Introduction

Suppose you had 1 gram of water. If we add enough energy to this gram of water (as heat), we can raise its temperature by 1°. The amount of energy we add to 1 gram of water so that its temperature increases by 1° is call the *specific heat of water*.

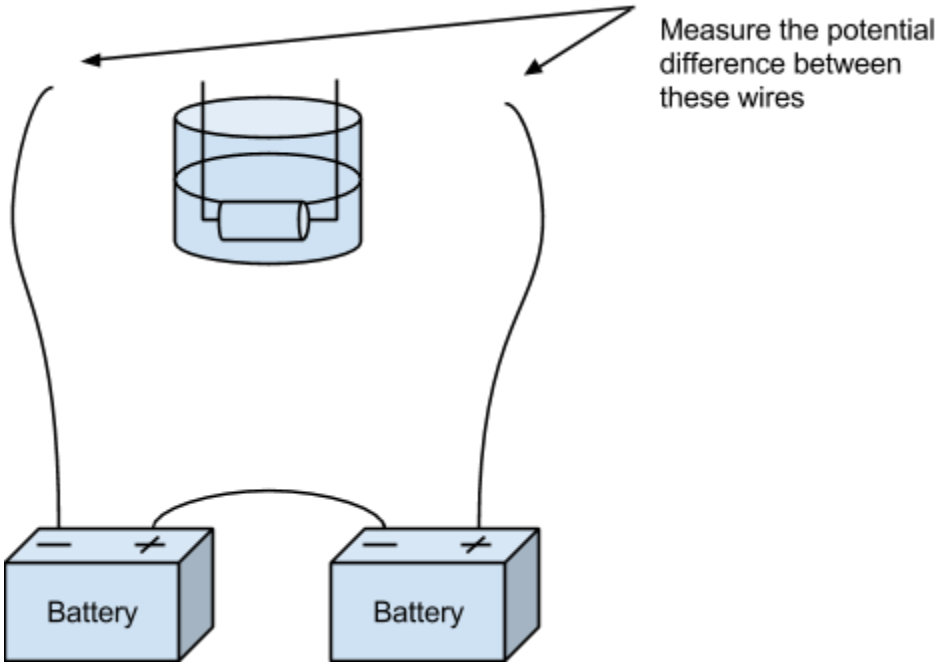
Now, if we put something into this water that delivers energy at a steady rate, we should observe the water's temperature steadily increase. For example, the amount energy delivered by a 30Ω resistor with a 12V potential difference over a 1 second duration is $(12V)^2 (30\Omega)^{-1}$ (1 second) = 4,320 Joules. Another way of saying this, is that the resistor delivers 4,320 Joules per second, or more succinctly, the *power output* of the resistor is 4,320 watts (1 watt = 1 Joule/second).

In this experiment, we will put a resistor into a small amount of water and apply a potential difference across the resistor. As current passes through the resistor, it will heat the water and we will record the water's change in temperature.

Supplies

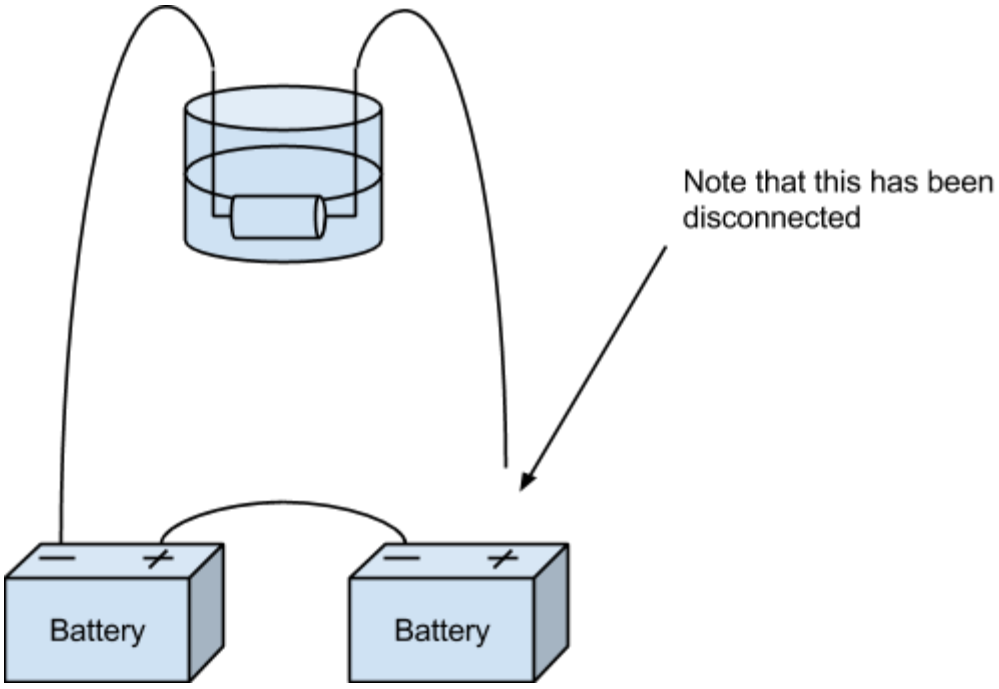
- (2) 6 Volt Batteries
- (1) 30Ω Resistor
- some wire with alligator clips
- a small cup with water

Procedure



- To start, you'll need to fill your cup partially with water; before doing so you'll need to measure the mass of water (preferably in grams); you may need to think about how to do this without also measuring the mass of the cup
- Connect the circuit as shown in the picture at right, however **please DO NOT connect the wires to the resistor just yet;** we need to measure the voltage first
- When you're ready, call Kurt or Oliver over to check your setup

- Using a voltmeter, measure the potential difference across the the two wires
- After you've measure the potential difference, connect the circuit as shown below **note that before you connect the wires to the resistor you should disconnect one of the wires from the battery**



- When you're ready, connect the remaining wire and start your watch
- You should notice the water temperature rising; let this continue for 2 minutes then disconnect the battery
- Now, try to obtain a value for the specific heat of the water; note the energy we put into the water is $(\text{Voltage})^2$ $(\text{Resistance})^{-1}$ and the amount of the energy required to change the temperature by a given amount is (mass of water) (specific heat of water) (change in temperature)
- Use the internet to find the actual specific heat of water, be sure to look at the units!