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Sr. No.321306

December, 2023

B. Sc. (Physics) ~~B.Sc.~~ III SEMESTER

Thermal Physics (BPH-302)

Time: 3 Hours **Max. Marks:75**

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Use of scientific calculator is allowed.*

PART -A

Q1 (a) State and explain first law of thermodynamics? (1.5)

(b) What do you mean by thermodynamic equilibrium? (1.5)

(c) What do you mean by isobaric process and isochoric process? (1.5)

(d) Find the efficiency of the Carnot's engine working between 127^0C and 27^0C. (1.5)

(e) Define first order phase transitions with suitable example. (1.5)

(f) Define entropy. Discuss the physical meaning of entropy. (1.5)

(g) What are intensive and extensive variables? (1.5)

(h) Calculate the mean free path of a gas molecule, given that the molecular diameter is 2×10^{-8}cm and the number of molecule per cc is 3×10^{19}. (1.5)

(i) What is temperature of inversion? (1.5)

(j) In what way a real gas differs from an ideal gas. (1.5)

PART -B

Q2 (a) Derive an expression for work done during an adiabatic process. (5)

(b) From the first law of thermodynamics, prove that C_P-C_V=R. (5)

(b) What is internal energy of a system? Explain that the internal energy is a state function and not a path function. (5)

Q3 (a) Describe Carnot's cycle and obtain an expression for the efficiency of an ideal heat engine working between two temperatures T_1 and T_2. (10)

(b) The efficiency of a Carnot's cycle is 1/6. If on reducing the temperature of the sink by 65^0C, the efficiency becomes 1/3. Find the initial and final temperatures between which the cycle is working. (5)

Q4 (a) Show that during a reversible adiabatic process the entropy of the system remain constant. (5)

(b) Derive Maxwell's thermodynamical general equations connecting the thermodynamic quantities. (10)

Q5 (a) Derive an expression for the viscosity (η) of a gas in term of mean free path of its molecules. Show that it is independent of pressure but depends upon the temperature of the gas. (10)

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