

C 83634

(Pages : 2)

Name.....

Reg. No.....

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2015  
(CUCSS)

Physics

PHY 2C 07 STATISTICAL MECHANICS

(2010 Admission)

Time : Three Hours

Maximum : 36 Weightage

**Section A**

*Answer all questions. Each question carries a weightage of 1.*

1. State the postulate of equal a priori probability.
2. Explain the terms microstate and macrostate of an ensemble .
3. Define thermodynamical probability of a system.
4. Find  $C_V$  of a monoatomic ideal gas using equipartition theorem.
5. Explain phase space of a classical system.
6. Define fermi energy.
7. What is Gibb's paradox.
8. Explain the statistical origin of third law of thermodynamics.
9. What is meant by Lorenz number ?
10. Draw the phase diagram of a particle free to move in one dimation.
11. Define virial co-efficient.
12. What is the relation between fugacity and  $q$ -potential.

(12 × 1 = 12 weightage)

**Section B**

*Answer any two questions. Each question carries a weightage of 6.*

13. Discuss the relation between statistics and thermodynamics. Express temperature. Pressure and chemical potential interms of the state function  $\Omega$ .
14. Derive Liouville's theorem and bring out its consequences.
15. Discuss the thermodynamic behaviour of an ideal Bose gas and explain Bose Einstein condensation.
16. Discuss the thermodynamics of black body radiation and deduce stefan Boltzman Law of black body radiation.

(2 × 6 = 12 weightage)

Turn over

**Section C**

Answer any **four** questions. Each question carries a weightage of 3.

17. Show that when  $g_i \gg n_i$  the B.E distribution reduces to the classical M.B distribution.
18. Two particles are to be distributed in 3 cells. How many microstates are possible if the particles are (a) Boltzons (b) bosons (c) Fermions.
19. Determine the fluctuation in the number of particles in a perfect gas obeying F.D statistics.
20. A mole of oxygen at  $p = 1$  atm and  $T = 300$  K is mixed with 4 moles of Nitrogen at the same pressure and temperature Find the entropy of mixing per mole of air formed.
21. Atomic weight of Li is 6.94 and its Density is  $530 \text{ kg/m}^3$  calculate the Fermi energy and Fermi temperature of Li.

22. Show that the expectation value of the quantity  $G$  is  $\langle G \rangle = \frac{\text{Tr}(\hat{\rho}\hat{G})}{\text{Tr}(\hat{\rho})}$  Where  $\hat{\rho}$  density matrix.

(4 × 3 = 12 weightage)