

16P208

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Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, MAY-2017

(Regular/Supplementary/Improvement)

(CUCSS - PG)

CC 15P PHY2 C07 - STATISTICAL MECHANICS

(Physics)

(2015 Admission Onwards)

Time: Three Hours

Maximum: 36 Weightage

Section A

(Answer *all* questions. Each question has weightage of 1)

1. What is a microcanonical ensemble?
2. What is Gibbs paradox?
3. Consider a collection of N independent spin half particles, each at a fixed location. What is the entropy of this system?
4. Define chemical potential.
5. Explain equipartition theorem.
6. What is a phase space?
7. State Virial theorem.
8. What are indistinguishable particles?
9. What is occupation number?
10. What is the relation between entropy and temperature of photon gas?
11. State Debye's law.
12. Check whether deuteron is a fermion or boson.

(12 × 1 = 12 Weightage)

Section B

(Answer any *two* questions. Each question has weightage of 6)

13. Find the thermodynamics of classical harmonic oscillators using canonical ensemble.
14. State and prove Liouville's theorem.

15. Obtain the bridging equation connecting grand partition function and free energy for grand canonical ensemble. Hence obtain the recipe of thermodynamics.

16. Show that susceptibility is negative for a diamagnetic material.

(2 × 6 = 12 Weightage)

Section C

(Answer any *four* questions. Each question has weightage of 3)

17. Draw the phase space diagram for a freely falling particle.

18. Express average energy of a quantum harmonic oscillator as a hyperbolic function.

19. Find an expression for chemical potential for an ideal gas.

20. Show that pressure obeys Stefan Boltzmann law for photons.

21. Find expressions for Fermi energy of 3 and 2 dimensional electron gas.

22. Show that fugacity approaches 1 at low temperature for a Bose gas.

(4 × 3 = 12 Weightage)
