

Exercises in Statistical Mechanics

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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 2330] Elasticity of a rubber band

The elasticity of a rubber band can be described by a one dimensional model of a polymer, involving N molecules of length a each, linked together end-to-end. The angle between successive links can be taken as 0° or 180° ; and the joints can turn freely. The distance between the end points is x , and the temperature is T . Find the force (tension) f which is necessary to maintain the distance x . Does the polymer try to expand or to contract? You can use the canonical formalism in order to solve the problem. Explain why the effect is of “entropic” nature.