KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: CHEM 121

COURSE TITLE: ORGANIC CHEMISTRY

STREAM: SESSION III & IV

DAY: THURSDAY

TIME: 9.00 – 11.00 A.M

DATE: 14/04/2011

INSTRUCTIONS:

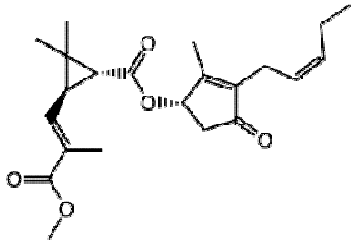
- ***Answer all questions***
- ***Two hours***

PLEASE TURNOVER

QUIESTION ONE (17.5marks)

a) Define the following terms.
   i) Functional group
   ii) Isomer
   iii) Stereoisomer
   iv) 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.



   i. Circle and name the functional groups in Jasmolin II (7marks)
   ii. Write the molecular formula of Jasmolin II (1mark)

c) Explain why the following names are incorrect and write the correct name in each case.
   i. 2,2,6-trimethyloctane
   ii. 2,methylpropane
   iii. But-1-en-3-yne
   iv. 1,1-diphenyl-1,3-butene (4marks)

d) Draw the geometric isomers of the following compound.
   $CH_3CH=CHCH=CHCH_3$ (1.5marks)

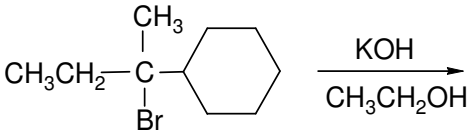
QUESTION TWO (17.5marks)

a) Draw and name the structures of the following compounds
   i. $C_3H_7COCH_3$
   ii. $C_2H_5OC_2H_5$
   iii. $CH_3COOC_2H_5$ (3marks)

b) Give the structures to the following compounds
   i. 2,3,3-trimethyl- pentane
   ii. pentanol.
   iii. *Ortho*-chloronitrobenzene
   iv. 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. .



(4marks)

ii. $CH_4 + Cl_2 \xrightarrow{light}$ (4marks)

iii. Hexane + excess Oxygen $\longrightarrow$ (3.5marks)

QUESTION THREE (17.5marks)

a) Give an explanation to 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)

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

1 **2**

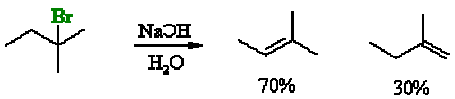
(4marks)

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

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

i. 

(3marks

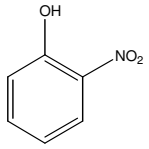
ii. 

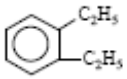
(4.5marks)

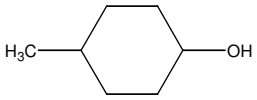
QUESTION FOUR (17.5MARKS)

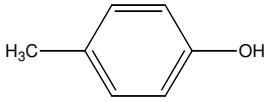
a. Name the following compounds by IUPAC nomenclature. (3.5marks)

i. $(CH_3)_3N$

ii. 

iii. 

iv. 

v. 

vi. $(CH_3)_2CHCOCH_2CH_2CH_3$

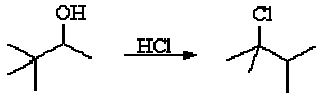
vii. $CH_3(CH_2)_2COO(CH_2)_4CH_3$

b. Distinguish between Aldehydes, ketones esters and carboxylic acids in terms of their structures. (1.5marks)

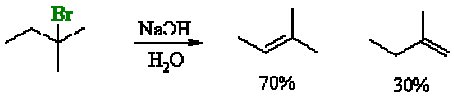
c. Provide an explanation for the observation that Carboxylic acids having higher boiling points than alcohols as well as aldehydes and ketones with comparable molecular weights. (3marks)

d. Suggest a test that would distinguish between aldehydes and ketones. (2mark)

d) Outline the mechanism using curlyarrows to account for the following experimental observations:

iii. 

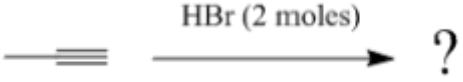
(2marks

iv. 

(3.5marks)

e. Predict the major products of the following reactions

i. (1mark)



ii. (1mark)