Name(s) of the student(s):

Grading:	
Part A:	/ 1
Part B:	/ 10
Part C:	/ 10
TOTAL:	**/ 21**

Lab on thermodynamics

Part A: Theoretical temperature of a mix of hot and cold water.

The general formula for the first law of thermodynamics combined with conservation of energy is:

$E_{final} = E_{initial} + Q + W$ *The final energy is the initial energy plus the energy that is added through heat or work*

E_{final}: Sum of all energies at the end

$E_{initial}$: Sum of all energies at the beginning

Q: Energy added through heat (a negative value if energy is leaving the system through heat)

W: Energy added through work (a negative value if energy is leaving the system through work)

Apply this formula to the situation of mixing a batch of cold water with a batch of hot water. Assume no energy is added or removed through external heat or work and that the only form of energy that changes is the thermal energy (E_{th}=mcT).

Prepare a formula (no numbers) that gives the final temperature (T_f) as a function of:

T_h: The temperature of the hot water

T_c: The temperature of the cold water

m_h: The mass of the hot water

m_c: The mass of the cold water

c: The specific heat capacity of water

Write the result here:

$T_f =$

[1 pt]

(Call your teacher over to verify your answer before continuing)

Name(s) of the student(s):

Part B: Predict the temperature of a mix of hot and cold water

1. Take a sample of cold water (about 400 mL). Measure its mass (without the container) and temperature. Convert the temperature to Kelvin. (Fill in the table below)

2. Take a sample of hot water (about 200 mL). Measure its mass (without the container) and temperature. Convert the temperature to Kelvin. (Fill in the table below)

3. Use the formula you developed in part A to predict the temperature of the mix.

   (Show your work here)

Predicted temperature =

[1 pt]

4. Mix the two samples and measure the resulting temperature.

	Cold water	Hot water	Mix
Mass [kg]			
Temperature [°C]			
Temperature [K]			

[9 pt]

(Call your teacher over to verify your answer before continuing)

Name(s) of the student(s):

Part C: Create a water mix at a predefined temperature.

1. Choose a temperature that you want to obtain. The temperature should be between the cold and hot water temperature (why?) and be different from the temperature of the mix obtained in B.

Target temperature =

2. Modify your formula from part A to calculate the mass of hot water needed as a function of all the other parameters.

(Show your work here)

$m_h =$

[1 pt]

3. Take a sample of cold water (about 200 mL). Measure its mass (without the container) and temperature. Convert the temperature to Kelvin. (Fill in the table below)

4. Use the above formula to calculate the amount of hot water needed. Take that amount of hot water, mix it with the cold one and write the results in the table below.

(Show your work here)

	Cold water	Hot water	Mix
Mass [kg]			
Temperature [°C]			
Temperature [K]			

[9 pt]

(Call your teacher over to verify your answer before leaving)