



UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF CHEMICAL AND BIOENGINEERING
TECHNOLOGY

FINAL EXAMINATION
OCTOBER 2025 SEMESTER

COURSE CODE	: CCB40902
COURSE NAME	: WASTEWATER TREATMENT ENGINEERING
PROGRAMME NAME	: BACHELOR OF CHEMICAL ENGINEERING WITH HONOURS
DATE	: 29 JANUARY 2026
TIME	: 2.00 PM – 5.00 PM
DURATION	: 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper **CAREFULLY**.
2. This question paper has information printed on both sides of the paper.
3. This question paper contains a total of **THREE (3)** questions. Answer **ALL** questions.
4. Please write your answers on the answer booklet provided.
5. Answer all questions in English language **ONLY**.

THERE ARE 2 PAGES OF QUESTIONS EXCLUDING THIS PAGE.

(Total: 100 marks)

INSTRUCTION: Answer ALL questions

Question 1

- (a) The BOD_5 of wastewater is determined to be 150 mg/L at 20°C. The rate constant, k , is known to be 0.23 per day. Determine the BOD_8 if the test were conducted at 15°C. ($\Theta = 1.135$ when $T < 20^\circ\text{C}$ and $\Theta = 1.056$ when $T > 20^\circ\text{C}$)

(17 marks)

- (b) Calculate the Chemical Oxygen Demand (COD) of a solution containing 500 mg/L of butanol (C_4H_9OH). If the compound is readily biodegradable, as shown in Table 1, determine the expected BOD_5 value.

Table 1: Significance of reaction rate constant, k upon BOD

Percent of total BOD exerted					
Days	$k = 0.10$	$k = 0.2$	$k = 0.30$	$k = 0.40$	$k = 0.50$
1	10	18	26	33	39
2	18	33	45	55	63
3	26	45	59	70	78
4	33	55	70	80	86
5	39	63	78	86	92
6	45	70	83	91	95
7	50	75	88	94	97
10	63	86	95	98	99
15	78	95	99	99+	99+
20	86	98	99+	99+	99+

(18 marks)

Question 2

- (a) Ammonia stripping is a physical desorption process commonly applied in industrial wastewater treatment to reduce high ammonia concentrations, particularly in effluents from fertilizer, petrochemical and food-processing industries. With reference to an industrial wastewater treatment case, explain the mechanism by which air stripping enables the effective removal of ammonia.
- (18 marks)
- (b) A fertilizer manufacturing plant produces wastewater containing high levels of nitrogen compounds, including ammonia (NH_3) and nitrate (NO_3^-). The effluent is discharged into a nearby river, which is used as a source of drinking water and supports aquatic life. Justify why nitrogen removal is necessary in this wastewater treatment scenario.
- (12 marks)

Question 3

- (a) Wastewater from chemical manufacturing differs significantly from electronics manufacturing wastewater. Predict **FIVE (5)** key characteristics of wastewater generated from electronics manufacturing.
- (10 marks)
- (b) Based on your answer in (a), recommend an environmentally friendly wastewater management system for an electronic manufacturing facility to convey its wastewater to a centralized treatment center. Justify your recommendation by considering technical feasibility, environmental impact and sustainability.
- (25 marks)

END OF EXAMINATION PAPER

