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**DHANALAKSHMI SRINIVASAN COLLEGE
OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)**

(For Candidates admitted from 2020 - 2021 onwards)



PG DEGREE EXAMINATIONS APRIL - 2021

M.Sc., - PHYSICS

STATISTICAL MECHANICS

Time: 3 Hrs

Max.Marks: 75

PART - A

CHOOSE THE CORRECT ANSWER

(10X1=10)

1. The first law of thermodynamics states that energy can not be -----
 a) created only b) destroyed only c) converted d) created and destroyed
2. For a spontaneous process, the change in Gibbs function is equal to the -----
 a) the heat content of the system b) entropy change of the system
 c) work of expansion d) useful work
3. Phase space is a -----
 a) 3 Dimensional Space b) 4 Dimensional Space
 c) 5 Dimensional Space d) 6 Dimensional Space
4. In a classical microcanonical ensemble for a system of N interacting particles, the fundamental volume in phase space which is regarded as equivalent to one microstate is equivalent to -----
 a) h^{3N} b) h^N c) h^{2N} d) h
5. The difference between fermions and bosons is that bosons' wave function is -----
 a) Continuous b) Single Valued c) Symmetric d) Differentiable
6. Fermi-Dirac statistics cannot be applied to-----
 a) Electrons b) Photons c) Fermions d) Protons
7. The density of molecules is maximum at which speed?
 a) V_{rms} b) V_p c) V_{mean} d) V_{inst}
8. Which law states that the ratio of the thermal conductivity is proportional to the absolute temperature for all metals?
 a) Hall law b) Weidmann Franz law c) Hartley's law d) Wein's displacement law
9. Which of the following is heat required in phase transitions?
 a) Latent Heat b) Sensible Heat
 c) Depends on type of phase transition d) none of the mentioned
10. The amount of heat required to raise the temperature of 1 kg mass of that substance through 1K is called
 a) specific energy b) specific heat c) specific stress d) specific density

PART- B

ANSWER ALL THE QUESTIONS

(5X7=35)

11. a) Define entropy. Relate entropy with temperature.

(OR)

b) Derive Helmholtz free energy equation.

12. a) Define ensemble. Explain Grand canonical ensemble in detail.

(OR)

b) Define Microstates and Macrostates.

13. a) Derive Planck's radiation law from Bose Einstein Distribution law.

(OR)

b) Discuss Bose Einstein Condensation. Give its significance.

14. a) Explain what is mean by Brownian movement. Give Einstein's theory of Brownian movement.

(OR)

b) Derive the Wiedmann –Franz law.

15. a) What are the phase transitions of first and second kind?

(OR)

b) Discuss Ising model for phase transition of second kind.

PART - C

ANSWER ANY THREE QUESTIONS

(3X10=30)

16. What is mean by thermodynamic potential? Explain the four potentials.

17. State and prove Liouville's theorem.

18. Derive Pauli's theory of Paramagnetism.

19. Deduce the Maxwell – Boltzmann law for the distribution of velocities of the perfect gas.

20. What is Bragg's Williams approximation? How is energy equation of Ising model expressed in this approximation?