

[tex142] Ising trimer

Three spins at the corners of an equilateral triangle interact with each other and with a magnetic field. The Hamiltonian is of the form

$$\mathcal{H} = -J(s_1s_2 + s_2s_3 + s_3s_1) - H(s_1 + s_2 + s_3),$$

where $s_n = \pm 1$, $n = 1, 2, 3$, and J , H are energy units representing the interaction and the magnetic field, respectively.

- (a) Calculate the canonical partition function Z and infer from it the Gibbs free energy $G(T, H)$.
- (b) Write detailed instructions for the derivation, from Z or G , of the magnetization M , the entropy S , and the internal energy U .

Solution: