1. WRITE OUT THE REACTIONS AND OBSERVED ENTHALPY VALES

(q/mol LIMITING REACTANT) FOR REACTION 1 AND REACTION 3

Reaction 1:

HCl(aq) + NaOH(aq) 🡪 NaCl(aq) + H2O(l) H: -56,902

Reaction 3:

NaOH(s) **–**H2O🡪 NaOH(aq) H: -40,428

1. COMBINE THESE TWO REACTIONS (USE HESS’S LAW) TO OBTAIN REACTION 4. COMBINE THE OBSERVED ENTHALPY VALUES IN THE SAME MANNER TO OBTAIN A CALCULATED VALUE FOR THE ENTHALPY OF REACTION 4

HCl(aq) + NaOH(aq) 🡪 NaCl(aq) + H2O(l) H: -56,902

+ NaOH(s) **–**H2O🡪 NaOH(aq) H: -40,428

HCl(aq)+ NaOH(s)+ ~~NaOH~~~~(aq)~~ 🡪 NaCl(aq)+ H2O(l)+ ~~NaOH~~~~(aq)~~~~~~

HCl(aq)+ NaOH(s)+ 🡪 NaCl(aq)+ H2O(l) H: -97,330

1. WHAT WAS THE ACTUAL ENTHALPY VALUE OBSERVED FOR

REACTION 4? HOW WELL DOES THE CALCULATED ENTHALPY VALUE OF REACTION 4 AGREE WITH THE OBSERVED VALUE? EXPLAIN.

Observed Enthalpy Rxn 4 : -95,551

Calculated Enthalpy Rxn 4 : -97,330

They are very close. Many factors could have

caused the values to not be exact. Since the enthalpy value is the heat that is released, my T from the reactions could have been a result to the enthalpy values not coinciding with each other. This could have happened from the lid not being sealed tightly to the Styrofoam cup. Causing heat to be released in the surrounding and therefore not recording a precise temperature. Still this is extremely close and accurate.

1. HOW WELL DOES THE OBSERVED ENTHALPY VALUE OF

REACTION 1 AGREE WITH THE LITERATURE VALUE?

Observed Enthalpy Rxn 1 : -56,902

Literature Enthalpy Rxn1 : -57,300

<http://www.scribd.com/doc/60696670/Thermochemistry-Heat-of-Neutralization>

They are fairly close. T could have been altered

because of the lid on the Styrofoam cup not being

closed tightly. Or from the temperature probe

touching the actually cup, instead it could have been submerged in the solution but not touching the bottom or sides of the cup.

1. WRITE THE FULL AND NET IONIC EQUATIONS FOR REACTION 1

AND REACTION 2.

Reaction 1:

ME: HCl(aq) + NaOH(aq) 🡪 NaCl(aq) + H2O(l)

IE: H+(aq)+ ~~Cl~~~~-~~~~(aq)~~+ ~~Na~~~~+~~~~(aq)~~+ OH-(aq) 🡪 ~~Na~~~~+~~~~(aq)~~+ ~~Cl~~~~-~~~~(aq)~~+ H2O(l)

NI: H+(aq)+ OH-(aq) 🡪 H2O(l)

Reaction 2:

ME: CH3COOH(aq) + NaOH(aq) 🡪 CH3COONa(aq) + H20(l)

IE: CH3COO+(aq) + H-(aq) ~~Na~~~~+~~~~(aq~~) + OH-(aq) 🡪 CH3COO+(aq) + ~~Na~~~~-~~~~(aq~~) + H20(l)

NI: CH3COOH(aq) + OH-(aq) 🡪 CH3COO-(aq) + H2O(l)

1. COMBINE THE NET IONIC EQUATIONS OF REACTION 1 AND

REACTION 2 TO GIVE THE EQUATION FOR THE IONIZATION OF ACETIC ACID (CH3COOH)

H+(aq)+ OH-(aq) 🡪 H2O(l)

+ CH3COOH(aq) + OH-(aq) 🡪 CH3COO-(aq) + H2O(l)

H+(aq) + CH3COOH(aq) + OH-(aq) + OH-(aq) 🡪 CH3COO-(aq) + H2O(l) + H2O(l)

CH3COOH(aq) + H2O(l) 🡪 CH3COO(aq) + H3O(aq)

1. USE YOUR ENTHALPY VALUES FOR REACTION 1 AND REACTION 2

TO CALCULATE THE ENTHALPY OF IONIZATION OF ACETIC ACID

Rxn 1 H: -56,902

Rxn 2 H: -51,044

Ionization CH3COOH : H -107,946

1. HOW WELL DOES THE CALCULATED ENTHALPY OF IONIZATION OF

ACETIC ACID AGRREE WITH THE LITERATURE VALUE?

Calculated: H -107,946

Literature: H -112,750

[Textbook of Physical Chemistry - Page 221 - Google Books Result](http://books.google.com/books?id=wyP_V3X8YOIC&pg=PA221&lpg=PA221&dq=enthalpy+of+ionization+of+ch3cooh&source=bl&ots=7x0mY_6S8_&sig=E-2bHRgfKztDg491TIbnsqvSzfc&hl=en&sa=X&ei=gQ1JUaqNH5TU9AT_7ICoDg&ved=0CDsQ6AEwAQ)

books.google.com/books?isbn=0852260202

They are very similar to each other. Again many factors could have affected this to be slightly off. The lid may have not been sealed tightly. During the transfer of solutions, the lid was probably opened for too long allowing the temperature of the surroundings to affect the temperature of the readings recorded

1. COMMENT ON THE AGREEMENT OF OBSERVED ENTHALPY OF

SOLUTION OF NaOH WITH THE LITERATURE VALUE.

Observed Enthalpy: H -40,428

Literature Value: H -44,510

http://en.wikipedia.org/wiki/Enthalpy\_change\_of\_solution

My observed value is relatively close to the literature value. Many key factors could have affected the precision in recorded readings. The NaOH solid could not be handles with our fingers directly, so during the transfer into the Styrofoam cup of water, the lid was opened the longest than any other reaction, primarily because we had to scrape the pellets into the cup one by one without splashing the water. This could have been the reasoning behind the two different values.