



VIT

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

REG.NO.: 24BCE 2300

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2024-2025

SLOT: D2 +TD2

Programme Name & Branch : B.Tech.
Course Code and Course Name : BCHY101L - Engineering Chemistry
Faculty Name(s) : Dr. Mohana Roopan S, Dr. Vijayaraghavan R,
Dr. Karpagam S, Dr. Buvaneshwari G, Dr. Priyankar Paira,
Dr. Asharani IV, Dr. Sumathi S, Dr. Mausumi Goswami,
Dr. Rajasekar P, Dr. Namrata Deka, Dr. Akhila
Maheswari M, Dr. Arup Sinha
Class Number(s) : VL2024250106755/6759/6762/6766/6770/6771/
6773/6775/6779/6784/6786/6788
Date of Examination : 16-10-2024
Exam Duration : 90 minutes Maximum Marks: 50

General instruction(s):

- Answer All Questions.
- Students are permitted to bring any number of textbooks, printouts of e-books (complete / chapters) and handwritten notebooks (class notes).
- M - Max mark; CO - Course Outcome; BL - Blooms Taxonomy Level (1 - Remember, 2 - Understand, 3 - Apply, 4 - Analyse, 5 - Evaluate, 6 - Create)
- Course Outcomes:
CO1: Apply the fundamental concepts in organic, inorganic and physical chemistry.
CO3: Discuss energy conversion devices and protective corrosion techniques.

Q. No	Question	M	CO	BL
1.	a) In which scenarios do spontaneously reactions proceed? b) One mole of an ideal gas expands isothermally and reversibly from 10 L to 20 L at a temperature of 400 K. Calculate the work done during this process.	10	1	3
2.	a) As a chemist, considering the environmental impact of hydrogen peroxide (H ₂ O ₂) detected in surface water from products like mouthwashes and cleaners, how would you employ a homogeneous catalyst to effectively decompose H ₂ O ₂ ? What effects do these catalysts have on the reaction rate and mechanism? b) The decomposition of H ₂ O ₂ at 25 °C follows first-order kinetics with a rate constant of $4.0 \times 10^{-4} \text{ s}^{-1}$. If the initial concentration of H ₂ O ₂ is 0.1 M, what is its concentration after 3000 s?	10	1	3
3.	a) As the newly appointed R&D chemist at a leading pharmaceutical company, your first challenge is to enhance the efficiency of the Contact and Haber process using catalysts. What specific catalysts would you select for each process, and explain them with suitable chemical reactions? b) Describe the preparation of an alkaline dye using sulfanilic acid and N,N-dimethylaniline. What are the steps involved in the synthesis, and explain the mechanism?	5 5	1	3

4.	a) For the cell: $Zn_{(s)} Zn^{2+}(0.01\text{ M}) Ag^+(0.1\text{ M}) Ag_{(s)}$ Given standard reduction potentials: $E^{\circ}_{Zn^{2+}/Zn} = -0.76\text{ V}$ and $E^{\circ}_{Ag^+/Ag} = +0.80\text{ V}$, find the half-cell reactions, net reactions, cell EMF and predict its feasibility.	5	3	2
	b) Identify the type of battery typically utilized in mobile phones. Explain the materials, charging, and discharging reactions involved in it.	5		
5.	a) Explain the working principle of fuel cells that operate at $80\text{ }^{\circ}\text{C}$. What are the roles of the anode, cathode, and proton exchange membrane in the electrochemical process?	10	3	2
	b) Explain in detail the chemistry involved in the utilization of organic dye sensitizers in improving the efficiency of photovoltaic cells in harvesting visible light.			
