Directions: Complete the following problems according to the lecture.

1. (This is one we worked in class.) Using the thermochemical equations

$$C_2H_6(g) + 7/2\ O_2(g) \rightarrow 2\ CO_2(g) + 3\ H_2O(\ell) \qquad \Delta H = -1560\ kJ$$

$$2\ C_2H_2(g) + 5\ O_2(g) \rightarrow 4\ CO_2(g) + 2\ H_2O(\ell) \qquad \Delta H = -2599\ kJ$$

$$H_2(g) + 1/2\ O_2(g) \rightarrow H_2O(\ell) \qquad \Delta H = -286\ kJ$$

calculate ΔH for

$$C_2H_2(g) + 2\ H_2(g) \rightarrow C_2H_6(g)$$

2. Using the thermochemical equations in Problem #1 as needed, in addition to

$$CH_4(g) + 2\ O_2(g) \rightarrow CO_2(g) + 2\ H_2O(\ell) \qquad \Delta H = -890\ kJ$$

$$C_2H_4(g) + 3\ O_2(g) \rightarrow 2\ CO_2(g) + 2\ H_2O(\ell) \qquad \Delta H = -1411\ kJ$$

calculate ΔH for

$$C_2H_4(g) + 2\ H_2(g) \rightarrow 2\ CH_4(g)$$

3. Calculate ΔH for

$$Mg(s) + 1/2\ O_2(g) \rightarrow MgO(s)$$

given the equations

$$Mg(s) + 2\ HCl(aq) \rightarrow MgCl_2(aq) + H_2(g) \qquad \Delta H = -462\ kJ$$

$$MgO(s) + 2\ HCl(aq) \rightarrow MgCl_2(aq) + H_2O(\ell) \qquad \Delta H = -146\ kJ$$

$$2\ H_2(g) + O_2(g) \rightarrow 2\ H_2O(\ell) \qquad \Delta H = -571.6\ kJ$$

4. Given the thermochemical equations

$$H_2(g) + Br_2(g) \rightarrow 2\ HBr(g) \qquad \Delta H = -72\ kJ$$

$$H_2(g) \rightarrow 2\ H(g) \qquad \Delta H = 436\ kJ$$

$$Br_2(g) \rightarrow 2\ Br(g) \qquad \Delta H = 224\ kJ$$

Calculate the enthalpy change for

$$H(g) + Br(g) \rightarrow HBr(g)$$

5. In the process of isolating iron from its ores, carbon monoxide reacts with iron (III) oxide, as described by the equation

$$Fe_2O_3(s) + 3\ CO(g) \rightarrow 2\ Fe(s) + 3\ CO_2(g) \qquad \Delta H = -24.8\ kJ$$

The enthalpy change for the combustion of carbon monoxide is

$$2\ CO(g) + O_2(g) \rightarrow 2\ CO_2(g) \qquad \Delta H = -566\ kJ$$

Use the preceding thermochemical equations to calculate the enthalpy change for

$$4\ Fe(s) + 3\ O_2(g) \rightarrow 2\ Fe_2O_3(s)$$