(6 pages)

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Code No. : 7563   Sub. Code : KPHM 33/
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M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2019.

Third Semester

Physics

STATISTICAL MECHANICS

(For those who joined in July 2016 and afterwards)

Time : Three hours   Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer :

1. Under   equilibrium,   the   thermodynamical
    probability for macrostate is

    (a) minimum

    (b) maximum

    (c) constant

    (d) none

2. Which of the following is the examples of
    macrostates

    (a) Specific heat   (b) Velocity

    (c) Atom   (d) Molecules

3. The number of phase point in each cell is defined
    as ——————— of the ensemble

    (a) Microstate   (b) Macrostate

    (c) Ensemble   (d) Canonical ensemble

4. All the system in canonical ensemble have the
    same

    (a) energy   (b) chemical potential

    (c) temperature   (d) none

5. The electron gas obeys ——————— distribution
    law

    (a) Maxwell-Boltzmann

    (b) Bose-Einstein

    (c) Fermi-Dirac

    (d) All

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6. At high temperatures, Fermi distribution law approaches —————— distribution law

   (a) Maxwell- Boltzmann

   (b) Bose-Einstein

   (c) Fermi-Dirac

   (d) None

7. The particles which are obey Pauli-Exclusion principle

   (a) Gas molecules   (b) Photons

   (c) Bosons   (d) Fermions

8. Below Bose-Einstein condensation temperature, the liquid helium displays the properties of a ——————

   (a) gas   (b) solid

   (c) fluid   (d) super fluid

9. The transition of liquid helium I into liquid helium II is the example of —————— order phase transition

   (a) First   (b) Second

   (c) Third order   (d) All

10. The conversion of water into water vapour at transition temperature, the density

    (a) increases

    (b) decreases

    (c) increase and then decreases

    (d) constants

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What do you mean by the statistical equilibrium of an example? Derive the necessary condition.

    Or

    (b) Derive the formula of volume in sphase-space.

12. (a) How to find factorial of a given number n when n is large?

    Or

    (b) Discuss and prove the law of equipartition of energy in statistical mechanics.

13. (a) Distinguish the assumption and results of three statistics.

Or

(b) Write a note on indistinguishability and quantum statistics.

14. (a) Obtain the internal energy of ideal Bose Einstein gas.

Or

(b) Discuss the drawback in Debye's theory.

15. (a) What is critical component? Explain.

Or

(b) Discuss about the Ising model in one dimension.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Derive Liouville's theorem for the conservation of density.

Or

(b) Write notes on :

    (i) Postulate of equal of priori probability.

    (ii) Density of distribution in phase space.

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

Or

(b) Discuss about the probability of magnetic moment distribution of independent atoms.

18. (a) Give the thermo dynamical interpretation of the parameters α and β.

Or

(b) What is meant by black body radiation? State Planck's formula for black body radiation and derive it from Bose-Einstein statistics.

19. (a) Discuss the phenomenon of Bose-Einstein condensation.

Or

(b) Write a brief notes on electron gas.

20. (a) Explain Yang and Lee theory about phase transition.

Or

(b) Discuss the mean field theory and calculate the exponent from it.

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