Determination of the Specific Heat Capacity of Water. Name: _____

Aim: To determine the specific heat capacity of water using the formula…

Heat energy (absorbed) = specific heat capacity × mass × change in temperature

We will supply an amount of heat energy to a known mass of water and record the change in temperature that is produced. The only unknown in the equation will be the specific heat capacity.

Equipment: calorimeter, 100mL beaker, thermometer, 5 wires, powerpack, voltmeter, ammeter.

Method:

1. Pour exactly 100mL (100g) of water into the calorimeter.
2. Place the heating element into the calorimeter.
3. Place the thermometer into the water through the hole.
4. Record the initial temperature of the water.
5. Connect the powerpack, the ammeter, and the calorimeter "in series" as shown in Figure 1.
6. Connect the voltmeter "in parallel" as shown in Figure 2.
   The ammeter will measure the current and the voltmeter will measure the voltage.
7. Set the voltage to 6V and turn on the power. Heat the water for 10 minutes.
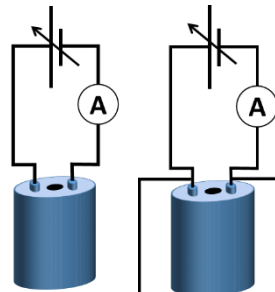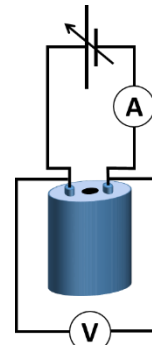8. Record the final temperature of the water.

Figure 1

Figure 2

Results:

Heat Energy Input (which is absorbed by the water)

Heat Energy Input = V I t, where V = voltage, I = current and t = time in seconds.

Voltage, V= _____ Volts   Current, I = _____ A   t = 10 minutes = _____ seconds.

Heat Energy Input = V I t = _____ (= Heat Energy Absorbed)

(We will assume that 100% of the heat energy produced by the electricity is absorbed by the water.)

Mass of water

Mass of water, m = _____ g = _____ kg

Temperature Change

Initial Temperature of Water: _____°C   Final Temperature of Water: _____°C

Change in Temperature, ΔT = _____°C

Specific Heat Capacity of Water

The formula that equates absorbed heat energy, specific heat capacity, mass, and temperature change is shown below. You have now measured 3 of the 4 values in the formula and can now calculate the specific heat capacity of water.

heat energy absorbed = specific heat capacity × mass × change in temperature

Therefore, according to your measurements…

$$specific\ heat\ capacity\ of\ water = \frac{heat\ energy\ absorbed}{(mass\ \times change\ in\ temperature)} =$$

Discussion: The actual specific capacity of water is 4200 J/kg/°C. Calculate the % error in your calculation.

$$\%\ error = \frac{difference\ between\ your\ result\ and\ the\ actual\ value}{actual\ specific\ heat\ capacity\ of\ water} \times 100\% =$$

Suggest why your results were not 100% accurate.

_____
_____
_____