

T.Y.B.SC. SEM – VI (2014 COURSE) : WINTER - 2017
SUBJECT: PHYSICS: THERMODYNAMICS AND STATISTICAL PHYSICS

Day Wednesday
Date 01/11/2017

Time 12.00 NOON TO 02.00 PM
Max. Marks : 40.

W-2017-0690

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate full marks.
- 3) Draw neat and labelled diagrams **WHEREVER** necessary

Q.1 Attempt any **TWO** of the following: **(10)**

- a) Obtain Maxwell's expression for mean free path $\frac{1}{\sqrt{2}\pi\sigma^2 n}$ where σ is the molecular diameter and n is the number of molecules per unit volume, on the basis of kinetic theory of gases.
- b) Obtain the first and second TdS equations.
- c) Obtain an expression for Joule-Thomson coefficient for a Van der Wall's gas.

Q.2 Attempt any **TWO** of the following: **(10)**

- a) For random walk problem, Obtain mean value of n_1 and mean square deviation.
- b) Consider an ideal monoatomic gas of N molecules enclosed in a volume V . Show that the number of accessible states for the energy interval between E and $E+dE$ is expressed in the form: $\Omega(E) = BV^N E^{3N/2}$, Where B is constant.
- c) For canonical ensemble, obtain the expression for mean square deviation.

Q.3 Attempt any **TWO** of the following: **(10)**

- a) Derive an expression for thermal conductivity (K) of a gas on the basis of kinetic theory of gases.
- b) Calculate the change in entropy when 10 grams of ice at 0°C is converted into water at the same temperature. (Given: Latent heat of ice = 80 cal/gram)
- c) Describe with neat diagram adiabatic demagnetisation.

Q.4 Attempt any **FIVE** of the following: **(10)**

- a) State any two assumptions of kinetic theory of gases.
- b) Define first law of thermodynamics.
- c) An ideal gas absorbs 2000 kcal of heat and does an amount of work 16800 joules during its expansion. What is the increase in its internal energy?
- d) What is meant by distribution function?
- e) A bag contains 10 red balls and 8 white balls. Two balls are drawn at random one after the other. What is the probability that both balls are red?
- f) Distinguish between accessible and inaccessible states.
- g) What is meant by ensemble? Discuss grand canonical ensemble.

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