LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc.DEGREE EXAMINATION –**PHYSICS**

FIFTH SEMESTER – **APRIL 2019**

16UPH5MC02– THERMAL PHYSICS

Date: 16-04-2019   Dept. No.   Max. : 100 Marks
Time: 09:00-12:00

Part A

Answer **ALL** questions.   **(10 x 2 = 20 Marks)**

1. State Boyle's and Charles law.
2. Show that the specific heat capacity of monoatomic gas $C_V = 3R/2$
3. What is mean free path?
4. List any four thermodynamical variables.
5. Distinguish internal energy and enthalpy.
6. A Carnot's engine is made to work between $0^{o}C$ and $-200^{o}C$. Calculate its efficiency.
7. Define entropy. Give its unit.
8. What is unavailable energy?
9. What is an adiabatic process? Give example.
10. What is phase transition?

Part B

Answer any **FOUR** questions.   **(4 x 7.5 = 30 Marks)**

11. List any five fundamental assumptions of kinetic theory of gases.
12. State zeroth law of thermodynamics. Explain the concept of thermodynamic equilibrium and temperature.
13. a) State second law of thermodynamics.   **(3+4.5)**
    b) Explain the thermodynamic scale of temperature.
14. Discuss the Clausius inequality.
15. Explain the general conditions for a natural change of a composite system.
16. Write notes on a) Thermal b) Mechanical c) Diffusive interactions   **(2.5+2.5+2.5)**

Part C

Answer any **FOUR** questions.   **(4 x 12.5 = 50 Marks)**

17. Derive the Maxwell's distribution law. Use it to obtain the following values of molecular speeds a) average speed b) RMS value c) most probable speed
18. Derive the Vander Waals equation of state of perfect gas. Plot the equation in a P-V diagram.
19. a) Show that $C_p – C_V = R$ for an ideal gas.   **(5+5+2.5)**
    b) Explain the variation of temperature in the atmosphere with height.
    c) Calculate the adiabatic lapse rate for $\Upsilon = 1.4$, $g = 9.8$ m/s^2 and M = 0.029 kg/mol.
20. Derive the various forms of TdS equations. Obtain the first energy equation.
21. a) Explain the thermodynamic mnemonic diagram for Maxwell relations.   **(8+4.5)**
    b) Discuss the general conditions for thermodynamic equilibrium with reference to isothermalprocess.
22. a) Derive an expression for the change in entropy in an irreversible process.   **(8+4.5)**
    b) Discuss the principle of increase in entropy of the universe.

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