

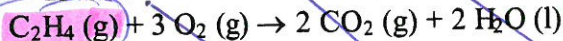
Answer Key Hess' Law Worksheet

Solutions



Reactions that were reversed or multiplied by a constant are shown in italics.

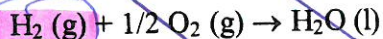
1. $\Delta H = -137. \text{ kJ}$



$$\Delta H = -1411. \text{ kJ}$$

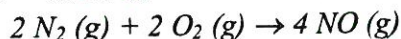


$$\Delta H = +1560. \text{ kJ}$$



$$\Delta H = -285.8 \text{ kJ}$$

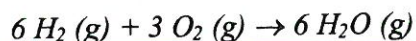
2. $\Delta H = -1628. \text{ kJ}$



$$\Delta H = 2 \times (-180.5 \text{ kJ})$$

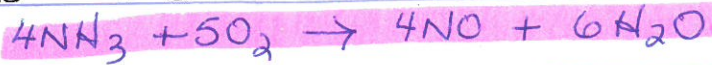


$$\Delta H = 2 \times (+91.8 \text{ kJ})$$



$$\Delta H = 3 \times (-483.6 \text{ kJ})$$

3. $\Delta H_f^\circ = -486. \text{ kJ}$



Reaction defining ΔH_f° ($\text{HC}_2\text{H}_3\text{O}_2$) is: $2 \text{C}(\text{s, graphite}) + 2 \text{H}_2 (\text{g}) + \text{O}_2 (\text{g}) \rightarrow \text{HC}_2\text{H}_3\text{O}_2 (\text{l})$.

$$\Delta H = -485.6 \text{ kJ}$$



$$\Delta H = +875. \text{ kJ}$$



$$\Delta H = 2 \times (-394.51 \text{ kJ}) = -789.02$$



$$\Delta H = 2 \times (-285.8 \text{ kJ}) = -571.6$$

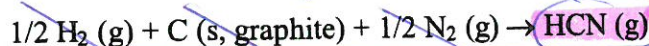
4. $\Delta H = +256.0 \text{ kJ}$



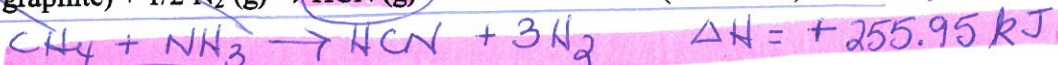
$$\Delta H = 1/2 \times (+91.8 \text{ kJ}) = +45.9$$



$$\Delta H = +74.9 \text{ kJ}$$



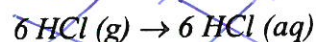
$$\Delta H = 1/2 \times (+270.3 \text{ kJ}) = +135.15$$



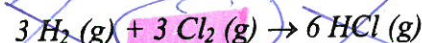
5. $\Delta H = -6387. \text{ kJ}$



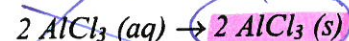
$$\Delta H = -1049. \text{ kJ}$$



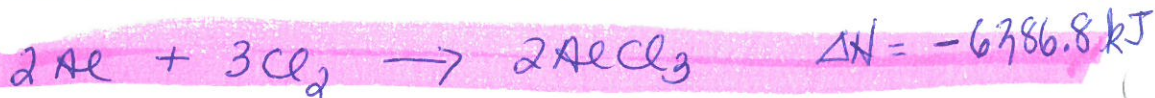
$$\Delta H = 6 \times (-74.8 \text{ kJ}) = -448.8$$



$$\Delta H = 3 \times (-1845. \text{ kJ}) = -5535$$



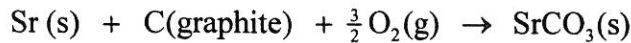
$$\Delta H = 2 \times (+323. \text{ kJ}) = +646$$



Here are some additional Hess' Law problems:

Ref. Moore, J.W., Stanitski, C.L., and Jurs, P. C., Chemistry: The Molecular Science, 2nd ed., Thomson, 2005.

1. Calculate the standard enthalpy change, ΔH° , for the formation of 1 mol of strontium carbonate (the material that gives the red color in fireworks) from its elements.



The information available is

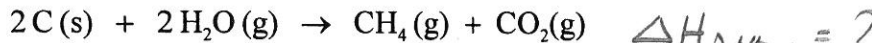


$$\Delta H_f^\circ = -1220 \text{ kJ}$$

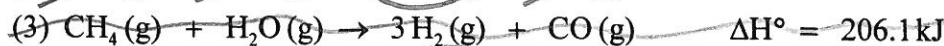
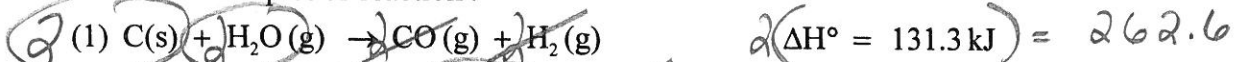
why is this a formation rxn?

*nothing to do!
everything cancels as is!*

2. The combination of coke and steam produces a mixture called coal gas, which can be used as a fuel or as a starting material for other reactions. If we assume coke can be represented by graphite, the equation for the production of coal gas is

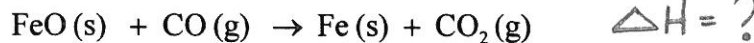


Determine the standard enthalpy change for this reaction from the following standard enthalpies of reaction:

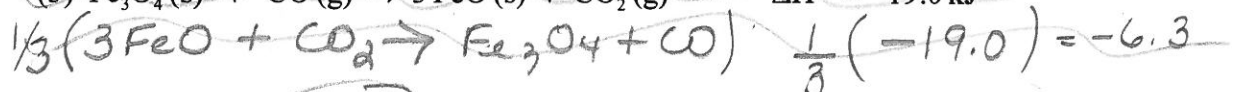
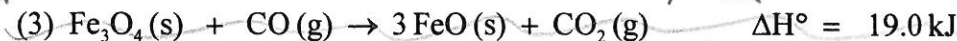
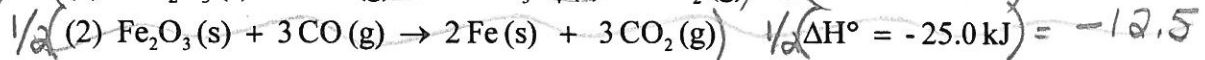
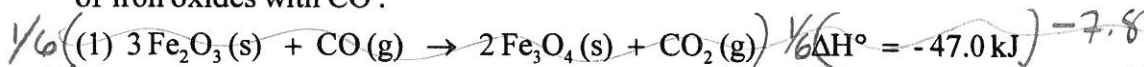


The next one is challenging!

3. One reaction involved in the conversion of iron ore to the metal is



Calculate the standard enthalpy change for this reaction from these reactions of iron oxides with CO:



Answers: 1. -1220 kJ

2. +15.3 kJ

3. -11.0 kJ



$$-11 \text{ kJ}$$

*-15.3 kJ
? know this!*