

## AP PHYSICS II

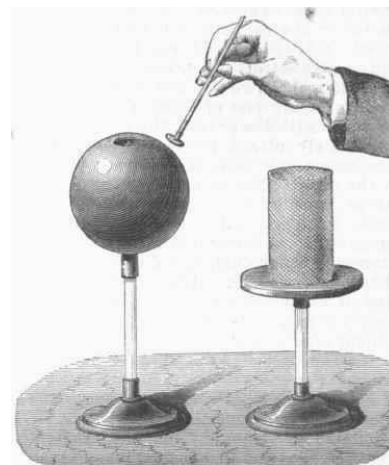
### Lab 5: Charge Concentration by Induction

#### Purpose

The purpose of this lab is to determine the concentration of charge on a surface under certain conditions.

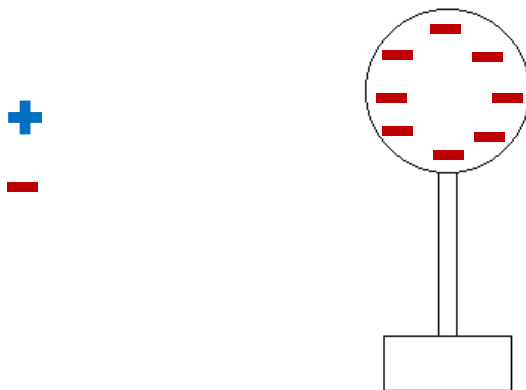
#### Background

You will be using the Proof Plane to take samples of charge distributed at specific locations of the surface of charged spheres. You will be looking at, specifically, the *concentration of charge* around the surface of the sphere. To read the charge, dip the Proof Plane into the Ice Pail. You know by now that the charge read by the charge sensor is the same as the charge of the proof plane. You will need to be sure to ground *everything* after each trial, otherwise data might be skewed.



#### Procedure

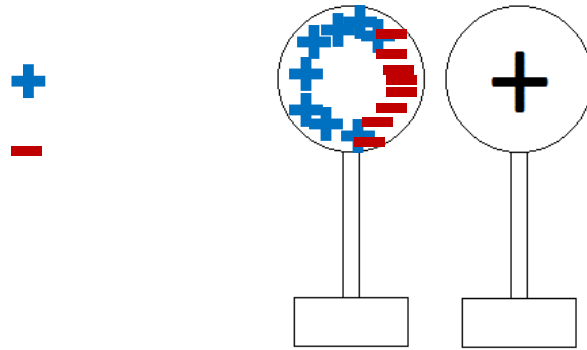
1. Begin by assuring that everything is grounded.
2. Uncover the sphere which is connected to your voltage supply. Leave the other one COVERED.
3. Turn on the Voltage Source to 3000V.
4. Touch the proof plane to any location of the sphere and dip it into the ice pail to determine the charge. What kind of charge is the sphere (Positive or Negative)?  
Positive
5. We will now begin sampling the concentration of charge around the sphere at different locations. For example, if one location of the sphere yields a charge of  $10 \mu C$  and another location yields a charge of  $10 \mu C$ , you know that the charge concentration is the same at those two points. Be sure to GROUND YOUR PROOF PLANE before taking a sample from another location on the sphere.
6. Do this to many different locations around the sphere's surface to sample the charge at those locations. Draw a charge concentration diagram indicating the location of charge on the sphere's surface. Use 8 "+" OR 8 "-" signs and distribute them to correspond to the physical charge concentration.



Please ask the teacher to check your progress before moving on.

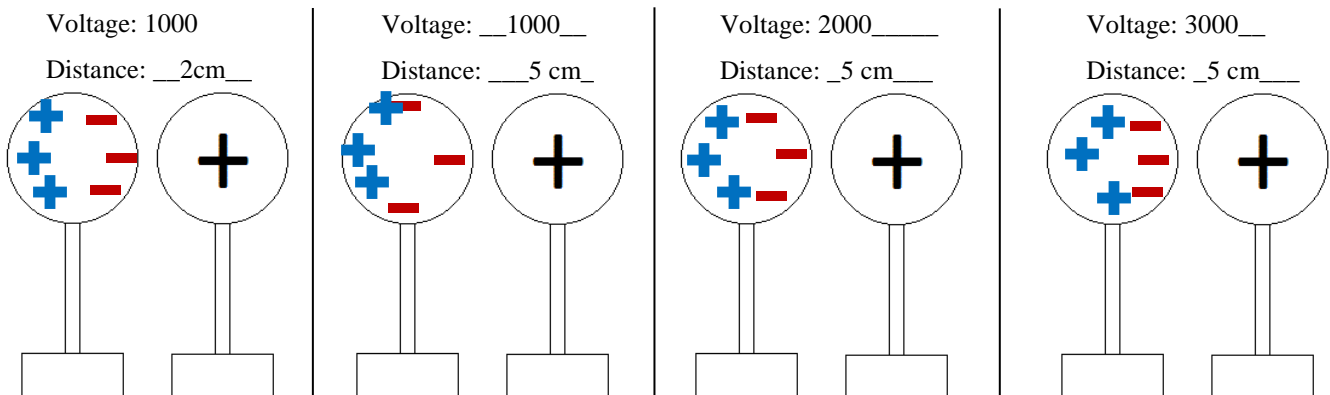
## Two Sphere Systems

7. Uncover the second sphere. Assure that the sphere is neutral by grounding it.
8. Bring the uncharged sphere close to (but not touching!) the charged sphere. Allow enough distance between the two spheres to be able to fit the proof plane between them. Begin sampling different locations around the neutral sphere, remembering to ground the proof plane AND the neutral sphere after EACH sample.
9. Once you have a good idea about the charge concentration of different locations, indicate it by drawing 8 “+” AND 8 “-” signs at different locations to indicate the concentration. Recall that these are surface charges. The locations will be graded on accuracy.



Please ask the teacher to check your progress before moving on.

10. Now that you have the hang of it, try some other stuff yourself. Feel free to change the distance to be slightly further or to change the voltage from the supply. Before doing this, be sure to TURN OFF the supply then GROUND the charged sphere before changing the voltage. Once you have selected a new voltage, turn the supply back on.



11. Based on your diagrams, describe what kind of effect the voltage applied on the charged sphere has on the concentration of charges on the neutral sphere.

An increased voltage causes the charges to polarize themselves and go on opposing ends

12. Based on your diagrams, describe what kind of effect the distance between the spheres has on the concentration of charges on the neutral sphere.

The distance affects how strongly the charges are attracted and therefore the concentration of charges. More distance causes less concentration of charges.