10/24 Lecture outline

• Continue from last time, relate $\Delta W_{mech} \leq -\Delta F$, or $-\Delta H$ or $-\Delta G$, depending on what's held fixed.

• Set $\Delta W_{mech} = 0$. Using result from last lecture, $\Delta(U - T_0 S + P_0 V) \leq 0$. Reaches minimum at equilibrium. For fixed P and T, process reaches equilibrium when G is minimized. Etc. for other choices of variables and H or F minimization.

• G and P-T phase diagrams. Phase boundary at $g_1(T, P) = g_2(T, P)$. Gives "Clausius-Clapeyron eqn.":

$$\frac{dP}{dT} = \frac{s_1 - s_1}{v_2 - v_1} = \frac{\ell_{1\to 2}}{T(v_2 - v_1)}.$$

Integrate to get $P(T)$.

• Example: liquid to gas. Assume $v_{gas} \gg v_{liquid}$ and ideal gas to get vapor pressure $P = P_0 \exp(-\ell/RT)$, where P_0 is an integration constant.