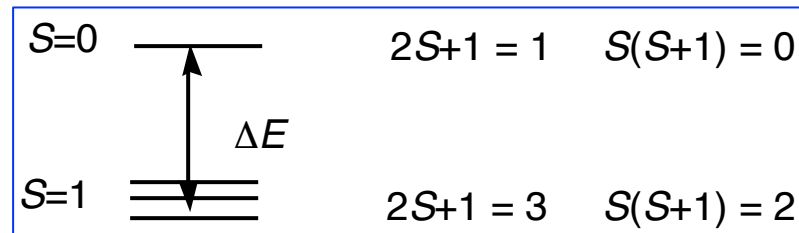


Quiz (homework; upload to GClassroom in a week)

[1] A magnetized iron(0) block attracts steel nails and clips. After heated over 770 °C (T_c) in a flame and then cooled to room temperature, it does not attract nails or clips anymore. As for the samples before and after such annealing, which is a stable phase or metastable phase? Why does a ferromagnet (an ordered state below T_c) not behave as a “magnet”?

[2] In a general biradical, the singlet and triplet states are thermally equilibrated (see Figure).



Derive the following Bleaney-Bowers equation.

$$\chi_{\text{mol}} = \frac{2Ng^2\mu_B^2}{kT} \frac{1}{3 + \exp(-\Delta E / kT)}$$

A critical hint:

Based on the Boltzmann distribution law, the molar magnetic susceptibility χ_{mol} is described with the van Vleck equation:

$$\chi_{\text{mol}} = \frac{Ng^2\mu_B^2}{3kT} \frac{\sum (2S_i + 1) S_i (S_i + 1) \exp(-E_i/kT)}{\sum (2S_i + 1) \exp(-E_i/kT)}$$