



MAASAI MARA UNIVERSITY

**REGULAR UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR
SECOND YEAR SECOND SEMESTER**

**SCHOOL OF SCIENCE AND INFORMATION SCIENCES
BACHELOR OF SCIENCE AND BACHELOR OF
EDUCATION (SCIENCE)**

COURSE CODE: CHE 2214

COURSE TITLE: ORGANIC CHEMISTRY II

DATE: 16TH APRIL 2019

TIME: 11.00 AM – 1:00 PM

INSTRUCTIONS TO CANDIDATES

This examination paper consist of two sections **A** and **B**. Section **A** is compulsory. Answer any other TWO questions in section **B**.

This paper consists of 6 printed pages. Please turn over:

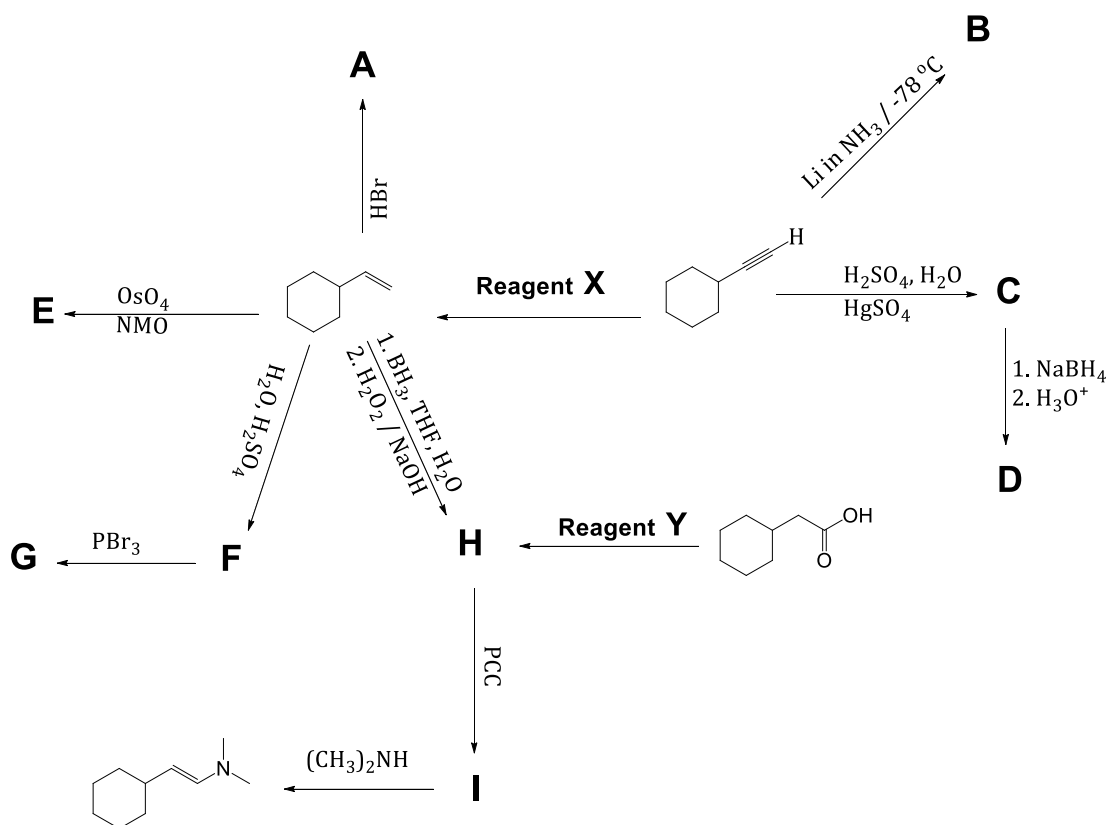
SECTION A

Question ONE (30 marks)

a) Differentiate between the following organic chemistry terminologies giving example(s) in each case. (6 marks)

- i. Stereospecificity and Regioselectivity
- ii. Constitutional isomer and Stereoisomer
- iii. Markovnikov's rule and Zaitsev rule

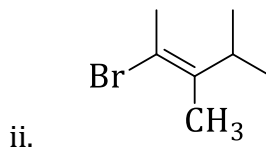
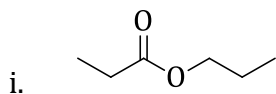
b) Complete the reactions by filling in the missing product or starting material A - I and reagents X and Y. Show stereochemistry where appropriate. (11 marks)



c)

- i. Draw three constitutional isomers that have the molecular formula $\text{C}_3\text{H}_6\text{F}_2\text{O}$, in which the oxygen is bonded to two carbon atoms. (3 marks)
- ii. Account for the fact that acid-catalyzed dehydration of **3,3-dimethyl-2-butanol** exclusively yields **2,3-dimethyl-2-butene**. Draw arrow pushing mechanism for this reaction. *Hint: follows E1 mechanism.* (6 marks)

d) Provide IUPAC names or structural formulas for the following compounds. Pay attention to stereochemistry where applicable. (4 marks)



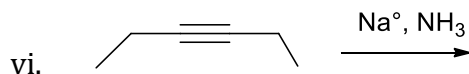
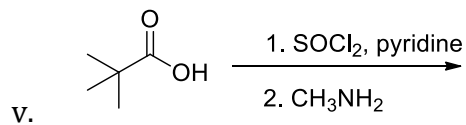
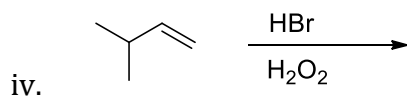
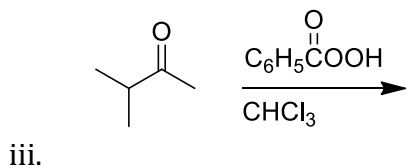
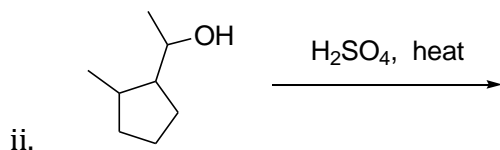
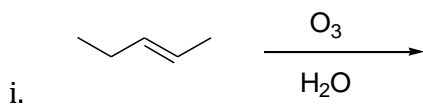
iii. 2-fluorobutanamide

iv. 4-chloro-2-ethyl-3-methylcyclopentanol

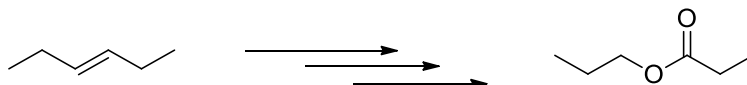
SECTION B

Question TWO (20 marks)

a) For the following short reactions draw the **major** product. You do not need to show all stereoisomers formed. (12 marks)



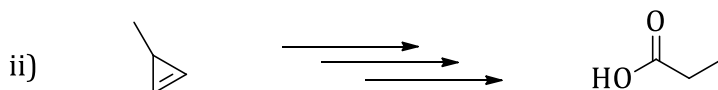
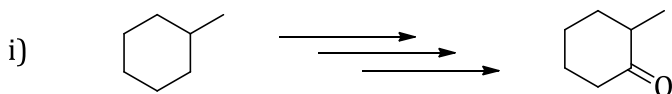
- b) Propose multi-step synthetic pathway that lead from the starting material to the product given. Show accurate reaction scheme with the proper reagents/conditions and show the major products made along the way. All the carbons in the product originate from the starting material. The arrows indicate multi-step reaction sequence. (Arrow pushing mechanism is not necessary). **(5 marks)**



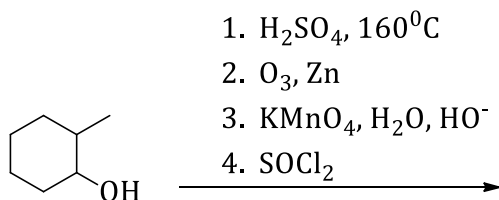
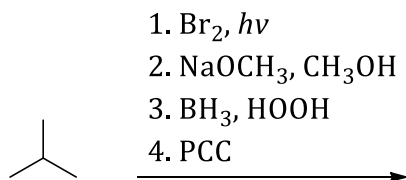
- c) If acetic acid (CH_3COOH) is dissolved in isotopically labeled ethanol ($\text{CH}_3\text{CH}_2\text{O}^{18}\text{H}$) and an acid catalyst is added, where will this label reside in the product? Show work! **(3 marks)**

Question THREE (20 Marks)

- a) Propose multi-step synthetic pathway that lead from the starting material to the product given. You need to show an accurate reaction scheme using the proper reagents/conditions and show the major products made along the way. The arrows indicate multi-step reaction sequence (Arrow pushing mechanism is not necessary). **(8 marks)**



- b) For the following sequences of reactions, provide the final product. **(8 marks)**

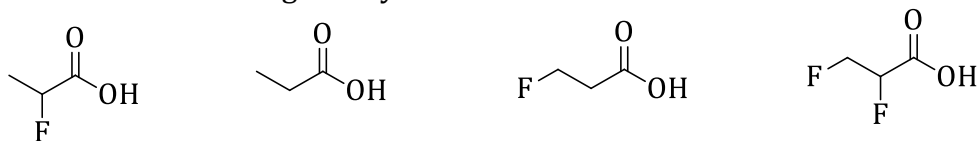


c) Rank the following molecules based on the indicated property. Rationalize your answer. **(4 marks)**

i. In order of decreasing rate of hydration

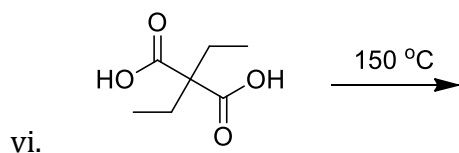
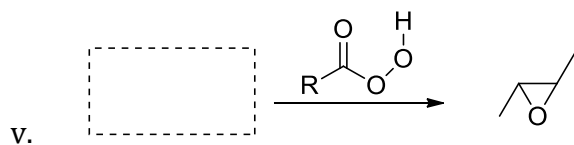
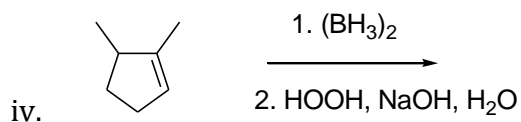
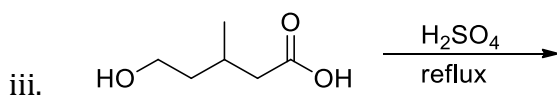
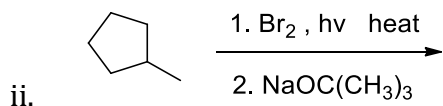
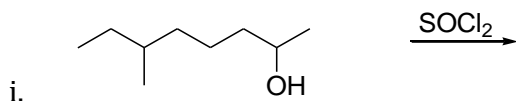


ii. In order of increasing acidity

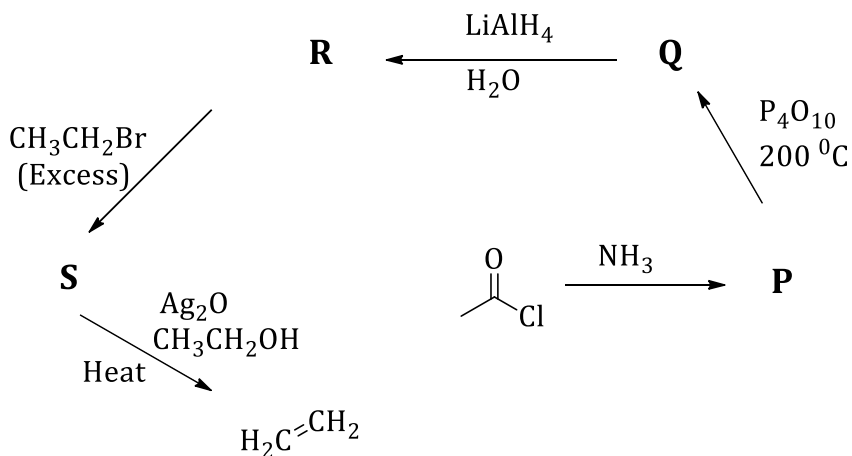


Question FOUR (20 Marks)

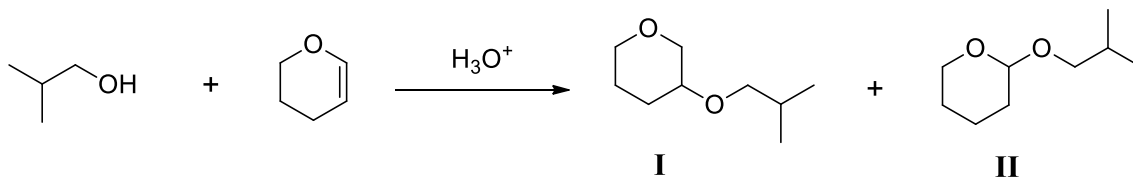
a) For the following short reactions draw the **major** product or missing starting material. You do not need to show all stereoisomers formed. **(12 marks)**



- b) Complete the reactions by filling in the missing reactants or products **P – S**.
(4 marks)



- c) Dihydropyran can be used to protect alcohol functional groups as tetrahydropyranyl ethers (THPs) by acid-catalyzed reaction as shown below. This addition reaction is can form both compounds I and II.



Suggest the *curved arrow-pushing mechanism* for the formation of compound **II**.
(4 marks)

*Spell an English word (6 letters minimum) using the element symbols -----

HAVE A GREAT VACATION!