

6. (a) State and explain Planck's law and discuss the Bose-Einstein condensation.

*Or*

- (b) Discuss in detail the Ising model (one dimensional) in Bose gas.

2019

*Time : 3 hours*

*Full Marks : 80*

Answer from **both** the Sections as directed

*The figures in the right-hand margin indicate marks*

*Candidates are required to answer in their own words as far as practicable*

**(STATISTICAL MECHANICS)**

**SECTION – A**

1. Answer any *four* of the following : 4 × 4
- (a) Explain the postulates of classical statistical mechanics.
  - (b) Explain the density fluctuations in grand canonical ensemble.
  - (c) Explain the third law of thermodynamics.
  - (d) Explain Fermi-Dirac distribution.

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- (e) Briefly explain Pauli paramagnetism.  
(f) Explain phase transitions.

*Or*

2. Answer *all* questions : 2 × 8

- (a) Define ensemble.  
(b) What is Gibb's paradox ?  
(c) Define third law of thermodynamics.  
(d) State F-D distribution.  
(e) What is paramagnetism ?  
(f) Define ideal Fermi gas.  
(g) What is photon ?  
(h) Distinguish between 1st order and 2nd order phase transition.

**SECTION – B**

Answer *all* questions : 16 × 4

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3. (a) State and explain Liouville's theorem and equipartition theorems.

*Or*

- (b) Define canonical and grand canonical ensembles and explain the energy fluctuations in canonical and grand canonical ensembles.

4. (a) Explain the postulates of quantum statistical mechanics and discuss the ensembles in quantum statistical mechanics.

*Or*

- (b) Explain the ideal gas in ground canonical ensemble and write a note on M - B distribution.

5. (a) Obtain the equation of state of ideal Fermi gas.

*Or*

- (b) Discuss in detail the theory of white dwarf stars.