

Transfer of Heat in Liquids

Objective: To verify the conservation of heat energy, heat lost = heat gained.

Procedure:

1. Pick up the following :
 - Calorimeter
 - Graduated cylinder
 - Mass set
 - balance
2. Remove the inside can of the calorimeter. Find the mass using the balance. Change the mass to kilograms. Replace the inside can of the calorimeter.
Return balance and mass set.
3. Take the entire calorimeter and the graduated cylinder to the front of the room. I will pour approximately 100 ml of cold water into the calorimeter. Measure the exact volume of water. Then quickly pour it in the calorimeter and replace the top. Return to your seat and record the data from step 4.
4. Find the mass of the cold water as follows. Because one $\text{cm}^3 = 1 \text{ ml}$ of water and 1 ml has a mass of 1 g the volume is the mass in grams. Change the mass to kg and record.
5. After every one has the cold water you will take the calorimeter to where the water is being heated (front of the room)
6. When it is your turn to add the hot water do the following:
 - ***Find the initial temperature of the cold water and record.***
 - ***Using the graduated cylinder I will pour approximately 75 ml of hot water from the beaker of water being heated on the hot plate. I will use the beaker tongs because the beaker may be too hot to touch.***
 - ***Measure the actual volume. Remember you can easily change this volume to mass. Record as kg.***
 - ***Immediately pour the hot water into the calorimeter. Gently swirl the calorimeter to mix the water.***
 - ***I will give the initial temperature of the hot water. Record.***
7. ***Return the graduated cylinder***

8. Watch the thermometer in your calorimeter. When it stop moving record this as the experimental equilibrium temperature. This will happen in a very short period of time.
9. After you record the equilibrium temperature, **remove the inner can. Take it to the sink by my desk and pour out the water. Do not pour the water down the student desks. Assemble the calorimeter and return to were you found it**
10. Use the following equation to find the calculate equilibrium temperature.
$$m_w c_w (T_{ih} - T_e) = (m_w c_w + m_{Al} c_{Al}) (T_e - T_{ic})$$
 m_{Al} is the mass of the inside can of the calorimeter.
11. Calculate the percent error $\frac{\text{Experimental } T_e - \text{Calculated } T_e}{\text{Calculated } T_e} * 100$
12. Do lab report. Set up like other reports.