

Intermediate Laboratory: Homework 5

Due: 7 March 2024

1 Taylor, *Error Analysis*, 2nd ed., 6.2, page 170.

2 Specific heat

In the experiment to determine the heat capacity of water the total heat capacity, C_{tot} , is plotted against the mass of water m_w . A trend line is fitted to the data giving

$$C_{\text{tot}} = am_w + b$$

where $a = 4.0 \pm 0.4 \text{ J/gK}$ and $b = 58 \text{ J/K}$. Suppose that there is a data point for which $m_w = 145 \text{ g}$ and $C_{\text{tot}} = 750 \text{ J/K}$

- According to the trend line data what would the expected value of C_{tot} be when $m_w = 145 \text{ g}$? What would the uncertainty in C_{tot} be?
- Should the data point be rejected according to Chauvenet's criterion? Note that there is effectively only one measurement at this point.

3 Taylor, *Error Analysis*, 2nd ed., 6.6, page 171.

4 Taylor, *Error Analysis*, 2nd ed., 7.1, page 178.

5 Taylor, *Error Analysis*, 2nd ed., 7.4, page 178.

6 Specific heat capacity of water

Four lab groups obtained the following results in an experiment to measure the specific heat capacity of water.

Group	Specific heat capacity in J/gK
1	4.1 ± 0.2
2	4.0 ± 0.4
3	3.9 ± 0.8
4	3.9 ± 0.7

Determine the weighted average and uncertainty for the specific heat capacity of water using all of this data.