

**W1-2-60-1-6**

**JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2015/2016**

**EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE**

**SCH 2303: ORGANIC SYNTHESIS I**

**DATE:DECEMBER 2015 TIME: 2 HOURS**

**INSRUCTIONS:** Answer question one(compulsory) and any other two questions.

QUESTION ONE

a. Show how CH3Li may react with the following. In each case show the mechanism.

 i. C6H5c=N

 ii. CS2

 iii. SO2 (6 marks)

b. Show how the following organic compounds may be synthesized suggest plausible conditions for each reaction

 i. C6H5CH2Li

 ii. CH2=C CH3

 Na

 iii. CH3C=CMgBr

 iv. Pb(CH2 CH3)4 (10 marks)

c. Explain the following observations and where appropriate use chemical equations for clarity.

 i. Ethylchloride may be preferred to ethylflouride in synthesis of a compound of industrial importance. (2.5 marks)

 ii. A solution containing organoithium may be destroyed if ammonia gas is bubbled through. (2 marks)

 iii. 2-pentanone and 3-pentanone react with RMgx, but 2-pentanone gives two

 products while 3-pentanone gives only one product. (4 marks)

 iv. Benzaldehyde reacts faster than p-methoxybenzaldehyde with HCN.

 (3 marks)

d. Predict the product of the reaction of propanal with each of the following.

 i. Lithium aluminium hydride.

 ii. Sodium borohydride.

 iii. Hydrogen gas in presence of nickel catalyst. (3 marks)

QUESTION TWO

a. i. Show the mechanism for the following reactions

 CH3-Li +CUI→CH3Cu+LiI- (3.5 marks)

 ii. Suggest a combination of organic halide and cuprate reagent appropriate for the preparation of 1,3,3-trimethylcyclopentene. (5.5 marks)

b. Show how the compound below may be synthesized using Grignard reagent (2 methods) (9 marks)

c. A plausible last step of synthesis

 of mestranol is shown below

 Give the structure of mestranol. (2 marks)

QUESTION THREE

a. On standing in O17 labeled water, both methanal and its hydrate are found to have incorporated O17 isotope of oxygen. Suggest a reasonable explanation for this observation. (3 marks)

b. i Show how 2-mercaptoethanol (HO CH2 CH2 SH) may be used as a protecting group in the conversion below.

 ii. Why do you need to use a protecting group in this reaction? (3 marks)

c. Using Wittings reaction, outline two methods of synthesis of the alkene shown below with explanations, identify the method that will give higher yields.

 C6H5C=C(CH3)2 (7.5 marks)

QUESTION FOUR

a. The compound shown below can undergo aldolcyclisation in presence of a base forming various cyclic rings. Show how two cyclic systems may be formed from this compound. With explanations identify the major cyclic product.

 CH3 C CH2 CH2 CH2 CH2 C H (5 marks)

b. The compounds shown below were initially synthesized through aldol condensation. Outline a synthesis of each of them.

i. 2-ethyl-l-hexanol. (6 marks)

ii. CH2 CH2 CH2 OH (6.5 marks)

c. Study the conversion shown below and then explain the constitution of each of the isomers.

 CH3 C CH2 C CH3⇌CH3 C=CH C CH3

 20% 80% (3 marks)