: **SAMPLE INFORMAL LAB REPORT FROM CHEMISTRY 31**

Title: Determination of Heat Capacity

Introduction:

The purpose of this experiment was to determine the heat capacity of an adiabatic calorimeter. An adiabatic calorimeter is an apparatus used to measure heat changes for experiments done at constant pressure. Heat capacity is the amount of heat required to raise the heat of a system one degree Centigrade. To determine the heat capacity of the calorimeter, a solution of hydrochloric acid was standardized and the temperature change from the reaction between the acid and a base (NaOH) in the calorimeter was observed. This temperature change was then related to the energy that evolved.

Experimental Procedure:

1. Set up the calorimeter, CAREFULLY. Make sure you weigh the 100mL beaker.
2. Standardize the HCI solution with the 1 M NaOH solution obtained from the stockroom. Add the phenolphthalein indicator to the diluted HCI solution and titrate to the end point with the NaOH solution.
3. Do three trials.
4. Calibrate the calorimeter by adding 25mL NaOH into a 100mL beaker and take the temperature every thirty seconds until it remains constant for a minute and a half.
5. Run 25mL of the standardized HCI solution into the beaker with the NaOH solution. Take the temperature every 30 seconds for ten minutes.
6. After the ten minutes, weigh the beaker and its contents.
7. Do three trials.

Data and Calculations:

Data

Standardization of HCI

	Trial 1	Trial 2	Trial 3
Volume HCI (mL)	25	25	25
Volume NaOH (mL)	31.3	31.2	31.0
Molarity ofNaOH (M NaOH)	.9484	.9484	.9484

Heat of Reaction

	Trial 1	Trial 2	Trial 3
Volume NaOH (mL)	25	25	25
Volume HCI (mL)	25	25	25
Wt of mixture (g)	48.2785	34.3444	51.0721
Temp change (degrees Celsius) [highest temp-initial temp]	4.6	4.9	4.3

Calculations

	Trial 1	Trial 2	Trial 3
Molarity of HCI (M) [(M NaOH*L NaOH)* (lmol HCI/lmol NaOH)]/L HCI	1.1874 [(.9484 MNaOH*.031L NaOH)*(lmol HClIl mol *N~OH)]/.025L* HCl	1.1836	1.176
Average Molarity HCI	1.18233 MHCI		
Mol ofvvater formed [M NaOH*L NaOH]	.02371 (.9484 mol NaOH*.025 L NaOH)	.02371	.02371
Heat of reaction, qr (J) [(heat reaction/l mol water)(lOOOJ/lkJ)(# mol water)	-1325.389 *(-55.9kJ/mol* water)(1000J/lkJ)(.237l mol water)	- 1325.389	- 1325.389

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Heat capacity of Calorimeter (J/deg C) (-Qr-[(M)(4.184J/g deg C)(change T)])/change T	86.13 (1325.389-[(48.2785)(4. 184X4.6)])/4.6	126.79	94.75

Average Heat Capacity of Calorimeter: **102.56 J/degrees C**

Results and Discussion:

After doing the necessary calculations, we found the average heat capacity of our calorimeter to be 102.56 J/degrees C. This number is a high number compared to the numbers that many of my classmates got (most were in the 80s). The higher the number, the better the calorimeter, so our high number could mean that our calorimeter was working really welL. Seeing as how the three different heat capacities for each of the trials were all pretty different from each other, and those numbers were used to find the average heat capacity, I think that we got such a high number from some sort of experimental error rather than an excellent functioning calorimeter. This experimental error was most likely caused by incorrectly measuring either the acid or the base or both, resulting in very different weights of the mixtures after each trial. The differences between the weights resulted in the differences between heat capacities after all the calculations were done. The second trial is at least 20 J/degrees C higher than the other two trials (126.79 versus 86.13 and 94.65), leading me to believe that there were definitely some incorrect measurements made during that trial. The weight of the mixture for the second trial was also much less than for the other two trials (34.3444 g versus 48.2785 g and 51.0721 g), which could mean that not enough of both the acid and the base were measured for the reaction during this trial. When I calculated the moles of water formed from the reaction, I used the molarity of NaOH instead of HCI because the base was the limiting reagent in the reaction (i.e. all of the base reacted with the acid, leaving left over acid not left over base).