LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – **NOVEMBER 2019**

16/17UPH5MC02 – THERMAL PHYSICS

Date: 31-10-2019   Dept. No.   Max. : 100 Marks

Time: 09:00-12:00

PART –A
Answer ALL questions: (10x2 =20 Marks)

1. State the law of equipartition of energy.

2. The pressure of the gas depends on the square of r.m.s. speed of the molecule, why?

3. Define mean free path.

4. Mention any four thermodynamical variables.

5. State Carnot's theorem.

6. What is meant by mechanical equilibrium?

7. Write a note on thermal death of universe.

8. What is the physical significance of entropy?

9. Define Helmholtz energy.

10. Write down the set of conditions for stable equilibrium of a thermally isolated-isobaric system.

PART –B
Answer any FOUR questions: (4x7.5 =30 marks)

11. Applying the kinetic interpretation to a system of gas, obtain an expression for the pressure exerted on the walls of the container.

12. State and explain the Zeroth law of thermodynamics and hence give an interpretation for the concept of temperature.

13. Explain the working of a heat engine and calculate its efficiency when a perfect gas is the working substance.

14. Derive an expression for the entropy change in a reversible process.

15. Discuss the thermodynamic mnemonic diagrams.

16. 1.29 litre of a perfect gas weighs 2.7×10^{-3} kg at 18^0C and 1 atm pressure. Compute its rms speed, average speed and most probable speed. (Take 1 atm = 10^5 Nm^{-2} and R = 8.31 J mol^{-1} K^{-1}).

PART – C

Answer any FOUR questions: (4x12.5 =50 Marks)

17.   Derive the Maxwell's law of distribution of molecular speeds in a perfect gas.

18.   Derive and discuss the van der Waals equation of state of a real gas. Mention its demerits.

(10+2.5)

19.   Show that the empirical temperature is the same as the thermodynamic temperature.

20.   Derive Maxwell's thermodynamical equations and use them to obtain Tds equation.

(6+6.5)

21.   Discuss the Clausius – Clapeyron's equation for first order phase transition.

22.   a) Explain the Kelvin – Planck statement of the second law of thermodynamics.

   b) A Carnot engine whose low temperature reservoir is at 7^0C   has an efficiency of 50%. By how much degree should the temperature of the hot reservoir be increased so that efficiency increases to 70%.

(5+7.5)

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