

Chapter 16 — Spontaneity

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- Thermodynamically Feasible — Occurs by self
- Enthalpy (ΔH) — Heat flow
- Most exothermic reactions are spontaneous, but not all
- Entropy (ΔS) — Measurement of disorder. Higher value, higher disorder.
- Gas has highest entropy (disorder), with liquid next and then solid
 1. Solid \rightarrow Gas: Disorder Increasing, ΔS is positive.
 2. Gas \rightarrow Solid: Disorder Decreasing, ΔS is negative.
- Gibbs Free Energy (ΔG) — Measurement of doing spontaneous work
 1. $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$
 2. $\Delta G > 0$ — Not Spontaneous
 3. $\Delta G < 0$ — Spontaneous
 4. $\Delta G = 0$ — At equilibrium
- Temperature Effects:

<u>ΔH</u>	<u>ΔS</u>	<u>Spontaneous Under</u>
+	+	High Temp
-	-	Low Temp
-	+	Any Temp
+	-	No Temp

- At non-standard conditions: $\Delta G = \Delta G^\circ + RT \ln(Q)$
- Equilibrium Constant: $\Delta G^\circ = -RT \ln(K)$
- ΔG is large and positive — K is very small, meaning no products are formed, meaning that the reaction is not spontaneous