Enthalpy Change and Representing Enthalpy Change

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Some 8.00 g of fresh sodium hydroxide are added to 100 g of deionized water in a Styrofoam cup calorimeter, initial temperature 20.6 °C. The reactant is gently swirled and eventually it reaches a maximum temperature of 40.4 °C. What is the molar enthalpy of solution for the salt?

(-41.5 kJ/mol)

1. When a 10.0 g sample of pure sulfuric acid is added to 100 mL of water in a calorimeter. The initial temperature of the water is 20.0 °C. The highest temperature reached by the solution is 31.2 °C.
   1. What is the energy change of this reaction? (4.69 kJ)
   2. What is the molar enthalpy of solution of the acid? (-46 kJ/mol)
2. The enthalpy of solution of potassium nitrate is +34.89 kJ/mol. Some 0.100 mol of KNO3(s) is dissolved in 100 g of water in a simple cup calorimeter, initial temperature 20.0 °C. Estimate the likely temperature of the calorimeter just as reaction stops. (11.7°C)

***Use the following information to answer the next two questions***

For a reaction in a bomb calorimeter:

**n rxnH°= (m c t)H2O + (m c t)b + (m c t)st + (m c t)th + (m c t)con**

*(b = bomb, st = stirrer, th = thermometer, con = containers)*

Which reduces to:

**n rxnH°= (m H2Oc H2O  + m bc b + m stc st + m thc th + m conc con) t**

Which further simplifies to: **n rxnH°= C t** since all the masses and specific heat capacities of the components are constant and where **C = m H2Oc H2O  + m bc b + m stc st + m thc th + m conc con.** C, the heat capacity of the bomb calorimeter with the units kJ/°C, is the quantity of energy lost/gained when the whole calorimeter changes in temperature by 1°C.

1. The heat of combustion of benzoic acid, C6H5COOH(s), is 26.38 kJ/g. When a 1.200 g sample of benzoic acid burns in a bomb calorimeter it causes the calorimeter temperature to rise by 3.38 ºC. What is the heat capacity of the calorimeter? (9.37 kJ/ºC)
2. Nitromethane, CH3NO2(l) burns to produce nitrogen and carbon dioxide gases and liquid water. Burning 2.00 g of Nitromethane in a bomb calorimeter, heat capacity 7.794 kJ/ºC, raises the apparatus temperature from 25.00 ºC to 27.98 ºC. Calculate the molar enthalpy of combustion of nitromethane. (-709 kJ/mol)

Communicating Enthalpy 4 Ways:

1. When a mole of potassium chlorate forms, 393.7 kJ of energy is released.

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1. When one mole each of aqueous sodium hydroxide and hydrochloric acid react, 57 kJ of heat energy is lost to the surroundings

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