

Roll No.

(05/24)

15431

M.Sc. EXAMINATION

(For Batch 2021 & Onwards)

(Fourth Semester)

PHYSICS

MSc/Phy/4/CC15

Statistical Mechanics

Time : Three Hours

Maximum Marks : 70

Note : The question paper consists of nine questions in all. Q. No. 1 is compulsory and consists of five short answer type questions of 2 marks each. In addition, eight more questions are set unitwise with two questions from each of the four units. Attempt *four* more questions, selecting *one* question from each Unit.

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P.T.O.

(Compulsory Question)

1. (a) Define Chemical Potential.
(b) Explain the concept of ensemble.
(c) Define Partition Function.
(d) Describe the density matrix.
(e) Explain critical exponents. $5 \times 2 = 10$

Unit I

2. Describe entropy of mixing, Gibbs paradox and derive Sackur-Tetrode Equation. 15
3. Write short notes on the following : 15
 - (a) Macroscopic and microscopic states
 - (b) Contact between statistics and thermodynamics.

Unit II

4. Discuss the thermodynamics of classical ideal gas in microcanonical ensemble. 15

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5. State the prove Liouville's Theorem. 15

Unit III

6. Define Bose-Einstein condensation. Discuss laser cooling of atoms as an example of Bose Condensate. 15
7. Discuss Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics.

Unit IV

8. Define Random walk and Brownian motion. Discuss the Langevin theory of Brownian motion. 15
9. Discuss first and second order phase transitions with examples. 15

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