

(6 pages)

Reg. No. :

Code No. : 30065 E Sub. Code : GMPH 6 A

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2020.

Sixth Semester

Physics — Main

Major Elective — STATISTICAL MECHANICS

(For those who joined in July 2012 – 2015)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer :

1. The ratio of number of cases in which event occurs to total cases is called
 - (a) Thermodynamic quantity
 - (b) Thermodynamic probability
 - (c) Probability
 - (d) None

2. All microstates of a given microstate are
 - (a) Equally probable
 - (b) Not equally probable
 - (c) Zero
 - (d) Infinity
3. Phase space is
 - (a) 1D space
 - (b) 3D space
 - (c) 6D space
 - (d) None
4. The disorderliness of a system is called
 - (a) Entropy
 - (b) Enthalpy
 - (c) Free energy
 - (d) Probability
5. Partition function indicates the partition of particles amongst various
 - (a) Energy states
 - (b) Densities
 - (c) Space
 - (d) None
6. The entropy of joint system increases by an additional factor that is not accounted this is
 - (a) Einstein paradox
 - (b) Gibbs paradox
 - (c) Chemical potential
 - (d) None of the above

7. Common gases at normal temperature obeys _____ statistics
- (a) Maxwell boltzman (b) Bose Einstein
(c) Fermi-Disac (d) None
8. The rms speed is given by
- (a) $1.7\sqrt{\left(\frac{KT}{m}\right)}$ (b) $10\sqrt{KT/m}$
(c) $\sqrt{\frac{KT^2}{m}}$ (d) $\sqrt{\frac{m}{KT^2}}$
9. In bose-Einstein statistics the particles are
- (a) Distinguishable
(b) Indistinguishable
(c) Differentiable
(d) None
10. The highest energy that electrons can have at absolute zero is
- (a) Thermal energy
(b) Internal energy
(c) Fermi energy
(d) None

PART B — ($5 \times 5 = 25$ marks)

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

Each answer should not exceed 250 words.

11. (a) Explain the principle of equal a priori probability.

Or

- (b) Define Ensemble and average properties.

12. (a) Discuss momentum space and phase space in detail.

Or

- (b) Explain Boltzmann canonical law in detail.

13. (a) Explain the law of equipartition of energy and its implications.

Or

- (b) Discuss about Gibb's paradox.

14. (a) Discuss the applications of MB distribution law.

Or

- (b) Describe three kinds of particles in detail.

15. (a) Write about photon gas.

Or

- (b) Compare classical and quantum statistics.

PART C — ($5 \times 8 = 40$ marks)

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

Each answer should not exceed 600 words.

16. (a) Explain in detail

- (i) Micro and macrostate
- (ii) Thermodynamic probability.

Or

- (b) Explain in detail

- (i) Constraints on a system
- (ii) Concept of a cell in a compartment.

17. (a) Explain in detail the density of quantum states of energy of a particle.

Or

- (b) Discuss

- (i) Fundamental postulates of statistical mechanics
- (ii) Statistical ensembles.

18. (a) Explain partition function and its relation with thermodynamic quantities.

Or

- (b) Explain in detail the statistical interpretation of second law of thermodynamics and entropy.

19. (a) Explain in detail MB statistics applicable to ideal gas.

Or

- (b) Explain Maxwell - Boltzmann law of distribution of velocities.

20. (a) Discuss Bose-Einstein distribution law.

Or

- (b) Explain
- (i) Planck's distribution law
 - (ii) Fermi level and fermi energy.
-