**Enthalpy Calculations**

**1.** Calculate the standard enthalpy of combustion for the following reaction:

C2H5OH (l) + (7/2) O2 (g) ---> 2 CO2 (g) + 3 H2O (l)

ΔHfCO2 = -393.5 kJ/mol ΔHfH2O = -286 kJ/mol ΔHfC2H5OH = -278 kJ/mol ΔHfO2 = 0 kJ/mol

**2.** Calculate the standard enthalpy of combustion for the following reaction:

C6H12O6 (s) + 6 O2 (g) ---> 6 CO2 (g) + 6 H2O (l)

To solve this problem, we must know the following ΔH°f values:

|  |  |
| --- | --- |
| C6H12O6 (s) | -1260.0 kJ/mol |
| O2 (g) | 0 kJ/mol |
| CO2 (g) | -393.5 kJ/mol |
| H2O (l) | -285.8 kJ/mol |

**3.** Calculate the standard enthalpy of formation for glucose, given the following values:

6CO2 (g) + 6H2O (l) ---> C6H12O6(s) + 6O2(g)

ΔH°f, C6H12O6 = -1260. kJ/mol   
ΔH°f, CO2 = -393.5 kJ/mol   
ΔH°f, H2O = -285.8 kJ/mol

**4.** Complete combustion of 1.00 mol of acetone (C3H6O) is as follows:

C3H6O (l) + 4 O2 (g) ---> 3 CO2 (g) + 3 H2O (l)

Using this information together with the data below (values in kJ/mol), calculate the enthalpy of combustion of acetone.

ΔH°f, acetone = -297.99/mol kJ

ΔH°f, O2: 0 kJ/mol   
ΔH°f, CO2: -393.5 kJ/mol   
ΔH°f, H2O: -285.83 kJ/mol

**5.** Ammonia reacts with oxygen to form nitrogen dioxide and steam, as follows:

4 NH3(g) + 7 O2(g) ---> 4 NO2(g) + 6H2O(g)

Given the following standard enthalpies of formation (given in kJ/mol):

|  |  |
| --- | --- |
| NH3(g) | -45.90 kJ/mol |
| NO2(g) | +33.1 kJ/mol |
| H2O(g) | -241.83 kJ/mol |

Calculate the enthalpy of the reaction.

**6.** Using standard enthalpies of formation, calculate the heat of combustion during the complete combustion of ethane gas.

2C2H6 + 7O2 ---> 4CO2 + 6H2O

The enthalpies of formation needed are:

|  |  |
| --- | --- |
| C2H6(g) | -84.68 kJ/mol |
| O2 (g) | 0 kJ/mol |
| CO2 (g) | -393.5 kJ/mol |
| H2O (g) | -241.8 kJ/mol |

**7.** For the following reaction:

IF7 + I2 ---> IF5 + 2IF

These standard enthalpies of formation are known:

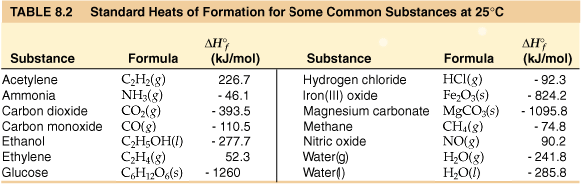
IF7 = -941 kJ/mole IF5 = -840 kJ/mole I2 = 0 kJ/mole IF = -95 kJ/mole

Determine the ΔHf°.

**8.** What is the enthalpy change for the following reaction?

SiCl4(l) + 2H2(g) ---> Si(s) + 4HCl(g)

Use the following standard enthalpies of formation: SiCl4(l); -687 kJ/mol and HCl(g); -92 kJ/mol



9. Calculate ΔH° of the following reaction:

2CO(g) + O2(g) 🡪 2CO2(g)

10. Calculate ΔH° of the following reaction:

C2H2(g) + H2(g) 🡪 C2H4(g)

11. Calculate ΔH° of the following reaction:

CH4(g) + 2O2(g) 🡪 CO2(g)+ 2H2O(g)

12. Calculate ΔH° of the following reaction:

4NH3(g) + 5O2(g) 🡪 4NO(g)+ 6H2O(g)

**Answers (in random order)**

-2855 kJ -2815.8 kJ -1740.0 kJ -1367 kJ -1135.0 kJ -906 kJ -802 kJ -566 kJ -174kJ -89 kJ +319 kJ +2816 kJ