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SUBJECT CODE NO:- B-2014
FACULTY OF SCIENCE & TECHNOLOGY
B.Sc. F.Y (Sem-I)
Examination November/December- 2022
Physics Paper-II
Heat and Thermodynamics

[Time: 1:30 Hours] [Max. Marks: 50]

Please check whether you have got the right question paper.

N.B i) Attempt all questions.
  ii) Use of logarithm table and electronic pocket calculator is allowed.

Q.1 (a) Explain in detail the spherical shell method of radial flow of heat. 10

  (b) Derive Vander Waal's equation of state, with correction for pressure and volume. 10

OR

  (c) Define an isothermal process. Derive an expression for work done during an isothermal process. 10

  (d) Derive following Maxwell's thermodymanical relations. 10

  (i) $\left(\frac{\partial T}{\partial V}\right)_s = -\left(\frac{\partial P}{\partial S}\right)_v$ ii) $\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_v$

Q.2 (a) Write a short note on coefficient of thermal conductivity. 5

  (b) In an Ingen – Hausz experiment wax melted over 8cm of copper rod and over 5cm of iron rod. 5
  What is the conductivity of iron when the conductivity of copper is 0.90

  (c) Describe Carnot's ideal heat engine. 5

  (d) A gas occupying 1 liter at 80cm of Hg pressure is expanded adiabatically to 1200cc. If the 5
  pressure fall to 60cm of tlg in the process. Deduce the value of γ

OR

  (a) Write short note on sphere of Influence. 5

  (b) The r.m.s. velocity of a gas molecule is 450 m/sec and the density of gas is 1kg /m^3. Calculate the 5
  viscosity of the gas if the mean free path of the gas molecule is 1.5 x 10^{-8}m.

  (c) Prove that in complete reversible process, the total change in entropy is always zero. 5

  (d) Water boils at a temperature 101℃ and at a pressure of 787mm of Hg. If lgm of water occupies 5
  1601cm on evaporation, then calculate the latent heat of steam (J=4.2 x 10^7 ergs/cal)

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Q.3 Multiple choice questions. 10

1. The S.I. unit of thermal resistivity is

(a) $Jm.s/°C$ (b) $m - s°C/J$ (c) $watt/ms°C$ (d) $ms/J°C$

2. Two rods of length l and 2l, thermal conductivities 2k and k are connected end to end. If cross section areas of two rods are equal, then equivalent thermal conductivity of system is

(a) $\left(\frac{5}{6}\right)K$ (b) $\left(\frac{6}{5}\right)K$ (c) $\left(\frac{3}{5}\right)K$ (d) 1.5K

3. Viscosity of gas is due to transport of

(a) momentum   (b) energy   (c) mass   (d) Both a and b

4. The mean free path of a gas molecule is inversely proportional to

(a) square of the diameter of the molecule

(b) square root of the diameter of the molecule

(c) molecular diameter

(d) Fourth power of the molecular diameter.

5. The S.I. unit of coefficient of viscosity (η) is

(a) Nm^{-2}/S (b) N/m^2S (c) NS/m^3 (d) NS/m^2

6. The amount of work done in Carnot's heat engine working between 2100J & 1660J is.

(a) 420J   (b) 410J   (c) 440J   (d) 430J

7. The device which convert heat into mechanical work is

(a) Motor   (b) generator   (c) heat engine   (d) energy converter.

8. For adiabatic expansion of an ideal gas the equation is

(a) $TV^{\gamma-1} = constant$ (b) $TV^{\gamma} = constant$

(c) $T^{\gamma}V^{\gamma-1} = constant$ (d) $VT^{\gamma-1} = constant$

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9. The unit of entropy is

(a) Joule / Kelvin   (b) Cal / Kelvin   (c) Both a & b   (d) Watt / Kelvin

10. When 10kg of water heated at $100°C$ is converted into steam at same temperature. The increase in entropy is.

(a) 14477 cal / k   (b) 17,240cal / k   (c) 27 cal /k   (d) 3730 cal / k