No. of Printed Pages : **2**

21CHE4C12L

Sl. No.

M.Sc IV Semester Degree Examination, October - 2023

THERMODYNAMICS

Disciplines Specific Core (DSC) and Discipline Specific Elective (DSE)

(NEP)

Time : 3 Hours Maximum Marks : 70

Note : *Answer **any five** of the following questions with Question No. **1** (**Q1**) **compulsory**, each question carries **equal** marks.*

1. (a) Derive an equation for the variation of free energy change with respect to temperature (t) and pressure (P). **5+5+4**

(b) State and explain Nernst heat theorem. Mention its applications.

(c) Calculate the free energy change accompanying the compression of 1 mole of carbon dioxide at 57°C from 5 to 50 atmospheric pressure, assume that carbon dioxide behaves like ideal gas. [R = 1.987 cal/mol]

2. (a) Define Fugacity. Explain the method for the determination of fugacity. **5+5+4**

(b) How do you determine the Activity co-efficient by Solubility method ?

(c) Write the different laws of Thermodynamics and their mathematical expression.

3. (a) Derive an equation for Maxwell-Boltzmann distribution law. **5+5+4**

(b) Write a note on :

(i) Fermi-Dirac statistics.

(ii) Bose-Einstein statistics.

(c) What are the different types of partition functions ? Explain briefly.

4. (a) Explain the mathematical form of Gibb's-Duhem equation. **5+5+4**

(b) State and deduce Raoult's law.

(c) What are Ideal and Non-ideal solutions ? Give examples.

5. (a) Derive Onsager equation. **5+5+4**

(b) What are the Thermodynamic criteria for non-equilibrium states ?

(c) Write a note on Irreversible thermodynamics.

P.T.O.

6. (a) Differentiate between partial molar free energy, partial molar volume and partial molar heat content. **5+5+4**

(b) Write the importance of canonical, grand canonical and micro canonical ensembles with respect to distribution laws.

(c) List out the applications of distribution law.

7. (a) How do you co-relate Entropy with free energy mixing ? Give example. **5+5+4**

(b) Write a note on Cryoscopy and Osmotic pressure.

(c) Briefly explain Electrokinetic phenomena.

8. (a) What are the factors affecting non-ideal solutions ? **5+5+4**

(b) How do you calculate Thermodynamic properties in terms of partition functions ?

(c) Deduce mathematical expression for Duhem-Margules equation.

- o 0 o -