

[This question paper contains 2 printed pages.]

4607-A

Your Roll No.

B.Sc. Prog. /II

AS

PHYSICS

PH-202 – Thermal Physics and Optics

(Admissions of 2007 & before)

Time : 3 Hours

Maximum Marks : 75

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

Attempt any Five questions.

All questions carry equal marks.

- (a) State two well known statements of the Second law of thermodynamics and prove their equivalence. (8)

(b) State and prove Carnot's theorem. (7)
- (a) Define entropy. Calculate the change in entropy during (i) a reversible cyclic process and (ii) an irreversible cyclic process. (10)

(b) Explain the principle of increase of entropy. (5)
- (a) Show that the Joule-Thomson coefficient is given by

$$\mu = \left(\frac{\partial T}{\partial P} \right)_H = \frac{1}{C_p} \left[T \left(\frac{\partial V}{\partial T} \right)_P - V \right] \quad (8)$$

and $\mu = 0$ for a perfect gas. (2)

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- (b) Derive Clausius-Clapyron latent heat equation. (5)
4. (a) Define Micro and Macro states of a system. Give examples. (5)
- (b) Explain the meaning of term thermodynamic probability and show that the entropy of a system is proportional to the logarithm of thermodynamic probability of that system. (10)
5. (a) Derive Bose-Einstein distribution function. (9)
- (b) Show that Rayleigh Jeans law and Wien's law are special cases of Planck's law. (6)
6. (a) Derive Maxwell's four thermodynamic relations. (10)
- (b) Using these relations show that
- $$C_p - C_v = -T \left(\frac{\partial P}{\partial V} \right)_T \left(\frac{\partial V}{\partial T} \right)_P^2 \quad (5)$$
7. Write short notes on any **TWO** of the following :
- (a) Zeroth and first law of thermodynamic
- (b) Law of equipartition of energy and its application to specific heat of gases
- (c) Bose Einstein Condensation
- (d) Transport phenomenon (7½×2)