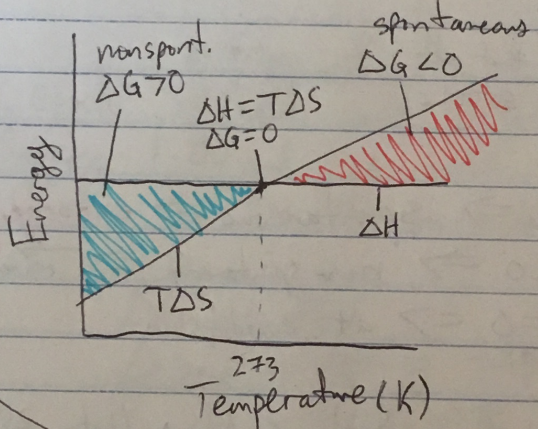
Spontaneity and Temperature

$\Delta G = \Delta H - T\Delta S$

- This relationship allows us to understand how spontaneity depends on temperature

ΔH	ΔS	T	Spontaneous?
+	−	any	$\Delta G > 0$, non-sponst. @ all T_s
−	+	any	$\Delta G < 0$, sponst @ all T_s
−	−	low	$\Delta G < 0$, sponst @ low T_s
−	−	high	$\Delta G > 0$, non-sponst @ high T_s
+	+	low	$\Delta G > 0$, non-sponst @ low T
+	+	high	$\Delta G < 0$, sponst @ high T



exothermic ⇒ contributes to spontaneity
$\Delta H < 0$

$\Delta S > 0$ ⇒ contributes to spontaneity

Ex: $H_2O(s) \rightleftharpoons H_2O(l)$

is ΔH positive or negative?

$\Delta H > 0$

is ΔS positive or negative?

$\Delta S > 0$

- When T is low, $\Delta H > T\Delta S$, so $\Delta G > 0$ → process non-sponst.
- When T is high, $\Delta H < T\Delta S$, so $\Delta G < 0$ → process spontaneous

ΔG° for a rxn

Standard free energy of formation (ΔG°_f):

- A compounds ΔG°_f is the change in free energy associated w/ formation of one mol of it in its stb. state from its elements in their stb. states