WKS-Honors
Hess's Law

Name _____
Period _____ Date_____

Use Hess's Law to find the enthalpy changes for the stated reactions given the component reactions and their enthalpy changes. Use the space given to rewrite the modified component reactions and show that they add up to the desired reaction.

1) Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$H_2SO_4(l) \rightarrow SO_3(g) + H_2O(g)$

$H_2S(g) + 2\ O_2(g) \rightarrow H_2SO_4(l)$	ΔH = –235.5 kJ
$H_2S(g) + 2\ O_2(g) \rightarrow SO_3(g) + H_2O(l)$	ΔH = –207 kJ
$H_2O(l) \rightarrow H_2O(g)$	ΔH = 44 kJ

2) Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$N_2(g) + 2\ O_2(g) \rightarrow 2\ NO_2(g)$

$N_2(g) + 3H_2(g) \rightarrow 2\ NH_3(g)$	ΔH = –115 kJ
$2\ NH_3(g) + 4\ H_2O(l) \rightarrow 2\ NO_2(g) + 7\ H_2(g)$	ΔH = –142.5 kJ
$H_2O(l) \rightarrow H_2(g) + ½\ O_2(g)$	ΔH = –43.7 kJ

3) Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$CO_2(g) \rightarrow C(s) + O_2(g)$

$H_2O(l) \rightarrow H_2(g) + ½\ O_2(g)$	ΔH = 643 kJ
$C_2H_6(g) \rightarrow 2\ C(s) + 3\ H_2(g)$	ΔH = 190.6 kJ
$2\ CO_2(g) + 3\ H_2O(l) \rightarrow C_2H_6(g) + {}^{7}/_{2}\ O_2(g)$	ΔH = 3511.1 kJ

4) Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$$\tfrac{1}{2}\ H_2(g) + \tfrac{1}{2}\ Cl_2(g) \rightarrow HCl(g)$$

$COCl_2(g) + H_2O(l) \rightarrow CH_2Cl_2(l) + O_2(g)$	ΔH = 47.5 kJ
$2\ HCl(g) + \tfrac{1}{2}\ O_2(g) \rightarrow H_2O(l) + Cl_2(g)$	ΔH = 105 kJ
$CH_2Cl_2(l) + H_2(g) + \tfrac{3}{2}\ O_2(g) \rightarrow COCl_2(g) + 2\ H_2O(l)$	ΔH = –402.5 kJ

5) Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$$C_2H_2(g) + \tfrac{5}{2}\ O_2(g) \rightarrow 2CO_2(g) + H_2O(g)$$

$C_2H_6(g) \rightarrow C_2H_2(g) + 2\ H_2(g)$	ΔH = 283.5 kJ
$H_2(g) + \tfrac{1}{2}\ O_2(g) \rightarrow H_2O(g)$	ΔH = –213.7 kJ
$2\ CO_2(g) + 3\ H_2O(g) \rightarrow C_2H_6(g) + \tfrac{7}{2}\ O_2(g)$	ΔH = 849 kJ

6) Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:

$$Zn(s) + \tfrac{1}{8}\ S_8(s) + 2O_2(g) \rightarrow ZnSO_4(s)$$

$Zn(s) + \tfrac{1}{8}\ S_8(s) \rightarrow ZnS(s)$	ΔH = –183.92 kJ
$2\ ZnS(s) + 3\ O_2(g) \rightarrow 2ZnO(s) + 2\ SO_2(g)$	ΔH = –927.54 kJ
$2\ SO_2(g) + O_2(g) \rightarrow 2\ SO_3(g)$	ΔH = –196.04 kJ
$ZnO(s) + SO_3(g) \rightarrow ZnSO_4(s)$	ΔH = –230.32 kJ

Answers: 1) 73 kJ; 2) –83 kJ; 3) 886 kJ; 4) –230. kJ; 5) –705 kJ; 6) –976.03 kJ