Statistical Mechanics

Iclicker

Protons in a magnetic field, B_0 , exist in one of two energy states which we called E_{α} and E_{β} previously. The energy of the two states are

$$E_{\alpha} = -g_N\beta_NB_0/2$$
 and $E_{\beta} = g_N\beta_NB_0/2$.

What is the ratio between the number of protons in these two states, N_{α} and N_{β} at a temperature of 298 K in a 7 T field?

Partition function

 Partition function for a proton in an external magnetic field.

Energy for a proton in an external magnetic field

Partition function

- Limiting behavior
 - T approaches zero

• T approaches infinity

 Correct modeling of heat capacity of atomic solid a major triumph for statistical mechanics

 Heat capacity modeled as a vibration of the atoms in the atomic lattice

Partition function

<E>

 C_{v}

- Limiting behavior
 - T approaches zero

• T approaches infinity