



(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

**UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR**

FIRST YEAR FIRST SEMESTER EXAMINATIONS

**FOR THE DEGREE
OF
BACHELOR OF SCIENCE (CHEMISTRY, INDUSTRIAL
CHEMISTRY, BIOCHEMISTRY)
&
BACHELOR OF EDUCATION (SCIENCE)**

COURSE CODE: SCH 130

COURSE TITLE: ORGANIC CHEMISTRY I

DATE: Thursday, 7TH February 2019

TIME: 12.00 pm - 2.00 pm

INSTRUCTIONS TO CANDIDATES

➤ Answer ALL questions

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 6 Printed Pages. Please Turn Over. ►

QUESTION ONE (17 Marks)

a) Give a brief description of the unique properties of carbon

4 marks

b) Explain the following observations

6 marks

i) The element carbon forms a very large number of compounds

ii) Propan-1-ol is soluble in water but 1-chloropropane is insoluble

iii) Butan-1-ol and ethoxyethane have the same relative molecular mass but very different boiling points, 117°C and 35°C respectively

c) A laboratory technician is supplied with three unlabelled bottles containing an alcohol, an aldehyde and an alkane respectively of comparable molecular mass. She takes a sample from each bottle and labels them P, Q and R. In order to identify each sample, she determines the boiling point of each under the same conditions. The results are shown in the table below.

Sample	Boiling Point (°C)
P	36
Q	76
R	118

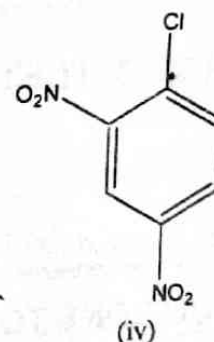
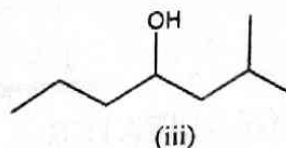
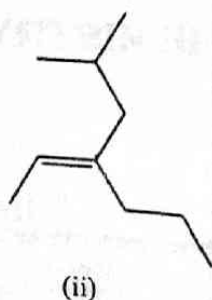
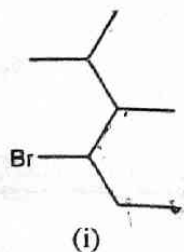
From this information, select the letters (P, Q or R) representing an alkane, aldehyde and alcohol.

Explain

3 marks

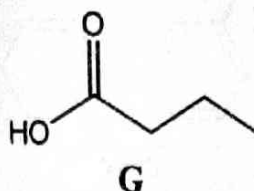
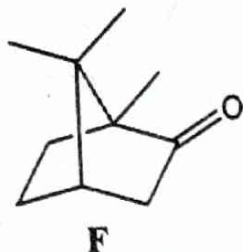
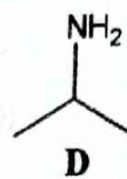
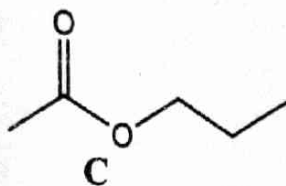
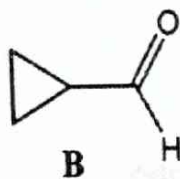
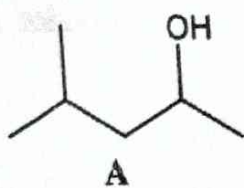
d) Provide the systematic names for the compounds whose structures are given below

4 marks



QUESTION TWO (18 Marks)

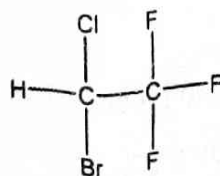
- a) The following molecules only have a single functional group. Identify to which class of organic compounds each molecule belongs based on its functional group **4 marks**



- b) Differentiate between constitutional isomers and stereoisomers **2 marks**
- c) Give the structures and names of any four constitutional isomers of C_6H_{14} **4 marks**
- d) By giving relevant example/illustration in each case, explain the difference between heterolytic bond fission and homolytic bond fission **4 marks**
- e) Using chlorination of methane as an example, show the three steps involved in the chain reaction. **4 marks**

QUESTION THREE (18 Marks)

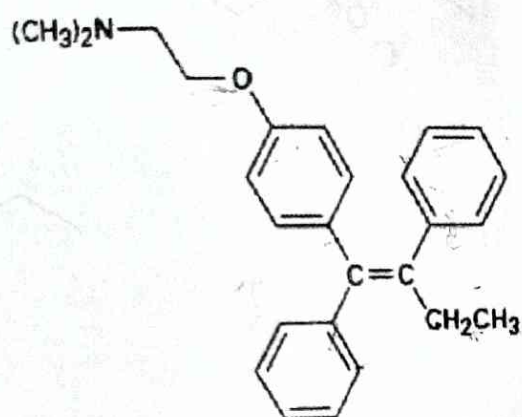
- a) Give two differences between organic and inorganic compounds **2 marks**
- b) Halothane, a well known general anesthetic has the structural formula shown below:



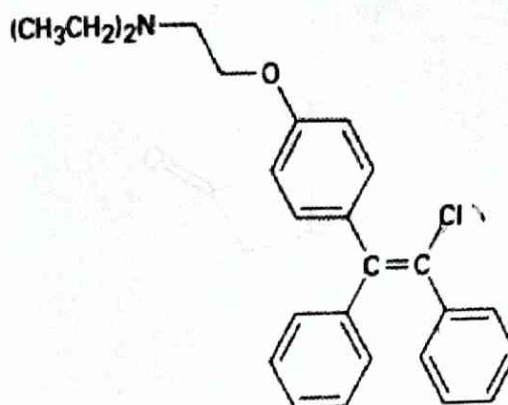
- i) Give the systematic name of the halothane **1 mark**
- ii) A related compound bromochlorodifluoromethane is sold under the name Halon which is used in automatic fire extinguisher systems. State with an explanation whether Halo, or halothane has the highest boiling point **2 marks**
- c) Draw four alkene isomers for the organic compound C_4H_8 **4 marks**

d) Identify and explain why only two compounds in (c) above are cis and trans (geometric) isomers. **2 marks**

e) Tamoxifen and clomiphene have similar structures but very different medical uses. Explain whether the alkene double bond in each is *E* or *Z* **2 marks**

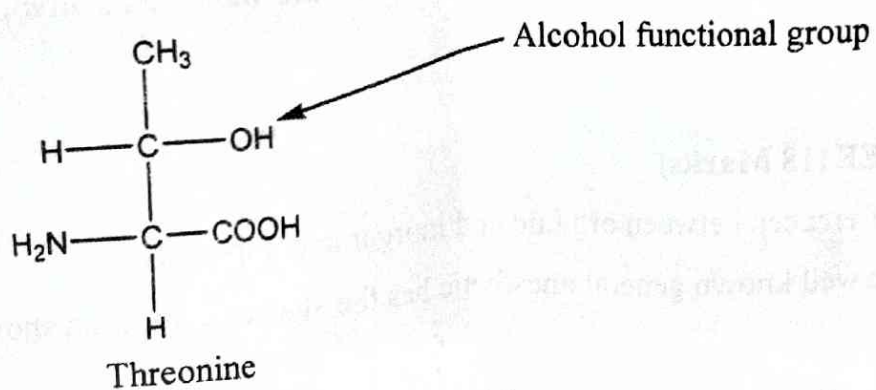


Tamoxifen
(anticancer)



Clomiphene
(fertility treatment)

f) The structure of a molecule of an organic compound, threonine, is shown below.

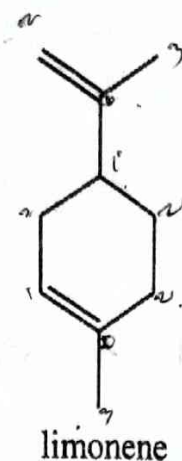


An alcohol functional group has been identified in the threonine molecule above.

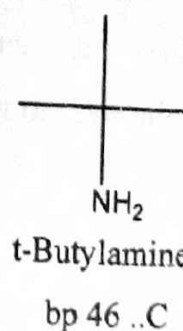
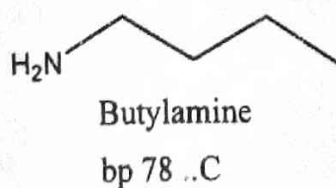
- Identify and name two other functional groups on the threonine molecule above **2 marks**
- Classify the alcohol functional group as primary, secondary, or tertiary **1 mark**
- Explain how you classified the alcohol group. **2 marks**

QUESTION FOUR (17 Marks)

- a) The following is the structure of limonene, the chemical component of oranges that is partly responsible for their citrus scent. The following is the structure of limonene, a compound found in lemons.

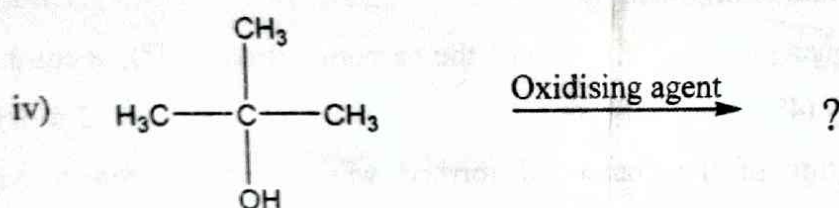
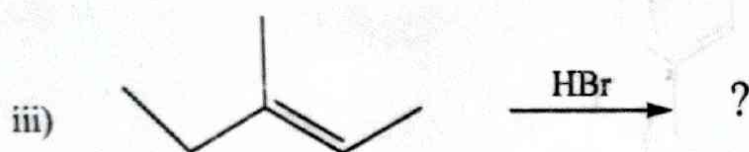
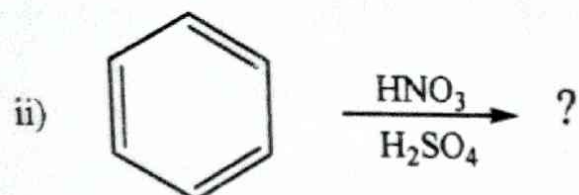
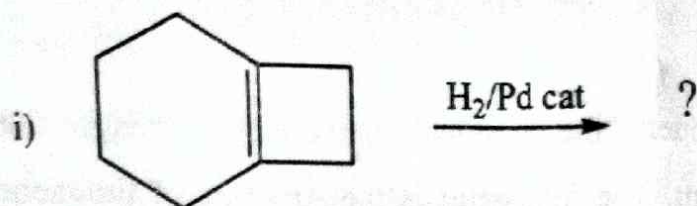


- i) What is the molecular formula of limonene? **1 mark**
- ii) Draw the structure of limonene and classify each of the carbons primary (1°), secondary (2°), tertiary (3°), or quaternary (4°). **3 marks**
- iii) Draw the chemical structure of the compound formed when limonene reacts with hydrogen in the presence of a catalyst. **2 marks**
- iv) Draw the chemical structure of the compound formed when limonene reacts with bromine. What would you observe? **2 marks**
- b) Account for the fact that butylamine has a higher boiling point than *t*-butylamine

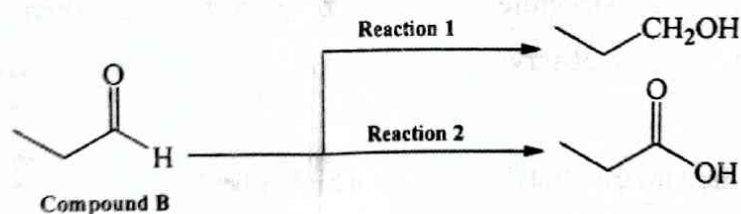
2 marks

- c) Give products for the reactions given below, and where applicable identify the major product

4 marks



d) Compound **B** undergoes the following reactions



- i) To what class of compounds does compound **B** belong? **1 mark**
- ii) Determine what reactions 1 and 2 are and suggest appropriate reagents. **1 mark**
- iii) Identify the class to which the reaction products belong **1 mark**