



# KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS  
2020/2021 ACADEMIC YEAR**

**SECOND YEAR SECOND SEMESTER  
SUPPLEMENTARY EXAMINATIONS**

**FOR THE DEGREE OF BSC (CHEMISTRY)**

**COURSE CODE: SCH 222**

**COURSE TITLE: ORGANIC CHEMISTRY II**

**DURATION: 2 HOURS**

**DATE: 19/1/2022**

**TIME: 8-10AM**

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## INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

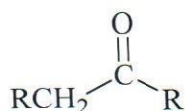
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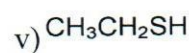
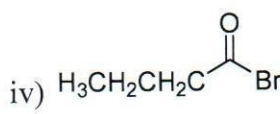
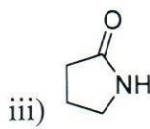
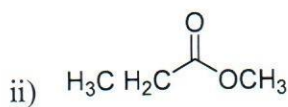
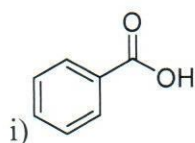
KIBU observes ZERO tolerance to examination cheating

### Question One (30 Marks)

- a) By use of examples illustrate primary, secondary and tertiary: (3 marks)
- i) Alcohols (3 marks)
- ii) Amines (3 marks)
- b) Illustrate an acid catalyzed keto-enol interconversion using the species below. (3 marks)



- ii) Illustrate a base catalyzed keto-enol interconversion using the species in (i) above (3 marks)
- c) Give the IUPAC names of the following compounds (5 marks)



- d) Draw the structures of the following compounds: (5 marks)

- i) Methylbenzoate    ii) Ethylthioethane    iii) Propenenitrile    iv) Ethanamide    v) Ethanoic anhydride

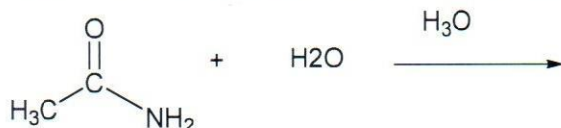
- e) Define the following terms: (5 marks)

- i) Bathochromic shift
- ii) Hysochromic shift
- iii) Hyperchromism
- iv) Hypochromism
- v) Auxochromes

- f) Which would be expected to be more intense and the least intense the stretching vibration of N-H bond, C-H bond, or O-H bond. (3 marks)

### Question Two (20 Marks)

- a) i) Explain why amides do not react with carboxylate ions. (1 mark)
- ii) Amides react with water and alcohols if the reaction mixture is heated in the presence of an acid. Show the mechanism and the products formed from the reaction. (7 marks)

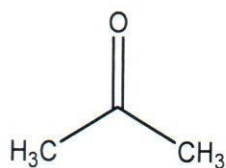


iii) Give the reasons for using the acid catalyst

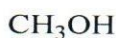
(2 marks)

b) Using A and B as starting materials, illustrate by use of mechanism how C can be prepared using acid as a catalyst.

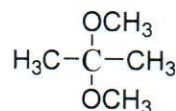
(7 marks)



A



B



C

c) Draw the enol tautomer of the compound A using a base as catalyst.

(3 marks)

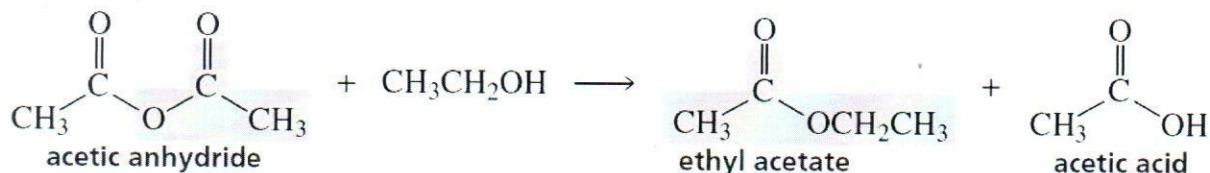
### Question Three (20 Marks)

a. Illustrate the mechanism for Hydroxide-Ion-Promoted Ester Hydrolysis

(5 marks)

b) Consider the reaction below. Propose its mechanism

(4 marks)



c) i) Draw the most reactive and least reactive forms of carboxylic acids

(2 marks)

ii) Carboxylic acids do not react with halide ions. Why?

(1 mark)

d) Give reasons for the following observations in organic reactions;

i) Steric factors contribute to the greater reactivity of both aldehyde and ketones.

(2 marks)

ii) Aldehydes more reactive than a ketones

(2 marks)

iii) The melting points and boiling points of carboxylic acids are higher than those of hydrocarbons

iv) Amides do not react with halide ions or carboxylate ions

(1 mark)

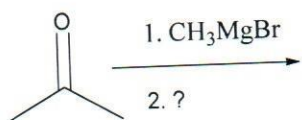
v) Thiols have low boiling points than alcohols

(1 mark)

### Question Four (20 Marks)

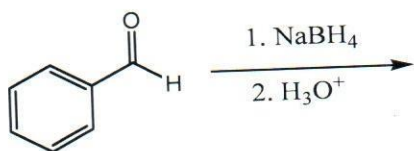
a) Give the products and/or reactants of the following nucleophilic addition reactions;

i.



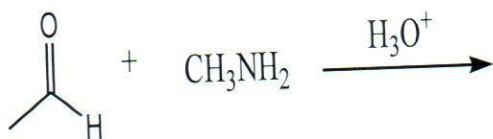
(2 marks)

ii.



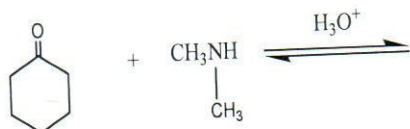
(2 marks)

iii)



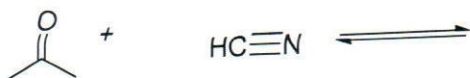
(2 marks)

(iv)



(2 marks)

v)



(2 marks)

b) Give four advantages of using a Fourier transform IR (FT-IR) spectrometer.

(4 marks)

c) By use of examples illustrate primary, secondary and tertiary:

(3 marks)

i) Alcohols

(3 marks)

ii) Amines

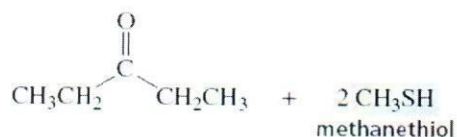
### Question Five (20 Marks)

a) Use an example to describe how an alkyl halides can be used to prepare a secondary amine.

(3 marks)

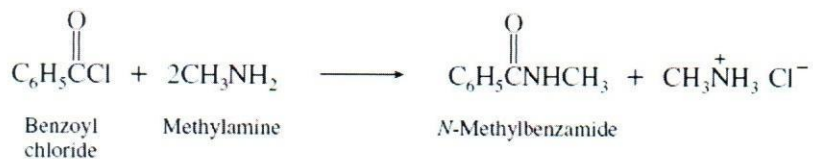
b) Complete the following thiol reaction.

(1 mark)



c) Establish the mechanism of the reaction below

(5 marks)



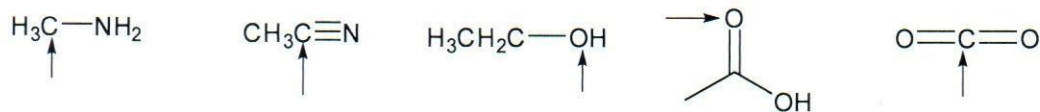
d) Alcohols react with Si-Cl compounds such as  $\text{Me}_3\text{SiCl}$  by an  $\text{S}_{\text{N}}2$  reaction. This reaction is mainly used in protection of alcohols while doing multiple step synthesis. Use ROH as the alcohol to show the reaction with  $\text{Me}_3\text{SiCl}$ .

(3

marks)

e) State the hybridization of the indicated atom.

(5 marks)



f) Arrange in order of increasing basicity

(3 marks)

