EXTRA PRACTICE PROBLEMS for HESS' LAW OF HEAT SUMMATION:

1. Given the following equations and ΔH^o values, determine the heat of reaction (kJ) at 298 K for the reaction:

$$2\ OF_2(g) + 2\ S(s) \rightarrow SO_2(g) + SF_4(g)$$

$OF_2(g) + H_2O(l) \rightarrow O_2(g) + 2\ HF(g)$	$\Delta H^o = -276.6$ kJ
$SF_4(g) + 2\ H_2O(l) \rightarrow 4\ HF(g) + SO_2(g)$	$\Delta H^o = -827.5$ kJ
$S(s) + O_2(g) \rightarrow SO_2(g)$	$\Delta H^o = -296.9$ kJ

Answer: -319.5 kJ

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

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

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

Answer: -18 kJ

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

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

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

Answer: -83 kJ

4. Calculate the value of ΔH^o/kJ for the following reaction using the listed thermochemical equations:

$$P_4O_{10}(g) + 6\ PCl_5(g) \rightarrow 10\ Cl_3PO(g)$$

$1/4\ P_4(s) + 3/2\ Cl_2(g) \rightarrow PCl_3(g)$	$\Delta H^o = -306.4$ kJ
$P_4(s) + 5\ O_2(g) \rightarrow P_4O_{10}(g)$	$\Delta H^o = -2967.3$ kJ
$PCl_3(g) + Cl_2(g) \rightarrow PCl_5(g)$	$\Delta H^o = -84.2$ kJ
$PCl_3(g) + 1/2\ O_2(g) \rightarrow Cl_3PO(g)$	$\Delta H^o = -285.7$ kJ

Answer: -610.1 kJ