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**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

**THIRD YEAR FIRST SEMESTER
SUPPLEMENTARY EXAMINATIONS**

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: SCH 312*/313

COURSE TITLE: ORGANIC SYNTHESIS

DURATION: 2 HOURS

DATE: 24/8/2023

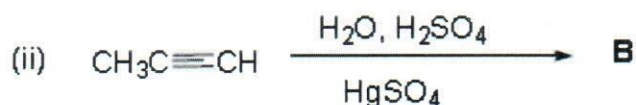
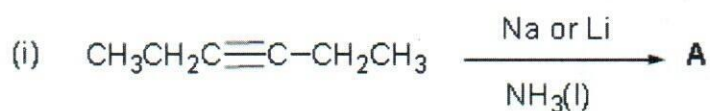
TIME: 8:00-10:00AM

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.*

Question 1 (20 marks)

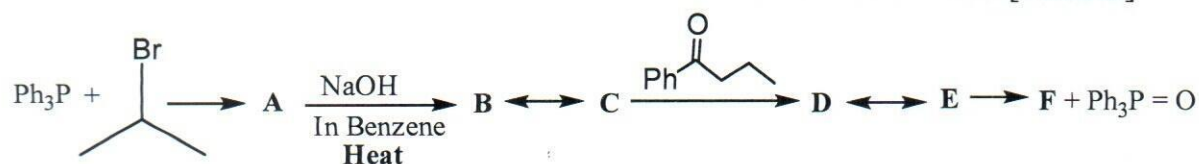
- a) What is meant by each of the following terms; [5 marks]
- Target molecule (TM):
 - Retrosynthetic analysis:
 - Disconnection:
 - Synthons:
 - Synthetic equivalent.
- b) Explain why the carbonyl group is important in synthesis [4marks]
- c) Using methylcyclohexanol carry out its retrosynthesis [4 marks]
- d) Give the write in the above case (c) [3 marks]
- e) Give the products of the following reactions [4marks]



- f) Give four characteristics of Diels-Alder cycloaddition reaction [4Marks]
- g) Give one reasonable disconnection for
- 3-methyl-1-phenyl-1-pentanone [2 marks]
 - 3-cyclohexyl-2-methyl-3-hexanol. [2 marks]
- h) State the function of the tertiary amine when a primary alcohol is being protected with chlorotrimethylsilane. [2marks]

Question 2 (20 marks)

- a) Suggest the structures A, B, C, D, E and F in the following reaction sequences. [6 marks]



- b) Write key considerations when you want to disconnect any target molecule 4mks]

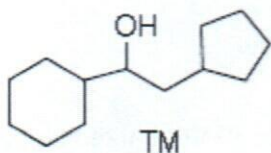
- c) i). 2-heptanone is responsible for the peppery odor in some cheese. You have been asked to synthesize it. Show how you would arrive at the starting materials. [4 marks]



- ii). Show how you synthesize 2-heptanone using the starting materials you identified in b (i) above. [6 marks]

Question 3 (20 marks)

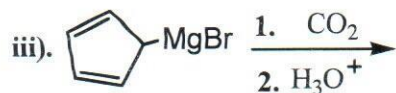
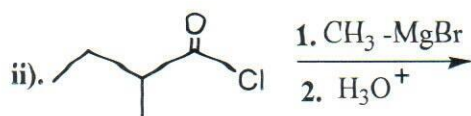
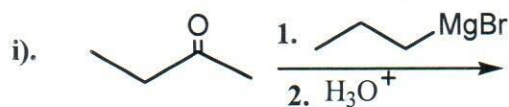
- a) Explain five strategies in Synthetic Planning [10 marks]
 b) The following compound (TM) was synthesized using Grignard reagents and other organic reagents.



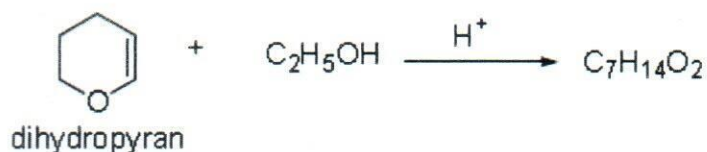
- i) Carry out its retrosynthesis showing clearly the synthons and synthetic equivalents [4mks]
 ii) Write its synthesis and mechanism [6marks]

Question 4 (20 marks)

- a) Provide the products formed in the reactions and show the mechanism in each. [12 marks]



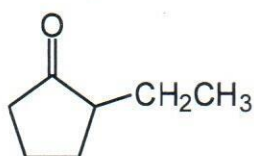
- b) Dihydropyran is sometimes used to protect primary alcohols. The reaction between dihydropyran and the alcohol (ROH) takes place in absence of an acid catalyst to produce an ether linkage. An example of this reaction is



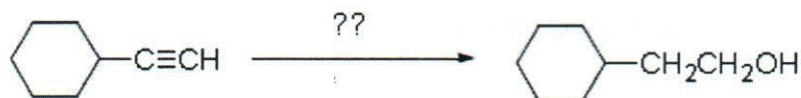
Give the structure of the protected alcohol and give a mechanism for its formation. [5mks]

Question 5 (20 marks)

- a) Compound 1 below was obtained by enamine synthesis. Use it to define the terms **synthon** and **synthetic equivalent** as used in organic synthesis. [4 marks]



- b) By use of a relevant equation, describe the application of di-imide in reduction of alkenes. [4 Marks]
- c) How could you carry out the following synthesis using the given starting material? [4marks]



- d) State three qualities of a Good Protecting Group in Organic Synthesis. [3 marks]
- e) Show how the compound below can be prepared from the given starting material. You will need to use a protecting group. [5marks]

