

STATISTICAL PHYSICS AND THERMODYNAMICS - II

Paper - I

Time : Three Hours]

[Maximum Marks : 40

Note : Attempt two questions each from Section A and B carrying 8 marks each, and the entire Section C consisting of 8 short answer type questions carrying 1 mark each.

Section - A

1. What do you understand by Entropy ? Give its physical significance. Show that entropy of a perfect gas remains constant in a reversible process. 8
2. Explain Carnot cycle, and derive an expression for its efficiency. Show that efficiency of Carnot cycle is less than 100%. 8
3. Explain the thermodynamics of a thermocouple, and obtain an expression for Thermoelectric and Peltier coefficient. 8
4. (a) Derive an expression for the entropy of a perfect gas. 5
 (b) Calculate the change in entropy when 2 kg of ice at 0°C melts to water at 0°C. Latent heat of melting of ice is 80 cal gm. 3

Section - B

5. What do you understand by Joule Thomson effect ? Discuss mathematically the Joule Thomson effect for Van der Waal's gas. Show that the temperature of inversion is given by $T_1 = \frac{2a}{bR}$. 8
6. (a) Prove that $C_p - C_v = R$ for one mole of an ideal gas. 6
 (b) Calculate the critical temperature of a gas for which Van der Waal's constant are $a = .0080$, $b = .0020$ and $R = 1.0060$. 2
7. Show that the change in temperature of a wire is given by $dT = \frac{\gamma \Gamma L}{mC_p} dF$, when it is stretched adiabatically, where symbols have their usual meanings. 8
8. (a) Explain the production of low temperature by thermomagnetic effect. 4
 (b) Explain the liquefaction of Helium making use of regenerative cooling effect. 4

Section - C

9. Attempt all parts : (1)

(a) Give Magnetic-Calorie effects.	(i) Write Classius Clapeyron equation.
(c) Temperature of inversion.	(d) Give Boyle's temperature.
(e) Give the significance of $\Delta S > 0$, where S is entropy.	
(f) Thermo-e.m.f.	
(g) Give Mechanical equilibrium.	(h) What are Thermodynamic variable? (1*8= 8)