No. of Printed Pages : **1**

Sl. No.

# 21PHY3C9L

## M.Sc. III Semester Degree Examination, April/May - 2023

## PHYSICS

### Thermal and Statistical Physics

### (CBCS)

Time : 3 Hours Maximum Marks : 70

***Note :*** *Answer* ***any five*** *of the following questions with Question No.* ***1 (Q1) Compulsory****, each question carries* ***equal*** *marks.*

**1.** (a) What is canonical ensemble ? Obtain the expression for probability distribution in case of canonical ensemble. **8**

(b) State and explain any three laws of thermodynamics. **6**

**2.** (a) What is partition function ? Obtain rotational partition function and discuss its use in explaining specific heat. **8**

(b) State and prove Boltzmann equipartition theorem. **6**

**3.** (a) Obtain Fermi-Dirac distribution function. **8**

(b) What are symmetry and anti-symmetry of wave functions ? Explain how antisymmetric nature of fermions leads to Pauli Exclusion Principle. **6**

**4.** (a) What are fluctuations ? Arrive at the expression for fluctuations in case of grand canonical ensemble. **8**

(b) What are Seebeck and Peltier effects ? Obtain the relation connecting Seebeck and Peltier coefficients. **6**

**5.** (a) Obtain Clausius-Clapeyron equation. Illustrate its use in vapour pressure curve. **8**

(b) Obtain Saha ionization formula. **6**

**6.** (a) Obtain Maxwell - Boltzmann distribution function for velocities. **8**

(b) What is Bose-Einstein condensation ? Obtain the expression for Bose-Einstein condensation temperature. **6**

**7.** (a) Obtain Onsager reciprocity relations. **10**

(b) What are first and second order phase transitions ? Explain. **4**

**8.** (a) State and explain Debye $T^3$ Law. **5**

(b) Obtain the relation between Thomson and Seebeck coefficients. **5**

(c) Write a note on chemical equilibrium. **4**

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