

Exercises in Statistical Mechanics

Based on course by Doron Cohen, has to be proofed
Department of Physics, Ben-Gurion University, Beer-Sheva 84105, Israel

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 4445]

Adsorbtion and decomposition

- (a) Evaluate the chemical potential of a classical ideal gas in two dimensions in terms of the temperature and the density per unit area.
- (b) An H_2 molecule decomposes into H atoms when it is absorbed upon a certain metallic surface with an energy gain ϵ per H atom due to binding on the surface. (This binding is not to a particular site on the surface, i.e. the H atoms are free to move parallel to the surface). Consider H_2 as an ideal gas with mass $2m_H$ and derive the density adsorbed per unit area as function of ϵ , temperature and the H_2 pressure.

[Hint: Chemical equilibrium is obtained by minimizing the total free energy with respect to one of the densities.]