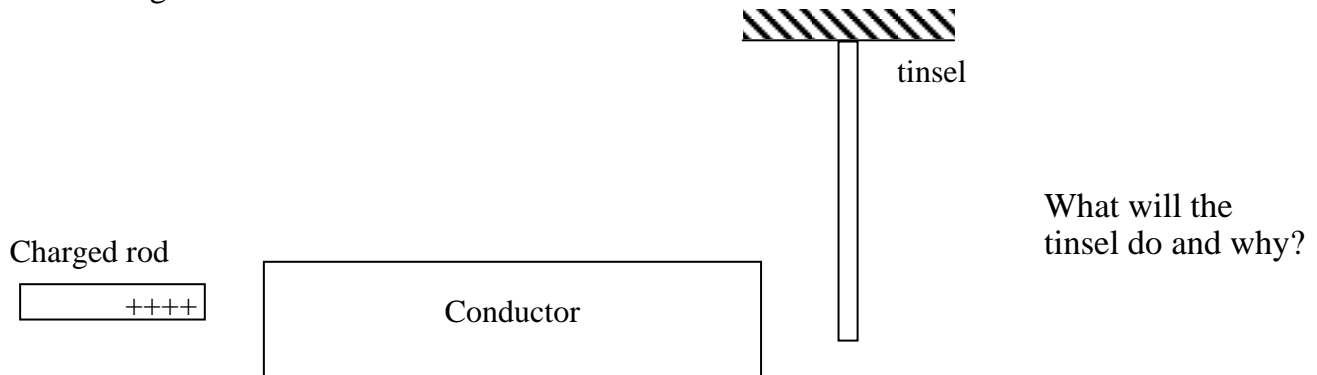
Does the amount of needle deflection depend upon the speed of the motion?

Summarize your observations with regards to the motion of the charged blue foam and your explanations of your observations.

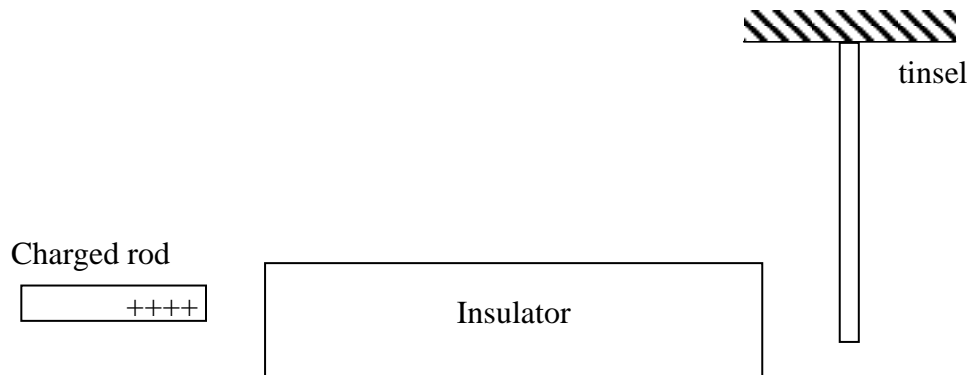
Names

Physics 251 Laboratory 2 Final Task

A positively charged rod is brought up near a long block of a conducting material. At the other end of the block of material is a piece of tinsel initially hanging vertically from a rod. See the figure below.



A positively charged rod is brought up near a long block of an insulating material. At the other end of the block of material is a piece of tinsel initially hanging vertically from a rod. See the figure below.



How will the angle that the tinsel makes with the vertical differ, if it will, for these two cases?