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SUBJECT CODE NO: - YY-2336
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. F.Y (Sem-I)
Examination May / June - 2023
Physics Paper-II Heat and Thermodynamics

[Time: 1:30 Hours]   **[Max. Marks: 40]**

Please check whether you have got the right question paper.

N. B   1) All questions are compulsory.
              2) All questions carry equal marks.
              3) Draw neat diagrams and give labels wherever necessary.
              4) Figures to the right indicate full marks.

Q1 Define Coefficient of thermal conductivity. Derive an expression for radial flow of heat   10
along the wall of cylindrical tube.

OR

Explain in brief.
- a) Compare the Vander Waal's equation of state of gas results with Andrew's   05
experimental PV curves
- b) Calculate the Vander Waal's constants for dry air, given that   05
$T_c = 132K, P_c = 37.2 \ atmos \ and \ R \ per \ mole = 82.07 \ cm^{-3} \ atm \ K^{-1}$.

Q2 Derive the Clausius expression for mean free path (λ) on the basis of Kinetic theory of   10
gases.

OR

Explain in brief.
- a) State the second law of thermodynamics with the help of Kelvin and Clausius   05
statement.
- b) A Carnot's engine whose temperature of the Source is 400 K takes 200 calories   05
of heat to the sink. What is the temperature of sink? Also calculate efficiency of
engine.

Q3 Solve any two questions.   10
   1) In an Ingen-Hausz experiment, Wax melted over 10 cm of copper rod and over 4
   cm iron rod. What is the conductivity of iron, when conductivity of Copper is
   0.90?
   2) Derive an Vander Waal's equation of state of a gas.
   3) In an experimental viscosity of gas was found to be 2.25×10^{-4} CGS unit. The
   r. m. s velocity of the molecule is $4.5 \times 10^4 \ cm/s$. The density of gas is 1
   gm/lit. Calculate mean free path of the molecule.

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4) Explain reversible and irreversible process.

Q4 Multiple choice questions. 10

1) The heat is flowing along a rectilinear bar of uniform area of cross section then
_____ equation represent the excess of temperature of a point at a distance
x from the hot end after steady state is reached.
a) $\theta = \theta_0 e^{-\mu x}$ b) $\theta = e^{-\mu x}$ c) $\theta_0 = \theta e^{-\mu x}$ d) None of these

2) The mean free path of Nitrogen at $0^{°C}$ and 1 atmosphere pressure is $8 \times 10^{-8} m$.
The molecular diameter is $3.23 \times 10^{-10} m$. Find the number of molecular per
unit volume at this temperatures and pressures.
a) 38×10^{25} per m^3 b) 3.8×10^{25} per m^2
b) 38×10^{25} per m^2 d) 3.8×10^{25} per m^3

3) Viscosity of a gas is directly proportional to
a) Temperature   b) Density of gas   c) Pressure   d) T^2

4) The coefficient of thermal conductivity K is _____.
a) $\frac{QX}{A(\theta_1 - \theta_2)t}$ b) $\frac{Q}{A(\theta_1 - \theta_2)tX}$ c) $\frac{Qt}{A(\theta_1 - \theta_2)X}$ d) None of these

5) Heat transfer takes place by the process of
a) Conduction   b) Convection   c) Radiation   d) All of these

6) Correction for pressure in van der Waal's equation
a) $P + \frac{a}{V^2}$ b) $P - \frac{a}{V^3}$ c) $V + b^2$ d)) $V - b^2$

7) Viscosity of a gas is due to transport of _____.
a) Momentum   b) Energy   c) Mass   d) None of these

8) The efficiency of Carnot's reversible engine is independent of the
a) Heat source   b) Nature of working Substance.
c) Heat sink   d) All of these

9) In reversible adiabatic process, the entropy of the system.
a) Increase   b) decrease   c) remain constant   d) None of these

10) The rate of change of temperature with respect to distance is
a) Velocity of gradient   b) Temperature Gradient
c) Mass conversion gradient   d) None of these