

17P212

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Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, MAY 2018

(Regular/Supplementary/Improvement)

(CUCSS - PG)

CC15P PHY2 C07 / CC17P PHY2 C07 – STATISTICAL MECHANICS

(Physics)

(2015 Admission onwards)

Time: Three Hours

Maximum: 36 Weightage

Section A

Answer *all* questions. Each question carries 1 weightage.

1. Find the number of microstates for a collection N spin half particles.
2. Starting from Sackur Tetrode equation obtain an expression for chemical potential of an ideal gas.
3. State and explain Liouville's theorem.
4. What is the value of minimum volume required by a particle to occupy in two dimensional phase space?
5. State equipartition theorem.
6. What is the chemical potential of a photon? Explain.
7. What is occupation number?
8. Write an expression for grand partition function and explain the terms.
9. Explain why we are not using canonical ensemble formalism for obtaining quantum statistics.
10. What is Bose Einstein condensation?
11. What is Stefan Boltzmann law?
12. State Debyes law for specific heat.

(12 × 1 = 12 Weightage)

Section B

Answer any *two* questions. Each question carries 6 weightage.

13. Explain Gibb's paradox using the idea of entropy of mixing. How is the paradox resolved. Will there be Gibbs paradox if we use quantum statistics for ideal gas.
14. Using occupation number concept obtain grand partition function for Bose and Fermi systems.
15. Obtain an expression for distribution of particles in different energy levels for Fermi Dirac statistics using microcanonical ensemble formalism.

16. Obtain an expression for susceptibility of a diamagnet.

(2 × 6 = 12 Weightage)

Section C

Answer any *four* questions. Each question carries 3 weightage.

17. Show that a system shows quantum behaviour at low temperature and high number density.

18. Show that entropy of a collection of classical harmonic oscillators is always extensive.

19. Show that radiation pressure exerted by the photons is equal to one third of its energy density.

20. Find an expression for Fermi energy of a 2 dimensional electron gas.

21. Obtain an expression for total energy of electrons at zero Kelvin.

22. Show that susceptibility of a paramagnet is independent of temperature at 0 Kelvin.

(4 × 3 = 12 Weightage)
