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**SUBJECT CODE NO: - CB-2334**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. F.Y. (Sem-I)**  
**Examination December/January-2022-23**  
**Physics Paper-II PHY-021**  
**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 a) Explain the comparison of thermal conductivities of different metal by using Ingen-Hanzs experiment. **10M**

**Or**

Explain in brief.

a) Explain the reason for modification of Perfect gas equation. **05M**

b) Vander Waals constants for a gas are  $a = 6.9 \times 10^{-2} \text{ Jm}^3 \text{ mole}^{-2}$  and  $b = 2.9 \times 10^{-5} \text{ m}^3 \text{ mole}^{-1}$ . The Universal gas constant  $R = 8.31 \text{ J mole}^{-1} \text{ K}^{-1}$ . Calculate the critical temperature of the gases. **05M**

Q2 a) Derive relation for coefficient of thermal conductivity. **10M**

**Or**

a) State and explain zeroth law of thermodynamics **05M**

b) Find the efficiency of the Carnot's engine working between the steam point and ice point. **05M**

Q3 Solve any two questions.

a) The opposite faces of a metal plate of 0.2cm thickness are at a difference of temperature of  $100^\circ\text{C}$  and area of 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. **05M**

b) Derive an expression for constant of Van-der-Waals equation. **05M**

c) The diameter of nitrogen molecule is  $3.2 \times 10^{-10} \text{ m}$  pressure is  $2.69 \times 10^{25}$  per  $\text{m}^3$ . Calculate mean free path for nitrogen molecules. **05M**

d) What is isothermal process? Derive an expression for work done during isothermal process. **05M**

## Q4 Multiple choice questions

- The dimensions of coefficient of thermal conductivity are -----  
 a)  $[MLT^3\theta^{-1}]$       b)  $[MLT^{-1}\theta^{-1}]$       c)  $[MLT^{-1}\theta^{-3}]$       d) None of these
- The value of critical volume  $V_c$  according to Vander Waals gas equation is-----  
 a)  $V_c=b$       b)  $V_c=2b$       c)  $V_c=3b$       d) none of above
- The coefficient of thermal conductivity of a gas is directly proportional to  
 a)  $T$       b)  $T^2$       c)  $\sqrt{T}$       d) none of these.
- In Carnot cycle, the second step is -----  
 a) Isothermal expansion      b) Isothermal Compression  
 c) Adiabatic expansion      d) Adiabatic compression.
- The quantity  $\frac{d\theta}{dx}$  is called as -----  
 a) Temperature coefficient      b) Temperature  
 c) Temperature gradient      d) none of these
- Critical volume is-----  
 a)  $V_c = 3b$       b)  $V_c = -3b$       c)  $V_c = 27b$       d)  $V_c = 0$
- Viscosity of a gas is directly proportional to -----  
 a) Temperature      b) Density of gas      c) pressure      d)  $T^3$
- The physics underlying the working of a refrigerator closely resembles the physics underlying -  
 a) Ice formation      b) Vapour compression  
 c) Heat engine      d) Vaporization of water
- Correction for volume in Vander Waal's is -----  
 a)  $V + b$       b)  $V - b$       c)  $V + b^2$       d)  $v - b^2$
- The flow of heat in the steady state does not depends on -----  
 a) The area of cross section of the rod      b) the temperature gradient  
 c) The mass of the rod      d) The time of flow of heat.