Roll No. .

Total Pages : 2

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GSM/M-16

PHYSICS

(Statistical Physics)

Paper–VII

Time : Three Hours] [Maximum Marks : 40

Note : Question No. 1 is compulsory. *Four* more questions are to be attempted, selecting *one* question from each unit. Use of Scientific (Non-programmable) calculator is allowed. Log tables may be asked for.

Compulsory Question

1. (a) Calculate Einstein's frequency in a case for which $\theta_E = 236K$.

Given that $k_B = 1.4 \times 12^{-23}\ JK^{-1}$, $h = 6.6 \times 10^{-34}$ J sec.

(b) If the r.m.s. speed of hydrogen molecule at N.T.P. is 2×10^5 cm/sec., find the r.m.s. speed of oxygen molecule at N.T.P. 2

(c) Calculate the 'A Priori Probability' of drawing a king out of a well shuffled pack of cards. 1

(d) Distinguish between Bosons and Fermions. 1

(e) What are the constraints which are obeyed by a photon gas at a given temperature? 1

(f) Distinguish between Statistical Probability and A Priori Probability. 1

UNIT–I

2. Explain the distribution of four distinguishable particles in two compartment of equal size, and hence define microstate, macrostate and thermodynamic probability. 8

3. (a) Explain the basic postulate of Statistical Physics. 3

(b) Derive Boltzmann Distribution Law. 5

UNIT–II

4. Explain the different kinds of Statistics. Also explain the common approach in dealing with these statistics. 8

5. Define Maxwell-Boltzmann's law of distribution of speeds, and hence explain in detail its graphical representation. 8

UNIT–III

6. What do you mean by Fermi gas? Derive an expression for the energy of a Fermi gas at absolute gas. Point out its physical significance. 8

7. What do you understand by Bose-Einstein condensation? Calculate the critical temperature at which condensation will start. 8

UNIT–IV

8. What are the assumptions of Einstein's theory of Specific heat of solid? Derive the relation for specific heat using this theory. 8

9. What are Debye's assumptions? How does it obtain specific heat of solid at different temperatures ? What is fault of this theory? 8