

Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 4 – EXAMINATION – SUMMER 2026

Subject Code: 3140508

Date: 16/06/2026

Subject Name: Unit Processes & Chemical Technology

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) Define alkylation and give one industrial example. **03**
 - (b) List environmental issues in chemical manufacturing. **04**
 - (c) State the need for process optimization in chemical industries. **07**
- Q.2**
- (a) State the difference between alkylation and acylation. **03**
 - (b) Differentiate between mercury cell and diaphragm cell. **04**
 - (c) Describe the DCDA process for the manufacture of sulfuric acid. **07**
- OR
- Q.2**
- (c) Explain the process of H₂SO₄ manufacture with flow diagram, reactions, and environmental considerations. **07**
- Q.3**
- (a) Explain the mechanism of nitration of benzene. **03**
 - (b) Explain the manufacturing of Portland cement in detail with chemical reactions and flow diagram. **04**
 - (c) Explain the membrane cell process for caustic soda manufacture with neat flow sheet **07**
- OR
- Q.3**
- (a) List any three important uses of sulfuric acid. **03**
 - (b) Explain the preparation of sodium bicarbonate using Solvay process with flow diagram. **04**
 - (c) Explain the fermentation process for citric acid manufacture with reactions, process flow diagram, and applications. **07**
- Q.4**
- (a) What are the raw materials used in the manufacture of ammonia? **03**
 - (b) Provide flow diagram and reactions required in the manufacturing of urea from ammonia and carbon dioxide **04**
 - (c) Describe Ostwald's process for nitric acid manufacture with process flow sheet, reactions, and efficiency factors. **07**
- OR
- Q.4**
- (a) Define and classify fertilizers with examples. **03**
 - (b) Classify dyes based on their mode of application. **04**
 - (c) Discuss in detail the manufacture of aspirin – raw materials, reactions, process steps, and applications. **07**

- Q.5**
- (a)** Differentiate between wet and dry process for cement manufacture. **03**
 - (b)** List the major vitamins and their sources. **04**
 - (c)** Explain the cracking process in petroleum refinery with types, mechanisms, and industrial significance. **07**

OR

- Q.5**
- (a)** List the properties of good quality paper. **03**
 - (b)** Explain the Kraft process for pulp manufacture. **04**
 - (c)** Discuss polymerization reactions (addition and condensation) with mechanisms and industrial applications. **07**

Enrolment No./Seat No _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV EXAMINATION – SUMMER 2025

Subject Code:3140508

Date:17-05-2025

Subject Name: Unit Processes & Chemical Technology

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 the reductive alkylation reaction of aniline	03
(b) Discuss the oxidation of xylene	04
(c) Write a note on friedel crafts alkylation reaction of benzene, benzoic acid and phenol	07
Q.2 (a) Write the reaction mechanism of nitration of benzene.	03
(b) Discuss the chlorination of toluene and hydrogenation of nitrobenzene	04
(c) Describe the process description of H ₂ SO ₄ by DCDA process and discuss its major engineering problems	07
OR	
(c) Explain the manufacturing process of urea.	07
Q.3 (a) Differentiate the dye, paint and pigment	03
(b) Write a note on dispersive reactive and azo dye	04
(c) Discuss the manufacturing process of H-acid dye	07
OR	
Q.3 (a) Explain the manufacturing process of aspirin	03
(b) Discuss the classification of drug.	04
(c) Discuss the manufacturing process of penicillin	07
Q.4 (a) Define cement and refractory and discuss the calcination of CaCO ₃	03
(b) Write a note on setting and hardening of cement	04
(c) Write a note on manufacturing process of cement.	07
OR	
Q.4 (a) Define petroleum, paper and sugar.	03
(b) Write a note on cracking of petroleum.	04
(c) Define the fermentation and write a note on manufacturing process of alcohol	07
Q.5 (a) Write a note on process description of ammonia	03
(b) Draw the schematic diagram of nitric acid production.	04
(c) Discuss the hydrochloric acid leaching method for the production of phosphoric Acid.	07
OR	
Q.5 (a) Discuss the chemical reaction of Kraft (Pulp) Process.	03
(b) Write a note on LPG, Gasoline and Diesel.	04
(c) Write a note on pigments.	07

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2024****Subject Code:3140508****Date:01-07-2024****Subject Name: Unit Processes & Chemical Technology****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) Enlist the oxidizing and reducing reagent.	03
	(b) Discuss the oxidation reaction of xylene.	04
	(c) Explain DCDA process with neat flow sheet for the production of sulphuric acid.	07
Q.2	(a) Discuss in brief: NPK fertilizer.	03
	(b) Explain the major engineering problem in the manufacturing of H_3PO_4 by wet process.	04
	(c) Enlist Sulphonating reagent. Explain the sulphonation process of Benzene with flow diagram.	07
	OR	
	(c) Starting with neat flow diagram and chemical reactions, discuss the manufacturing of Nitric acid.	07
Q.3	(a) Give the classification of dyes according to its application.	03
	(b) Synthesis of Vat Dyes.	04
	(c) Explain the manufacturing process of Koch-Acid with a process flow diagram.	07
	OR	
Q.3	(a) What is the role of a membrane in the production on caustic soda?	03
	(b) Enlist advantages and disadvantages of Solvay Process.	04
	(c) Define Varnish, Thinner. Discuss the types of Pigments with suitable example.	07
Q.4	(a) Write a note on ceramics.	03
	(b) Discuss the difference between sulphate and sulphite process for pulping.	04
	(c) What is pulp? Explain manufacturing of Paper making process. Why fillers and sizing agent are added in paper production?	07
	OR	
Q.4	(a) Synthesis of Barbitol.	03
	(b) Synthesis of Congo Red azo dye and its application	04
	(c) Explain manufacturing process of Portland cement with neat flow diagram.	07
Q.5	(a) Write the important properties of petroleum products.	03
	(b) Write a note on cracking of petroleum.	04
	(c) What is fermentation? Explain manufacturing of industrial alcohol with neat flow diagram.	07
	OR	
Q.5	(a) Write a note on Ascorbic acid.	03
	(b) Give the classification of various drugs and pharmaceuticals.	04
	(c) Describe the application, synthesis of penicillin and Aspirin.	07

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

Subject Code:3140508**Date:17-07-2023****Subject Name:Unit Processes & Chemical Technology****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

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|------------|-----|--|-----------|
| Q.1 | (a) | Discuss following unit processes: Oxidation, Reduction, Acylation | 03 |
| | (b) | Define drugs and write the classification of drugs. | 04 |
| | (c) | Write the electrophile for the Nitration, Sulphonation, and Alkylation reaction and also write the stepwise mechanism of formation of nitrobenzene from benzene. | 07 |
| | | | |
| Q.2 | (a) | Write major applications of Drugs. | 03 |
| | (b) | Discuss classification of dyes based on application. | 04 |
| | (c) | Explain manufacturing process of H acid with the help of diagram. | 07 |
| OR | | | |
| | (c) | Explain following terms: Dyes, Pigments, Varnishes, C1,C2,C3 Chemicals, Vitamin B12, Fermentation, Refining | 07 |
| | | | |
| Q.3 | (a) | Draw a neat diagram for manufacturing process of Sodium Bicarbonate. | 03 |
| | (b) | Write a note on Fertilizer industry and its major pros and cons. | 04 |
| | (c) | Construct neat flow diagram for one of the antibiotic and state its major engineering problems. | 07 |
| OR | | | |
| Q.3 | (a) | Draw a neat diagram for membrane cell process of manufacturing Chlorine. | 03 |
| | (b) | Write a note in favor of advancements of Chemical Industries by major use of unit processes. | 04 |
| | (c) | Explain manufacturing of sulphuric acid with a neat flow diagram and chemistry involved. | 07 |
| | | | |
| Q.4 | (a) | What are refractories? Write their applications. | 03 |
| | (b) | Explain in detail settling and hardening of cement. | 04 |
| | (c) | Explain pulp manufacturing by Kraft process | 07 |
| OR | | | |
| Q.4 | (a) | Write a note on types of refractories. | 03 |
| | (b) | Explain in brief about methods of making pulp. | 04 |
| | (c) | Write details about the manufacturing of cement by dry process with the help of a neat schematic diagram. | 07 |
| | | | |
| Q.5 | (a) | Explain properties which make Petroleum versatile. | 03 |
| | (b) | Discuss the reaction mechanism of thermal cracking. | 04 |
| | (c) | Explain the manufacturing process of sugar from sugar cane with proper diagram | 07 |
| OR | | | |
| Q.5 | (a) | Draw process flow diagram for manufacturing of citric acid. | 03 |
| | (b) | Discuss the advantages of catalytic cracking over thermal cracking. | 04 |
| | (c) | Describe the process of atmospheric distillation and vacuum distillation for petroleum refining. | 07 |

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

Subject Code:3140508**Date:02-07-2022****Subject Name:Unit Processes & Chemical Technology****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 the mechanism of acylation of benzene. | 03 |
| | (b) Explain the role of sulfuric acid in nitration process. | 04 |
| | (c) Explain the role of four pass converter to convert SO ₂ into SO ₃ by drawing. | 07 |
| | | |
| Q.2 | (a) Write the application of various dyes. | 03 |
| | (b) Define dye. How are dyes classified on the basis of structure? | 04 |
| | (c) Explain the manufacturing process of chrome blue black dye with neat sketch diagram. | 07 |
| | | |
| | OR | |
| | (c) Explain the manufacturing process of H-acid dye with neat sketch diagram. | 07 |
| | | |
| Q.3 | (a) Write a note on Disperse dyes. | 03 |
| | (b) Explain the mining of sulfur by claus methods. | 04 |
| | (c) Explain the manufacturing process of caustic soda by membrane cell. | 07 |
| | | |
| | OR | |
| Q.3 | (a) Write a note on Vat dyes. | 03 |
| | (b) Explain the Frasch process for sulfur. | 04 |
| | (c) Explain the manufacturing process of NPK fertilizer with major engineering problems. | 07 |
| | | |
| Q.4 | (a) Explain the reason for failure of paints. | 03 |
| | (b) Write a note on any one pigments. | 04 |
| | (c) Explain the manufacturing process of paints with neat flow diagram. | 07 |
| | | |
| | OR | |
| Q.4 | (a) Explain the role of plasticizer/Binder/Oil as an ingredient used in paint | 03 |
| | (b) Write a note on Lithophone as a pigment. | 04 |
| | (c) Explain the manufacturing process of sugar from sugar cane with proper diagram. | 07 |
| | | |
| Q.5 | (a) What are drugs? Write the types of drugs. | 03 |
| | (b) Explain preparation of Barbitol with chemical reaction | 04 |
| | (c) Explain the manufacturing process of Erythromycin with flow diagram. | 07 |
| | | |
| | OR | |
| Q.5 | (a) Write various chemical reaction for setting and hardening of cement. | 03 |
| | (b) What is the basic prerequisites of good fermentation. | 04 |
| | (c) Explain the manufacturing process of cement with proper flow diagram. | 07 |
