Brady Kondek **6.04 Thermal Energy Lab**

Data Table (create your own based on the trial information)

Trial	Cold Water Capacity (mL)	Cold Temperature (°C)	Warm Water Capacity (mL)	Warm Temperature (°C)	Mixed Temperature (°C)
Trial 1	**250**	**20**	**250**	**98**	**56**
Trial 2	**200**	**20**	**400**	**98**	**72**
Trial 3	**300**	**15**	**150**	**90**	**41**

More Data:

Trial	Mass (kg)	Change in Cold Temperature (°C)	Change in Warm Temperature (°C)
Trial 1	**0.50**	**36**	**42**
Trial 2	**0.22**	**52**	**26**
Trial 3	**0.32**	**26**	**49**

Questions

1. Calculate the heat gained, Q, by the cold water for **each trial**. Show your work.

Trial 1 –

$m = 0.50\ kg$

$c = 4186\ J/(kg\ °C)$

$\Delta T = 36\ ℃$

$Q = mc\Delta T$

$Q = (0.50)(4186)(36) = 75348\ J$

$\boldsymbol{Q = 7.5\ E4\ J}$

Trial 2 –

$m = 0.22\ kg$

$c = 4186\ J/(kg\ °C)$

$\Delta T = 52\ ℃$

$Q = mc\Delta T$

$Q = (0.22)(4186)(52) = 47887.84\ J$

$\boldsymbol{Q = 4.8\ E4\ J}$

Trial 3 –

$m = 0.32\ kg$

$c = 4186\ J/(kg\ °C)$

$\Delta T = 26\ ℃$

$Q = mc\Delta T$

$Q = (0.32)(4186)(26) = 34827.52\ J$

$\boldsymbol{Q = 3.5\ E4\ J}$

2. Calculate the heat lost, Q, of the hot water for **each trial**. Show your work.

Trial 1 –

$m = 0.50\ kg$

$c = 4186\ J/(kg\ °C)$

$\Delta T = 42\ ℃$

$Q = mc\Delta T$

$Q = (0.50)(4186)(42) = 87906\ J$

$\boldsymbol{Q = 8.8\ E4\ J}$

Trial 2 –

$m = 0.22\ kg$

$c = 4186\ J/(kg\ °C)$

$\Delta T = 26\ ℃$

$Q = mc\Delta T$

$Q = (0.22)(4186)(26) = 23943.92\ J$

$\boldsymbol{Q = 2.4\ E4\ J}$

Trial 3 –

$m = 0.32\ kg$

$c = 4186\ J/(kg\ °C)$

$\Delta T = 49\ ℃$

$Q = mc\Delta T$

$Q = (0.32)(4186)(49) = 65636.48\ J$

$\boldsymbol{Q = 6.6\ E4\ J}$

3. Compare the values for temperature changes and heat gain and heat loss in the previous questions for **each trial**.

    a. Describe what you notice.

    After comparing this values as seen in the previous questions above for each trial, I noticed that the total lost heat of the warmer water and the total gained heat of the colder water do not match each other.

    b. Why do you think this occurred?

    This could have occurred due to an error in measuring/reporting, such as inaccurate recording of the right measurement or the student may have let some heat escape in their trials.

4. **In an isolated system, the total heat given off by warmer substances equals the total heat energy gained by cooler substances. Now look at your answer to question 3. What might have caused the difference you have reported? (Even though this data was provided to you, think of the errors the student could have encountered when collecting the data.)**

    With this in mind, it could be possible that the difference could have been caused by the student letting some of the heat escape, or perhaps as well there could have been an error when the student was recording the data and displaying the correct measurements. Simple things like this can lead to systematic issues, which can end up with results like this.

5. **Write a complete conclusion for this activity.**

    The purpose of this lab was to help provide a hands-on approach to analyzing the heat gained/lost and other components that affect it such as mass, the temperature, etc. From doing this lab, the main thing I learned is how to calculate how much heat is either gained or lost from a substance, given the mass, change in temperature, and heat capacity. This gave me the opportunity to work with those things instead of just simply reading about it. Some errors that may have occurred while collecting raw data include letting some of the heat escape during the trials, and also a mistake in the way the data was recorded (error in recording it 100% correctly). Overall, this lab helped to reinforce the concept of the interaction of heat with other elements/substances.