VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES

Department of Chemistry

Winter Semester 2023-24

Continuous Assessment Test –II

Course Code: BCHY101L **Duration :** 90 Minutes **Slot : B1+ TB1**

Course Name: Engineering Chemistry **Max. Marks :** 50

Class Numbers: VL2023240502624; 2626; 2628; 2630; 2653; 2655; 2657

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Q N	Answer ALL the questions (5 x 10 = 50 Marks)	Marks	CO	BL
1	What chemical process involves the acceleration of a reaction by a substance that remains unchanged at the end of the reaction? What is its commercial importance? Explain the mechanism and different types of this chemical process with suitable chemical reactions.	10	CO2	BL1
2	a) A certain amount of ideal gas undergoes a reversible isothermal expansion from an initial volume of 3.0 m^3 to a final volume of 6.0 m^3 at a temperature of 300 K. If the initial pressure of the gas is 5.0 atm, calculate (i) the work done by the gas during the expansion in Joules, and ii) the final pressure of the gas. b) Consider a chemical reaction where the rate of reaction is given by the equation as Rate= κ [A]. If the concentration of reactant A decreases from 0.8 M to 0.2 M over a period of 60 seconds. Calculate the (i) rate constant (κ) for this reaction, and (ii) half-life ($t_{1/2}$) of the reaction.	(5 + 5)	CO2	BL3
3	a) What is the energy available with a system to do work called? Explain the factors that determine if a reaction will be spontaneous or not? b) A galvanic cell consisting of a zinc electrode immersed in a 0.1 M $Zn(NO_3)_2$ solution, and the other copper electrode immersed in a	(5 + 5)	CO2	BL3

	0.01 M $Cu(NO_3)_2$ solution. The standard reduction potentials for the zinc and copper half-reactions are: Zn^{2+} (aq) + $2e^-$ ⟶ Zn (s) with a value of E°= -0.76 V and Cu^{2+} (aq) + $2e^-$ ⟶ Cu (s) with a value of E°= 0.34 V, respectively. Represent the galvanic cell in standard notation and calculate the standard electromotive force at 25°C.			
4	a) What type of high-temperature fuel cell operates using a solid ceramic electrolyte? Draw a neat diagram and discuss the key components, and electrochemical reactions involved in producing the electricity. b) What type of solar cell offers a cost-effective alternative to traditional silicon-based solar panels and offers flexibility and transparency? Describe the key steps involved in its operation.	**(5 + 5)**	CO3	BL3
5	What is the most commonly used rechargeable energy storage device in portable electronics? Using a neat diagram discuss the key components and the mechanisms involved in the charging and discharging processes.	**10**	CO3	BL2