Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–I & II EXAMINATION – WINTER 2024

Subject Code:BE01000031 Date:03-01-2025

Subject Name:Chemistry

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			Marks
Q.1	**(a)**	Explain de Broglie's concept in wave mechanics.	**03**
	(b)	Explain the types of hybridization with the molecular shapes of the following compounds: CH_4 and C_2H_4.	**04**
	(c)	Discuss caustic embrittlement in boilers.Why does caustic embrittlement occur in boilers, and how can it be prevented?	**07**
Q.2	**(a)**	Define the following terms: 1. Octane Number 2. Fullerenes 3. Corrosion	**03**
	(b)	Compare scale formation and sludge formation in boilers.	**04**
	(c)	Explain the deionization method used for softening of water with appropriate diagrams.	**07**
		OR	
	(c)	Discuss the manufacturing of acetic acid through fermentation with appropriate diagrams.	**07**
Q.3	**(a)**	What is meant by the mobile phase and stationary phase in liquid chromatography?	**03**
	(b)	Differentiate between internal and external treatment for water softening.	**04**
	(c)	Explain electrochemical theory of corrosion with appropriate diagrams.	**07**
		OR	
Q.3	**(a)**	State the products formed by the action of the enzyme invertase and zymase on cane sugar under suitable fermentation conditions, along with the reactions.	**03**
	(b)	Compare hard acids and bases with soft acids and bases.	**04**
	(c)	What do you mean by spectroscopy? Explain the principle of NMR spectroscopy.	**07**

Q.4	**(a)**	Briefly explain thin-layer chromatography.	**03**
	(b)	Discuss the applications of nanomaterials.	**04**
	(c)	Explain the principle and working of lithium batteries, including the reactions occurring in them. Reflect how they are better than other types of batteries.	**07**

OR

Q.4	**(a)**	List the applications of IR spectroscopy.	**03**
	(b)	What are inhibitors? Provide two examples.	**04**
	(c)	Analyze the structure of a bomb calorimeter and explain whether its design is suitable for measuring the calorific value.	**07**

Q.5	**(a)**	Illustrate the uses of steel as an alloy with examples.	**03**
	(b)	Write about Heisenberg's Uncertainty Principle.	**04**
	(c)	Discuss the "Top-Down" and "Bottom-Up" approaches for synthesizing a nanomaterial.	**07**

OR

Q.5	**(a)**	Explain the sacrificial protection method for preventing metal corrosion with suitable diagrams.	**03**
	(b)	Discuss carbon nanotubes and nanowires in detail.	**04**
	(c)	Explain the refining of petroleum with the help of suitable diagrams.	**07**

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