Y-2008

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FACULTY OF SCIENCE AND TECHNOLOGY

B.Sc_(PATTERN-2013) (F.Y SEM I)

Examination April / May - 2024

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 logarithmic table and electronic pocket calculator is allowed.

Q.1 (a) Derive an expression for the spherical shell method of radial flow of heat. **10**

(b) Derive an expression for mean free path Explain its variation with temperature and Pressure. **10**

OR

(a) What is adiabatic process? Derive an expression for work done during adiabatic process. **10**

(b) Derive an general relationship by Maxwell's thermo dynamical equation. **10**

Q.2 (a) Discuss about transference of heat. **05**

(b) The opposite faces of a metal plate of 0.2 cm thickness are at a difference of temperature of 100°c and the area of the plate is 200 sq. cm. Find the quantity of heat that will flow through the plate in one minute if K= 0.2 CGS units. **05**

(c) Explain reversible and irreversible process. **05**

(d) Calculate the work done when a gram molecule of an ideal gas expands isothermally at 27°c to double its original volume. [R = 8.3 J/deg mole]. **05**

OR

(a) Explain sphere of influence. **05**

(b) Calculate the critical temperature for CO_2, given that a = 0.00874 atmas. Cm^6 and b= 0.0023 cm^3. **05**

(c) Derive the Clapeyron's - Claudius equation. **05**

(d) Prove $\left(\frac{dv}{dt}\right)_P = -\left(\frac{ds}{dp}\right)_T$ **05**

Q.3 Multiple choice question. **10**

(1) In the Ingen-Hausz experiment the thermal conductivity K and length L of the rod upto which was melts are related as :

(a) $\frac{K}{L}$ = Constant (b) $\frac{K^2}{L}$ = Constant

(c) $\frac{K}{L^2}$ = Constant (d) KL = Constant

(2) The S.I. unit of thermal conductivity is:

(a) $Js\ m^{-1}\ {}^{\circ}c^{-1}$ (b) $Js^{-1}m^{-1}\ {}^{\circ}c^{-1}$

(c) $Js^{-1}m^{-1}\ {}^{\circ}c$ (d) $Js^{-1}m\ {}^{\circ}c^{-1}$

(3) The Van der Waal's equation of states for a real gas is.

(a) $\left(P + \frac{a}{v^2}\right)(v - b) = RT$ (b) $PV = RT$

(c) $\left(P - \frac{a}{v^2}\right)(v - b) = RT$ (d) none of above

(4) Viscosity of a gar is due to transport of

(a) momentum (b) energy (c) mass (d) none of above

(5) Isothermal process in process at constant.

(a) temperature (b) pressure

(c) volume (d) none of above

(6) In Carnot cycle, the fast step is:

(a) Isothermal expansion (b) Isothermal compression

(c) Adiabatic expansion. (d) Adiabatic compression

(7) The change in entropy of a mole of an ideal gar, when the gar undergoes free expansion is :

(a) positive (b) zero (c) negative (d) all of these

(8) Entropy is measured of.

(a) perfect order (b) available energy

(c) disorder (d) none of the above

(9) The efficiency of Carnot's engine working between 127 °c and 27°c is

(a) 25% (b) 50%

(c) 75% (d) 100%

(10) Which of the following represent a reversible process

(a) $ds < 0$ (b) $ds = 0$

(c) $ds > 0$ (d) none of these