SECOND SEMESTER M.Sc. DEGREE EXAMINATION, JUNE 2015

(CUCSS)

Physics

PHY 2C 07 – STATISTICAL MECHANICS (4C)

(2012 Admissions)

Time : Three Hours   Maximum : 36 Weightage

Section A

Answer all questions.

Each question carries a weightage of 1.

1. What is the difference between a micro state and a macro state?

2. Explain degenerate state and statistical weight factor.

3. State the postulates of equal a priori probability.

4. What is the criterion for classifying particles into bosons and fermions?

5. Draw the phase diagram for a particle free to move in one dimension.

6. What is grand partition function?

7. What is the thermodynamic meaning of Fermi energy?

8. Define virial co-efficient.

9. Explain Gibbs paradox.

10. Name and explain the statistics obeyed by free electrons in metals.

11. Explain the term fugacity.

12. Why the electrons in a metal do not contribute to its specific heat at room temperature?

(12 × 1 = 12 weightage)

Section B

Answer any two questions.

Each question carries a weightage of 6.

13. Derive Liouville's theorem and explain its consequences.

14. Explain microcanonical ensemble. Find the quantum states and the phase space of linear harmonic oscillator.

Turn over

15. Describe the thermodynamic behaviour of an ideal Bose gas.

16. Give a theoretical description of Pauli paramagnetism.

($2 \times 6 = 12$ weigh

Section C

Answer any **four** *questions.*

Each question carries a weightage of 3.

17. A Maxwell-Boltzmann system of N particles exists in any of the three non-degen states–E, 0, E. Find the entropy of the system at OK.

18. Find C_v of a monoatomic ideal gas using equi-partition theorem.

19. For a gas obeying Maxwell velocity distribution, obtain the most probable speed o molecules.

20. Prove that the phase space area equivalent to one Eigen state of a linear harmonic oscil is h.

21. Find the fluctuation in the number of particles in a perfect gas obeying F D statistics.

22. A cubic meter of atomic hydrogen at STP contains about 2.6×10^{25} atoms. Find the numl atoms in their first excited state at 1000 K.

($4 \times 3 = 12$ weigh