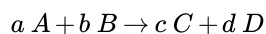


3.12: Evaluating Entropy Changes Using Thermochemical Cycles

As for the standard enthalpy of reaction, we can obtain the standard entropy of reaction at a new temperature by evaluating entropy changes around a suitable thermochemical cycle. To do so, we need the standard entropy change at one temperature. We also need heat capacity data for all of the reactants and products. For the reaction



we can evaluate the entropy change at a second temperature by summing the individual contributions to the change in entropy around the cycle in Figure 5. For this cycle, we have

$$\Delta_r S^\circ(T_2) = \Delta_r S^\circ(T_1) + c \int_{T_1}^{T_2} \frac{C_P(C)}{T} dT + d \int_{T_1}^{T_2} \frac{C_P(D)}{T} dT - a \int_{T_1}^{T_2} \frac{C_P(A)}{T} dT - b \int_{T_1}^{T_2} \frac{C_P(B)}{T} dT$$

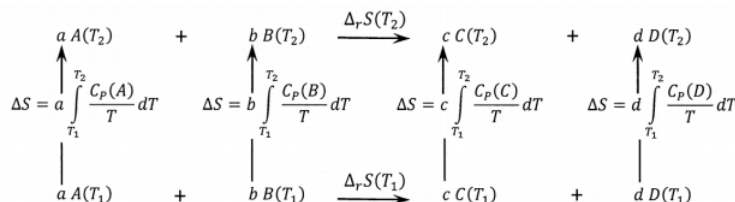


Figure 5. Cycle relating the entropy changes for a reaction at two temperatures.

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