INS Physics Lab 2: Charge and Circuits

In this lab you will investigate outrageous claims made in the text and, in general, by physicists for the last 200 years throughout the world. Some of your experiments will be qualitative and some will be quantitative. In most cases, you will work to support your answer to a specific question. If your results do not support your initial answer, you will modify your prediction to match reality.

Charge There is only one kind of matter (attractive). Are there really two kinds of charge?

Make sure the electroscope has a decent piece of gold foil. Rub the rubber rod with the fur. Bring it near the bolt/ball at the top of the electroscope (avoid touching the electroscope).

- What do you predict will happen? Explain.
- What do you observe? Explain.

Touch the electroscope's bolt with your finger.

- What do you predict will happen? Explain.
- What do you observe? Explain.

Recharge the electroscope with the rubber rod. Now rub the glass rod with the silk cloth. Bring the glass rod near the bolt at the top of the electroscope (avoid touching the electroscope).

- What do you predict will happen? Explain.
- What do you observe? Explain.

Try the above with various combinations of rods and fabrics. Note the results. Moisture in the air (and other factors) can really screw up the electroscope. If the above is not giving interesting results, use the jeweled magnet stands. Balance a rubber rod on it, charge another rubber rod and observe what happens when you bring two ends close. Without discharging the rod on the stand, try the glass rod/silk and see what happens when you bring the unlike rods together.

Explain how the above procedures support the claim that there are two types of charge: attractive and repulsive.

Cool Van de Graaff Accelerator Undeniably, the Van de Graaff generator is fun. But how does it work?

Run the generator for a short while to charge it.

Bring the ground rod near the generator's metal ball.

- What do you predict will happen? Explain.

- What do you observe? Explain.

Bring the rubber rod near the generator's metal ball.

- What do you predict will happen? Explain.
- What do you observe? Explain.

Bring the large metal ball near the generator's metal ball.

- What do you predict will happen? Explain.
- What do you observe? Explain.

Bring the large metal ball near the generator's base.

- What do you predict will happen? Explain.
- What do you observe? Explain.

Some of the following may be useful in explaining what you observed: charge, induced charge, current, potential, resistance, capacitance, insulator, lightning.

Can you light the fluorescent tube with the generator?

Parallel circuits How can resistance go down when you add more resistance? (If only debt worked that way.)

The Elenco M-1700 Multimeter

To measure resistance: the red plug goes into the red socket; the black plug goes into the black socket. Turn the multimeter on and set it to DC. Turn the dial to the bottom left part of the face so that it is on 2k in the Ω region. The readings are now in 2000 Ohms.

To measure current: turn the dial to the upper left part of the face so that is reads 200m in the A region. One of the battery's leads must be attached to the circuit, and the other to the meter. If both of the battteries leads are attached to the circuit and you attempt to use the multimeter, bad things will happen. :(When you are done with the multimeter, turn the dial to the Ω region. Just do it.

Use the alligator clips to set up a circuit with a 1-kΩ and a 2-kΩ resistor in parallel.

- What do you predict the equivalent resistance will be? Explain.
- What do you observe? Explain.

Use alligator clips to up a circuit with the 6-V battery and 3 identical resistors in parallel.

- Calculate the current going through each of the resistors.
- Measure the current going through each of the resistors. How does this match your predicted value?
- Remove one of the resistors. Predict the current flowing through each of the remaining resistors.
- Measure the current going through each of the remaining resistors. How does this match your predicted value?

Series (and other) Circuits Find the Bulb Circuit Board I 11 with the 40-W and 75-W bulbs in series. Plug in the lights.

- Which bulb do you predict will be brighter? Explain.
- What do you observe? Explain.
- What happens when you unscrew one of the bulbs?

Find the Bulb Circuit Board I 11 with the 40-W and 75-W bulbs in parallel. Plug in the lights.

- Which bulb do you predict will be brighter? Explain.
- What do you observe? Explain.
- What happens when you unscrew one of the bulbs?

Find the Bulb Circuit Board I 10 with the tangled nest of wires and bulb. Connect the battery to make a circuit.

- Draw the circuit as it might appear in a text. Pay special attention to parallel and series circuits.
- Which bulb do you predict will be brightest? Explain.
- What do you observe? Explain.
- Unscrew one of the bulbs in the parallel circuit. What do you predict will happen? Explain.
- What do you observe?