



CBCS SCHEME

18BT45

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 Bio Chemical Thermodynamics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define Thermodynamics. Derive the first law of Thermodynamics for flow process. (10 Marks)
- b. Define the following with example: (10 Marks)
- Closed system
 - Open system
 - Isolated system
 - State function
 - Path function.

OR

- 2 a. Define the Zeroth law of thermodynamics. A system consisting of some fluid is stirred in a tank. The rate of work done on the system by the stirrer is 2.25hp. The heat generated due to stirring is dissipated to the surroundings. If the heat transferred to the surrounding is 3400kJ/h, determine the Internal Energy? (10 Marks)
- b. With suitable example, explain the following: (10 Marks)
- Reversible process and Irreversible process
 - Intensive and Extensive properties.

Module-2

- 3 a. What is heat effects? Explain with example. (10 Marks)
- Standard heat of reaction
 - Standard heat of combustion
 - Standard heat of formation.
- b. Define saturation temperature. Explain about the Hess's law of constant heat summation. (10 Marks)

OR

- 4 a. One kilo mole CO₂ occupies a volume of 0.381m³ at 313K. Compare the pressure given by i) Ideal gas equation ii) Vander Waals equations. Take the Vander Waals constants to be a = 0.365Nm⁴/mol² and b = 4.28 × 10⁻⁵m³/mol. (08 Marks)
- b. Draw a P.V. diagram and explain its significance. (06 Marks)
- c. Show that CP-CV = R for an Ideal gas. (06 Marks)

Module-3

- 5 a. Define fugacity co-efficient. Explain the effect of temperature and pressure on fugacity. (10 Marks)
- b. Write a note on: i) Maxwell's equations ii) Clapeyron equations. (10 Marks)

OR

- 6 a. Discuss about:
i) Helmholtz free energy
ii) Gibb's free energy
iii) Energy properties. (10 Marks)
- b. What are derived properties? Derive the Gibb's-Helmholtz equation. (10 Marks)

Module-4

- 7 Write a short note on the following:
i) Azeotropes
ii) Henry's law
iii) Criteria of phase Equilibria
iv) Duhem's theorem. (20 Marks)

OR

- 8 a. Derive the Gibb's Duhem's equation and mention the various form of the equation. (10 Marks)
- b. Explain: i) Chemical potential ii) Lewis-Randall rule. (10 Marks)

Module-5

- 9 Write a note on:
a. Coupled reactions and Energy rise compounds
b. Factors affecting the equilibrium conversion
c. Criteria of biochemical reaction equilibrium
d. Phase rule for reacting system. (20 Marks)

OR

- 10 a. Show that $\Delta G^\circ = -RT \ln K$ (08 Marks)
- b. Explain the effect of pressure and temperature on equilibrium constant. (12 Marks)
