Chem Team Practice - HESS' LAW (#2)

1) Calculate the enthalpy (ΔH in kJ) for the following reaction:

$2\ C(s) + H_2(g) \rightarrow C_2H_2(g)$

given the following thermochemical equations:

$C_2H_2(g) + \frac{5}{2}\ O_2(g) \rightarrow 2\ CO_2(g) + H_2O(l)$ $\Delta H = -1299.5$ kJ

$C(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta H = -393.5$ kJ

$H_2(g) + \frac{1}{2} O_2(g) \rightarrow H_2O(l)$ $\Delta H = -285.8$ kJ

2) Calculate the enthalpy of the following chemical reaction:

$CS_2(l) + 3\ O_2(g) \rightarrow CO_2(g) + 2\ SO_2(g)$

given the following thermochemical equations:

$C(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta H = -393.5$ kJ/mol

$S(s) + O_2(g) \rightarrow SO_2(g)$ $\Delta H = -296.8$ kJ/mol

$C(s) + 2\ S(s) \rightarrow CS_2(l)$ $\Delta H = +87.9$ kJ/mol

3) Given the following data:

$SrO(s) + CO_2(g) \rightarrow SrCO_3(s)$ $\Delta H = -234$ kJ

$2\ SrO(s) \rightarrow 2\ Sr(s) + O_2(g)$ $\Delta H = +1184$ kJ

$2\ SrCO_3(s) \rightarrow 2\ Sr(s) + 2\ C(s) + 3\ O_2(g)$ $\Delta H = +2440$ kJ

find the ΔH of the following reaction:

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

4) Given the following information:

$2\ NO(g) + O_2(g) \rightarrow 2\ NO_2(g)$ $\Delta H = -116$ kJ

$2\ N_2(g) + 5\ O_2(g) + 2\ H_2O(l) \rightarrow 4\ HNO_3(aq)$ $\Delta H = -256$ kJ

$N_2(g) + O_2(g) \rightarrow 2\ NO(g)$ $\Delta H = +183$ kJ

calculate ΔH for the following reaction:

$3\ NO_2(g) + H_2O(l) \rightarrow 2\ HNO_3(aq) + NO(g)$

5) Calculate ΔH for this reaction: $CH_4\,(g) + NH_3\,(g) \rightarrow HCN\,(g) + \underline{3}\,H_2\,(g)$
Given the following reactions:

$N_2\,(g) + \underline{3}\,H_2(g) \rightarrow \underline{2}\,NH_3\,(g)$	$\Delta H = -91.8$ kJ
$C\,(s) + \underline{2}\,H_2\,(g) \rightarrow CH_4\,(g)$	$\Delta H = -74.9$ kJ
$H_2\,(g) + \underline{2}\,C\,(s) + N_2\,(g) \rightarrow \underline{2}\,HCN\,(g)$	$\Delta H = +270.3$ kJ

6) Determine the heat of reaction for the following reaction:
$\underline{2}\,Fe\,(s) + \underline{3/2}\,O_2\,(g) \rightarrow Fe_2O_3\,(s)$
given the thermochemical equations:

$\underline{2}\,Fe\,(s) + \underline{6}\,H_2O\,(l) \rightarrow \underline{2}\,Fe(OH)_3\,(s) + \underline{3}\,H_2\,(g)$	$\Delta H = +322$ kJ
$Fe_2O_3\,(s) + \underline{3}\,H_2O\,(l) \rightarrow \underline{2}\,Fe(OH)_3\,(s)$	$\Delta H = +289$ kJ
$\underline{2}\,H_2\,(g) + O_2\,(g) \rightarrow \underline{2}\,H_2O\,(l)$	$\Delta H = -572$ kJ

7) Determine the standard enthalpy of formation for butane, using the following data:

$C_4H_{10}\,(g) + \underline{13/2}\,O_2\,(g) \rightarrow \underline{4}\,CO_2\,(g) + 5H_2O\,(g)$	$\Delta H = -2657.4$ kJ
$C\,(s) + O_2\,(g) \rightarrow CO_2\,(g)$	$\Delta H = -393.5$ kJ
$\underline{2}H_2\,(g) + O_2\,(g) \rightarrow \underline{2}H_2O\,(g)$	$\Delta H = -483.6$ kJ

8) Given the equation $C_2H_6 + O_2 \rightarrow \underline{3}H_2 + \underline{2}CO$, calculate delta H.

$\underline{2}\,C_2H_6 + \underline{7}\,O_2 \rightarrow \underline{4}\,CO_2 + \underline{6}\,H_2O$	$\Delta H = -3119.7$ kJ
$\underline{2}\,H_2 + O_2 \rightarrow \underline{2}\,H_2O$	$\Delta H = -478.84$ kJ
$\underline{2}\,CO + O_2 \rightarrow \underline{2}\,CO_2$	$\Delta H = -565.98$ kJ