

Lab 3: Applied & Induced Charge Distributions

Challenge

Devise two ways to measure the charge on a metal ball.

Available materials:

aluminum foil	string	fur scraps
insulating rod	protractor	your phone's camera
ring stand with clamps	mass scale	charge sensor
metal pail & plastic disk	Faraday cage	charge separators
grounding wires & wrist strap	ground plate	<i>Logger Pro</i> software

Technical details

Before attempting to measure the charge on a metal ball, familiarize yourself with the Vernier equipment and *Logger Pro* software. For example, measure the net charge created by rubbing your feet against carpet. Also, test the claim that when two charge separators are rubbed against each other they will have equal and opposite charges.

Watch the video on how to use the Vernier charge sensor equipment:

<http://www.vernier.com/training/videos/play/?video=169>

Lab report considerations

Include a computation of the ratio of the ball's net charge to the total charge due to electrons in the ball.

For this lab you should compute the *error* on the metal ball's charge as the percentage difference for the two experimental techniques. The lab report should state the *average error* along with its *uncertainty*, where the *uncertainty* is computed in the usual statistical way that incorporates the standard deviation from N trials. This final result should appear in both the abstract and results/conclusions sections.

In addition, remember that each number throughout the lab report should have an *uncertainty* attached to it, including those presented in tables. Uncertainties can be measured statistically via multiple repeated measurements, or by quantitatively gauging the limitations in the equipment.

A photo of the lab setup must be included.

Teacher signatures

Please get your TA to sign off on your experimental plan, the pre-lab equipment practice, and the completion of the lab. These signatures will be worth 4% of the lab grade and will help to promote a successful experience.

