Name_____

Hess's Law Problems

1. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:
   $2C_2H_4O(l) + 2H_2O(l) \rightarrow 2C_2H_6O(l) + O_2(g)$

   $C_2H_6O(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$ $\Delta H = -685.5$ kJ
   $C_2H_4O(l) + 5/2O_2(g) \rightarrow 2CO_2(g) + 2H_2O(l)$ $\Delta H = -583.5$ kJ

2. Find the enthalpy value, ΔH, given the following reactions and subsequent ΔH values:
   $PCl_5(g) \rightarrow PCl_3(g) + Cl_2(g)$

   $P_4(s) + 6Cl_2(g) \rightarrow 4PCl_3(g)$ $\Delta H = -2439$ kJ
   $4PCl_5(g) \rightarrow P_4(s) + 10Cl_2(g)$ $\Delta H = 3438$ kJ

3. Find the ΔH for the reaction below, given the following reactions and subsequent ΔH values:
   $2CO_2(g) + H_2O(g) \rightarrow C_2H_2(g) + 5/2O_2(g)$

   $C_2H_2(g) + 2H_2(g) \rightarrow C_2H_6(g)$ $\Delta H = -94.5$ kJ
   $H_2O(g) \rightarrow H_2(g) + 1/2O_2(g)$ $\Delta H = 71.2$ kJ
   $C_2H_6(g) + 7/2O_2(g) \rightarrow 2CO_2(g) + 3H_2O(g)$ $\Delta H = -283$ kJ

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

$N_2H_4(l) + H_2(g) \rightarrow 2NH_3(g)$

$N_2H_4(l) + CH_4O(l) \rightarrow CH_2O(g) + N_2(g) + 3H_2(g)$	ΔH = -37 kJ
$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$	ΔH = -46 kJ
$CH_4O(l) \rightarrow CH_2O(g) + H_2(g)$	ΔH = -65 kJ

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

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

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

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

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

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$	ΔH = -115 kJ
$2NH_3(g) + 4H_2O(l) \rightarrow 2NO_2(g) + 7H_2(g)$	ΔH = -142.5 kJ
$H_2O(l) \rightarrow H_2(g) + 1/2O_2(g)$	ΔH = -43.7 kJ