

**KABARAK**



**UNIVERSITY**

**UNIVERSITY EXAMINATIONS**

**2009/2010 ACADEMIC YEAR**

**FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE**

**COURSE CODE: CHEM 121**

**COURSE TITLE: ORGANIC CHEMISTRY**

**STREAM:               SESSION II**

**DAY:                    SATURDAY**

**TIME:                  9.00 – 11.00 A.M.**

**DATE:                  14/08/2010**

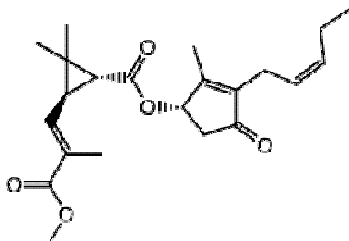
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**INSTRUCTIONS:**  
*Attempt ALL questions*

**PLEASE TURNOVER**

### QUESTION ONE (17.5marks)

- a) Define the following terms;
- Functional group
  - Isomer
  - Stereoisomer
  - Nucleophile
- (4marks)
- b) Pyrethrins such as Jasmolin II (shown below) are a group of natural compounds that are synthesized by flowers of the genus *Chrysanthemum* to act as insecticides.



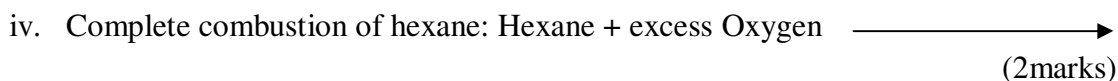
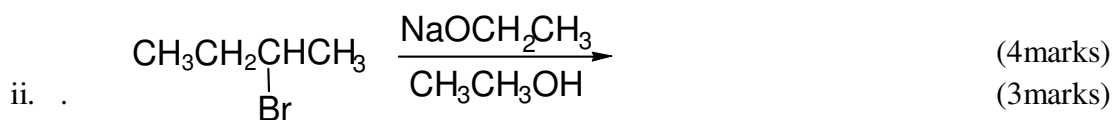
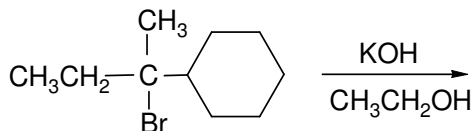
- Circle and name the functional groups in Jasmolin II (7marks)
  - Write the molecular formula of Jasmolin II (1mark)
- c) Explain why the following names are incorrect and write the correct name in each case.
- 2,2,6-trimethyloctane
  - 2,methylpropane
  - But-1-en3-yne
  - 1,1-diphenyl-1,3-butene
- (4marks)
- d) Draw the geometric isomers of the following compound.  
 $\text{CH}_3\text{CH}=\text{CHCH}=\text{CHCH}_3$  (1.5marks)

### QUESTION TWO (17.5marks)

- a) Draw and name the structures for each of the following compounds:
- $\text{C}_3\text{H}_7\text{COCH}_3$
  - $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$
  - $\text{CH}_3\text{COOC}_2\text{H}_5$
- (3marks)
- b) Give the structures for the following compounds
- 2,3,3-trimethyl- pentane
  - pentanol.
  - Ortho*-chloronitrobenzene
  - 5-propyl-1,3-cyclopentadiene
- (4marks)

c) Draw all the products formed in the following reaction and state which one will be the major product.

i. .



### QUESTION THREE (17.5marks)

a) Explain the following observations:

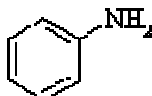
i. Organic compounds that are essentially nonpolar exhibit weak intermolecular forces. (2marks)

ii. Methane is a gas at room temperature while methanol is a liquid at the same room temperature. (2marks)

iii. Cyclohexylamine (**1**) is more reactive than aniline (**2**) towards methyl iodide.



**1**

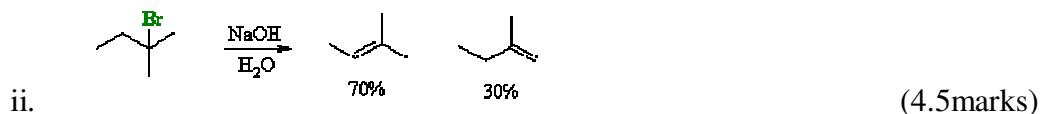


**2**

(4marks)

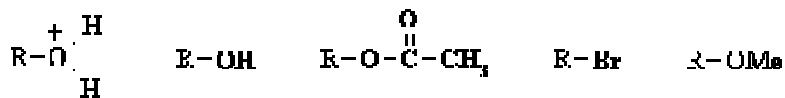
b) Differentiate between SN1 and SN2 reactions. (2marks)

c) Draw a double headed curly arrow mechanism to account for the following experimental observations:



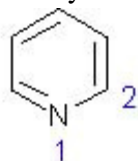
#### QUESTION FOUR (17.5marks)

- a) When soap is used in hard water containing  $\text{Ca}^{2+}$  ions, it forms scum. Give an equation to explain this phenomenon. Illustrate your answer with reference to sodium stearate  $\text{CH}_3(\text{CH}_2)_6\text{CO}_2\text{Na}$  soap. (4marks)
- b) Aldehydes and ketones have lower boiling points than alcohols of similar molecular weights, yet they show remarkable similarities in their solubility in water. Explain this observation. (4marks)
- c) Rank the groups (bold) in order of decreasing leaving group ability. Explain your choice. (2.5marks)



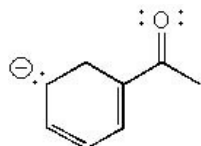
(2.5marks)

- d) What are the hybridizations of atoms 1 and 2 respectively in the following structure?



(2marks)

- e) Show the resonance structures that can be drawn for the following anion.



(5marks)