REG. NO.:

VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

SLOT: D2+TD2

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - I
FALL SEMESTER 2025-2026

Programme Name & Branch	: B. Tech. Computer Science and Engineering
Course Code and Course Name	: BACHY105 and Applied Chemistry
Faculty Name(s)	: Madhvesh Pathak, Napoleon A. A, Thenmozhi K, Bhawana Pandey, Susanta Kumar Bhunia, Karpagam S,
Class Number(s)	: VL2025260106583, 6587, 6591, 6595, 6599, 6603
Date of Examination	: 20-08-2025
Exam Duration	: 90 minutes

Maximum Marks: 50

General instruction(s):

- **Answer All Questions**
- M - Max mark; CO – Course Outcome; BL – Bloom's Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- **Course Outcome:**
  - CO1: Understand the fundamental concepts in physical, analytical, and materials chemistry.

Q. No	Question	M	CO	BL
1.	Explain the concept of Gibbs free energy and its significance in determining the spontaneity of a chemical reaction. How ΔH and ΔS influence the feasibility of a reaction? Discuss this in the context of exothermic, endothermic, and equilibrium conditions.	10	1	2
2.	Using the concept of the Carnot cycle, show that the efficiency of a reversible heat engine depends only on the temperatures of the heat source and sink. Justify why this efficiency can never reach 100%.	10	1	3
3.	a) For a reaction, $\Delta H = +25$ kJ/mol and $\Delta S = +80$ J/mol·K. Calculate ΔG at 298 K and at 500 K. Comment on the spontaneity of the reaction at both the temperatures. Use your result to explain how the signs of ΔH and ΔS influence the temperature-dependent spontaneity.	5	1	3
	b) An ideal gas (1 mol) undergoes a reversible expansion, changing its state from 25 dm^3 at 250 K to 40 dm^3 at 350 K. Given that the molar heat capacity at constant volume C_v=1.5R, calculate the total change in entropy for the process. R=8.314 J $mol^{-1} K^{-1}$	5		
4.	a) Explain the characteristics of a second-order reaction and how it differs from first-order and zero-order reactions using a concentration versus time plot. Illustrate your answer with the graphical methods used to represent each order of reaction.	5	1	2
	b) The decomposition of a compound A→Products follows first-order kinetics. The initial concentration of A was 0.4 mol/L, and after 60 minutes, the concentration of A was found to be 0.1 mol/L. Calculate the rate constant and half-life of the reaction.	5		
5.	State the Arrhenius equation and describe how temperature influences the rate of a chemical reaction. Define activation energy and explain its importance with the help of an energy profile diagram for the isomerization of methyl isonitrile to acetonitrile.	10	1	1

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