BA/BSc 4th Sem Physics

(i) Printed Pages : 3 Roll No. .....

(ii) Questions : 7 Sub. Code : 0345

Exam. Code : 0004

B.A./B.Sc. (General) 4th Semester

1046

PHYSICS

Paper : A Statistical Physics and Thermodynamic–II

Time Allowed : Three Hours] **[Maximum Marks : 22**

Note :– (1) Attempt **five** questions in all, selecting **two** each from Unit I and II. Unit III is compulsory.

(2) All questions carry marks as indicated.

(3) Non -Programmable Calculators are allowed.

(4) Logarithmic Tables can be asked.

UNIT–I

I. (a) Find the relation for the entropy of one mole of an ideal gas. 2

(b) Find the change in entropy of one mole of carbon dioxide, when its absolute temperature increased by 3 times, if the process of heating is :

(i) Isochoric

(ii) Isobaric 1,1

II. (a) Define and find expressions for Thermo-emf, Peltier co-efficient and Thomson co-efficient. 2

(b) The entropy of v = 3.0 moles of an ideal gas increases, by $\Delta S = 23\ JK^{-1}$ due to isothermal expansion. How many times should the volume of the gas be increased or decreased ? 2

III. (a) How does Heat pump differ from Refrigerator ? Prove that the amount of mechanical energy required to extract a given amount of heat from a cold body increases with decrease in temperature of the body, for a given temperature of sink. 2

(b) A heat engine employing a Carnot cycle with an efficiency of $\eta = 20\%$ is used as a refrigerating machine, the thermal reservoir being the same. Find its refrigerating efficiency ε. 2

UNIT–II

IV. (a) Derive Clapeyron's equation from Maxwell's relations and explain the change of ice to water on the basis of it. 2

(b) Making use of Maxwell's thermodynamical relation prove that cooling is produced when the substance which contracts on heating is compressed. 2

V. (a) What are thermodynamic potentials ? What is their significance ? Deduce the relation $[\partial T/\partial V]_s$ = radiate $[\partial P/\partial S]_v$. 2

(b) Derive thermodynamically an expression for Joule-Thomson Co-efficient. Show that for a perfect gas Joule-Thomson effect vanishes. 2

VI. (a) Find an expression for the change in temperature of wire when stretched adiabatically. 2

(b) Prove that the specific heat at constant volume for a Vander Waal gas is equal to the specific heat at constant volume for a perfect gas. 2

UNIT–III(Compuslory)

VII. Attempt any **six** parts :

(a) How will the entropy change during free expansion of a gas ?

(b) Find the change in the energy of a system if 300 J of work is done on it, while 65 calorie of heat flows out of it.

(c) Write the Clausius-Claperyron's equation. What is its significance ?

(d) Correct representation of Ist law of thermodynamics is $(\partial Q = dU + \partial W)$ and not $(dQ = dU + dW)$, why ?

(e) How does free electron gas differ from an ordinary gas ?

(f) Why Seebeck effect is not an independent effect ?

(g) Two stars radiate maximum energy at wavelength 3.0×10^{-5} cm and 5.0×10^{-7} m respectively. What is the ratio of their temperatures ? $6\times1=6$