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**SUBJECT CODE NO:- B-2008**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. F.Y. (Sem-I) Examination Oct/Nov 2019**  
**Physics Paper-II**  
**Heat and Thermodynamics**

[Time: 1:30 Hours]

[Max.Marks:50]

Please check whether you have got the right question paper.

- i) Attempt all questions.
- ii) Illustrate your answer with suitable labelled diagram.

Q.1 (a) Define coefficient of thermal conductivity deduce expression for radial flow of heat along the wall of cylindrical tube. 10

(b) What is critical constant. Derive an expression for constant of vanderwall's equation. 10

OR

(c) What is adiabatic process. Derive an expression for work done in adiabatic process. 10

(d) Discuss change of entropy in an irreversible process and show that 10

$$\frac{Q_2}{T_2} - \frac{Q_1}{T_1} > 0$$

Q.2 (a) Write a note on comparison of conductivities of different metals. 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 unit. 05

(c) Write a note on Carnot's ideal heat engine. 05

(d) Find the efficiency of a Carnot's engine working between 127 °C and 27 °C. 05

OR

(a) Explain correction for volume in vanderwall's gas equation. 05

(b) The Vanderwall's constant a and b for 1 gram molecule of hydrogen are a=0.245atms-liter<sup>2</sup>-mole<sup>2</sup> and b=2.67 × 10<sup>-2</sup> liter-mole<sup>-1</sup>. Calculate the critical temperature. 05

(c) Using maxwell's thermodynamical relation prove that 05

$$\frac{dP}{dT} = \frac{L}{T(V_2 - V_1)}$$

(d) Calculate the change in entropy when 100gm of Ice at 0°C is converted into water at the same temperature. 05

(Given Latent heat of Ice = 80 Cal/gm)

## Q.3 Multiple choice questions.

10

- 1) The rate of change of temperature with respect to distance is -----
  - (a) Velocity of gradient
  - (b) Mass concentration gradient
  - (c) Temperature gradient
  - (d) None of these
- 2) Heat transmitted through a substance with actual migration of particles.
  - (a) Convection
  - (b) Conduction
  - (c) Radiation
  - (d) All of these
- 3) A Carnot's engine is operating between 100°C and 50°C. Its efficiency will be -----
  - (a) 13.4%
  - (b) 15.2%
  - (c) 50%
  - (d) 100%
- 4) An isothermal process is related to -----
  - (a) Constant pressure
  - (b) Constant volume
  - (c) Constant temperature
  - (d) Constant heat
- 5) Volume of sphere of influence of the molecule is----- time of the volume of molecule.
  - (a) 8
  - (b) 6
  - (c) 4
  - (d) 10
- 6) The critical constant of temperature (Tc) is -----
  - (a)  $\frac{a}{27Rb}$
  - (b)  $\frac{8ab}{27R}$
  - (c)  $\frac{27Rb}{8a}$
  - (d)  $\frac{8a}{27Rb}$
- 7) maxwell's thermodynamical relation does not depend on
  - (a) Temperature
  - (b) Pressure
  - (c) Volume
  - (d) Density
- 8) The clausius – claapeyron equation is -----
  - (a)  $\frac{dP}{dt} = \frac{L}{T(V_2 - V_1)}$
  - (b)  $\frac{dP}{dt} = \frac{P}{T(V_2 - V_1)}$
  - (c)  $\frac{dP}{dt} = T_L(V_2 - V_1)$
  - (d) None of these
- 9) Maxwell's thermodynamic relation is
  - (a)  $\left(\frac{ds}{dT}\right)_T = \left(\frac{\partial P}{\partial V}\right)_T$
  - (b)  $\left(\frac{\partial T}{\partial V}\right)_S = -\left(\frac{dP}{ds}\right)_V$
  - (c)  $\left(\frac{\partial T}{\partial P}\right)_P = \left(\frac{\partial V}{\partial P}\right)_P$
  - (d) None of these
- 10) Entropy is measured in -----
  - (a) Joules / Kelvin
  - (b) Cal / Kelvin
  - (c) Both (a) and (b)
  - (d) None of the above