

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER- IV EXAMINATION – SUMMER 2026

Subject Code:3141309

Date:21-05-2026

Subject Name: Fundamentals of Wastewater Quality

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.

- Q.1** (a) Give the difference between BOD and COD. 03
- (b) List the membrane technologies used in and highlight application of Membrane Technology in Environmental Engineering field. 04
- (c) Explain the step by step procedure to determine the Chemical Oxygen demand of wastewater sample 07

- Q.2** (a) Discuss the significance of Dissolved oxygen in water bodies and wastewater treatment. 03
- (b) Explain the procedure to determine Volatile acids concentration in the sludge samples. 04
- (c) Enlist the sources of different types of acidity. Explain the procedure to determine acidity in laboratory. 07

OR

- (c) Explain in detail the general properties of Colloids. 07

- Q.3** (a) Explain role of intracellular and extracellular enzymes in biodegradation? 03
- (b) Explain homogeneous and heterogeneous chemical equilibrium. 04
- (c) Explain phenomena of Common Ion effect with suitable examples. 07

OR

- Q.3** (a) Define the following term: i. Permeate ii. Reject iii. Flux 03
- (b) At what Ca^{+2} concentration in mg/L will precipitation of $\text{Ca}(\text{PO}_4)_2$ occurs if solution contains $10^{-5} \text{ M PO}_4^{-2}$. K_{sp} of $\text{Ca}(\text{PO}_4)_2 = 1 \times 10^{-27}$ 04
- (c) Define Adsorption and explain in brief physisorption and chemisorptions. 07

- Q.4** (a) Highlight the sources of organic matter and also highlight the application of COD data. 03
- (b) Define Isomerism and explain in detail with examples. 04
- (c) Give the difference between: 07
- i. Aliphatic and Aromatic compounds
 - ii. Organic and Inorganic compounds

OR

- Q.4** (a) Expand Acronym: PCE, TCE, NAD **03**
- (b) Highlight the importance of sample collection and sample preservation procedure for the analysis of wastewater samples. **04**
- (c) Explain the process of biodegradation of organic compound with equations. **07**

- Q.5** (a) Write the chemical equations involved in unmodified Winkler method for dissolved oxygen **03**
- (b) Discuss the sample preservation method for determination of Dissolved oxygen of sample by standard method. **04**
- (c) Prepare a list of chemicals used in BOD test. Explain the procedure to prepare the dilution water for BOD test. **07**

OR

- Q.5** (a) Discuss general sources of N₂O in the environment, highlight problems it can cause? **03**
- (b) What changes should be incorporated in the procedure to measure the COD of low concentration organic wastewater? **04**
- (c) List and explain four precautions that must be observed to ensure an accurate gravimetric determination of sulfate concentration. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV EXAMINATION – SUMMER 2025****Subject Code:3141309****Date:12-05-2025****Subject Name: Fundamentals of Wastewater Quality****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) Define: binary mixture, vapor pressure, osmosis	03
	(b) What is the significance of dissolved oxygen in water and wastewater?	04
	(c) Explain standard procedure for determining acidity of wastewater sample.	07
Q.2	(a) List properties of organic compounds.	03
	(b) Explain phenomena of diversion Ion effect with suitable examples.	04
	(c) Explain the importance of following chemicals used in BOD test: CaCl_2 , FeCl_3 , MgSO_4 , NH_4Cl , K_2HPO_4 , Na_2HPO_4 & KH_2PO_4	07
	OR	
	(c) Explain standard procedure to determine oil and grease of wastewater sample in laboratory.	07
Q.3	(a) Explain the principle of dialysis with neat sketch.	03
	(b) Explain any one class of binary mixture with neat figure.	04
	(c) Classify the types of alcohols and explain each with example.	07
	OR	
Q.3	(a) Explain the significance of Colloids in environment.	03
	(b) Explain the terms: Extracellular enzymes and intracellular enzymes. Identify the factors that affect the performance of enzyme activity in biochemical reaction.	04
	(c) Describe the Brownian movement and Tyndall effect	07
Q.4	(a) Define with suitable examples: (i) Primary alcohol (ii) Secondary alcohol (iii) tertiary alcohol.	03
	(b) What is importance of determining volatile acids in anaerobic treatment.	04
	(c) List types of detergents. Explain in detail biological degradation of Detergents.	07
	OR	
Q.4	(a) Enlist different chemical reactions by which saturated hydrocarbons are formed. Explain any one with example.	03
	(b) List the sources of sulphate and oil and grease in wastewater.	04
	(c) Explain hydrolysis and hydrogenation of fats and Oil.	07
Q.5	(a) Explain the procedure of DO fixation in wastewater sample at site.	03
	(b) Summarize application of COD and BOD data in environmental engineering field.	04
	(c) Explain modified Winkler method for DO determination.	07
	OR	
Q.5	(a) Why is the BOD test performed for 5 days only?	03
	(b) Summarize significance of phosphorous in water and wastewater.	04
	(c) Explain the standard procedure for determining COD of wastewater sample.	07

Enrolment No./Seat No _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2024

Subject Code:3141309

Date:18-07-2024

Subject Name: Fundamentals of Wastewater Quality

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.

- Q.1** (a) Differentiate between BOD and COD. 03
- (b) Explain the brownian movement of colloidal suspension with neat sketch. 04
- (c) Explain chemistry involved for COD determinations. 07
- Q.2** (a) Explain the principle of dialysis with neat sketch. 03
- (b) Define binary mixture. Explain any one of its type briefly. 04
- (c) Explain the phenomena of common ion effect with example. 07
- OR**
- (c) Explain in physisorption and chemisorptions. State difference between them. 07
- Q.3** (a) The solubility product K_{sp} for calcium sulphate in water is 2.96×10^{-4} . Determine the equilibrium Ca^{+2} concentrations in mg/l for a saturated calcium sulphate solution. 03
- (b) Discuss the mechanisms by which colloids can be coagulated. 04
- (c) List types of detergents. Explain in detail biological degradation of Detergents. 07
- OR**
- Q.3** (a) Explain transformation reactions (any two) of organic matter by bacteria. 03
- (b) Explain role of intracellular and extracellular enzymes in biodegradation? 04
- (c) Explain hydrolysis of fats and oil with chemical reactions. 07
- Q.4** (a) Write a the sources of CO_2 acidity and mineral acidity. 03
- (b) What is the theoretical COD of samples containing : 04
- a) 250 mg/L of Butanol and b) 250 mg/L phenol.
- (c) Explain Modified Winkler method for DO determination with chemical reactions. 07
- OR**
- Q.4** (a) Explain procedure for analysis of volatile acids in laboratory. 03
- (b) Explain crown corrosion with chemical reactions. 04
- (c) Which species of Nitrogen generally found in drinking water and wastewater. Write its possible sources and its significance. 07

- Q.5** (a) Summarize significance of phosphorous in water and wastewater. **03**
(b) List the sources of organic matter and oil and grease in wastewater. **04**
(c) What is importance of following chemicals in BOD test: **07**
(i) Seed (ii) Aeration (iii) MnSO_4 (iv) phosphate buffer (v) FeCl_3 (vi) CaCl_2 (vii) Potassium Iodide.

OR

- Q.5** (a) Summarize significance and source of volatile acids in anaerobic treatment. **03**
(b) How can following interference eliminated during COD test? **04**
(a) Chloride (b) nitrite
(c) Write the method of sample preservation for following test **07**
(i) COD test (ii) dissolved oxygen test.

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2023

Subject Code:3141309**Date:11-07-2023****Subject Name:Fundamentals of Wastewater Quality****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) What is a Chemical buffer? | 03 |
| | (b) What is Osmosis and Reverse Osmosis? | 04 |
| | (c) Write down the experimental process for the measurement of the acidity present in the wastewater. | 07 |
| | | |
| Q.2 | (a) Differentiate between BOD and COD. | 03 |
| | (b) How dilution water for BOD test is prepared in laboratory? | 04 |
| | (c) Write down the experimental process for the measurement of the Dissolved oxygen present in the wastewater. | 07 |
| | OR | |
| | (c) Write down the experimental process for the measurement of the chemical oxygen demand (COD) present in the wastewater. | 07 |
| | | |
| Q.3 | (a) Explain application of Adsorption in the wastewater treatment. | 03 |
| | (b) Explain Dialysis process with sketch. | 04 |
| | (c) Classify the Binary Mixtures and explain each class. | 07 |
| | OR | |
| Q.3 | (a) How colloids are significant environment? | 03 |
| | (b) State Hardy Schulze Law and its importance in wastewater treatment. | 04 |
| | (c) Derive the Equation for the substrate remaining after nth solvent extraction. | 07 |
| | | |
| Q.4 | (a) Give functional group and characteristics of Alcohol, Aldehydes and Ketones. | 03 |
| | (b) How Common Ion effect important in wastewater treatment? | 04 |
| | (c) Explain Ionization of Acids with examples. | 07 |
| | OR | |
| Q.4 | (a) Draw the structure of Furfural, Pyrrole and Pyridine. | 03 |
| | (b) Explain kinetic approach of Chemical Equilibrium of endothermic process when temperature is increase. | 04 |
| | (c) Explain Solubility products with suitable examples. | 07 |
| | | |
| Q.5 | (a) Give the difference between organic compounds and inorganic compounds. | 03 |
| | (b) Write a short note on Carbohydrates | 04 |
| | (c) Write a short note on biodegradation of organic compounds. | 07 |
| | OR | |
| Q.5 | (a) Give the difference between Fats and Wax. | 03 |
| | (b) Write a short note on Polyhydroxy Alcohols | 04 |
| | (c) Explain about the Fate of Organics. | 07 |

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2022

Subject Code:3141309**Date:27-06-2022****Subject Name:Fundamentals of Wastewater Quality****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.

- Q.1** (a) State and explain Le Chatelier's principle. **03**
(b) Explain the significance of different types of acidity present in wastewater. **04**
(c) Explain standard procedure of COD determination. **07**

- Q.2** (a) What is isomerism? Explain with example. **03**
(b) Explain phenomena of Common Ion effect with suitable examples. **04**
(c) Explain modified Winkler method for DO determination. **07**

OR

- (c) Identify the role of carbohydrates in higher animals. Explain the mechanism by which carbohydrates are converted to simple sugar with equations. **07**

- Q.3** (a) Explain the principle of dialysis with neat sketch. **03**
(b) Differentiate between organic compounds and inorganic compounds. (Give at least two points and example) **04**
(c) Classify the types of alcohols and explain each with example. **07**

OR

- Q.3** (a) Explain the terms: (i) emulsion (ii) smoke (iii) smog. **03**
(b) Explain the terms: Extracellular enzymes and intracellular enzymes. Identify the factors that affect the performance of enzyme activity in biochemical reaction. **04**
(c) Explain general properties of Colloids. **07**

- Q.4** (a) Explain briefly Amphoteric hydroxides. **03**
(b) List out the characteristics of pesticides. **04**
(c) Identify functional group is associated with Aldehyde, Ketone and Alcohol. Explain the nomenclature of each with example. **07**

OR

- Q.4** (a) Enlist different chemical reactions by which saturated hydrocarbons are formed. Explain any one with example. **03**
(b) Explain process to produce ethers. Highlight its application. **04**
(c) Explain Aliphatic and Aromatic compounds with examples. **07**

- Q.5** (a) Summarize significance of volatile acids in anaerobic treatment. **03**
(b) Explain about the significance of nitrogen species for aquatic life and aquatic bodies. **04**
(c) Explain the standard procedure to examine the sulphate concentration in wastewater sample. **07**

OR

- Q.5** (a) Explain the procedure of DO fixation in wastewater sample at site. **03**
(b) Find out theoretical COD of **04**
i. 500mg/L of Ethanol

- ii. 100mg/L of Phenol
- (c) Explain the any one standard procedure of determination of oil and grease present in wastewater.

07
