



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS  
2021/2022 ACADEMIC YEAR**

**FOURTH YEAR FIRST SEMESTER EXAMINATIONS  
SUPPLEMENTARY/SPECIAL EXAM**

**FOR THE DEGREE  
OF  
BACHELOR OF SCIENCE (CHEMISTRY) AND BACHELOR OF  
EDUCATION (SCIENCE)**

**COURSE CODE: SCH 230**

***COURSE TITLE: CHEMISTRY OF CARBONYL AND  
ORGANOMETALLIC COMPOUNDS***

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

**TIME: 8.00 TO 10.00 AM**

---

**INSTRUCTIONS TO CANDIDATES**

1. This paper consists of four questions
2. Answer all questions

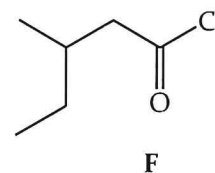
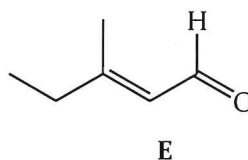
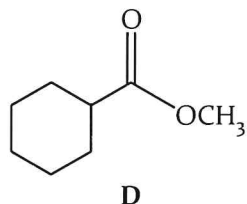
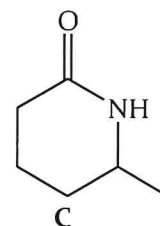
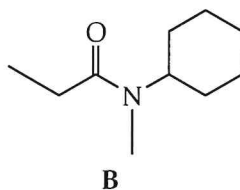
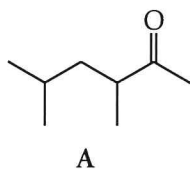
**TIME: 2 Hours**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 5 Printed Pages Please Turn Over. ►

## Question 1 (16 Marks)

a) Give the systematic names for the compounds whose structures are given below. 6 Marks

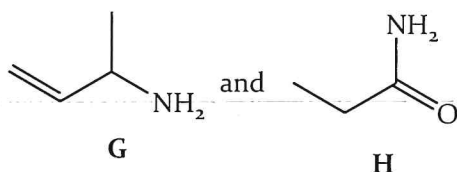


b) Give structures for the compounds whose IUPAC names are given below. 4 Marks

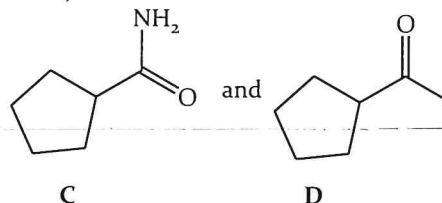
- 2-bromo-4-methoxypentanoic acid
- 5-hydroxyheptan-2-one
- cyclohexyl butanoate
- methyl benzenecarboxylate

c) Giving detailed explanation determine which, between each of the two pairs of compounds given below, has a higher boiling point. 6 Marks

i)



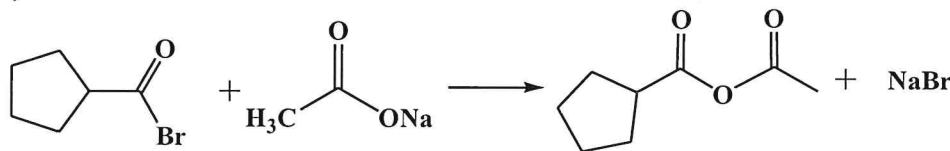
ii)



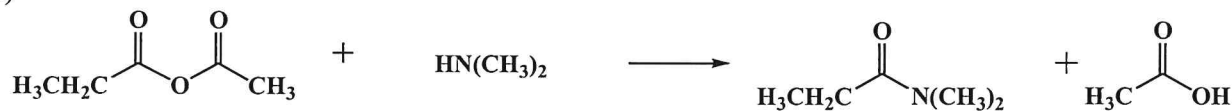
## Question 2

a) Study the reactions given below and the reaction conditions. Giving reasons for your answer determine whether or not the forward reactions are possible. 5 Marks

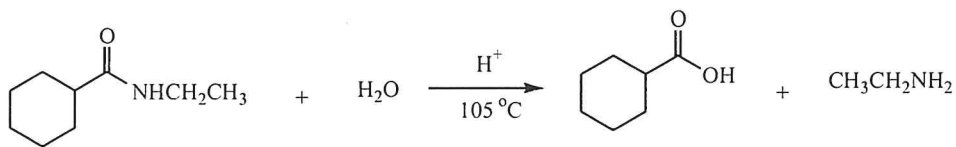
i)



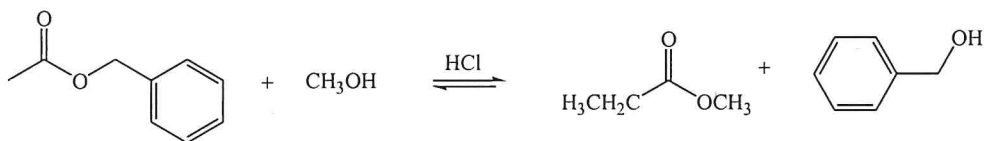
ii)



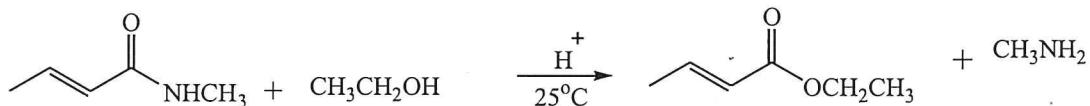
iii)



iv)



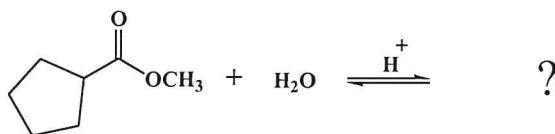
v)



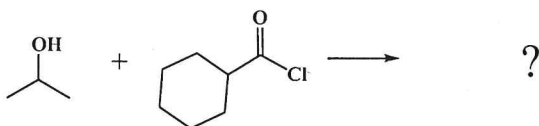
b) Give products for the following *nucleophilic acyl substitution* reactions and *nucleophilic addition* reactions.

6 Marks

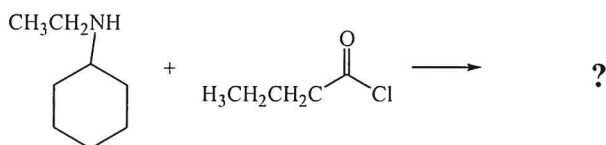
i)



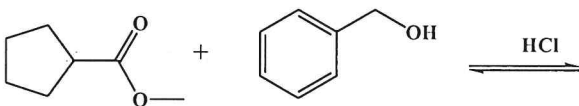
ii)



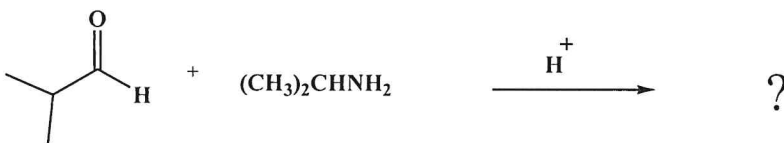
iii)



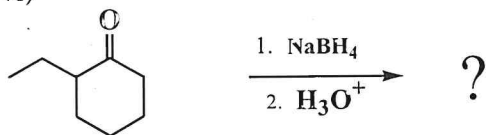
iv)



v)



vi)

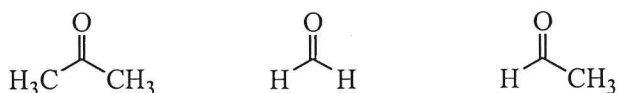


c) Refer to question 2, b above to answer the following questions

- What name is given to reaction in question iv) above and how would the forward reaction be enhanced? **1.5 Marks**
- What difficulties are expected with reaction in question iii) above and how can this be solved? (Note: Give equations to explain this). **2.5 Marks**
- Give mechanism for the reaction in question v) above **6 Marks**

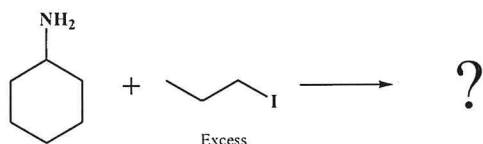
### Question 3

a) Arrange the compounds given below in order of reactivity in *nucleophilic addition* reactions starting with the most reactive, then explain the order in each case. **2 Marks**

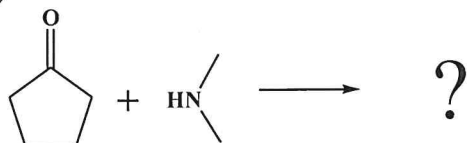


b) Give products and intermediates for the reactions given below. **7 Marks**

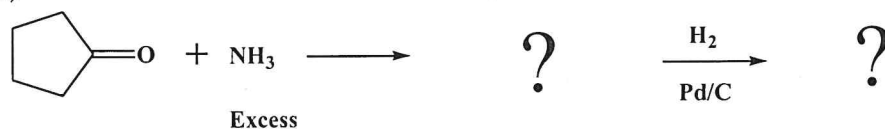
i)



ii)



iii)

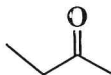


Intermediate

c) Refer to question 3, b) above to answer the following questions

- On reacting the product obtained in i) above with Ag<sub>2</sub>O and H<sub>2</sub>O compound X would be obtained. Give the chemical equation leading to compound X? **2 Marks**
- What product do you obtain on exposing compound X to heating? Give the mechanism **3 Marks**
- Propose a mechanism for reaction v) **4 Marks**

- d) Show how the base catalyst can be used to generate the most stable *enol tautomers* for the compound given below. 2 Marks

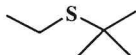


### Question 4

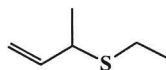
- a) Using an alkyl halide and a thiol as starting materials, how would you prepare the following thioethers? 4 Marks



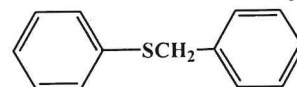
A



B

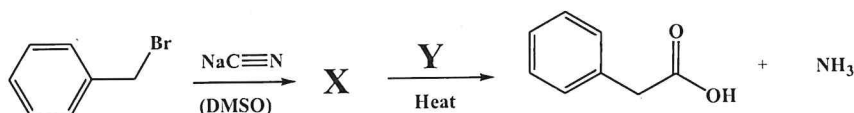


C



D

- b) Refer to the reaction scheme below to answer the following questions.



- i) Determine structure of intermediate X 1 Mark  
 ii) Give mechanism for the generation of the final acid from intermediate X. 4 Mark
- c) Study the reactions reaction conditions given below and propose the products. 4 Marks

