

## Today

- I. First take home exam due a week from today
- II. Our Stamina Breaks for the Semester: We will take Friday Oct 23rd off, Wed Nov 25th, and Fri Nov 27th.
- III. Last Time
- IV. Guillermo's Guest Lecture: Diffusive Equilibrium and Chemical Potential
- V. An Example of Chemical Potential

I. Last time we discussed the Thermodynamic Identity  
 $dU = TdS - PdV$  (for processes where  $N$  isn't varying).

From this we can derive

$$\frac{1}{T} = \left( \frac{\partial S}{\partial U} \right)_{V,N}, \quad P = - \left( \frac{\partial U}{\partial V} \right)_{S,N}, \quad P = T \left( \frac{\partial S}{\partial V} \right)_{U,N}$$

I. Gave a definition of pressure that was closely related to our definition of temperature:

$$\frac{1}{T} \equiv \left( \frac{\partial S}{\partial U} \right)_{V,N}, \quad \frac{P}{T} \equiv \left( \frac{\partial S}{\partial V} \right)_{U,N}.$$

This allowed us to derive

$$PV = NkT.$$

There are very few discussion notes from this class as we spent most of the class discussing Guillermo's guest lecture on diffusive equilibrium and chemical potential. You can reference the class video and his very nice notes.