Calorimetry Specific Heat Capacity of Solids

Abbreviated Report

Object: To determine the **specific heat capacity** of various solids, and compare the experimental values found with published mean values.

Apparatus: Heating beaker, thermocouple temperature measuring device (TMD), metal samples, lagged calorimeters.

Procedure:

1. Determine the mass of the solid specimen (m_1).
2. Weigh the copper calorimeter inner can and determine its mass (m_2).
3. Add approximately 75ml of water to the calorimeter and then re-weigh it to find the combined mass of the calorimeter and water (m_3).
4. Replace the calorimeter in its lagged outer can and allow it to stand until the water and can temperature equalise. Measure the water temperature (t_1).
5. Record the values for m_1, m_2, m_3, and t_1.
6. Partly fill the heating beaker with water and then place the specimen in the water. Heat the beaker until the water has boiled for approximately five minutes. Assume that the specimen temperature (t_2) is the same.
7. Rapidly transfer the specimen to the calorimeter and carefully monitor the temperature of the water until it reaches its highest temperature (t_f).

Results:

Complete the appropriate result sheet for the experiment, and include in your results sample calculations of how the specific heat capacity ($C_{specimen}$) was determined for the specimen that you tested.

Show calculated values of the specific heat capacity only for the samples tested by other groups.

Determine differences between the experimental values found and published average values for the specimens tested.

Theory and Calculations:

Water mass,

$$m_w = (m_3 - m_2)$$

Heat lost by specimen = Heat gained by water and calorimeter

$$m_1 c_{specimen}(t_2 - t_f) = m_w c_{p,water}(t_f - t_1) + m_2 c_{p,\,copper}(t_f - t_1)$$

Use the tables in your textbook to find specific heats for water and copper

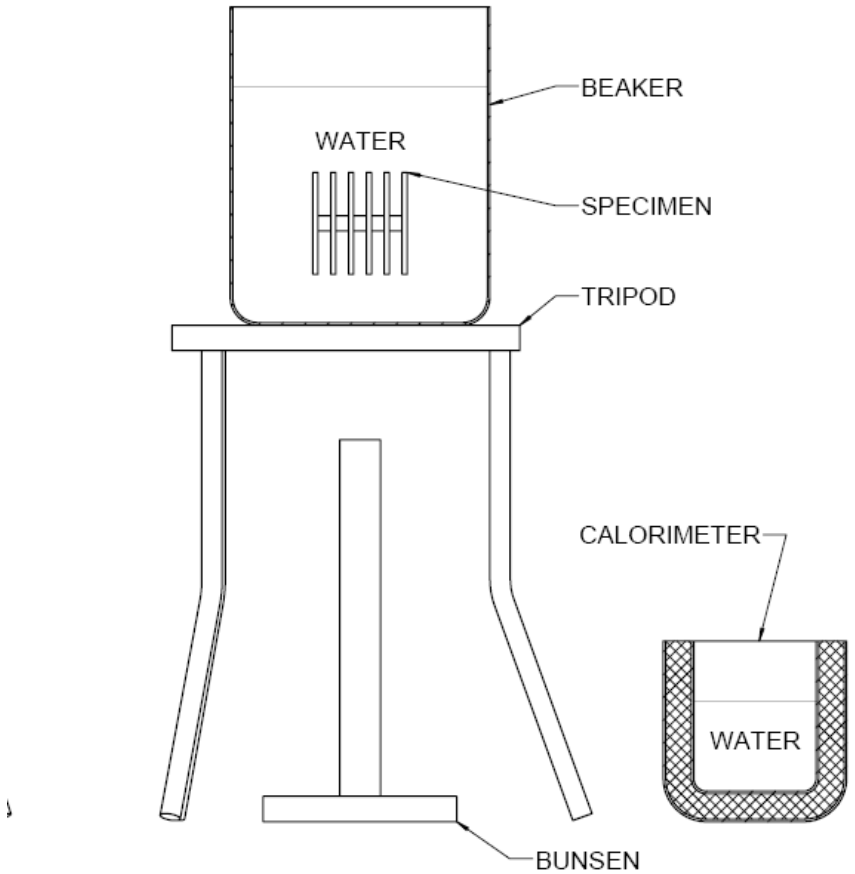
Comments:

In this section, comment on the success or otherwise of the experiment.

Use the following leading questions as a guide:

1. What was the percentage variation found between experimental and accepted values?
2. What caused any variations, and how could they be minimised?

Experiment Setup:



Results

	Stainless steel	Copper	Brass	Aluminium
$m_{specimen}$ (m_1)				
$m_{calorimeter}$ (m_2)				
$m_{water} + m_{calorimeter}$ (m_3)				
m_{water} (m_w)				
T_{water}, $T_{calorimeter}$ Initial (t_1)				
$T_{specimen}$ Initial (t_2)	100°C	100°C	100°C	100°C
T_{water}, $T_{calorimeter}$, $T_{specimen}$ Final (t_f)				

Comparative results

	Experimental c	Published c	Error	Error %
Stainless steel				
Copper				
Brass				
Aluminium				