WI-2-60-1-6

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY

UNIVERSITY EXAMINATIONS 2024/2025

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE, MEDICINAL CHEMISTRY

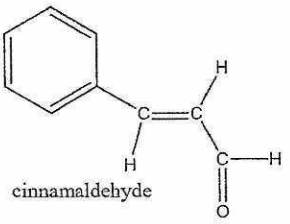
PRINCIPLES OF ORGANIC AND INORGANIC SYNTHESIS: TPS 3102 (MAIN)

DATE: NOVEMBER 2025 **TIME: 3 HOURS**

Instructions: Answer any FOUR of the SIX questions

Question 1

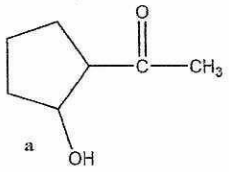
a) Cinnamaldehyde is used as a flavouring agent in cinnamon candies. Show how cinnamaldehyde is synthesized by mixed (cross) aldol condensation followed by dehydration **(5 marks)**



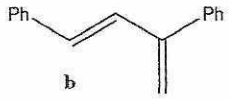
cinnamaldehyde

b) Propose a detailed mechanism for the free-radical chlorination of methane **(10 marks)**

c) How would you employ base-catalyzed reactions in the synthesis of the following compounds? **(10 marks)**



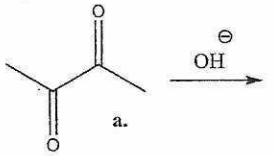
a



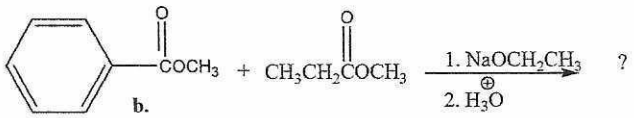
b

Question 2

a) Write the product of the following reactions **(10 marks)**

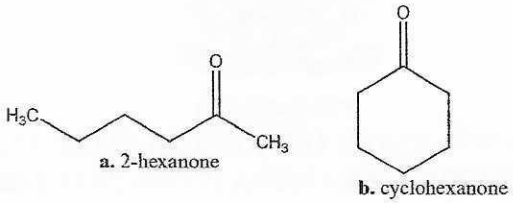


a.



b.

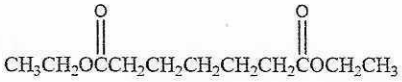
b) If the following compounds were reacted with methylmagnesium bromide what would be the products? **(10 marks)**



a. 2-hexanone

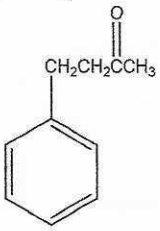
b. cyclohexanone

c) Write the structure of the Dieckmann cyclization product formed on treatment of the following diester with sodium ethoxide, followed by acidification **(5 marks).**

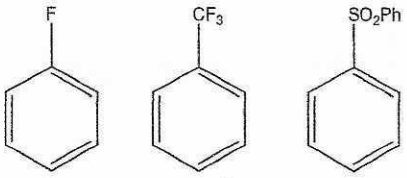


Question 3

a) Show how you could prepare the following ketone from ethyl acetoacetate and any necessary organic or inorganic reagents **(10 marks)**



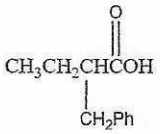
b) What would you expect to be the chief product (s) of the mononitration of the following compounds? **(15 marks)**



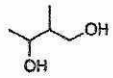
a b c

Question 4:

a) Show how the malonic ester synthesis is used to prepare 2-benzylbutanoic acid. **(15 marks)**

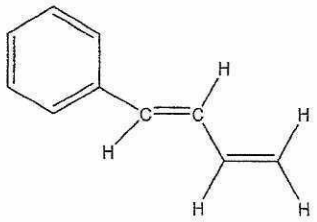


b) Outline synthetic method for the following which make use of acid-catalyzed reactions **(10 marks)**



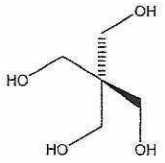
Question 5

a. Show how you would use a Wittig reaction to synthesize 1-phenylbuta-1,3-diene **(10 marks)**



1-phenylbuta-1,3-diene

b. Describe how pentaerythritol is synthesized from CH_2O and CH_3CHO in the presence of NaOH (mixed aldol reaction) followed by Reduction by the **Cannizzaro** reaction **(15 marks)**

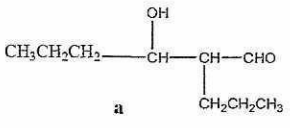


Pentaerythritol

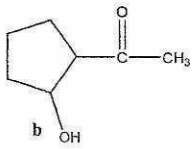
Question 6

a) Propose a mechanism for the self-condensation of ethyl acetate to give ethyl acetoacetate **(15 marks)**

b) Show how each compound can be dissected into reagents joined by an aldol condensation **(10 marks)**



a



b