



VIT[®]

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

SLOT: C2+TC2

REG.NO.: 9N18E010

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

Course Code: BCHY101L

Course Name: Engineering Chemistry

Faculty Name(s): Dr. BARNALI MAITI, Dr. BADAL KUMAR MANDAL, Dr. RAJAGOPAL D, Dr. MADHVESH PATHAK, Dr. SRIRAGHAVAN K, Dr. LOGANATHAN RANGASAMY, Dr. SHANMUGAM R

Class Number(s): VL2024250504281, 4283, 4284, 4287, 4289, 4292, 4293

Date of Examination: 18-March-2025 Exam Duration: 90 minutes Maximum Marks: 50

General Instruction(s):

- Answer **all** the Questions.
- 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.	Show that the efficiency of the reversible heat engine depends only on the maximum and minimum absolute temperature in the cycle (four strokes) and is always less than one.	10	1	BL3
2.	a) 1 mol of an ideal gas expands reversibly from a volume of 15 dm ³ and 300 K to a volume of 25 dm ³ and a temperature of 350 K. Assuming $C_v = 3/2 R$, calculate the entropy change for the process. b) How does the hydrogen peroxide breakdown in biological system? Explain the mechanism.	5 + 5	1	BL3
3.	a) If 5.0 g of substance 'A' decomposes for 45 minutes, the remaining mass of unreacted 'A' is found to be 0.400 g. What is the half-life of this reaction if it follows first-order kinetics? b) Explain the chemistry behind dye used in dyeing denim blue jeans?	5 + 5	1	BL3
4.	a) Explain any one energy device that is operated at a higher temperature, for example, 500 to 1,000 °C. b) Write the Nernst equation and calculate emf of the following cells at 298 K. $Mg(s) Mg^{2+}(0.050 M) Cu^{2+}(0.020 M) Cu(s)$. The standard reduction potentials are -2.37 V and 0.34 V, respectively.	5 + 5	3	BL2
5.	Which energy device technology was recognized with a Nobel Prize in Chemistry in 2019? Explain the chemistry behind it. Also, explain the advantages and disadvantages of this technology.	10	3	BL2