

## TA INSTRUCTIONS FOR THE CALORIMETRY LAB

Ch En 385 – Knotts

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### Overview

- Students will spend about 1 hour in the lab performing experiments and analyzing data.
- You, as the TA, will start the lab *before* students arrive and shut it down after students are finished.
- You do not need to take down the apparatus if another group is following the previous group.
- Before operating the equipment, you should have passed it off with either Dr. Knotts, Will Davis, or Mike Beliveau.

### General Instructions

1. Do the following to prepare for students.
  - a. Learn how to run the equipment and pass off your understanding with either Dr. Knotts, Mike Beliveau, or Will Davis.
  - b. Perform the experiments that the students will do.
2. You should have set up specific times (5 hours a week) for students to perform the experiments. You will be in the lab during these times.
3. You will setup the apparatus before each lab hour following the instructions below.
4. After students are finished with the lab, you will take down the apparatus following the procedures below.
5. You can grade assignments when in the lab and not answering student questions; however, you should be closely monitoring the students.
  - a. Keep them on task.
  - b. Ask questions to deepen understanding.

### Apparatus

Figure 1 is a picture of the apparatus. Notice the following.

1. Three digital readouts are connected to the calorimeter: *Temperature Reading*, *Voltage Measurement* and *Current Measurement*.
  - a. The temperature reading connects to the yellow thermocouple wire at the top of the reading device.
  - b. The voltage measurement connects to the positive D.C. leads in the port labeled “V” and one of the black leads coming from the calorimeter in the port labeled “A”.
  - c. The current measurement connects to the negative D.C. wires in the port labeled “COM” and the second black lead from the calorimeter in the port labeled “A”.
2. The Double wall calorimeter has one red lead connected to the red port and two black leads connected to the black port.
3. The positive and negative D.C. leads are connected to the wall adapter (Figure 2). This adapter converts the A.C. supply from the wall outlet to D.C. at a nominal 5 volts, 3 Amps.

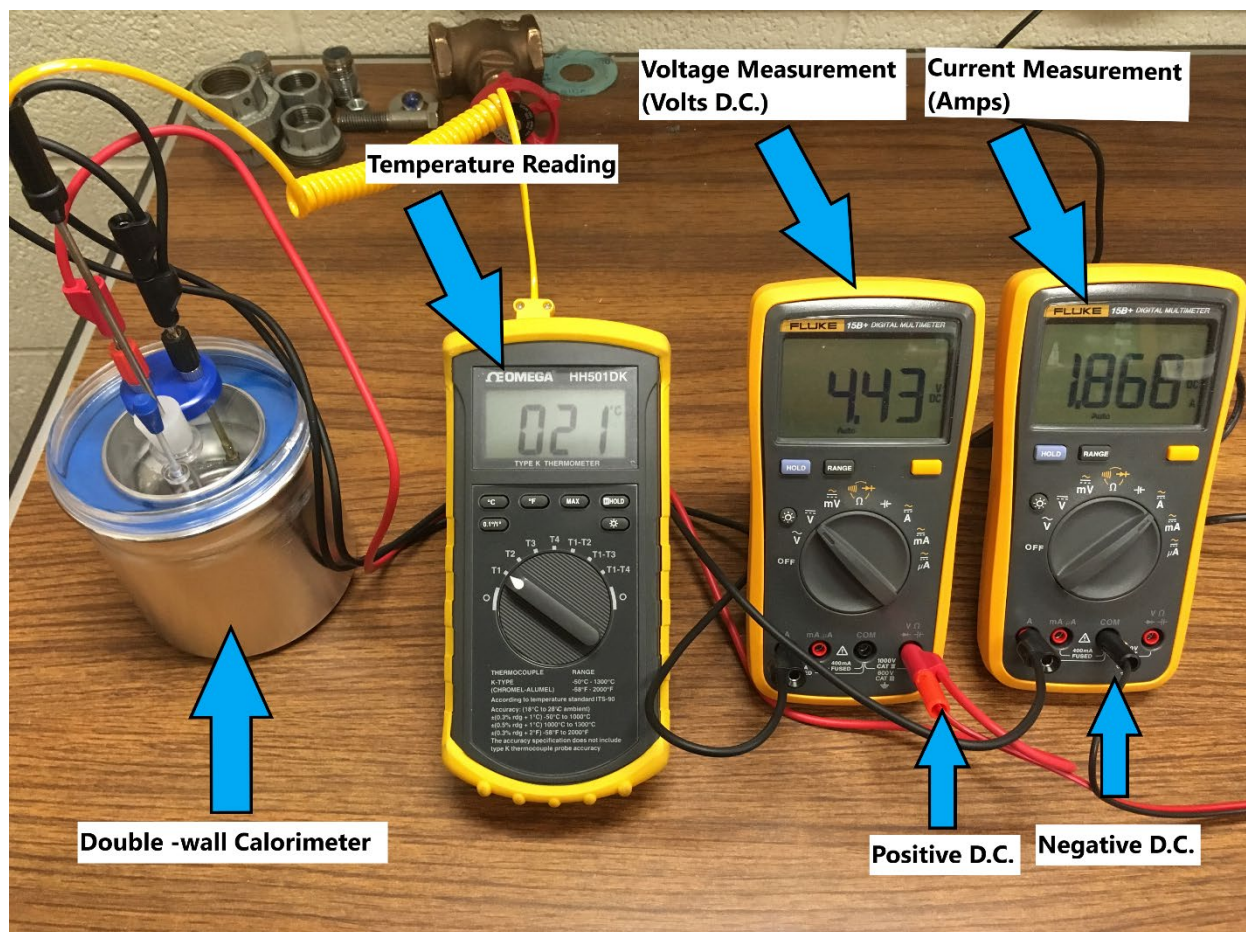


Figure 1. Calorimetry Testing apparatus

## Set Up of the Starting Configuration

Do the following, **before students arrive**, if not already done.

1. Connect the digital multimeters as shown.
  - a. The temperature reading connects to the yellow thermocouple wire at the top of the reading device.
  - b. The voltage measurement connects to the positive D.C. leads in the port labeled “V” and one of the black leads coming from the calorimeter in the port labeled “A”.
2. Connect the yellow thermocouple lead to the reading device in the T1 port at the top of the device, as shown.
3. Connect the positive and negative D.C. leads to the wall adapter. **Do not** plug it into the wall at this point. The students will do this when they start the experiment.
4. Connect the leads to the calorimeter with one red lead in the red port and two black leads in the black port, as shown.
5. Obtain a bottle of propylene glycol from the wooden cabinets to the right of the whiteboard.

## Lab Operation Procedures

1. Students will perform three measurements of each test substance using the calorimeter setup: RO water; propylene glycol.
  - a. The students can obtain their own samples.
  - b. The inner vessel of the calorimeter may be removed from the calorimeter and used to measure the sample into at the bench-top scale.
  - c. The calorimeter vessel should be filled approximately halfway in order to cover the heating element in the calorimeter.
2. Be sure to wear gloves when handling propylene glycol.
3. Each measurement should take about 10 mins with a short cool-down period in between. Use caution when removing the calorimeter vessel in between measurements as it may be hot.
4. You will dispose of the propylene glycol waste in the organic waste container in the flammables cabinet.
5. Rinse the calorimeter vessel, temperature probe and heating coil with RO water and dry them between each different sample.

## Shutdown Procedures

1. Make sure the wall adapter has been unplugged.
2. Ensure that all samples have been disposed of properly.
3. Return the bottle of propylene glycol to its proper storage area.
4. Clean the apparatus by removing the lid and sample vessel. Wash the heating element, thermocouple and vessel with water and detergent. Rinse them with RO water and dry before returning them to the calorimeter.

TAs will not have to prepare the apparatus for moving or long-term storage. This will be done by the lab manager or assistant lab manager.



Figure 2. Wall adapter with D.C. leads.

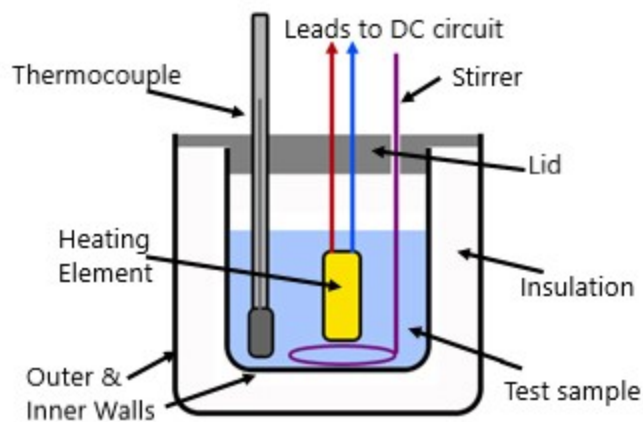


Figure 3. Calorimeter schematic. Courtesy of [a-levelphysicstutor.com](http://a-levelphysicstutor.com).