

PHY304 - Statistical Mechanics

Spring 2021, IISER Mohali

Instructor: Dr. Anosh Joseph

PHY304: Homework 3

Due: Friday, February 5, 2021 at 11:00pm.

(Upload your solutions to Moodle as a single .pdf file.)

1. Consider a system consisting of two particles of mass m . They interact weakly and are allowed to move in one dimension. Let us denote the position coordinates of particle 1 by x_1 and particle 2 by x_2 . We also denote their momenta by p_1 and p_2 . The boundaries of the one-dimensional space are at $x = 0$ and $x = L$. The total energy of the system is between E and $E + \delta E$. Draw the phase space regions that are accessible to the system. Since the phase space is four dimensional, draw separately the part of the phase space involving x_1 and x_2 and that involving p_1 and p_2 .
2. Let us consider a system made out of a very large number N of distinguishable molecules. Let us assume that they are non-moving and non-interacting. Each molecule can have two energy levels: 0 and δ , with $\delta > 0$. In the large N limit, $N \rightarrow \infty$, E/N represents the mean energy per molecule. Compute the mean entropy per molecule, S/N , as a function of E/N .