TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY (BTAC)

ACH4403: ORGANIC SYNTHESIS

SPECIAL SUPPLEMENTARY EXAMINATION

SERIES: JULY 2025

TIME: 2HOURS

DATE: 20**Jul2025**

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE**Question(s).Attemptquestion ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE

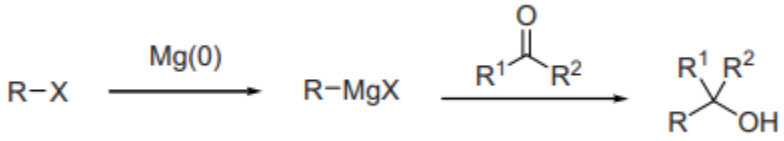
a) Define the following terms as used in Organic synthesis

i. Retron **(2 marks)**

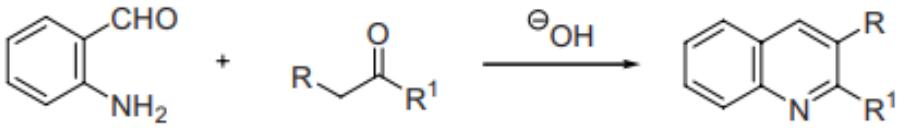
ii. Synthon **(2 marks)**

iii. Functional group inter conversion **(2 marks)**

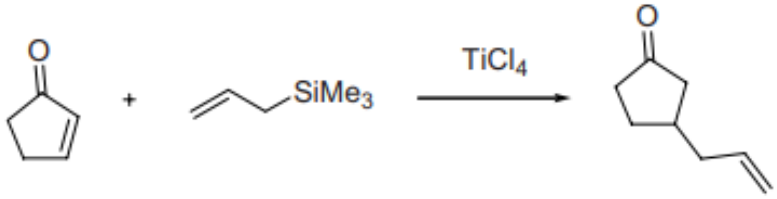
b) Provide the radical mechanism for the Grignard reagent reaction provided below. **(8 marks)**



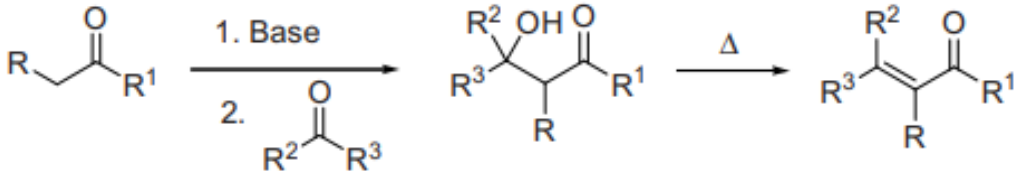
c) The Fredlander Quinoline synthesis proceeds via aldol condensation reaction. Provide the reaction mechanism for the following transformation. **(6 marks)**



d) Provide the reaction mechanism for the Hosomi- Sakurai allylation transformation given below. **(6 marks)**

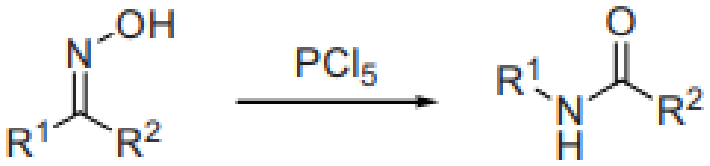


e) Provide the plausible mechanism for the aldol condensation reaction of the enolate ion coupling with an aldehyde in the transformation below. **(4 marks)**

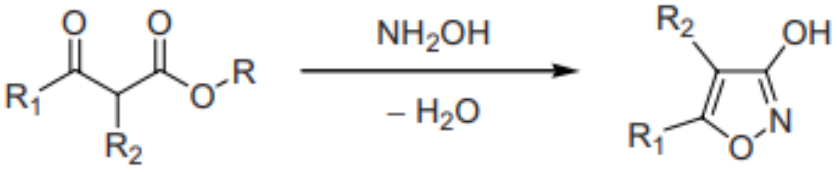


QUESTION TWO

a) Provide the reaction mechanism Beckmann rearrangement of acid mediated isomerization of oxime to amides in PCl_5. **(10 marks)**



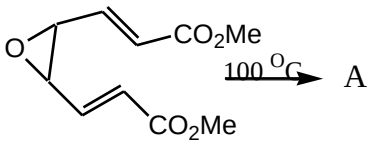
b) Provide the plausible mechanism for the side product formed during the cyclization of β-keto esters with hydroxylamine. **(10 marks)**



QUESTION THREE

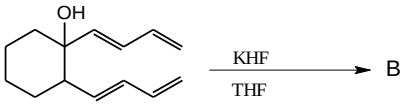
a) 3,3 Sigmatropic rearrangements is a concerted process in organic synthesis. Although the arrow pushing mechanism is illustrative provide the products **A and B** in the following reactions including the intermediates,

i.



(6 marks)

ii.

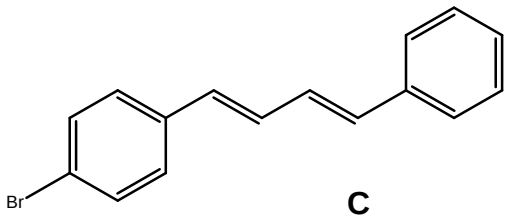


(6 marks)

b) Explain the migration order of the alkyl groups and the effect of the same to the final product in Baeyer Villiger oxidation reactions. **(8 marks)**

QUESTION FOUR

a) Outline the high yield synthesis route for the synthesis of C as the targeted molecule using the following starting materials. Benzaldehyde, ethylene glycol, acetaldehyde, benzyl bromide, pent-2, 4-dione, triphenyl phosphine and bromine solution and benzene as the solvents. **(12 marks)**



C

b) Draw a schematic diagram indicating the main classification of organic synthesis citing major applications. (8 marks)

QUESTION FIVE

a) Explain the term green chemistry with reference to organic synthesis. (4 marks)

b) Discuss the four guiding principles of green synthesis citing one practical example for each principle. (8 marks)

c) Provide the Bartoli indole synthesis mechanism using vinyl Grignard reagent. (8 marks)