

# Math Tutor

## HESS'S LAW

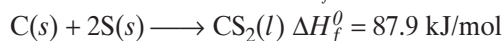
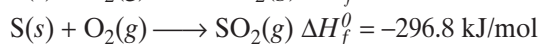
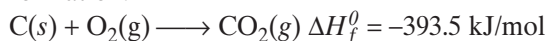
You may have seen a popular comic strip in which a little boy takes a long, twisting path between the school-bus stop and home. No matter which path the boy takes, the result is always the same: He goes from the bus stop to the door of his house. Hess's law covers a similar situation in thermochemistry. No matter which or how many steps occur in the process of changing one or more substances into one or more other substances, the overall change in enthalpy is always the same. Hess's law can be used, for example, to predict the enthalpy change,  $\Delta H^0$ , of a reaction without actually carrying out the reaction.

### SAMPLE

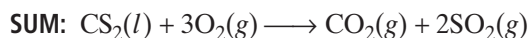
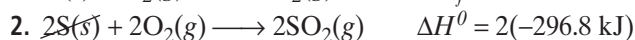
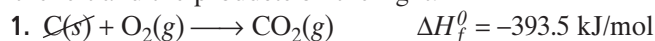
**Determine  $\Delta H$  for the burning of carbon disulfide in oxygen.**



Use the following information:



Rearrange the given equations in a way that will put the reactants of the above equation on the left and the products on the right.



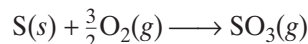
Notice that equation 2 is double the original equation  $\text{S}(s) + \text{O}_2(g) \longrightarrow \text{SO}_2(g)$ . The reason for this is that 2SO<sub>2</sub> are needed on the product side to match the 2SO<sub>2</sub> in CS<sub>2</sub>(l) + 3O<sub>2</sub>(g) → CO<sub>2</sub>(g) + 2SO<sub>2</sub>(g). The third equation is the reverse of the original, putting CS<sub>2</sub> on the reactant side of the final equation. The sign of  $\Delta H$  is likewise reversed. The value of  $\Delta H^0$  is the sum of the  $\Delta H^0$  values for the three added equations.

$$\Delta H^0 = -393.5 \text{ kJ} + 2(-296.8 \text{ kJ}) + (-87.9 \text{ kJ})$$

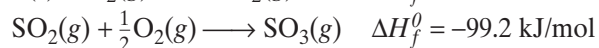
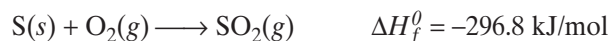
$$\Delta H^0 = -1075.0 \text{ kJ}$$

### PRACTICE PROBLEMS

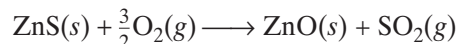
1. Calculate  $\Delta H^0$  for the complete oxidation of sulfur to sulfur trioxide.



Use the following information.



2. Calculate  $\Delta H^0$  for the reaction in which zinc sulfide ore is roasted to obtain zinc oxide.



Use the following information.

