[This question paper contains 3 printed pages.]

4402 *Your Roll No.* ....

Subsidiary for B.Sc. Honours/I AS

PHYSICS – Paper II

(Thermal Physics)

Time : 3 Hours *Maximum Marks : 50*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any **Five** *questions.*
All *questions carry equal marks.*

1. Describe the principle, construction and working of a thermo-electric thermometer. State its advantages.

   (8,2)

2. Define the coefficient of thermal conductivity of a solid. Describe Lee's method of determining the thermal conductivity of a bad conductor. Deduce the relevant formula. Why the specimen must have a small thickness and large surface area ? (1,5,2,2)

3. Discuss Maxwell-Boltzmann law of distribution of velocities of gas molecules. Describe a method for its experimental verification. Obtain an expression for the most probable speed. Show plot of Maxwell-Boltzmann distribution law of velocities at two different temperatures. (2,5,2,1)

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4. (a) Distinguish between isothermal and adiabatic processes.

    (b) Prove that adiabatic elasticity of a gas is $\gamma = (C_p/C_v)$ times the isothermal elasticity.

    (c) Calculate the work done when 1 gm mole of an ideal gas expands isothermally at 27°C to double its original volume.

    R = 8.3 J/mole/deg.   (2,4,4)

5. (a) State Kelvin-Planck and Clausius statements of second law of thermodynamics.   (2)

    (b) State and prove Carnot's theorem.   (5)

    (c) A Carnot's engine works within the temperatures 100°C and 0°C. If the work done in a cycle is 12000 Joules, find the (i) efficiency and (ii) amount of heat in calories extracted from the source.

                                                        (1,2)

6. (a) Deduce an expression for the effect of pressure on the melting point of a solid. What is the effect of increase of pressure on the melting point of a solid which contracts on melting ?   (5,2)

    (b) Calculate the pressure required to make ice freeze at −1°C.

$L = 79.6 \times 4.2 \times 10^7$ ergs/gm

Specific volume of water at $0°C = 1.00$c.c.

Specific volume of ice at $0°C = 1.091$c.c.

One atmosphere $= 1.013 \times 10^6$ dynes/cm^2 (3)

7. (a) What is a black body? What are the characteristics of a black body radiation? (1,3)

   (b) Define solar constant. Give an experimental method to determine solar constant.   (1,5)

8. Write short notes on any **two** of the following :

   (a) Joule-Thomson Effect

   (b) Absolute scale of temperature

   (c) Carnot's Cycle   (5,5)