

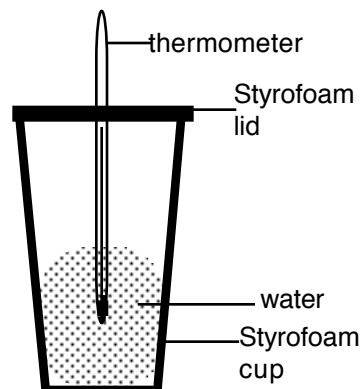
Calorimetry Lab

Name _____

A calorimeter is a device used to measure heat flow. It is a container with insulating walls, made so that essentially no heat is exchanged between the contents of the calorimeter and the surroundings. The purpose of this experiment is to determine the specific heat (*c*) of aluminum. This will be accomplished by heating the aluminum to a certain temperature, adding the aluminum to the water inside the calorimeter, and measuring the rise in water temperature.

Procedure

- Record the mass of about 12 aluminum pellets. Insert Al pellets into a large test tube, and place test tube in hot water bath. Heat for about 7 minutes.
- Add (and weigh) about 50 mL of water in the calorimeter cup. Record mass of water in data table. Assemble the calorimeter as shown, making sure the thermometer is submerged. Record the temperature of the water to the 0.1's place (initial temp)
- Take the test tube out of the hot water, and pour the metal into the water in the calorimeter. Be careful that no water adhering to the outside of the test tube runs into the calorimeter! Replace the calorimeter cover and agitate the water by shaking.
- Record the temperature of the water every 30 seconds until the temperature remains constant for two consecutive readings.



Date Table	Trial 1	Trial 2
mass of aluminum		
temp of aluminum	95.0 °C	95.0 °C
mass water		

time (min)	water temperature, °C	
	Trial 1	Trial 2
<i>initial T</i> 0		
0.5		
1.0		
1.5		
<i>final T</i> 2.0		

Calculations

- Using the equation $m \cdot c \cdot \Delta T = m \cdot c \cdot \Delta T$, calculate *c* for the aluminum for *trial 1* and then again for *trial 2*. (Use 4.184 J/g°C for the specific heat of water). For 1/2 point, don't forget units!!

Ans (trial 1) _____

Ans (trial 2) _____

Average _____

- What is the **actual value** for the specific heat of aluminum, as given to you by Mr. A? _____ J/g°C

- Calculate the percent error from your average specific heat.

$$\% \text{ error} = \frac{(\text{actual value} - \text{experimental value})}{\text{actual value}} \times 100$$

% error = _____

(questions on back side)...

Questions

1. Which component (the aluminum or water) experienced a greater change in temperature (ΔT)?
2. Give two possible explanations for your observations in question #1:

3. Consider each of the following potential error sources.

thinker
question!

Answer...

..."H" if it would have caused your experimental value for aluminum to come out too high,

..."L" if it would have caused it to come out too low, or

..."N" if it would have had no effect at all on your value

_____ You forgot to subtract the mass of the empty cup

_____ After weighing the aluminum pellets, a few of them unknowingly fell to the floor

_____ You measured the temperature using the Kelvin scale

_____ You used a metal can (which conducts heat away) instead of styrofoam (which insulates)

_____ You unknowingly used ethanol (specific heat = $2.452 \text{ J/g}^\circ\text{C}$) instead of water

_____ Someone drank some of your calorimeter water after you weighed it

_____ Instead of using water you used ethanol, and used ethanol's specific heat in the equation

Answer Bank (prob #3): IRO:

L L N N H H H