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 4210]

Chemical equilibrium: the law of mass action

Write the law of mass action for the reaction $H_2 + D_2 - - > 2HD$. Determine the equilibrium constant $K(T)$ in terms of the masses $\mathsf{m}_H, \mathsf{m}_D$ andω_0 the vibrational frequency of HD. Assume temperature is high enough to allow classical approximation for the rotational motion. Show that $K(\infty) = 4$.