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(FOR THE CANDIDATES ADMITTED DURING THE ACADEMIC YEARS 2024-26 ONLY)

SUBJECT CODE 24 PPS 103

REG.NO.

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI

END-OF-SEMESTER EXAMINATIONS : NOVEMBER – 2024

M.Sc. – PHYSICS **MAXIMUM MARKS: 75**

I SEMESTER **TIME : 3 HOURS**

STATISTICAL MECHANICS

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS. (K1)

1. The ensambles of identical in features are known as

   a) element b) space point c) phase points d) isomers

2. If the macroscopic parameters of an isolated system do not vary in time, then the system is in

   a) static position b) dynamic position

   c) equilibrium d) unequilibrium

3. If the electron wave functions are overlapped the particle of type is

   a) distinguishable b) indistinguishable

   c) muons d) phonon

4. Particles satisfying antisymmetric requirement are said to be

   a) boson b) fermion c) meson d) dwarf

5. Onsager relations are used in

   a) Thermodynamical irreversible process b) Thermodynamical reversible process

   c) Boltzmann Transport equations d) chamber equation

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES. (K2)

6. What is known as density of distribution?
7. Write the expression for the mean energy of a system of n diatomic molecules
8. Define the term “statistical weight”.
9. What are white dwarfs?
10. What is known as one dimensional Ishing model?

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SECTION – B (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K3)

11. a) Differentiate canonical and grand canonical ensembles.

(OR)

b) What is statistical equilibrium? What are the conditions to be obeyed?

12. a) Establish the connection between partition function and thermo dynamic quantities

(OR)

b) Differentiate microstate and macrostate

13. a) Discuss the important facts which influence the transition from classical mechanics to quantum statistics.

(OR)

b) Prove that the density matrix is a function of a constant of motion.

14. a) Write about the importance of black-body radiation and derive the planck's law of black-body radiation.

(OR)

b) Criticize Debye's Theory with at least five points.

15. a) Deduce the expression for fluctuation in energy.

(OR)

b) Write about the role of Bragg willim approximation in Ishing model.

SECTION – C (5 X 8 = 40 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.

(K4 (Or) K5)

16. a) State Liouvilles theorem. Prove that the density of a group of points along the trajectories in the phase space remains constant.

(OR)

b) What is meant by an ensemble? Discuss microcanonical, canonical and grand canonical ensembles. Compare these three types of ensembles.

17. a) Deduce Maxwell-Boltzmann law for the distribution of molecules in a gas.

(OR)

b) Deduce the expression for Boltzmann partition function and arrive the correlation with different thermodynamic quantities.

18. a) Give the theory of density matrix and describe its role in quantum statistics

(OR)

b) Compile the results of Maxewell –Boltzman. Bos-Einestein and Fermi-Dirac statistics.

19. a) Describe the theory of Free electron model and electronic emission. Deduce the appropriate expressions.

(OR)

b)) Describe the Debey theory of specific heat of solids for low temperature and list some of its critics

20. a) Explain the thermodynamics of irreversible process based on Onsager relations.

(OR)

b) What is Bragg-William approximation? Use this approximation to arrive the conditions of spontaneous magnetization and calculate the spontaneous magnetic moment

ETHICAL PAPER

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