G-3/386/22

Roll No. .....

III Semester Examination, January, 2022

M.Sc.

PHYSICS

Paper II

(Statistical Mechanics)

Time : 3 Hours] [Max. Marks : 80

Note : *All questions are compulsory. Question Paper comprises of 3 Sections. Section A is objective type/multiple choice questions with no internal choice. Section B is short answer type with internal choice. Section C is long answer type with internal choice.*

SECTION A **1×8=8**

(Objective Type/Multiple Choice Questions)

Choose the correct answer :

1. In which statistics number of particles are limiteds.

(a) FD statistics (b) BE statistics

(c) Both (a) and (b) (d) None of these

2. Which statistics follows Pauli's exclusion principle.

(a) FD statistics (b) BE statistics

(c) MB statistics (d) None of these

P.T.O.

3. In canonical ensemble the individual system is seperated by :

(a) Rigid, permeable, conducting walls

(b) Rigid, impermeable, conducting walls

(c) Rigid, impermeable, non-conducting walls

(d) None of the above

4. According to fundamental concept of statistical mechanics :

(a) Total energy of the system does not remains constant

(b) Total energy of system remains constant

(c) There is small change in energy

(d) Volume of the system is zero

5. During which process does matter change from a solid to a liquid with the addition of heat energy ?

(a) Fusion (b) Solidification

(c) Sublimation (d) Condensation

6. Phase transitions result from :

(a) Removale of heat energy

(b) Addition and removal of heat energy

(c) Chemical change

(d) Addition of heat energy

7. Phase space is a ..... space.

(a) 3 dimensional (b) 4 dimensional

(c) 5 dimensional (d) 6 dimensional

8. Brownian motion occurs because of :

(a) Departure from equilibrium

(b) Solute-solvent collisions

(c) Random process

(d) None of the above

SECTION B **6×4=24**

(Short Answer Type Questions)

Note : *Answer the following questions in* ***250*** *words.*

Unit-I

1. Write note on microchemical and canonical assemble.

Or

Explain Gibb's paradox.

Unit-II

2. Discuss indistinguishability and quantum state.

Or

Explain density matrix.

Unit-III

3. Explain phase transition.

Or

Discuss King model in one dimension.

Unit-IV

4. Write note on any *one* the following :

(a) Thermodynamic fluctuation

(c) Brownian motion

SECTION C **12×4=48**

(Long Answer Type Questions)

Note : *Answer the following questions in* ***500*** *words.*

Unit-I

1. Describe relation between statistical and thermodynamical quantities.

Or

Discuss position function and its correlation with thermodynamic quantities.

Unit-II

2. Describe Landau's theory of phase transition.

Or

Explain cluster expansion for classical gas.

Unit-III

3. Derive expression for Fermi-Dirac statistics.

Or

Discuss the phenomenon of Bose-Eintein condensation.

Unit-IV

4. Discuss Einstein relation and expression for mobility.

Or

State and prove Fluctuation dissipation theorem.

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