



DEDAN KIMATHI UNIVERSITY OF TECHNOLOGY

UNIVERSITY EXAMINATIONS 2021/2022

**YEAR ONE SEMESTER ONE EXAMINATIONS FOR THE DEGREE OF MASTER OF
SCIENCE IN CHEMISTRY**

SCH 6102 ADVANCED ORGANIC SYNTHESIS

DATE: OCTOBER 2021

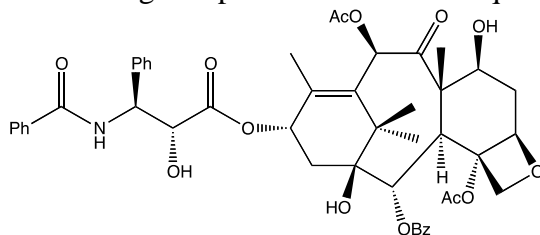
TIME: 2 HOURS

INSTRUCTION: Answer ALL questions

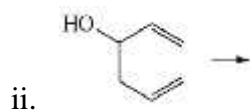
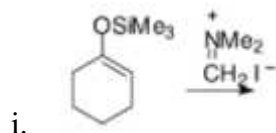
QUESTION ONE [15 MARKS]

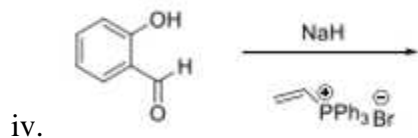
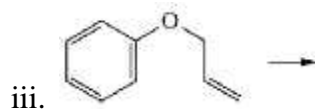
- a) Define the following terms: [3 marks]
- Sigmatropic rearrangement
 - The Claisen-Schmidt reaction
 - Mannich Reaction

- b) Use the following compound to answer the questions that follow.



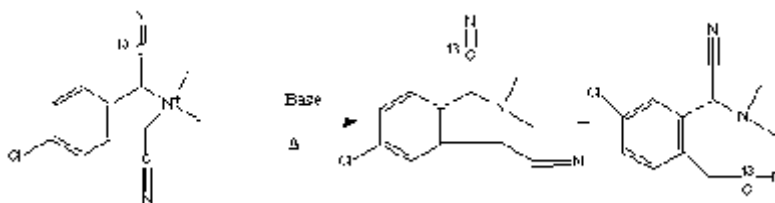
- What is the name of the compound above? [1 mark]
 - Give the name of the scientist who first synthesized the compound. [1 mark]
 - Give a brief history of the drug and what it treats. [3 marks]
 - Indicate the number of chiral centers and the number of stereoisomers [2 marks]
- c) Predict the products of the following reactions. Some are rearrangement reactions. [5 marks]



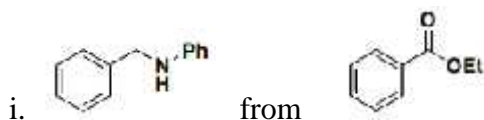


QUESTION TWO: [15 MARKS]

- a) When compound **1** is treated with base and heated, it rearranges to give the products shown. The ^{13}C isotope is distributed unequally between two products. Explain this result in mechanistic terms, and clearly indicate the type of reactions occurring and their nomenclature. **[9 marks]**

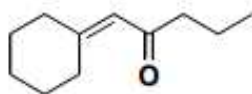


- b) Propose how to synthesize the following compounds. **[6 marks]**



QUESTION THREE: [15 MARKS]

- d) Propose a retrosynthetic analysis of the following compound. Your answer should include both the synthons, showing your thinking, and the reagents that would be employed in the actual synthesis. **[5 marks]**



one of the starting material is cyclohexanone

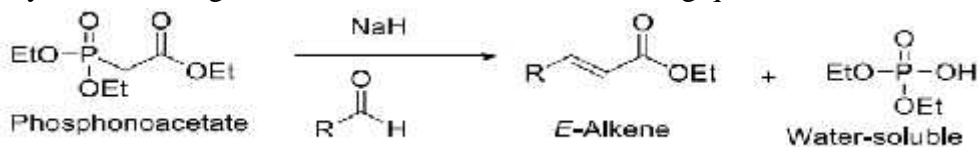
- e) The synthesis of the alkaloid Pulimiotoxin C may be achieved through the reaction sequence illustrated below, which proceeds via the formation of intermediate 6.



- What type of cycloaddition reaction is the above [2 marks]
- Account for the control of the regiochemistry of 6 in the cycloaddition. [3 marks]
- Draw a transition state for the cycloaddition reaction, showing the frontier molecular orbitals and thus predict the relative configurations of the three chiral centres in 6. [3 marks]
- The above reactions are known to be stereoselective and regioselective. Give the description of each case. [2 marks]

QUESTION FOUR: [15 MARKS]

- Use frontier molecular orbital diagram to show whether a [2+2] thermal reaction is forbidden or allowed. [5 marks]
- Using dimethyl sulfoxide and oxalyl chloride, illustrate mechanistically how primary alcohol is converted to aldehyde. [5 marks]
- Study the reaction given below and answer the following questions.



- What is the name reaction of the equation above? [1 mark]
- Propose a plausible mechanism for the reaction in c above. [4 marks]