



**MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2021/2022 ACADEMIC YEAR**

**SECOND YEAR SPECIAL/ SUPPLEMENTATRY EXAMINATION**

**FOR THE DEGREE OF**

**BACHELOR OF INDUSTRIAL CHEMISTRY**

**COURSE CODE: SCII 261**

**COURSE TITLE: CHEMISTRY OF FUNCTIONAL GROUPS**

**DATE: THURSDAY, 28<sup>TH</sup> JULY 2022**

**TIME: 11.00 - 1.00PM**

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**INSTRUCTIONS**

- *Answer ALL Questions as directed.*

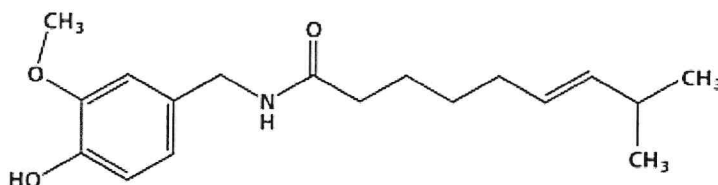
MMUST observes ZERO tolerance to examination cheating

*This paper consists of 3 printed pages. Please turn over. →*

QUESTION 1

(25 marks)

- (a) Explain the meaning of the term "Functional Group (FG)" as used in Chemistry. [3]
- (b) You are given an important organic molecule with the chemical structure shown below. Study the structure carefully and answer the following questions.

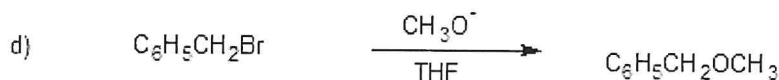
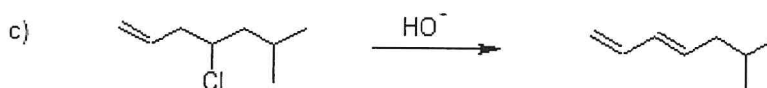
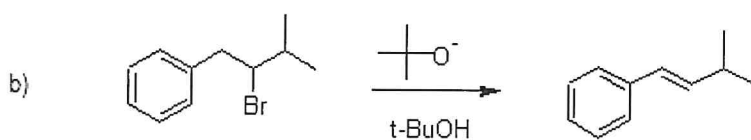
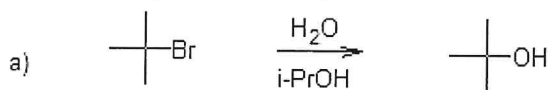


- (i) Identify all the functional groups in the molecule (*Each type of FG to be reflected once only*) [10]
- (ii) Of the FGs in (i) above, based on structure only, which one is of the highest priority? [2]
- (iii) How many  $sp^2$  hybridized and tertiary carbons are found in the molecule? [2]
- (iv) Name five (5) types of reactions this molecule may undergo? [5]
- (v) Speculate and cite the possible function(s) of the above molecule based purely on the chemical structure given. [3]

QUESTION 2

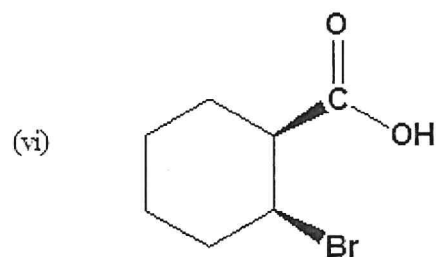
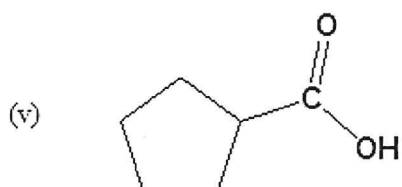
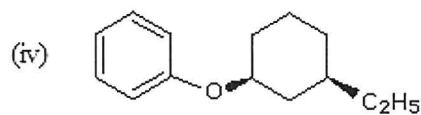
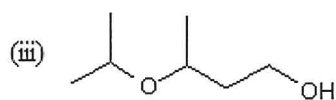
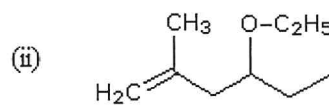
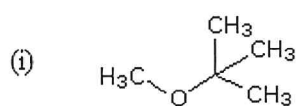
(14 marks)

- (a) With reasons, classify the following reactions as "Substitution" or "Elimination". [8]



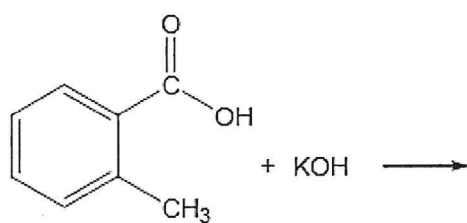
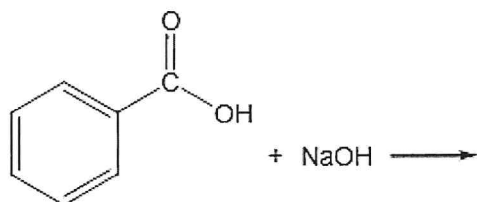
(b) Give IUPAC names of the following molecules.

[3]



(c) Give the products of the following reactions.

[3]

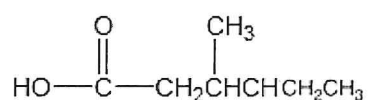


**QUESTION 3****(17marks)**

- (a) Oxidation of ketones to carboxylic acid esters using a peroxy-acid as the oxidizing agent is given a special name. State the name of this reaction. [2]
- (b) Using your own example a ketone and a peroxy-acid, outline the reaction mechanism of the reaction in (a) above. [15]

**QUESTION 4****(14 marks)**

- (a) What is the IUPAC name of the following carboxylic acid? [1]



- (b) Indicate on the structure above  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$  and  $\epsilon$  carbon atoms. [5]
- (c) Explain why melting points and boiling points of carboxylic acids generally increase with increase in number of carbons / molecular mass. [2]
- (d) List six (6) functions of carboxylic acids and their derivatives [6]