# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

THIRD SEMESTER – **APRIL 2013**

**PH 3505/PH 3503 - THERMODYNAMICS**

Date: 02/05/2013 Dept. No. Max. : 100 Marks
Time: 9:00 - 12:00

## PART – A

**Answer ALL the questions:** **(10 × 2 = 20 marks)**

1. State the law of equipartition of energy.
2. What do you mean by Brownian motion?
3. Explain reversible process with an example.
4. What is meant by superfluidity?
5. State first law of thermodynamics.
6. Define the concept of entropy.
7. Define Gibbs function.
8. What is meant by second order phase transition? Give any two examples.
9. What is thermodynamic probability?
10. What are the characteristics of a black body radiation?

## PART - B

**Answer any FOUR questions:** **(4 × 7.5 = 30 marks)**

11. (a) Define mean free path. (2)
    (b) Derive an expression for the mean free path of molecules in a gas. (5.5)

12. (a) Derive Mayer's relation for the two specific heat capacities of a gas. (5.5)
    (b) Calculate the specific heat capacity of air at constant volume, given that the specific heat capacity of air at constant pressure is 960J $kg^{-1}$ $k^{-1}$ and density of air at NTP is 1.293kg/$m^3$. (2)

13. (a) Prove that the change in entropy in a reversible process is zero. (3.5)
    (b) Discuss Clausius inequality. (4)

14. Describe Temperature – Entropy diagram in the case of Carnot's cycle and hence arrive at an expression for the efficiency of the Carnot's engine. (4+3.5)

15. (a) What do you mean by micro and macro states? (2.5+3)
    (b) Explain the term phase space. (2)

## PART – C

Answer any **FOUR** questions. (4× 12.5 = 50 marks)

16. (a) What do you understand by transport phenomena in a gas ? (2)

(b) Derive an expression for the viscosity of a gas on the basis of transport phenomenon. (10.5)

17. (a) Describe, with a suitable diagram, Linde's process of liquefying air. (8.5)

(b) Write a brief note on HeliumII. (4)

18. (a) Derive Clausius –Clapeyron latent heat equation. (8.5)

(b) One mole of a perfect gas is expanded isothermally to twice its initial volume. Calculate the change in entropy (R= 8.313J $mol^{-1}k^{-1}$). (4)

19. Give the theory of Joule – Kelvin effect and discuss its results. (9.5+3)

20. (a) Discuss Bose – Einstein distribution law. (5.5)

(b) Using it, derive Planck's radiation law for the black body radiation. (7)

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