

Exercises in Statistical Mechanics

Based on course by Doron Cohen, has to be proofed
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This exercises pool is intended for a graduate course in “statistical mechanics”. Some of the problems are original, while other were assembled from various undocumented sources. In particular some problems originate from exams that were written by B. Horovitz (BGU), S. Fishman (Technion), and D. Cohen (BGU).

===== [Exercise 2351]

Baruch's A12.

N monomeric units are arranged along a straight line to form a chain molecule. Each unit can be either in a state α (with length a and energy E_α) or in a state β (with length b and energy E_β).

- (a) Derive the relation between the length L of the chain molecule and the tension f applied between at the ends of the molecule.
- (b) Find the compressibility $\chi_T = (\partial L / \partial f)_T$. Plot schematically $L(fa/k_B T)$ and $\chi_T(fa/k_B T)$ and interpret the shape of the plots.