

PHY 202/182 Lab Instructor notes
Lab 2: Electrical energy conversion
Spring 2003

- I have set up eight stations in the lab: two for the electrolysis, three for the resistive heating, and three with the motor.
- C-clamps are in a drawer.
- We need a working barometer in the lab. John Stahl lost the one in the Chemistry lab.
- The motors are borrowed from the SCS 110 lab. Also, the 0.1°C thermometers can be found in the SCS 110 lab.
- Stop watches can be found in a drawer.
- Any spare batteries can be found in the box with the multimeters.
- On the board, draw the circuit that is common to all the experiments. Explain very slowly because they have not had any circuits in lecture yet. Explain to the students how to read the ammeters. This is a good time to mention how (not) to blow up an ammeter.
- For the electrochemical part:
 - In the past, this was done as a demonstration for the entire class, but I would like to make it a little more “hands-on.” You should get each group started on the experiment.
 - The apparatus should be run for a few minutes before class to allow the system to equilibrate.
 - Ask the question, “Which side is Hydrogen?”
 - Use distilled water with 3 molar sulphuric acid. (HCl does not work!)
 - According to Curt Frank, the carbon electrodes do not work very well. He always throws them out. The best set-up is with platinum electrodes on both sides. Second-best is to have plain copper on the oxygen (positive) side.
 - The voltage across the cell should be between 2 and 3 V and should be current limited on the power supply; this corresponds to perhaps 50 mA current. Use the multimeter to measure voltage and an analog ammeter, set to the 100 ma scale, to measure current.
 - The cross sectional area of the tube is 1.208 cm^2 . This needs to be better labelled on the apparatuses.
 - In principle, one should find the Hydrogen partial pressure P using:

$$P = P_B - P_V$$

in units of torr. But this is a small effect.

- For the motor part:
 - The ammeter should be set to the 100ma scale.
 - The terminals on the motors can come loose, causing a bad contact. I soldered the terminals to fix this.
 - We need better motors for this lab. The results for that section are generally quite poor: I was only able to get about 40% efficiency.
- At the end of the lab,
 - Put away the stop watches in drawer 39 (they tend to walk away between labs).
 - Disassemble the circuits, so the next lab can assemble them.
 - Turn off power supplies.
 - Disconnect the voltmeters from the circuits.