



**UTHM**  
Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2023/2024**

- COURSE NAME : ORGANIC CHEMISTRY II
- COURSE CODE : BWK 10603
- PROGRAMME CODE : BWK
- EXAMINATION DATE : JULY 2024
- DURATION : 3 HOURS
- INSTRUCTIONS :
1. ANSWER ALL QUESTIONS
  2. THIS FINAL EXAMINATION IS CONDUCTED VIA  
 Open book  
 Closed book
  3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

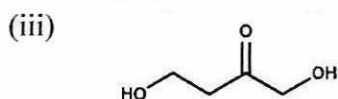
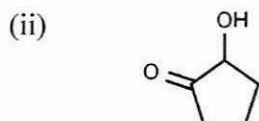
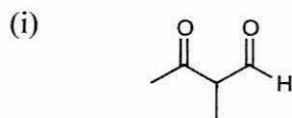
THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

**TERBUKA**

**CONFIDENTIAL**

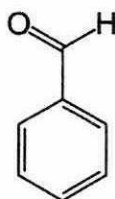
**Q1** A carbonyl group is an organic functional group composed of a carbon atom double-bonded to an oxygen atom and represented as (CO).

(a) Name the following carbonyl compound according to IUPAC.



(6 marks)

(b) Compound X is a carbonyl compound as shown in **Figure Q1.b**.



**Figure Q1.b**

(i) Determine a suitable chemical test that could be carried out in the laboratory, with the observation that could confirm the presence of the functional group in compound X.

(6 marks)

(ii) State the name of the mechanism if the compound in **Figure Q1.b** is reacted with NaCN (aq) and  $H^+$  (aq).

(2 marks)

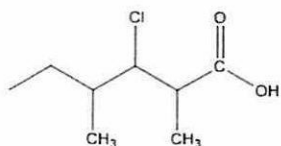
(iii) Draw the mechanism for the reaction of compound X with NaCN (aq) and  $H^+$  (aq). The answer should include curly arrows, lone pairs, intermediate or any relevant dipoles.

(6 marks)

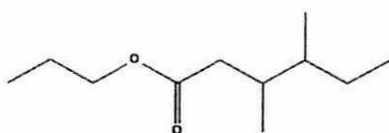
**Q2** Carboxyl groups or carboxylic acids are functional groups with a carbon atom double-bonded to an oxygen atom and single bonded to a hydroxyl group.

(a) Name the following compounds according to their IUPAC names.

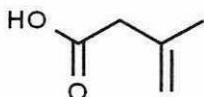
(i)



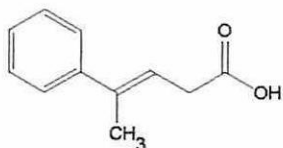
(ii)



(iii)



(iv)



(8 marks)

(b) Predict the product for following reactions.

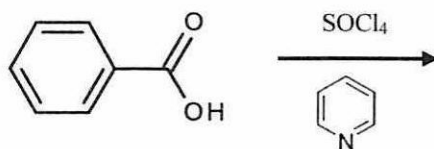
(i)



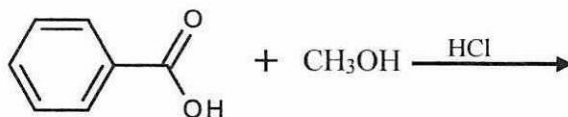
(ii)



(iii)



(iv)



(12 marks)

**Q3** The characterization of organic compounds involves the use of multiple instrumentation.

(a) Amine is one of the important organic compound which can be used in many reactions and applications.

(i) Define amine.

(2 marks)

(ii) Provide **TWO (2)** examples for each primary, secondary and tertiary amine.

(6 marks)

(b) Explain how the Fourier Transform Infrared (FTIR) spectroscopy can be used to identify functional groups in organic compounds. Provide an example for an FTIR spectrum and discuss the characteristic of the peaks that can be correlated with specific functional groups.

(12 marks)

**Q4** Nuclear magnetic resonance (NMR) spectroscopy is the study of molecules by recording the interaction of radiofrequency ( $R_f$ ) electromagnetic radiations with the nuclei of molecules placed in a strong magnetic field.

(a) Explain the concept of chemical shift in NMR spectroscopy in terms of:

(i) Fundamental and principle.

(4 marks)

(ii) Determination of the hydrogen atoms in organic compound.

(4 marks)

(b) Describe **FOUR (4)** factors that influence the chemical shift values with examples, to show that different functional groups and molecular environments will affect the proton NMR spectra.

(12 marks)

- END OF QUESTIONS -

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