



VIT

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

SLOT: E1+TE1

REG.NO.:

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST (CAT) -II
WINTER SEMESTER 2024-2025

Programme Name & Branch : B. Tech.

Course Code : BCHY101L

Course Name : Engineering Chemistry

Faculty Name(s) : Dr. Palanisami N, Dr. Karpagam S, Dr. Buvanewari G, Dr. Mausumi Goswami, Dr. Arunprasad M, Dr. Sovan Roy, Dr. Susanta Kumar Bhunia, Dr. Veera Venkata Ramesh E, Dr. Arup Sinha, Dr. Namrata Deka, Dr. Ramesh Kumar Singh

Class Number(s) : VL2024250504297, VL2024250504298, VL2024250504299, VL2024250504305, VL2024250504307, VL2024250504308, VL2024250504309, VL2024250504311, VL2024250504313, VL2024250504316, VL2024250502595

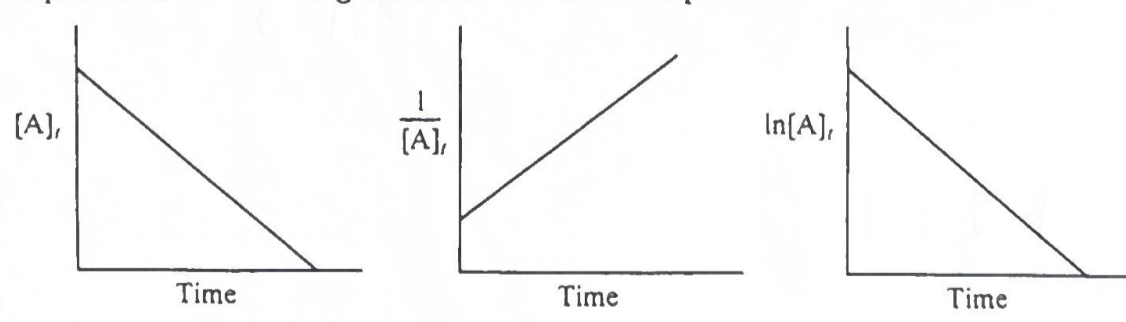
Date of Examination : 20-03-2025

Exam Duration : 90 minutes

Maximum Marks: 50

General Instruction(s):

- Answer **all** the Questions.
- Open Text Book / Open Note Book examination
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes Statement:
CO-1: Apply the fundamental concepts in organic, inorganic and physical chemistry.
CO-3: Discuss energy conversion devices and protective corrosion techniques.

Q. No	Question	M	CO	BL
1.	Write the significance of the entropy to establish the second law of thermodynamics. Justify the negative entropy changes associated with the following reactions: $\text{HCl}(g) + \text{NH}_3(g) \rightarrow \text{NH}_4\text{Cl}(s) \quad (\Delta S = -284 \text{ JK}^{-1}\text{mol}^{-1})$ $\text{N}_2(g) + 3 \text{H}_2(g) \rightarrow 2 \text{NH}_3(g) \quad (\Delta S = -198 \text{ JK}^{-1}\text{mol}^{-1})$ Comment on the spontaneity of the above reactions at room temperature.	10	1	BL3
2.	a) Ten moles of an ideal gas at the initial pressure 5 atm at 27°C were expanded reversibly under isothermal conditions to a final pressure of 0.1 atm. Calculate the work done by the gas, the change in enthalpy, change in internal energy and the heat absorbed by the system ($R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$). b) For a reaction $A \rightarrow \text{Products}$, which of the following linear plots represent (a) zero order, (b) first order, and (c) second order kinetics? Write the expressions of the integrated rate law for each plot. 	5 + 5	1	BL3

3.	<p>a) The rate constants of a chemical reaction at 25°C and 45°C were found to be 0.0062 s⁻¹ and 0.0184 s⁻¹, respectively. Calculate the value of the activation energy of the reaction ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$).</p> <p>b) Nitration of phenol with A gives a mixture of B and C. Reduction of B with NaBH₄ affords one aniline derivative D which upon acylation with E, provides a drug molecule F. Identify A to F and write at least two applications of F.</p>	5 + 5	1	BL3
4.	<p>a) Write a brief account on the usefulness of hydrogen as a potential alternative source of energy.</p> <p>b) Write the half cell reaction, the net reaction, cell EMF and predict the spontaneity of the electrochemical reaction associated with the following cell:</p> <p style="text-align: center;">$\text{Zn} \text{ZnSO}_4 (0.5 \text{ M}) \text{NiSO}_4 (0.05 \text{ M}) \text{Ni}$</p> <p>The standard reduction potentials of Zn and Ni are -0.76 V and -0.25 V, respectively.</p>	5 + 5	3	BL2
5.	Describe with a neat diagram the structure and charging-discharging mechanism of an energy device used in laptops.	10	3	BL2

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