

## 5.5: Standard Enthalpy of Formation

**Table 1** Standard Enthalpies of Formation for Several Compounds

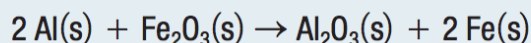
Compound	$\Delta H_f^\circ$ (kJ/mol)
AlCl <sub>3</sub> (s)	-704.2
Al <sub>2</sub> O <sub>3</sub> (s)	-1675.7
CaSO <sub>4</sub> (s)	-1434.1
Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub> (s)	-4120.8
CH <sub>3</sub> OH(l)	-239.1
CH <sub>4</sub> (g)	-74.4
C <sub>2</sub> H <sub>2</sub> (g)	+228.2
C <sub>2</sub> H <sub>5</sub> OH(l)	-235.2
C <sub>2</sub> H <sub>6</sub> (g)	-83.8
C <sub>3</sub> H <sub>8</sub> (g)	-104.7
C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> (s)	-1273.1
C <sub>8</sub> H <sub>18</sub> (l)	-250.1
C <sub>12</sub> H <sub>22</sub> O <sub>11</sub> (s)	-2225.5
CO(g)	-110.5
CO <sub>2</sub> (g)	-393.5
Fe <sub>2</sub> O <sub>3</sub> (s)	-824.2
HCN(g)	+135.1
HCl(g)	-92.3
HF(g)	-273.3
H <sub>2</sub> O(g)	-241.8
H <sub>2</sub> O(l)	-285.8
H <sub>2</sub> SO <sub>4</sub> (l)	-814.0
H <sub>3</sub> PO <sub>4</sub> (l)	-1271.7
MgO(s)	-601.6
Mg(OH) <sub>2</sub> (s)	-924.5
NH <sub>3</sub> (g)	-45.9
NH <sub>4</sub> Cl(s)	-314.4
NH <sub>4</sub> ClO <sub>4</sub> (s)	-295.8
NO(g)	+90.2
NO <sub>2</sub> (g)	+33.2
SiCl <sub>4</sub> (l)	-687.0
SiO <sub>2</sub> (s)	-910.7

$\Delta H_f^\circ$  -- the change in enthalpy that accompanies the formulation of 1 mole of a compound from its elements in their standard states. And standard state is the most stable form of a substance under standard conditions, 25 degree Celsius and 100 kPa.

$$\Delta H_r^\circ = \sum n_{\text{products}} \Delta H_{\text{products}}^\circ - \sum n_{\text{reactants}} \Delta H_{\text{reactants}}^\circ$$

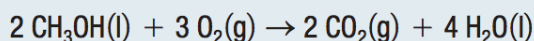
Example 1:

Using standard enthalpies of formation in Table 1, calculate the standard change in enthalpy for the thermite reaction represented by the balanced equation



Example 2:

Until recently, liquid methanol was used to fuel high-performance engines in race cars. Gasoline is a mixture of hydrocarbons, but assume for this problem that gasoline is pure liquid octane, C<sub>8</sub>H<sub>18</sub>(l). Using the data in Table 1, determine the standard enthalpy of combustion per gram of (a) methanol and (b) octane. Then (c) determine which fuel has the greater standard enthalpy per gram. The balanced chemical equation for the combustion of methanol is



The balanced chemical equation for the combustion of octane is

