

Opener: 1-20-06 Hess's Law

RULES FOR MANIPULATING THERMOCHEMICAL EQUATIONS:

1. When an equation is reversed (written in the opposite direction) the sign of ΔH° must also be reversed.
2. Formulas canceled from both sides of an equation must be for the substance in identical physical states.
3. If all the coefficients of an equation are multiplied or divided by a common factor, the value of ΔH° must be likewise changed.

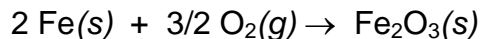
EX: Carbon monoxide is often used in metallurgy to remove oxygen from metal oxides and thereby give the free metal:



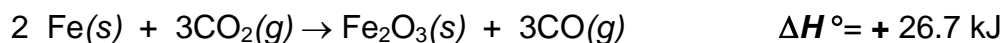
Use this equation and the equation for the combustion of CO:



to calculate the value of ΔH° for the following reaction:



STEP 1: Begin by trying to get the iron atoms to come out correctly, the target equation must have 2 Fe on the *left*, but the first equation has 2 Fe on the *right* of the arrow. Reverse the entire equation **as well as the sign of ΔH°**



STEP 2 There must be 3/2 O₂ on the left, and we must be able to cancel *three* CO and *three* CO₂ when the equations are added. If we multiply the second of the equations given by 3 we will obtain the necessary coefficients **remembering to multiply ΔH° by 3** also:



STEP 3: Now put the equations together and cancel out anything that appears on both sides of the equations (very similar to adding redox equations together)

