



UNIVERSITI KUALA LUMPUR
MALAYSIAN INSTITUTE OF CHEMICAL AND BIO-ENGINEERING TECHNOLOGY

FINAL EXAMINATION
OCTOBER 2025 SEMESTER

COURSE CODE : CPD22503
COURSE TITLE : PETROCHEMICAL & PETROLEUM REFINING TECHNOLOGY
PROGRAMME NAME : DIPLOMA IN CHEMICAL ENGINEERING TECHNOLOGY
DATE : 25 JANUARY 2026
TIME : 9:00AM - 11:00AM
DURATION : 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.
2. This question paper is printed on both sides of the paper.
3. This question paper consist of TWO sections.
4. Section A consist total of 60 marks. Answer ALL questions.
5. Section B consist of three questions. Answer TWO (2) questions only.
6. Please write your answer on the answer booklet provided.
7. Please answer all questions in English only.
8. Refer to the attached Formula/ Appendies. ☐ Tick if applicable

THERE ARE 8 PAGES OF QUESTIONS INCLUDING THIS PAGE

SECTION A (Total: 60 marks)

Answer ALL questions.

Please use the answer booklet provided.

Question 1

(a) Define the following terms:

i. Cloud point

(2 marks)

ii. Pour point

(2 marks)

iii. Viscosity

(2 marks)

(b) Identify five non-hydrocarbons composed in petroleum.

(5 marks)

(c) Describe three oil recovery methods that are very important for the extraction of crude oil.

(9 marks)

Question 2

- (a) List four physical properties of natural gas.
(4 marks)

- (b) Explain the difference between non-associated natural gas and associated natural gas.
(6 marks)

- (c) Discuss five importance of removing moisture content in natural gas processing.
(10 marks)

Question 3

- (a) Discuss one similarity and two differences between the processes listed below.
- i. Atmospheric Distillation and Vacuum Distillation.
(5 marks)
 - ii. Catalytic Cracking and Thermal Cracking.
(5 marks)
- (b) According to the statements below, state the name of thermal cracking process mentioned.
- i. *"A non-catalytic and mild thermal cracking of vacuum or atmospheric residues to produce light products and 75–85% cracked material of lower viscosity that can be used as fuel oil"*
(2 marks)
 - ii. *"A severe form of thermal cracking used to obtain straight-run gasoline and various middle distillate fractions with the formation of coke"*
(2 marks)
- (c) Explain upstream, midstream and downstream concept in oil and gas industry sector.
(6 marks)

SECTION B (Total: 40 marks)

Answer TWO (2) questions only.

Please use the answer booklet provided.

Question 1

- (a) According to the Figure,
Refer Below - Figure 1 : Schematic diagram of an Alkylation process .

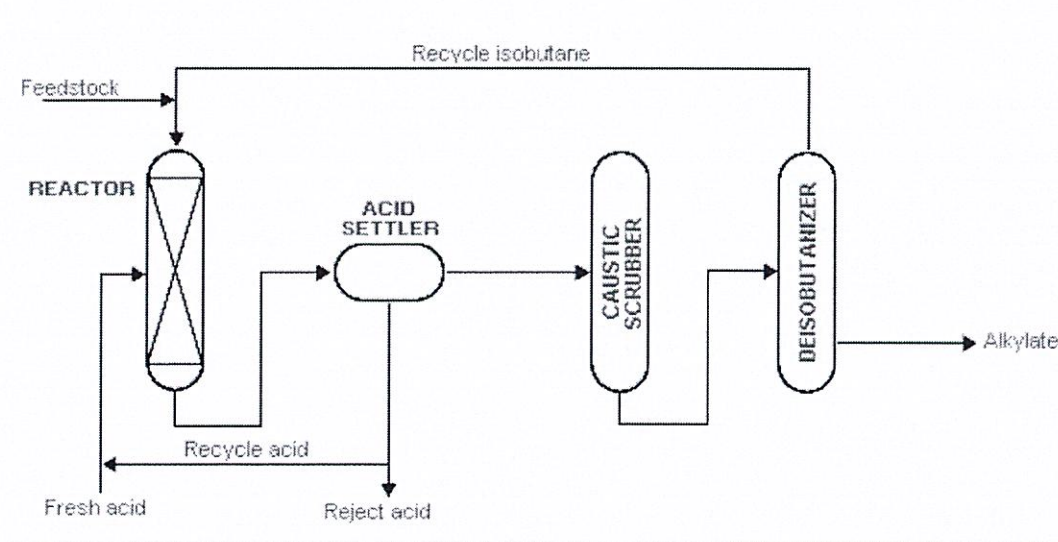


Figure 1: Schematic diagram of an Alkylation process

- i. Name the catalyst that favorably used in this process.
(2 marks)
- ii. Describe the alkylation process based on the schematic diagram.
(10 marks)
- (b) The petrochemical industry provides most items used in everyday life such as plastic products and soaps. Explain the concept of feedstock/raw material, primary petrochemical, derivatives petrochemical and final product of petrochemical products.

(8 marks)

Question 2

- (a) According to Table 1, measure the density of oil for both regions. Given density of water is 1000 kg/m^3 .

Refer Below - Table 1 : The API Gravity for selected crude blend .

(8 marks)

Table 1: The API Gravity for selected crude blend

Region	API Gravity
Dulang, Malaysia	12.6
Angsi, Malaysia	42.6

- (b) Based on the Figure, answer the following questions.

Refer Below - Figure2 : Cracking Process .

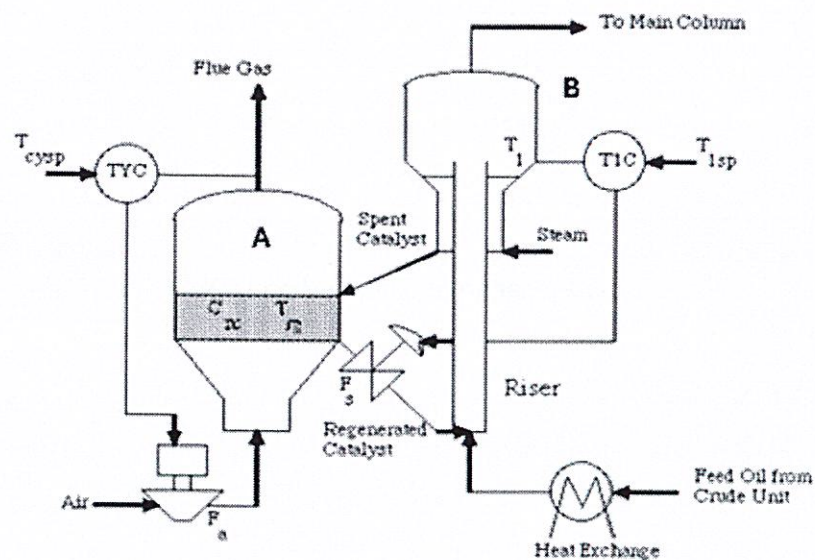


Figure 2: Cracking Process

- Name the process shown in the figure.
- Identify equipment A and B. Discuss the function of equipment A and B.

(2 marks)

(10 marks)

Question 3

- (a) According to the Tables, answer the following questions,
Refer Below - Table2 : Results of 98.5% of oil A distilled according to ASTM method . Table3 : Classification of oil based on UOP K Factor .

Table 2: Results of 98.5% of oil A distilled according to ASTM method

Time (minute)	Temperature (°C)	Temperature (°R)	Percentage Oil A Distilled (%)
0	0	491.67	0
10	15	518.67	7.5
20	65	608.67	12.5
35	88	650.07	20.5
45	110	689.67	32.0
60	132	729.27	45.5
80	155	770.67	62.0
95	182	819.27	75.0
102	202	855.27	82.5
108	210	869.67	85.0
120	215	878.67	98.5

Table 3: Classification of oil based on UOP K Factor

UOP K Factor	Classification
10	Highly Aromatics
10.5	Highly Naphtenic
12.9	Paraffinic
15	Highly Paraffinic

- i. Calculate the Universal Oil Product (UOP) K factor after 120 minutes distillation of oil A. Given density of oil A and density of water is 719.7 kg/m^3 and 1000 kg/m^3 respectively.

(8 marks)

- ii. Classify oil A based on the classification table provided.

(2 marks)

- (b) According to the Table,

Refer Below - Table4 : Density of crude oil A and crude oil B .

Table 4: Density of crude oil A and crude oil B

Crude Oil A	Crude Oil B
Density = 0.706 g/cm^3	Density = 895.0 kg/m^3

- i. Calculate the API Gravity of Crude Oil A and Crude Oil B. Given the density of water is 1000 kg/m^3 .

(6 marks)

- ii. Discuss the findings.

(4 marks)

END OF EXAMINATION PAPER

