Enthalpy of Neutralization

Name: ___________________________________  Section: __________

Partner: _________________________________

Date: ______________

Purpose (goal of the experiment):

DATA

Solutions Concentrations:  NaOH ________  HCl _________  H₃PO₄ __________

1. Determining the Calorimeter Constant

    Trial 1  Trial 2

Initial cold water temperature:  ________ °C  ________ °C

Initial hot water temperature:  ________ °C  ________ °C

Final temperature (from temperature – time graph):  ________ °C  ________ °C

ΔT_C  ________ K  ________ K

ΔT_H  ________ K  ________ K

C_cal  ________ J/K  ________ J/K

Average C_cal  ________ J/K

Show calculations for one trial and attach the temperature – time graphs:
2. Enthalpy of Neutralization HCl - NaOH

<table>
<thead>
<tr>
<th>Trial 1</th>
<th>Trial 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial temperature:</td>
<td>_______ °C</td>
</tr>
<tr>
<td>Final temperature (from temperature – time graph):</td>
<td>_______ °C</td>
</tr>
<tr>
<td>ΔT</td>
<td>_______ K</td>
</tr>
<tr>
<td>q = − (q₁ + q₂)</td>
<td>_______ J</td>
</tr>
<tr>
<td>ΔH</td>
<td>_______ kJ/mol</td>
</tr>
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Average ΔH | _______ kJ/mol |

Theoretical ΔH (from prelab) | _______ kJ/mol |

Show calculations for one trial and attach the temperature – time graphs:

q₁
q₂
n
ΔH

3. Enthalpy of Neutralization H₃PO₄ - NaOH

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Average ΔH | _______ kJ/mol |

Theoretical ΔH (from prelab) | _______ kJ/mol |

Show calculations for one trial and attach the temperature – time graphs:

q₁
q₂
n
ΔH
**Post Lab Questions**

1. Suppose that at the end of the experiment it was discovered that the thermometer had not been calibrated. When it was calibrated, it was found that thermometer read 0.50 °C low. What effect would this thermometer reading have on the experimental $\Delta H$ values calculated above? Explain your answer.

2. How do the experimental $\Delta H$ values agree with theoretical values? Calculate percent errors (show calculations) to support your answer.

3. What are the largest sources of error in the experiment (mention at least two). Explain your answer.

4. The experimental procedure requires that you wash your thermometer and dry it after measuring the temperature of the NaOH solution and before measuring the temperature of the HCl solution. Explain why.