Name:________________________ Date:________________________

Lab Partner:________________________ Lab Section: ________________________

Lab Report: Calorimetry and Hess's Law

Metal + HCl Reaction

Experimental Data

Assigned Metal: ________________________

	Trial 1	Trial 2
Mass of dry, empty calorimeter		
Mass of calorimeter plus HCl		
Mass of HCl used		
Mass of dry, empty beaker		
Mass of beaker plus metal		
Mass of metal used		
Initial (equilibrium) temperature of HCl		
Final (maximum) temperature of mixture		

Data Analysis

1) Write the balanced equation for the reaction between your assigned metal and HCl, with the smallest integer coefficients.

2) Complete the table below with the results of your calculations.

	Trial 1	Trial 2
Total mass of mixture, m		
Temperature change of mixture, ΔT		
Specific heat capacity of mixture, c		
Heat absorbed by mixture, in J		
$q_{reaction}$, in J		
ΔH_{rxn} in J/g of metal used		
ΔH_{rxn} in kJ/mol of metal used		
ΔH_{rxn} in kJ for the rxn as balanced		
Average ΔH_{rxn} in kJ		

3) Show your work for the following calculations using your <u>Trial 1 data</u> only:

- Heat absorbed by mixture, in J

- $q_{reaction}$, in J

- ΔH_{rxn} in J/g of metal used

- ΔH_{rxn} in kJ/mol of metal used

- ΔH_{rxn} in kJ for reaction as balanced in

4) Is this reaction exothermic or endothermic? What is your experimental evidence supporting this? Is ΔH_{rxn} positive or negative?

Metal Oxide + HCl Reaction

Experimental Data

Assigned Metal Oxide: ________________________________

	Trial 1	Trial 2
Mass of dry, empty calorimeter		
Mass of calorimeter plus HCl		
Mass of HCl used		
Mass of dry, empty beaker		
Mass of beaker plus metal oxide		
Mass of metal oxide used		
Initial (equilibrium) temperature of HCl		
Final (maximum) temperature of mixture		

Data Analysis

1) Write the balanced equation for the reaction between your assigned metal oxide and HCl, with the smallest integer coefficients.

2) Complete the table below with the results of your calculations.

	Trial 1	Trial 2
Total mass of mixture, m		
Temperature change of mixture, ΔT		
Specific heat capacity of mixture, c		
Heat absorbed by mixture, in J		
$q_{reaction}$, in J		
ΔH_{rxn} in J/g of metal used		
ΔH_{rxn} in kJ/mol of metal used		
ΔH_{rxn} in kJ for the rxn as balanced		
Average ΔH_{rxn} in kJ		

Note: You are not required to show your work for the calculations you performed to complete the above table.

Enthalpy of Combustion of a Metal

1) Write the balanced equation for the combustion of your assigned metal. The coefficient of the metal should be an implied 1, even if you get fractional coefficients for O_2(g) and metal oxide. That makes the ΔH for the reaction as written numerically equal to the enthalpy of combustion of the metal (which would be listed in units of energy per mol of metal).

2) Using Hess's Law, determine the enthalpy of combustion of your assigned metal as balanced above. To do this, you will need the balanced thermochemical equations for the two reactions studied in this lab, plus the balanced thermochemical equation for the formation of water from its elements. Clearly show how these three equations (and their reaction enthalpies) must be combined to give the target combustion reaction.

3) Find the "true" value for the enthalpy of combustion of your assigned metal, using the tabulated $\Delta H_f°$ values from the textbook. Remember the details of how a "formation reaction" is defined.

4) Determine the percent error in your experimentally determined value for the enthalpy of combustion.