University of Delaware
Interdisciplinary Science Learning Laboratories (ISLL)

SCEN 101: Lab Overview
Lab 05. Goldilocks Zone

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Section: 012
Office Hours: Wed, 3:00 pm - 5:00 pm (ISE 314)

Objective(s):

- Experiment with three different ratios of hot- and cold- water mixtures.
- Practice computing the final temperature of mixtures. Weighted averages.
- Verify the **conservation of heat energy**.

- *Explore conservation of heat energy in everyday life.*
- *Possibilities for R&E.*
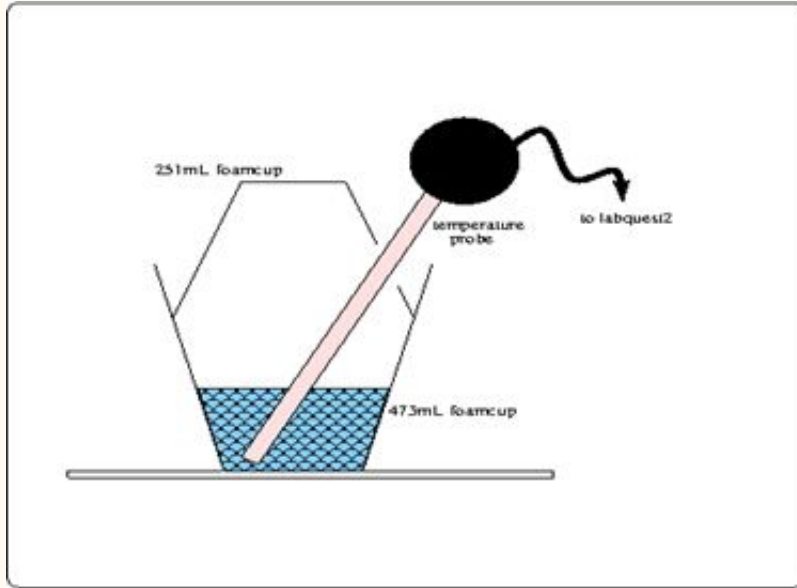
Experimentation setup

Figure 1. Cup filled with water and Vernier Wide-Range Temperature Probe (*experiment setup*)(left), insulated metal cup (575 mL) for hot liquids (middle), and insulated plastic cup (485 mL) for cold/cool liquids (right).

Save <u>1 photo</u> of experiment setup showing all materials

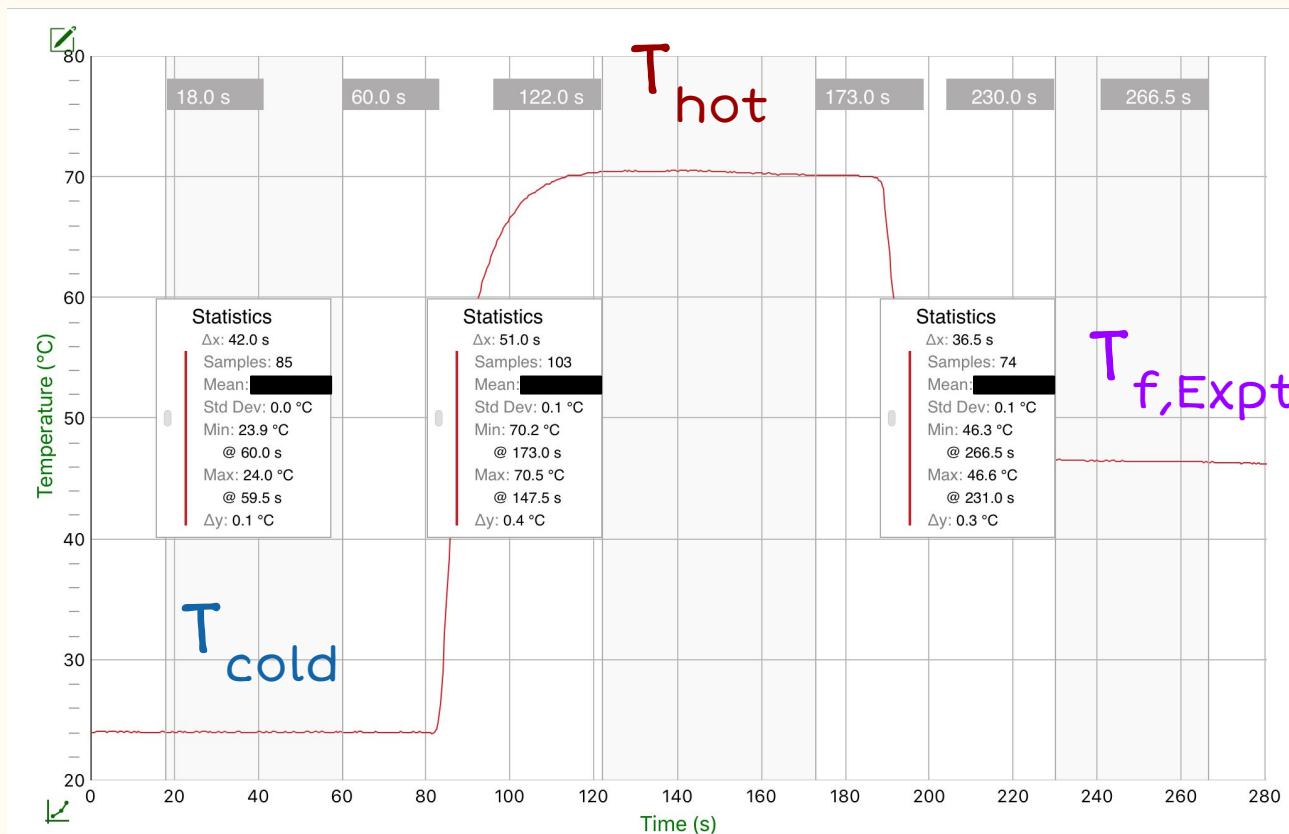**Save 3 graphs (one per trial) from Graphical!**

Figure 2. Temperature vs. Time, $m_c \approx m_h$ (Trial 1)

Table 5.1. Data for hot- and cold-water mixtures: measurements and calculations

$m_{c,cup}$ =	g	$m_{h,cup}$ =	g				Measured	Calculated	
Trial	$m_{c,cup}+m_{cold}$ (g)	$m_{h,cup}+m_{hot}$ (g)	m_{cold} (g)	m_{hot} (g)	T_{cold} (°C)	T_{hot} (°C)	$T_{f,Expt.}$ (°C)	$T_{f,Theor.}$ (°C)	% difference between $T_{f,Expt.}$ and $T_{f,Theor.}$
1 $m_c \approx m_h$									
2 $m_c > m_h$									
3 $m_c < m_h$									
								Average % difference between $T_{f,Expt.}$ and $T_{f,Theor.}$:	

CREATE YOUR OWN DATA SPREADSHEET!

$$(\text{Total } Q_{lost}) + (\text{Total } Q_{gained}) = 0$$

$$m_h c_w \Delta T + m_c c_w \Delta T = 0$$

$$m_h c_w (T_f - T_h) + m_c c_w (T_f - T_c) = 0$$
$$\downarrow$$
$$T_f = ???$$

$$\% \text{ Difference} = \left| \frac{\text{Value}_1 - \text{Value}_2}{\left(\dfrac{\text{Value}_1 + \text{Value}_2}{2}\right)} \right| \times 100\%$$

Lab Safety Reminder

You must use gloves when measuring, transporting, and experimenting with hot liquids!

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Deliverables

1. Photo 1. Experiment setup…   *name accordingly*
2. Figure 1. Temperature vs. Time, $m_c \approx m_h$ (Trial 1)
3. Figure 2. Temperature vs. Time, $m_c > m_h$ (Trial 2)
4. Figure 3. Temperature vs. Time, $m_c < m_h$ (Trial 3)
5. Completed Tables 5.1, with final numbers
6. Calculations, showing formulas used and all work

*The labels for visuals are examples, be sure to be more descriptive AND include <u>appropriate selections</u> within each graph.

ANY QUESTIONS?