

Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - III EXAMINATION - WINTER 2025

Subject Code: BE03013031

Date: 19-12-2025

Subject Name: Fundamentals of Water Quality Analysis

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) Discuss importance of calibration of glassware.	03
(b) Write the uses of following instrument and glassware, also mention capacity of measurement. (i) BOD Incubator (ii) Hot Air Oven (iii) volumetric flask (iv) Volumetric pipette.	04
(c) Explain the standard method for the determination of Total Solids (TS) and Total Dissolved Solids (TDS) of a water sample collected from lake. Also, include the calculation formula.	07
Q.2 (a) Differentiate between primary and secondary standard solutions.	03
(b) List the purpose of standard methods and water quality index.	04
(c) List the fundamental rule to be followed for balancing simple oxidation-reduction reactions and complex oxidation-reduction reactions. Explain with an example.	07
OR	
(c) A chemist has to prepare two solutions for hardness and COD analysis. Determine the weight of chemicals required to prepare i) 2 L 0.01 M EDTA ii) 1.5 L 0.0141 N AgNO ₃ . The solutions that he prepared are to be standardized, explain steps for standardization.	07
Q.3 (a) Draw neat sketch of turbidity meter and nephelometer instruments. Highlight their components.	03
(b) State and explain Lambert and Beer's law and derive equation.	04
(c) Explain the procedure for the determination of total hardness in water, and highlight the significance of each chemical used in the process.	07
OR	
(a) Explain the principle of Nephelometer and explain its components.	03
(b) Discuss the significance of Total Dissolved Solids (TDS) and conductivity in water. What is the relationship between the two?	04
(c) A sample of water is found to contains following dissolving salts in milligrams per litre Mg(HCO ₃) ₂ = 146, CaCl ₂ = 222, Ca(HCO ₃) ₂ = 162, MgSO ₄ = 80 and MgCl ₂ = 190. Calculate temporary and permanent hardness and total hardness	07

- Q.4 (a)** Calculate the pH of a solution of (i) 0.6 M HCl, (ii) 0.8 M NaOH, and (iii) 0.25 M HNO_3 ? **03**
- (b)** Explain, with reactions, the importance of maintaining pH during the determination of chlorides. **04**
- (c)** Write a short note on sampling techniques and comment type of sampling suitable for sampling from river. **07**

OR

- (a)** Explain the significance of alkalinity for water bodies and in wastewater treatment. **03**
- (b)** Explain the procedure for the determination of chlorides using the argentometric method. **04**
- (c)** Draw a neat diagram of a glass electrode and explain its working principle for measuring the pH of a water sample. **07**
- Q.5 (a)** Discuss the significance of sulphate in water and wastewater distribution and collection. **03**
- (b)** Explain the purpose of laying guidelines for quality of irrigation water and water quality criteria for bathing water. **04**
- (c)** Calculate the Sodium adsorption ratio of water sample using following data: **07**

	Ca^{+2} (mg/L)	Mg^{+2} (mg/L)	Na^{+} (mg/L)
Sample A	40.3	16.7	12.7
Sample B	209.5	50.8	200.5

OR

- (a)** Define the terms: precipitation, filtration, Concentration and drying. **03**
- (b)** Classify the water based on level of Hardness and list the hardness causing cations & anions. **04**
- (c)** Discuss the precautions that must be observed to ensure an accurate gravimetric determination of sulfate concentration. **07**
