

Glazer & Mark

4.1. Show that the susceptibility, χ of N spin $1/2$ paramagnetic atoms in volume V does not depend on whether the particles are distinguishable.

Let Z be the partition function, indistinguishability means

$$Z \rightarrow Z/N!$$

This only introduces an additive constant to $\ln Z$ which does not contribute to derivatives of $\ln Z$.

~~Thus~~ Recall

$$M = - \left(\frac{\partial F}{\partial B} \right)_T,$$

$$F = -k_B T \ln Z,$$

$$\chi = \frac{dM}{dB}.$$