

EASTERN UNIVERSITY, SRI LANKA
THIRD EXAMINATION IN SCIENCE 2004/05 (OCT/NOV. 2006)
SECOND SEMESTER
PH 305 - FUNDAMENTALS OF STATISTICAL PHYSICS

Time: 01 hour.

Answer ALL Questions.

-
01. Explain what is meant by the "single-particle partition function" Z of a system of N localized independent particles whose indivisible energy states are known. Derive the relation between the thermal average energy and the single particle partition function for a system of N weakly interacting, distinguishable particles.
- A system of N weakly interacting identical particles is in thermal equilibrium with a large reservoir at absolute temperature T . Each particle can take energies ε_1 or ε_2 .
- (i) Write down an expression for the partition function for a single particle.
 - (ii) What is the average thermal energy of a single particle?
 - (iii) Obtain an expression for the heat capacity at constant volume, C_V of the system.
02. (a) Define the following terms as used in statistical physics:
- (i) macrostate
 - (ii) microstate
 - (iii) distribution function.
- (b) State the conditions for Bose-Einstein statistics to be applicable to a system of particles. Outline qualitatively the important steps and assumptions made in the derivation of the distribution function for Bose-Einstein statistics. Hence, explain how the classical result can be obtained from this statistics.