15P208
(Pages: 2)

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JULY 2016

(CUCSS - PG)

(Physics)

CC 15P PHY2 C07 - STATISTICAL MECHANICS

(2015 Admission)

Time: Three Hours   Maximum: 36 Weightage

Section A

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

1. Derive the bridging relation between entropy and number of microstates for a system.
2. What do you mean by canonical ensemble?
3. State and explain Liouville's theorem.
4. What is fugacity?
5. What is density matrix?
6. What is meant by Fermi energy?
7. What is the chemical potential of a photon? Explain
8. What is Bose Einstein Condensation
9. What is Stefan Boltzmann law
10. What is Pauli paramagnetism?
11. What is the energy of electrons in a magnetic field in a diamagnet?
12. Give the expression for specific heat for a metallic solid.

(12 × 1 = 12 Weightage)

Section B

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

13. Explain Gibb's paradox using the idea of entropy of mixing. How is the paradox resolved? Do harmonic oscillators show Gibb's paradox?
14. Using microcanonical ensemble find the thermodynamics of an ideal gas.
15. Show that for large N canonical ensemble is equivalent to microcanonical ensemble.
16. Obtain Debye's law for phonons.

(2 × 6 = 12 Weightage)

Section C

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

17. Draw the phase space diagram for a harmonic oscillator.

18. For a system of independent non interacting one-dimensional quantum harmonic oscillators, what is the value of the Helmholtz free energy per oscillator, in the limit temperature tends to absolute zero ?

19. Show that energy density obeys Stefan Boltzmann law for photons.

20. Consider a system of 3 fermions which can occupy any of the 4 available energy states with equal probability. What is the entropy of the system?

21. Obtain an expression for chemical potential of a Bose gas at very low temperature.

22. Find an expression for Fermi energy of a 3 dimensional electron gas.

(4 × 3 = 12 Weightage)

****