

CHEM 111

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P. O. Box 845-50400 Busia(K)
principal@auc.ac.ke
Tel: +254 741 217 185
+254 736 044 469
off Busia-Malaba road

OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2017 /2018 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER REGULAR EXAMINATION

**FOR THE DEGREE OF BACHELOR OF
SCIENCE IN MICROBIOLOGY**

COURSE CODE: CHEM 111

COURSE TITLE: BASIC CHEMISTRY II

DATE: 19TH APRIL, 2018

TIME: 9AM – 12.00 NOON

INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 6 PRINTED PAGES

PLEASE TURN OVER

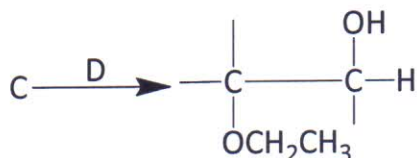
Question Two

a) Provide the missing reactants and reagents for the following transformations. (3 Marks)

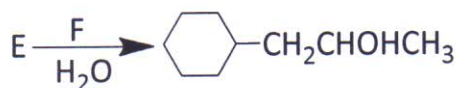
i)



ii)



iii)



b) Define the following terminologies:

i) Alkyl halides

ii) Vinyl chloride

iii) Aryl halide

iv) Vicinal dihalide

v) Germinal dihalide

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(1 Mark)

(1 Mark)

(1 Mark)

(1 Mark)

(1 Mark)

c) Describe the nature of carbon-halogen bond in alkyl halides

(1 Mark)

d) Aromatic compounds do not undergo addition reactions under normal conditions.

i) What is the reason for this observation? What compound would you expect if 1 mole of hydrogen was added to benzene?

(1.5 Marks)

ii) Give an example of a reaction that benzene can undergo and give the general name of such reactions.

(1.5 Marks)

SECTION B**Question Three**

a) An organic compound W was subjected to combustion analysis. On complete combustion, it gave 0.264g of carbon dioxide and 0.099g of water. Given that the compound is a hydrocarbon and its relative molecular mass is 58,

i) Calculate its molecular formula

(3 Marks)

ii) Give the structural formulae of the three possible isomers of W.

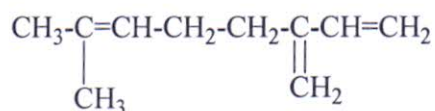
(1.5 Marks)

b) Explain the following observations:-

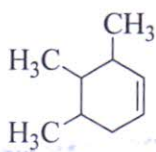
- i) *n*-heptane has a boiling point of 309K while 2,2-dimethylpropane has a boiling point of 283 K despite them having same molecular formula C_5H_{12} . (2 Marks)
- ii) C=C bond in ethene has a bond energy of 598 KJ mol^{-1} while C-C bond in ethane has a bond energy of 346 KJ mol^{-1} but ethene is more reactive than ethane. (2 Marks)

c) Give IUPAC names for the following compounds: (2 Marks)

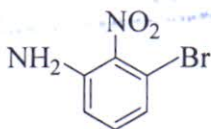
i)



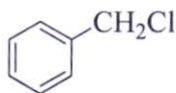
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iii)



iv)



d) Give three uses of carboxylic acids

(1.5 Marks)

Question Four

- a) Using suitable examples explain why alkenes with one double bond are isomeric with saturated cycloalkanes with the same number of carbons and with only one ring. (2 Marks)
- b)
- i) With an appropriate example define the term "geometrical isomerism" (2.5 Marks)
- ii) What are the conditions necessary for the existence of geometrical isomerism? (1 Mark)
- c) Alkenes can conveniently be made from dehydrohalogenation of alkyl halides. Illustrate using an appropriate example, indicating all the reagents required. (2 Marks)
- d) Addition of hydrogen halides across a double bond follows the Markovnikov's rule. Define the term "Markovnikov's rule" and illustrate by giving the major

- product expected in the reaction between propene and HCl. (2 Marks)
- e) Explain why alcohols have much higher boiling points than alkanes and alkyl halides with comparable molecular weights. (2 Marks)

Question Five

- a) Distinguish between the following chemical reactions: (2 Marks)
- S_N1 and S_N2
 - E_1 and E_2
- b) Using IUPAC system, name the following compounds: (4 Marks)
- $CH_3(CH_2)_3CHO$
 - $CH_3CH_2COCH_2CH_3$
 - $C_6H_5COC_6H_5$
 - $CH_2ClCH_2CH(CH_3)COOH$
- c) Using IUPAC system, draw the structure of the following compounds: (4 Marks)
- 2,4-Dinitro benzoic acid
 - 2-Butenoic acid
 - 2-propanone
 - Pentanal

Question Six

- a) What are free radicals? Show the mechanism of the following halogenation reaction.

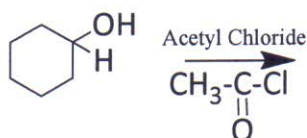


- b) Explain the following properties: (4 Marks)

<u>Compound</u>	<u>Solubility in Water</u>
Butanal	Soluble
Pentanal	Slightly soluble
Benzophenone	Insoluble

- c) Suggest products for the following reactions: (4 Marks)

i)



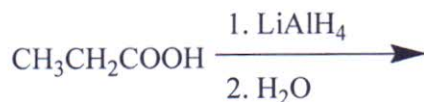
ii)



iii)



iv)

**Question Seven**

- a) Using examples differentiate between aliphatic and aromatic compounds (2 Marks)
- b) Draw the structures of the compounds corresponding to each of the following names (4 Marks)
- Iodobenzene
 - o*-Fluorotoluene
 - m-t*-Butylnitrobenzene
 - p*-Propylbenzoic acid
- c) With an example, describe the dehydration of alcohols (3 Marks)
- d) With one example, describe the polymerization of alkenes (3 Marks)
