

Chemistry
Dr. Vanderveen

This is a real student lab! It has been edited, and some of the original text has been omitted. It's not perfect, but it is a good example of how a lab report should look. Comments and notes for each section appear in the text boxes.

Patty Prettygood
4/7/17

Lab Report: Additivity of Heats of Reaction (Hess' Law)

Introduction: Hess' Law states that... In this experiment, experimental evidence for the additivity of heats of reaction was collected. Enthalpy is... The hypothesis is that, if a simple calorimeter is constructed, then the overall amount of heat energy released or absorbed (enthalpy changes) can be determined for three separate reactions.

Do NOT use personal pronouns (I, we, etc.) in lab reports—especially in the introduction, procedure and conclusion

If you were provided with specific requirements for the introduction, be certain to address all of those terms/concepts. Use correct grammar and spelling throughout the entire report—proofread before submitting!

Group Members:

Project Manager: Patty Prettygood
Quality Control Manager: Arthur Average
Materials Manager: Oliver Okay

Include full, correctly spelled names and the roles of each group member.

Materials:

List ALL of the materials and chemicals you used. Be sure to include solution concentrations and any changes from the handout.

Graduated cylinder	Thermometer	NaOH pellets
Plastic foam cup	Beaker	1.0M HCl
Tongs or forceps	Stirring rod	0.5M HCl
Balance	Weighing paper	1.0 M NaCl

Procedure:

- 1.) 100. ml of tap water was measured into a graduated cylinder and poured into a plastic foam cup. This was recorded to the nearest 0.01g .
- 2.) Approximately 2 g of NaOH pellets were weighed and the mass was recorded to the nearest 0.01g.
- 3.) The temperature of the water was then measured. This was recorded to the nearest 0.1 degree.
- 4.) NaOH pellets were added to the water and the solution's temperature was monitored using a thermometer. The solution was dissolved faster with the use of a stirring rod. Finally the highest solution temperature reached was recorded.
- 5.) The solution was then placed into a waste container and the materials were rinsed out.

Note the good use of passive voice in this writeup of the procedure. Don't just copy the lab handout; instead, report (using your own words) on what you actually did in the experiment, including any changes from the handout.

Data Table:

Make sure you put your data—including all measured quantities and derived quantities—in a TABLE!

Original temp. of water (T_1)	22.7°C
Final temp. of solution (T_2)	27.6°C
Temp. change ($T_2 - T_1 = \Delta T$)	5.7°C
Mass of 100ml of water	100.0g
Heat evolved by reaction Q_1 ($Q = mc\Delta T$)	2100 J
Mass of NaOH(s)	1.999g
Moles of NaOH	.05460 mol
ΔH_1 Energy per mole of NaOH ($Q_1 / \text{moles NaOH}$)	39000 J/mol

Correctly report measurements and calculations with the appropriate number of sig figs. No “naked” numbers (give units). Include relevant formulas and show one sample calculation of each type. Graphs need titles and axis labels.

Sample Calculation:

$$Q = mc\Delta T = (100.0 \text{ g})(4.18 \text{ J/g } ^\circ\text{C})(5.7^\circ\text{C}) = 2100 \text{ J}$$

Analyze and Apply Questions

- 1.) The third reaction seems to have the highest enthalpy change while the second reaction's enthalpy change was the smallest.
- 2.) The value of the H_3 was about three times as much as the H_1 solution combined with the H_2 solution.
- 3.) There was a 2.5% error in this experiment.
- 4.) There were definitely experimental errors in running this experiment. This most likely came as a result of working with an open cup, which resulted in....Because Q was smaller, ...
- 5.) If the mass in reaction 1 were doubled, then the number of joules released would most likely The Q_1 would also ..., and the enthalpy change per mol would

Make your answers as complete, correct, and as thorough as possible. Use complete sentences and answer all of the questions. This is your main opportunity to demonstrate your knowledge of the material. When solving problems, give relevant formulas and show all work (which this student did not). It is OK to hand-write in any calculations. Pay attention to significant figures and units in your calculations

Conclusion:

The results of this experiment are consistent with Hess' Law. It is possible to determine the amount of heat energy released from the three different reactions studied.

In this experiment, the enthalpy for the overall reaction (Reaction 3) ...was only slightly larger than the sum of the enthalpies for reactions 1 and 2, ..., with a 2.5% error. The data support this because...The main sources of error in this lab involved heat loss...If heat were lost to the environment, the ΔT for the trial would be too large, causing $\Delta H / \text{mol}$ for the trial... This experiment could be improved by ...

Include the following in your conclusion: Restate your main results. Discuss sources of error in your experiment. Specifically describe the effect of this particular error on your data—too big? Too small? Discuss ways to improve the procedure and data. This conclusion has been edited, and some information has been deliberately left out.

Works Cited

“Using Hess' Law.” *Higher Bitesize Chemistry*. Accessed 7 April 2005. <
http://www.bbc.co.uk/bitesize/higher/chemistry/calculations_3/hess/revision/1/>

Include relevant sources used. Use appropriate formatting. It is acceptable to write “No sources cited” if you did not use any outside references to write your report.