

YMCA UNIVERSITY OF SCIENCE & TECHNOLOGY, FARIDABAD
M.SC (PHYSICS) SEM-III EXAMINATION
STATISTICAL MECHANICS (PHY 302) (Reappear)

Time: 3 Hours

Max. Marks:60

- Note: 1. It is compulsory to answer the questions of Part -A. Limit your answers within 20-40 words in this part.
2. Answer any four questions from Part -B in detail.
3. Different parts of the same question are to be attempted adjacent to each other.

PART -A

- Q1 (a) What do you mean by an isolated system? Give an example. (2)
(b) Define Triple point (2)
(c) What are the uses of ensemble? (2)
(d) What is the difference between statistical and thermodynamic entropy? (2)
(e) Define phase space. (2)
(f) Differentiate between quantum and classical statistics. (2)
(g) What are symmetric wave functions? (2)
(h) Define a priori probability. (2)
(i) What do you mean by Helmholtz free energy? (2)
(j) Explain the equipartition theorem. (2)

PART - B

- Q2 (a) Explain perfect gas in a micro canonical ensemble. (5)
(b) Explain the Gibb's paradox. How was it resolved? (5)
- Q3 Derive the expression for energy and pressure of Bose Einstein gas. Also prove that the temperature at which the Bose Einstein condensation begins depends upon the density of the gas. (10)
- Q4 (a) Derive the expression for the distribution function in Maxwell Boltzmann statistics. (5)
(b) Considering the atomic nucleus as an ideal fermion gas, show that the Fermi energy is 28MeV (5)
- Q5 (a) Derive the expression for partition function and thermodynamic functions for a grand canonical ensemble. (5)
(b) Derive the Vander Waal's equation of state of imperfect or classical real gas. (5)
- Q6 (a) Explain the One-dimensional Ising Model. (5)
(b) Write a short note on Liquid Helium. What are some peculiar properties of Liquid Helium II? (5)
- Q7 Write short notes: (5x2)
(a) Mayer Cluster expansion
(b) Virial Coefficients