

Experiment 6 – Thermochemistry

Name Kyle Patrick Strickenberger

Lab Section

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Results and Discussion



Figure 1. Graphical representation of the change in temperature of a reaction occurring between $\text{NaOH}_{(s)}$ and $\text{H}_2\text{O}_{(l)}$ with linear regression lines used to extrapolate T_{initial} ($22.5\text{ }^\circ\text{C}$) and T_{final} ($26.4\text{ }^\circ\text{C}$) to calculate the $\Delta H_{\text{reaction}}$ (-17.1 kJ/mole)



Figure 2. Graphical representation of the change in temperature of a reaction occurring between $\text{NaOH}_{(aq)}$ and $\text{HCl}_{(aq)}$ with linear regression lines used to extrapolate T_{initial} (22.8 °C) and T_{final} (23.1 °C) to calculate the $\Delta H_{\text{reaction}}$ (-2.54 kJ/mole)



Figure 3. Graphical representation of the change in temperature of a reaction occurring between $\text{NaOH}_{(s)}$ and $\text{HCl}_{(aq)}$ with linear regression lines used to extrapolate T_{initial} (21.9 °C) and T_{final} (32.6 °C) to calculate the $\Delta H_{\text{reaction}}$ (-96.0 kJ/mole)

Table 1. Calculated Temperature, Heat, Moles, and Enthalpy Values for Three Reactions

| | Reaction #1 | Reaction #2 | Reaction #3 |
|--|--|--|---|
| | $\text{NaOH}_{(s)} \rightarrow \text{NaOH}_{(aq)}$ | $\text{NaOH}_{(aq)} + \text{HCl}_{(aq)} \rightarrow \text{NaCl}_{(aq)} + \text{H}_2\text{O}_{(l)}$ | $\text{NaOH}_{(s)} + \text{HCl}_{(aq)} \rightarrow \text{NaCl}_{(aq)} + \text{H}_2\text{O}_{(l)}$ |
| Mass of Solution (g) | 52.0 | 100.0 | 101.9 |
| Initial Temperature (°C) | 22.5 | 22.8 | 21.9 |
| Final Temperature (°C) | 26.4 | 23.1 | 32.6 |
| Change of Temperature (°C) | 3.9 | 0.3 | 10.7 |
| q_{solution} (J) | 791 | 120 | 4360 |
| $q_{\text{calorimeter}}$ (J) | 70 | 5 | 196 |
| q_{reaction} (J) | -861 | -125 | -4556 |
| Moles of NaOH (mole) | 5.035×10^{-2} | 5.0×10^{-2} | 4.625×10^{-2} |
| $\Delta H_{\text{reaction}}$ (kJ/mole) | -17.1 | -2.5 | -99 |
| $\Delta H^{\circ}_{\text{reaction}}$ (kJ/mole) | -44.5 | -55.83 | -100.33 |
| Percent Error | 61.6% | 95.6% | 1.3% |

