

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

FIRST SEMESTER EXAMINATIONS – 2022

CH412 – INDUSTRIAL CHEMISTRY

MONDAY 5TH JUNE 2022 – 12:50 PM

TIME ALLOWED: 2 HOURS

INFORMATION FOR CANDIDATES: -

1. You will have 10 minutes to read the question paper. You **MUST NOT** begin writing in the answer book during this time.
2. **ANSWER ALL QUESTIONS.**
3. All answers **MUST** be written on the answer book provided
4. Calculators are permitted in the examination room. Lecture notes, notebooks plain papers and textbooks are **NOT** allowed.
5. Mobile phones are not allowed. **SWITCH OFF THE MOBILE PHONES.**
6. Show all workings and calculations in the answer book.
7. **DRAW** the **STRUCTURES** clear and visible.
8. **DO NOT** over write.
9. Write your name and student **ID number** clearly on the front page of the answer book. **DO IT NOW.**

MARKING SCHEME: TOTAL 60 MARKS

1. (a) (i) What are the primary sources of organic chemicals? [2 marks]
(ii) Explain how the chemical transformation of prehistoric organisms resulted in the formation of natural gas, petroleum and coal. [3 marks]
- (b) (i) Show the equations involved in the synthesis of syngas from natural gas. [3 marks]
(ii) Define **Haber Process**. [2 marks]

(Total = 10 Marks)

2. (a) Define zymology. [1 mark]
- (b) Explain the general process of fermentation. [2 marks]
- (c) Name the factors that determine the rate of fermentation. [3 marks]
- (d) Show the chemical equation involving the steps in the production of ethanol from glucose in fermentation. [4 marks]

(Total = 10 Marks)

3. (a) (i) Show the reaction equation for the synthesis of the malathion. [3 mark]
(ii) Explain the mode of activity of the organophosphate insecticides. [2 marks]
- (b) Show the reaction equation for the preparation of the following hormone type herbicides. [4 marks]
- (i) Phenoxyethanoic acid.
(ii) Trichloroethanoic acid.
- (c) Explain the mode of activity of the growth hormone herbicides. [1 mark]

(Total = 10 Marks)

4. (a) With respect to fungicides, explain as to what is meant by *latent infection*? [1 mark]
- (b) Show the structure of hexaconazole (Anvil) – a common fungicide. [2 marks]
- (c) Name THREE micronutrients normally included in fertilizers. [3 marks]
- (b) Show chemical equations for the synthesis of the fertilizers below.
- (i) urea.
(ii) ammonium sulphate fertilizers. [4 marks]

(Total = 10 Marks)

5. (a) Explain the functions of RESINS and PIGMENTS in paints. [4 marks]
- (b) Show the reaction equation for the synthesis of:
- (i) Phenolic resin.
 - (ii) Polyurethane resin. [6 marks]

(Total = 10 Marks)

6. (a) A soap is produced when a vegetable oil, bearing esters of one lauric acid, one myristic acid and one oleic acid is reacted with NaOH. Show the chemical equation for the reaction. [3 marks]
- (b) Show the reaction equation involved in the synthesis of sodium alkyl sulphate detergent. [4 marks]
- (c) What are the reasons for adding the following ingredients into detergents:
- (i) Amylases.
 - (ii) Sodium perborate.
 - (iii) Aromatics. [3 marks]

(Total = 10 Marks)