

Hess' Law

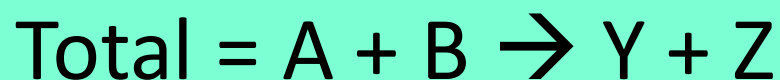
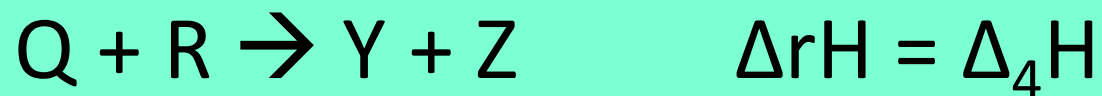
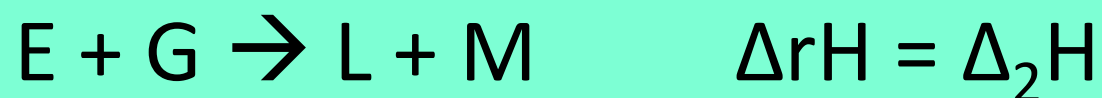
- The total enthalpy change for a chemical reaction is independent of the route of the reaction, provided the initial and final conditions are the same

example

- The energy released per mole of glucose combusted in a bomb calorimeter to produce CO_2 and H_2O is the same as that released by cellular respiration of glucose to give the same products

- The enthalpy change of a net chemical reaction is the **arithmetic sum** of the enthalpies of the individual reactions combined to make the net reaction

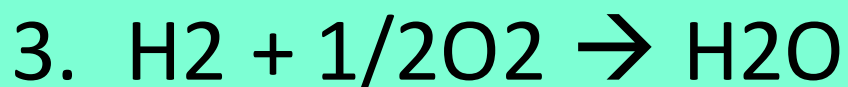
$$\Delta_{\text{net}}H^{\circ} = \Delta_1H + \Delta_2H + \Delta_3H + \Delta_4H + \dots$$



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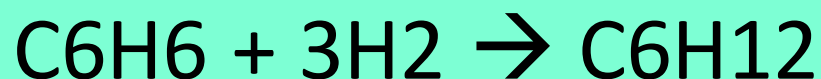
Example:

- What is the standard molar enthalpy of formation of hexane, given the following information:



Example 2:

- What is the standard enthalpy change for the hydrogenation of benzene to make cyclohexane?



1. $\text{C}_6\text{H}_6 + 15/2\text{O}_2 \rightarrow 6\text{CO}_2 + 3\text{H}_2\text{O} \quad \Delta\text{H} = -3267.0\text{kJ}$
2. $\text{C}_6\text{H}_{12} + 9\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} \quad \Delta\text{H} = -3930.0\text{kJ}$
3. $\text{H}_2 + \frac{1}{2}\text{O}_2 \rightarrow \text{H}_2\text{O} \quad \Delta\text{H} = -285.8\text{kJ}$