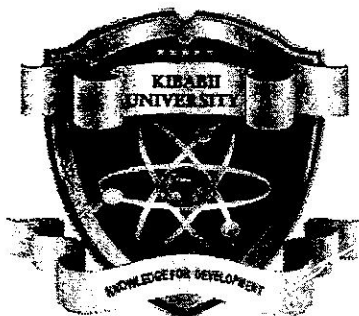


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KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF B.ED (SCIENCE)

COURSE CODE: SCH 230

COURSE TITLE: ORGANIC CHEMISTRY I

DURATION: 2 HOURS

DATE: 8/2/2019

TIME: 9-11AM

INSTRUCTIONS TO CANDIDATES

- Answer QUESTION ONE (Compulsory) and any other two (2) Questions.
- Indicate **answered** questions on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

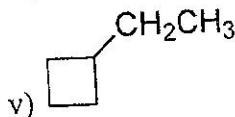
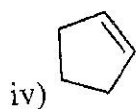
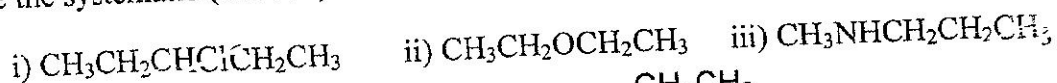
This paper consists of 4 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

Question 1

a) Give the systematic (IUPAC) names for each of the following compounds (5 marks)



b) Draw the structures of the following compounds. (4 marks)

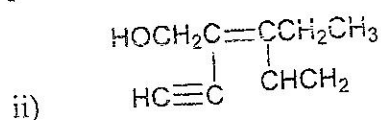
i) 3-methyl-3-heptene

ii) 6-bromo-4-ethyl-2-heptanol

iii) 4-methyl-2-hexyne

iv) 1,3-dimethylcyclohexane

c) Draw and label the E and Z isomers of the following compounds (4 marks)

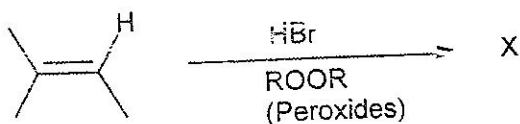


d) Draw the structures of:

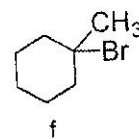
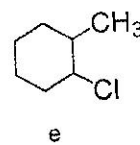
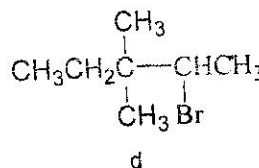
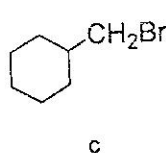
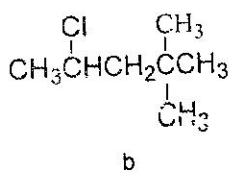
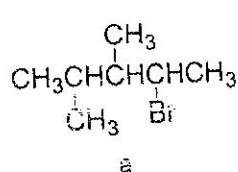
i) *Cis*-1,2-dimethylcyclopentane

ii) *Cis*-but-2-ene

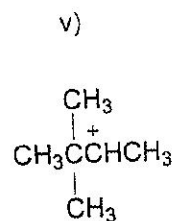
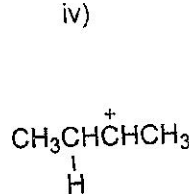
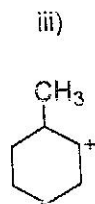
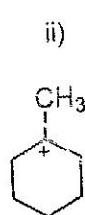
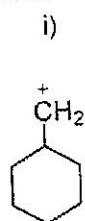
e) Draw the structure of the product X. Give a reason. (2 marks)



f) Which of the following alkyl halides forms a substitution product in an $\text{S}_{\text{N}}1$ reaction that is different from the substitution product formed in an $\text{S}_{\text{N}}2$ reaction? (2 marks)



g) Which of the following carbocations would you expect to rearrange? Show how it occurs and name the types of rearrangement leading to products (6 marks)

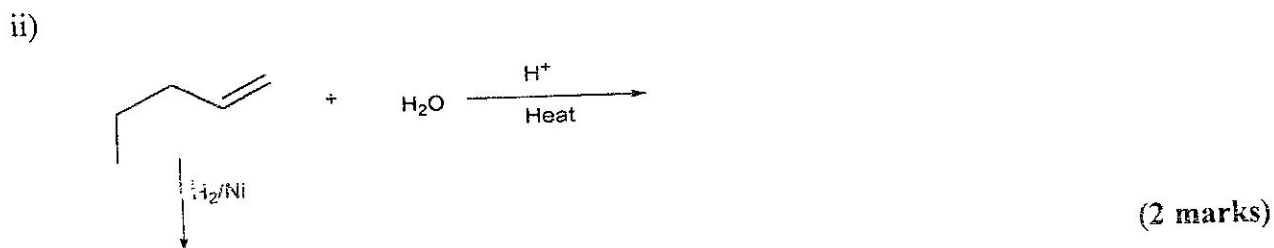
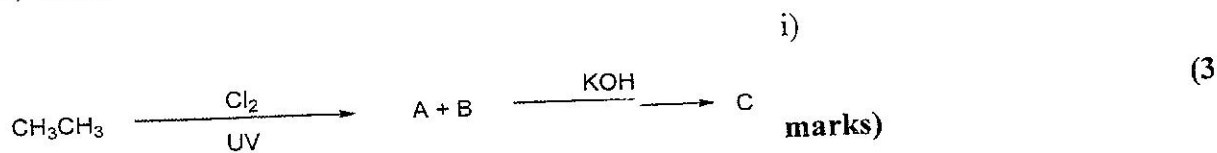


ii) Write an equation for the complete combustion of $\text{HC}\equiv\text{CH}$ (2 marks)

iii) Give two factors that affect formation of products in a substitution reaction (2 marks)

Question Two

a) Complete the reactions below:



b) Label and show the steps of the monochlorination reaction leading to products HCl and B above using curly arrows (6 marks)

c) Explain the following:

- i) 1,3-pentadiene is more stable than 1,4-pentadiene (2 marks)
- ii) Ethers generally have a higher boiling points than alkanes of comparable molecular weight (1 ½ marks)
- iii) Alkanes have lower boiling points than alcohols of comparable molecular weight (1 ½ marks)
- iv) Amines have lower boiling points than alcohols of comparable molecular weight (2 marks)
- v) Primary amines are more soluble in water than secondary amines with same number of carbons (2 marks)

Question Three

a) Give the general functional groups for each of the following (5 marks)

- i) Ethers
- ii) Amines
- iii) Esters
- iv) Carboxylic acids
- v) Ketones

b) Give the hybridization of the central atom and the shape of the molecule in each of the following species (5 marks)

- i) BH_3 ii) CO_2 iii) CH_4 iv) H_2O v) NH_3

c) Using curved arrows, show how an equally stable resonance structure can be generated for each of these anions **(5 marks)**

- i) NO_3^- ii) CO_3^{2-} iii) BO_3^- iv) $[\text{CH}_2\text{NH}_2]^+$

d) i) Define isomerism **(1 mark)**

ii) Draw and name the isomers of C_4H_6 **(4 marks)**

Question Four

a) Consider the isomers:

A) 1-bromo-3-methylbutane

B) 2-bromo-2-methylbutane

C) 2-bromo-3-methylbutane

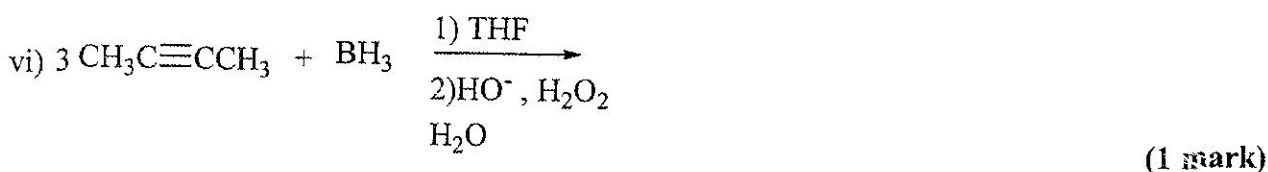
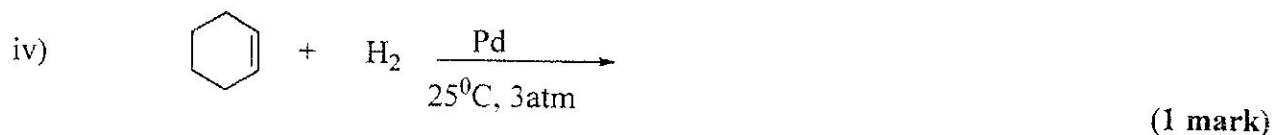
i) Select the isomer that will be most reactive in an $\text{S}_{\text{N}}2$ reaction and illustrate its $\text{S}_{\text{N}}2$ and $\text{E}2$ mechanisms when it reacts with sodium methoxide (NaOCH_3). **(6 marks)**

ii) Select the isomer that will be most reactive in an $\text{S}_{\text{N}}1$ reaction and illustrate its $\text{S}_{\text{N}}1$ and $\text{E}1$ mechanisms when it reacts with methanol (CH_3OH) **(9 marks)**

b) Differentiate between an $\text{S}_{\text{N}}1$ and an $\text{S}_{\text{N}}2$ reaction. **(5 marks)**

Question Five

a) Give the products of the following reactions



b) Draw Lewis structures for the four alcohols with molecular formula $C_4H_{10}O$. Classify each as a 1^o, 2^o or 3^o alcohol (8 marks)

c) Use δ^- or δ^+ symbols to indicate polarity in these covalent bonds (6 marks)

