

P-103

Total Pages : 3

Roll No.

MSCPH-504

Statistical Mechanics

M.Sc. Physics (MSCPH)

1st Semester Examination, 2023 (June)

Time : 2 Hours]

Max. Marks : 70

Note : This paper is of Seventy (70) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein. Candidates should limit their answer to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

SECTION–A

(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nineteen (19) marks each. Learners are required to answer any Two (02) questions only.

(2×19=38)

- 1.** Discuss the phase space trajectory of a particle of mass m in a gravitational field from a height h at time t .

2. State and prove Liouville's theorem. Also mention the consequences of Liouville's theorem.
3. Explain Gibbs paradox. How it can be resolved by the concept of indistinguishability of the molecules or particles.
4. Deduce the equation of state and the entropy of an ideal classical gas in a grand canonical ensemble. Show that the results are the same as obtained in a canonical ensemble. What do you infer from this?
5. (a) Calculate the pressure exerted by 0.275 moles of N_2 gas in a 0.500 L flask at 273 K using the first two terms of the series of virial equation. The value of B for N_2 at 273 K is $10.5 \text{ cm}^3/\text{mole}$.
(b) Explain Landau theory of Phase transitions.

SECTION-B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Eight (08) marks each. Learners are required to answer any Four (04) questions only. $(4 \times 8 = 32)$

1. What are the basic rules of probability?
2. State the principle of equal a priori principle in terms of microstate and macrostate.

3. Write down the expression of Maxwell-Boltzmann distribution law.
 4. What do you understand by partition function?
 5. Find out the equation of state of an ideal classical gas in canonical ensemble.
 6. What is gas degeneracy ? Explain it for He atom.
 7. Write notes on Weiss theory of ferro-magnetism.
 8. Write comparison of Ensembles.
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