15.8: State Functions

Both enthalpy and the internal energy are often described as **state functions**. This means that they depend only on the *state* of the system, i.e., on its pressure, temperature, composition, and amount of substance, but not on its previous history. Thus any solution of NaCl at 25°C and 1 bar (100 kPa) which contains a mixture of 1 mol NaCland 50 mol H_2O has the same internal energy and the same enthalpy as any other solution with the same specifications. It does not matter whether the solution was prepared by simply dissolving NaCl(s) in H_2O, by reacting NaOH(aq) with HCl(aq), or by some more exotic method.

The fact that the internal energy and the enthalpy are both state functions has an important corollary. It means that when a system undergoes any change whatever, then the alteration in its enthalpy (or its internal energy) depends only on the initial state of the system and its final state. The initial value of the enthalpy will be H_1, and the final value will be H_2. No matter what pathway we employ to get to state 2, we will always end up with the value H_2 for the enthalpy. The enthalpy change $\Delta H = H_2 - H_1$ will thus be independent of the path used to travel from state 1 to state 2. This corollary is of course the basis of Hess' law. The change in enthalpy for a given chemical process is the same whether we produce that change in one or in several steps.