

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

**JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY**

# **UNIVERSITY EXAMINATIONS 2015/2016**

**EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INDUSTRIAL CHEMISTRY**

**SCH 2303 : ORGANIC SYNTHESIS 1**

**DATE: AUGUST 2015 TIME: 2 HOURS**

**INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS. QUESTION TWO TO FOUR CARRIES 20 MARKS EACH. QUESTION ONE CARRIES 30 MARKS.**

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**QUESTION ONE**

1. Explain the following observations. Use chemical equations for clarity where possible
2. Organopotasium compounds are highly flammable in air while

organomagnesium readily react with oxygen. [3 marks]

1. Organolithium reagents may not be stored in diethylether but may be stored in pentane. [3 marks]
2. Cycloheptanone on chlorination forms 2 – chloroheptanone and not 3 – chlorocycloheptanone [3 marks]
3. Nucleophilic addition do not ordinarily occur to carbon-carbon double bond of alkenes but occurs with , β- unsaturated carbonyl compounds. [3 marks]
4. 4-hydroxy-2-butanone when treated with ethyllithium may give a mixture of products. [2 marks]
5. Give the IUPAC names of the following organic compounds
6. (CH3CH2)4 Si
7. (C6H5)2 Cd
8. (CH3CH2)2 CuLi [3marks]
9. With explanations identify the most stable compound for each given pair of compounds.
10. Show that formation of cyanohydrins from reaction between ethanal and hydrogen cyanide is catalyzed by cyanide ion. [5 marks]

**QUESTION TWO**

1. Show how you could use butylllithium to prepare lithium diethylamide (CH3CH2)2 NLi and lithium benzenethiolate, C6H5S Li [5 marks]
2. Show how you may use alkyllithium in preparing the following compounds from their respective halide.
3. Hg(CH2CH3)2
4. Sn(CH2CH2CH3)2
5. P(C6H5)3 [6 marks]
6. Applying retrosynthetic approach, suggest a combination of organohalide and cuprate reagent that may be used to synthesize 1, 3, 3- trimethylcyclopentene [4 marks]
7. Show the mechanism for the formation of alkyllithium, LiR [5 marks]

**QUESTION THREE [20 MARKS]**

1. (i) When would you be required to use a protecting group in a synthetic process? [1 mark]

(ii) “Use of protecting groups may be carried in two ways.” Explain. [4marks]

1. Study the reaction scheme below and then answer the questions that follows:
2. Identify the problems you might encounter while carrying out this transformation [3 marks]
3. Using cyclic ketal show how you may carry out this transformation [6 marks]
4. Justify the choice of cyclic Ketal as a protecting group [2 marks]
5. State the principle products in the following reactions

**QUESTION FOUR**

1. Applying retrosynthesis outline two methods of synthesizing the compounds shown below
2. 3 – methyl – 3- heptene (apply wittigs reaction) [5 marks]
3. Hexanol (Grignard reagent) [8 marks]

1. Compound (X) shown below can undergo base catalyzed intramolecular aldol condensation resulting to ring closure. With suitable explanations, show how the ring closure takes place. [2.5 marks]