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Total No. of Pages : 02

Total No. of Questions : 11

M.Sc. (Physics) (2018 Batch) (Sem.-2)

STATISTICAL MECHANICS

Subject Code : MSPH-422-18

M.Code : 75990

Time : 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains SEVEN questions carrying FIVE marks each and students have to attempt any SIX questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

Q1 Answer briefly :

- (a) Differentiate between classical and quantum statistics.
- (b) What do you understand by electron gas?
- (c) What are the properties of an ideal gas and photon gas?
- (d) Explain Pauli paramagnetism.
- (e) Define: Microstate, Macrostate and Thermodynamic probability.
- (f) Under what conditions do the Bose-Einstein and Fermi-Dirac distribution approach Maxwell- Boltzmann distribution?
- (g) What do you mean by phase space?
- (h) Define Debye field.
- (i) What is first order phase transition? Give an example.
- (j) What do you mean by random motion? Give two examples.

SECTION-B

- Q2 Show that the fractional concentration fluctuation varies as $N^{-1/2}$.
- Q3 Differentiate between microcanonical, canonical and grand canonical ensembles.
- Q4 State and explain Gibbs paradox.
- Q5 Show that the single particle partition function for an ideal monoatomic gas is given by :

$$Z = V \left(\frac{2\pi mkT}{h^2} \right)^{3/2}$$

- Q6 Write a short note on thermodynamic fluctuations.
- Q7 Differentiate between Bose-Einstein and Fermi-Dirac statistics.
- Q8 Write a note on Brownian motion.

SECTION-C

- Q9 State and prove Liouville's theorem and list its consequences.
- Q10 Discuss Bose-Einstein condensation in detail.
- Q11 What is meant by non-equilibrium processes? Derive equation of diffusion.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.