Calorimetry Lab

Name: _____

Calorimetry is a way to determine the transfer of energy from one source to another. We will use this today in lab to practice energy calculations.

Materials:

Tap water 250 mL beaker hot plate balance small test tubes
test tube holder calorimeter 25 mL graduated cylinder thermometer samples

Part A. Experimental Procedure

1. Place 150 -200 mL of tap water in the 250 mL beaker.
2. Heat on highest heat setting on hot plate.
3. Obtain the mass of the small test tube.
4. Fill the test tube half full of material to be studied.
5. Obtain the mass of the test tube and material together.
6. Place the test tube in the heating water until the water boils. When the water boils, lower the heat setting until the water is just boiling. Both samples may be in the water together. The samples need to spend at least 5 minutes in the boiling water before taking a temperature reading for step 11.
7. Obtain the mass of the dry calorimeter.
8. Add 15 mL of tap water to the calorimeter.
9. Obtain the mass of the calorimeter and water together.
10. Obtain the temperature of the water in the calorimeter. (temperature should be constant over a 5sec interval before recording)
11. Obtain the temperature of the material in the test tube. (temperature should be constant over a 5sec interval before recording)
12. Using your test tube holder, **carefully** pour the hot material into the calorimeter with the water. BE SURE NOT TO SPLASH!!
13. Stir the mixture and record the temperature. (temperature should be constant over a 5sec interval before recording)
14. Drain the water from the material and allow to set in the weighing dish with a paper towel to dry completely.
15. Repeat for a different sample.

Part B. Calculations – YOU MUST SHOW ALL WORK IN YOUR REPORT FOR CREDIT!

1. Calculate the mass of the material that you used.
2. Calculate the mass of the water that you used.
3. Calculate the change in temperature of the water. (13-10 from above)
4. Calculate the change in temperature of the material. (11-13 from above)
5. Calculate the energy change of the water ($Q = s \times m \times \Delta T$) ΔT is from #3 calculations
6. Take $0.12552 \times \Delta T$ and add to answer from #5. (Accounts for energy lost into the calorimeter)
7. Solve for s of your material by using the final Q that you obtain in #6 (#5 + #6)., the ΔT from #4 and m from #1.
8. Repeat the calculations for your second material.

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Part C. Calculating Your Percent Error- Show all work in your report!

1. Look up the actual specific heat values for your samples in your textbook on page 70.
2. Determine your percent error using the following equation:

$$\frac{|\text{Your value} - \text{Accepted value}|}{\text{Accepted Value}} \times 100\ \%$$

   This means the absolute value
3. Give the % error for each sample; **make sure you show your work, in your report**.

Part D. Questions Involving Calorimetry

1. If the calorimeter had been made of a heat conducting (rather than insulating) material would the heat lost to the calorimeter (#6 of the calculations) have been higher or lower than the one you measured?
2. Explain your answer to Question #1
3. Why is it important to not splash in step 12 of the procedure?
4. If you had splashed some water out of the calorimeter in step 12 what would that have done to your answer?
5. What is one possible source of error in this lab. You can not use "human error" be more specific.
6. Explain in a few sentences what would happen to your calculations if the lab group before you had left the material in the sealed container and it was wet when you started. Be sure to include what numbers in your calculation would have been changed and how your answer would have been altered (higher or lower) and why.