Today

I. How are you doing? Structure? Exam Questions? Hw Size Vote, Office Hours in Yard?
II. Last Time
III. Final Comments on Enthalpy
IV. Introduction to Multiplicities and Entropy
V. Julia on the Multiplicity of the Einstein Solid

I. Discussed heat capacities and specific heat capacities:

$C \equiv \frac{Q}{\Delta T}$, and $c = \frac{C}{m}$. These aren't well defined because you need to tell me the process you are using or the heat isn't clear:

$C_V = \left(\frac{\partial U}{\partial T}\right)_V$, we also looked at $C_P = \left(\frac{\partial U}{\partial T}\right)_P + P\left(\frac{\partial V}{\partial T}\right)_P$.

Discussed the enthalpy $H \equiv U + PV$, and found $\Delta H = Q + W_{\text{other}}$ (at const. pressure).

II. Final Comments on Enthalpy

There's a nice connection between enthalpy and heat capacity, in a constant pressure environment and where there is no W_{other},

$$\Delta H = Q,$$

Then

$$C_P = \left(\frac{\partial H}{\partial T}\right)_P.$$

Enthalpies are very common in chemistry and other experimental branches. Enthalpy needed to boil one mole of water at 1 atm pressure is

40660 J.

Some of this heat is invested in expanding the atmosphere . How much? On mole of H2O has a volume V = RT/P, so

PV=RT=3100J.

III. Microstates, Macrostates, and Entropy

Consider three coins, a penny, a nickel, and a dime.

Every coin has two options, so there are a total of $2^3 = 8$ possibilities .

Microstates are the individual configurations of each of the constituents of the system. E.g. HHH

Macrostates are partial information that tell you something about the overall configuration, but not everything. E.g two tails.

A "Multiplicity" is the number of possible microstates for a given macrostate.

Penny	Nickel	Dime
H	H	H
H	H	T
H	T	H
T	H	H
H	T	T
T	H	T
T	T	H
T	T	T

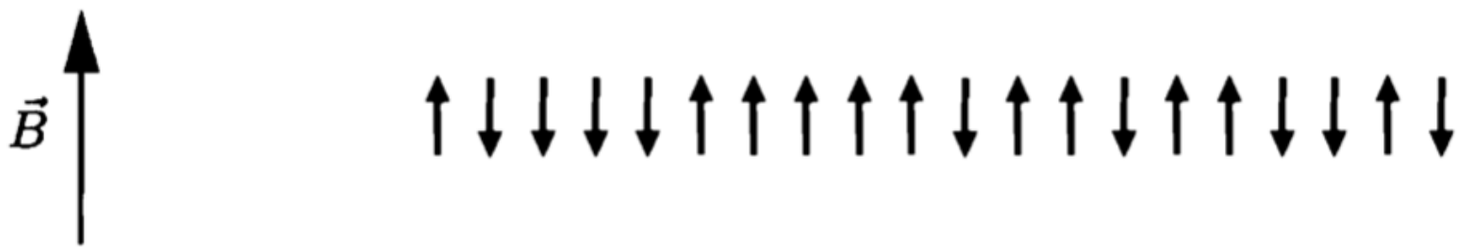

Figure 2.1. A symbolic representation of a two-state paramagnet, in which each elementary dipole can point either parallel or antiparallel to the externally applied magnetic field.

V. Julia's guest lecture on the Einstein Solid

See Julia's slides on our website.