Assignment 5

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment.

1) Consider a localized independent quantum candidate with fundamental frequencies \( \omega_1 \) and \( \omega_2 \). The total energy of the pair is \( 10 \hbar \). How many modes are accessible to the system as a whole? Answer:

2) Interpret you have \( N \) identical particles in a container of volume \( V \). Now divide the volume into \( n \) cells, with \( N_i \), \( i=1,2 \ldots n \). Suppose that each cell may be either empty or be singly occupied. Then the number of accessible microstates is \( \left( \frac{V}{N} \right)^{n} \) if each \( N_i \) is an integer.

3) Consider a magnetic system with a total energy \( E \) and having \( N \) spins in the microcanonical ensemble. The Hamiltonian for the system is \( H = -J \sum_{i,j} s_i s_j \) and \( s_i = \pm 1 \).

4) Hence the total number of microstates accessible to the system is \( \left( \frac{V}{N} \right)^{n} \) if each \( N_i \) is an integer.

5) Using the above expression, the temperature of the spin system is \( \frac{\frac{1}{2} \ln (2) \cdot \left( 2^{1/2} - 1 \right)}{\frac{1}{2} \ln (2) \cdot \left( 2^{1/2} + 1 \right)} \).

6) The equation of state for the magnetization per spin is given by \( \frac{1}{2} \ln (2) \cdot \left( 2^{1/2} - 1 \right) \).