To Determine a Celsius Value for Absolute Zero

Date

Equipment and procedure exactly as per the lab manual.

T / °C ± 1 °C	Syringe V / ml ± 1 ml	Total V / ml ± 3 ml
29	19	344
32	23	348
35	27	352
40	32	357
43	36	361
47	40	365
50	43	368
55	47	372

Volume of water in flask + tube = 325 ml ↑
Some drops were left inside estimated at 2 ml. Uncertainty in Total V = 1ml + 2ml ↑

The graph may have a gentle curve and the point at 55°C may be ~~and~~ anomalous but these can be investigated later.

Best fit gradient = $\frac{370.5 - 342.5}{52.5 - 27.5}$

$1\ ml = 1\ cm^3$ $= 1.12\ cm^3\ °C^{-1}$

Best fit calculation cont.

Taking point (27.5, 342.5):

$$342.5 = (1.12 \times 27.5) + c$$

$$\Rightarrow c = 311.7 \text{ cm}^3$$

When $V = 0$, $0 = 1.12T + 311.7$

$$\Rightarrow T = -\frac{311.7}{1.12} = \underline{\underline{-278\,^\circ\text{C}}}$$

$$\pm 18\,^\circ\text{C}$$

'Worst' best fit line:

$$\text{Gradient} = \frac{371.5 - 342.5}{57.5 - 30.0} = 1.055 \text{ cm}^3\,^\circ\text{C}^{-1}$$

Taking point (30, 342.5):

$$342.5 = (1.055 \times 30.0) + c$$

$$\Rightarrow c = 310.9 \text{ cm}^3$$

When $V = 0$, $0 = (1.055 \times T) + 310.9$

$$\Rightarrow T = \underline{\underline{-296\,^\circ\text{C}}} \quad (\pm$$

The best fit value for absolute zero is $\frac{278 - 273}{273} \times 100\% = 1.8\%$ away from the expected value and well within experimental uncertainty.