

CALORIMETRY II
An Interactive Lab

Use the simulation available on profpaz website to complete the experiments described in each of the following sections, (All calculations should be done with 3 significant figures)

A. Heat of Neutralization of an Acid and Base

Use the simulation to determine the heat and enthalpy of reaction for the neutralization of 50.0 mL of 1.00 M HCl and 50.0 mL of 1.00 M NaOH. (Show complete calculations for each step)

Initial temp. of HCl: _____ Initial temp. of NaOH: _____

Final temp. of mixture: _____

(show calculations here)

$q =$ _____ (J)

$\Delta H =$ _____ (kJ/mol H₂O)

Balanced thermochemical equation:

B. Heat of Neutralization of an Acid and Base (Change in volume)

Use the simulation to determine the heat and enthalpy of reaction for the neutralization of 100. mL of 1.00 M HCl and 100. mL of 1.00 M NaOH. (Show complete calculations for each step)

Initial temp. of HCl: _____ Initial temp. of NaOH: _____

Final temp. of mixture: _____

(show calculations here)

$q =$ _____ (J)

$\Delta H =$ _____ (kJ/mol H₂O)

Balanced thermochemical equation:

C. Heat of Neutralization of an Acid and Base (Change in concentration)

Use the simulation to determine the heat and enthalpy of reaction for the neutralization of 50.0 mL of 2.00 M HCl and 50.0 mL of 2.00 M NaOH. (Show complete calculations for each step)

Initial temp. of HCl: _____ Initial temp. of NaOH: _____

Final temp. of mixture: _____

(show calculations here)

$q =$ _____ (J)

$\Delta H =$ _____ (kJ/mol H₂O)

Balanced thermochemical equation:

D. Heat of Neutralization of an Acid and Base (Change in strength)

Use the simulation to determine the heat and enthalpy of reaction for the neutralization of 50.0 mL of 1.00 M acetic acid and 50.0 mL of 1.00 M NaOH. (Show complete calculations for each step)

Initial temp. of HCl: _____ Initial temp. of NaOH: _____

Final temp. of mixture: _____

(show calculations here)

$q =$ _____ (J)

$\Delta H =$ _____ (kJ/mol H₂O)

Balanced thermochemical equation:

Questions:

Complete each sentence below by choosing ***greater, lower,*** or ***the same*** for each blank. Explanations in each part should contain coherent writing based on chemical concepts learned in the class.

- a) The change in temperature (ΔT) for experiment B is _____ than experiment A.
- b) The change in heat (q) for experiment B is _____ than experiment A.
- c) The change in enthalpy (ΔH) for experiment B is _____ than experiment A.
- d) Provide an explanation for the observations above.

1. Complete each sentence below by choosing ***greater, lower,*** or ***the same*** for each blank:

- a) The change in temperature (ΔT) for experiment C is _____ than experiment A.
- b) The change in heat (q) for experiment C is _____ than experiment A.
- c) The change in enthalpy (ΔH) for experiment C is _____ than experiment A.
- d) Provide an explanation for the observations above.

2. Complete each sentence below by choosing ***greater, lower, or the same*** for each blank:
- The change in temperature (ΔT) for experiment D is _____ than experiment A.
 - The change in heat (q) for experiment D is _____ than experiment A.
 - The change in enthalpy (ΔH) for experiment D is _____ than experiment A.
 - Provide an explanation for the observations above.
3. In part C, how would the results (ΔT , q and ΔH) change if you used 50.0 mL of 2.00 M HCl and 50.00 mL of 1.00 M NaOH? Give an explanation for your predictions.
4. In part B, how would the results (ΔT , q and ΔH) change if you used 50.0 mL of 1.00 M H_2SO_4 and 100. mL of 1.00 M NaOH? Give an explanation for your predictions.