LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **PHYSICS**

THIRD SEMESTER – NOVEMBER 2007

PH 3503 - THERMODYNAMICS

AC 8

Date : 31/10/2007 Dept. No. Max. : 100 Marks
Time : 9:00 - 12:00

PART – A

Answer ALL the questions: (10 x 2 = 20)

1. Mention the degrees of freedom of a diatomic molecule with explanation.
2. Calculate the mean free path of a gas molecule, given that the molecular diameter is 2×10^{-8} cm and the number of molecules per cc is 3×10^{10}.
3. What is a super-fluid?
4. What do you understand by λ – point?
5. State any statement of second law of thermodynamics.
6. Define the concept of entropy.
7. What is a second order phase transition? Give an example.
8. Define Gibbs function.
9. Define phase space.
10. Define ensemble. Give and example.

PART – B

Answer any FOUR questions: (4 x 7.5 = 30)

11. State the law of equipartition of energy. Prove that for a perfect gas whose molecules have n degrees of freedom,
$$\frac{C_P}{C_V} = 1 + \frac{2}{n}.$$ (2+5.5 marks)
12. Describe Linde's method of liquefying air.
13. State first law of thermodynamics. Apply it to arrive at an expression for an adiabatic process. (2+5.5 marks)
14. Explain reversible and irreversible processes with suitable examples. (4+3.5 marks)
15. State the postulates of statistical mechanics. Explain the relation connecting entropy and probability. (3+4.5 marks)

PART – C

Answer any FOUR questions: (4 x 12.5 = 50)

16. (a) Derive an expression for the viscosity of a gas on the basis of kinetic theory. (10)
(b) The mean free path of a gas is 9 x 10-6 cm. The RMS velocity of the molecules is 4.5 x 102 m/s and the density of the gas is 1.25kg m-3. Calculate the viscosity of gas. (2.5)
17. Describe deriving the necessary formula how the value of γ is determined by Clement and Desorme's method.
18. Deduce Claussus-Clapeyron equation. How does it explain the effect of pressure on (i) melting point of solid and (ii) boiling point of liquid. (8.5+2+2)
19. Deduce Maxwell's thermodynamics relations.
20. Derive Planck's radiation law for the black body radiation.

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