KING SAUD UNIVERSITY. DEPARTMENT OF PHYSICS

THERMAL AND STATISTICAL PHYSICS H.W №5

Salwa Al Saleh

PROBLEM (1)

Consider a system of N particles of ideal gas of mass m in contact with reservoir at temperature T.

1. Calculate the partition function for the gas confined in the volume V.
2. Find the expression for the Gibbs free energy for the ideal gas.

PROBLEM (2)

A system of 3 energy states $\epsilon_1 = 0.4eV$, $\epsilon_2 = 0.45eV$ and $\epsilon_3 = 0.5eV$.

1. Find the partition function for a particle in that system at temperature $T = 340^o K$.
2. Find the probabilities for each energy level.
3. Find $\langle E \rangle$, and $\sigma(E)$.

PROBLEM (3)

A quantum harmonic oscillator with $\omega = 1.5 \times 10^{14} Hz$ immersed in a heat bath at temperature $400^o K$. Compute its partition function

PROBLEM (4)

2 fermions in a system with 3 energy states. What are the possible states ? Compare this result with bosons.