

**VIT**Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAIReg. Number: **25BAI1562****Continuous Assessment Test (CAT) – I AUGUST 2025**

Programme	:	B. Tech	Semester	:	FALL 2025-26
Course Code & Course Title	:	BACHY105 Applied Chemistry	Class Number	:	CH2025260103350
Faculty	:	Dr Tanushree Choudhury	Slot	:	F1+TF1
Duration	:	90 minutes	Max. Mark	:	50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer any five questions

Q. No	Sub Sec.	Description	Marks
1	a	State the Zeroth, First Laws of Thermodynamics and their significance	5
	b	Prove the value of C_p is always greater than C_v for an ideal gas.	5
2		Explain the Carnot cycle with the help of a neat P-V diagram. Describe all the processes involved in it. Derive an expression for the efficiency of a Carnot engine.	10
3	a	Calculate the entropy change when 2 moles of an ideal gas is allowed to expand isothermally at 293 K from a pressure of 10 atmosphere to a pressure of 2 atmosphere.	5
	b	The rate constant of a second order reaction is $5.70 \times 10^{-5} \text{ dm}^3 \text{ mol}^{-1} \text{ sec}^{-1}$ at 25°C and $1.64 \times 10^{-4} \text{ dm}^3 \text{ mol}^{-1} \text{ sec}^{-1}$ at 40°C . Calculate the activation energy of the reaction. ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$)	5
4	a	What is a pseudo first order reaction? Explain with a suitable example.	5
	b	How does the electrical conductance of silicon (Si) change when it is doped with arsenic (As)?	5
5	a	Explain the difference between homogeneous and heterogeneous catalysis with examples	5
	b	Describe the electrochemical process for gold plating on a metal, detailing the experimental setup with chemical reactions	5
5	a	For the reaction: $2\text{N}_2\text{O}_5 \longrightarrow 4\text{NO}_2 + \text{O}_2$ the rate is directly proportional to $[\text{N}_2\text{O}_5]$. At 45°C , 90% of the N_2O_5 reacts in 3600 seconds. Find the value of the rate constant k .	5
	b	For the cell: $\text{Mg} \text{Mg}^{2+} (0.01 \text{ M}) \text{Cu}^{2+} (0.5 \text{ M}) \text{Cu}$ Standard reduction potentials of Mg^{2+} and Cu^{2+} are -2.37 V and $+0.34 \text{ V}$ respectively. Write the half-cell reactions and determine the EMF.	5

***** All the best *****