

Entropy:

Most chemical reactions (occurring in nature) are exothermic. Most natural reactions are spontaneous. Some spontaneous reactions are endothermic. WHY??

Not only enthalpy helps determine whether a reaction will be spontaneous, we also use entropy.

Entropy is disorder.

If the arrangement of the atoms of the products of a chemical reaction is more disordered than the order of the reactants the reaction will tend to happen spontaneously.

Entropy is symbolized by S .

A disordered state has more entropy than an ordered one.

At absolute zero the entropy of a substance is zero.

Chemical reactions are driven by two processes;

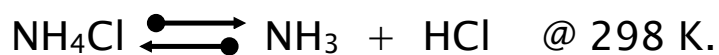
- 1) Towards and increase in entropy
- 2) Towards the lowest enthalpy

The combination of these two processes is called the free-energy of the system.
(Sometimes called the Gibb's Free Energy.)

Symbolized by ΔG .

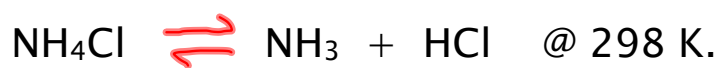
$$\Delta G = \Delta H - T\Delta S \quad (\text{Units are usually kJ/mol})$$

Does the reaction below proceed in the forward or reverse direction and calculate the free energy.



$$\Delta H = 176 \text{ kJ/mol} \quad \text{and} \quad \Delta S = .285 \text{ kJ/mol K}$$

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$\Delta G = \Delta H - T\Delta S = 176 - 298(.285) = 91 \text{ kJ/mol}$ it does not occur spontaneously at 298 in the forward reaction.