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KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2016/2017 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER
SUPPLEMENTARY/SPECIAL EXAMINATIONS

FOR THE DEGREE OF B.ED (SCIENCE)

COURSE CODE: SCH 230

COURSE TITLE: ORGANIC CHEMISTRY I

DURATION: 2 HOURS

DATE: 14TH SEPTEMBER 2017 **TIME:** 8 – 10 AM

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 5 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

Question 1

a) Terminal alkynes are acidic. Why? Give an example of a base capable of removing the terminal proton of an alkyne. **(3 marks)**

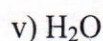
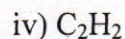
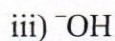
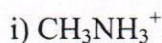
b) Explain why:

i) Alkynes have higher boiling points than alkenes with the same number of carbon atoms. **(2 marks)**

ii) Tertiary amines are less soluble in water than are secondary amines with the same number of carbons **(2 marks)**

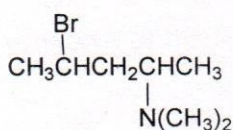
c) Name the isomers of C_6H_{14} **(2½ marks)**
Give any three characteristics of covalent bond. **(3 marks)**

e) Draw Lewis structures of the following: **(2½ marks)**

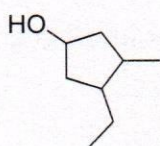


f) Give the systematic (IUPAC) names for each of the following compounds **(2½ marks)**

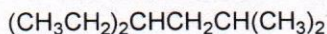
i)



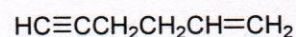
ii)



iii)



iv)



v)



g) Draw the structures of the following compounds **(2½ marks)**

i) 1,1,2-trimethylcyclopentane

ii) propan-1-ol

iii) Diethylamine

iv) 2-butene

v) 2-chlorohex-3-yne

h) i) Write the rate law of an S_N2 reaction **(1 mark)**

b) i) Show all the carbocations formed and name the products produced when 2-bromo-3-methylbutane ($CH_3CH(CH_3)CH(Br)CH_3$) undergoes S_N1 reaction with H_2O and also when it undergoes S_N2 with ^-OH . **(5 marks)**

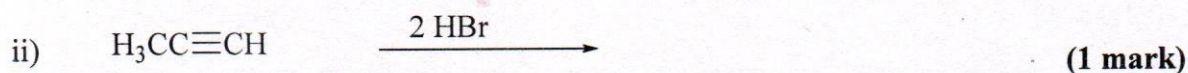
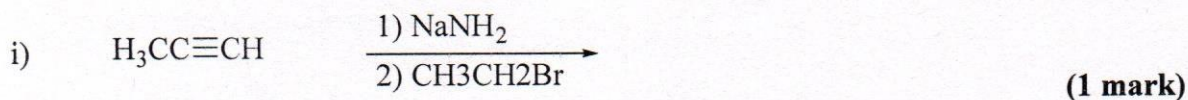
- ii) Show the mechanism when 2-bromo-2-methylpropane undergoes E2 reaction with hydroxyl ions. (3 marks)
- c) i) State Zaitsev's rule (1 mark)

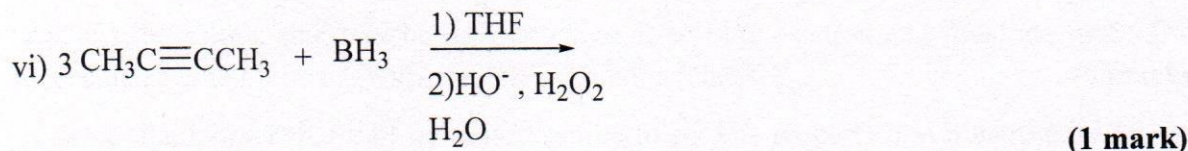
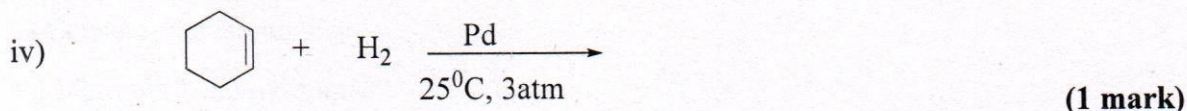
Question Two

- a) Draw the geometrical isomers of C_4H_8 and give their names (3 marks)
- b) Assign formal charges to each atom. (3 marks)
- i) HNO_3
- ii) H_3O^+
- iii) CH_4
- c) Using the symbols δ^- and δ^+ , indicate the direction of polarity of the bonds. (3 marks)
- i) C-O
- ii) Mg-C
- iii) N-H
- d) State the Importance of Organic Chemistry in daily life (3 marks)
- e) What is the hybridization of the bolded atom in each of the molecules below (3 marks)
- i) CH_3NH_2 ii) $O=C=O$ iii) CH_3OH
- iv) CH_3CN v) CH_3COOH vi) $CH_3C(CH_3)=NNH_2$
- e) Which of the following molecules have a dipole moment that is not zero? (2 marks)
- i) ii) iii) iv) v) vi)
- H_3C-Br CO_2 CH_4 NH_3 CH_3-OH CCl_4
- f) State three factors affecting an S_N2 reaction (3 marks)

Question Three

- a) With regard to CO_3^{2-} , explain the concept of resonance (3 marks)
- b) Give the products of the following reactions





c) Draw Lewis structures for the four alcohols with molecular formula C₄H₁₀O. Classify each as a 1^o, 2^o or 3^o alcohol and give their names (8 marks)

d) Use δ⁻ or δ⁺ symbols to indicate polarity in these covalent bonds (3 marks)

i) N-O ii) H-S iii) C-N iv) O-H v) C-Cl vi) C=O

Question Four

a) Define the following (5 marks)

- i. Allylic carbon
- ii. Stereoisomer
- iii. Isomer
- iv. Electrophile
- v. Nucleophile

b) The following are shapes that some molecules form. In each case give an example of a molecule that forms the shape and approximate the bond angles. (5 marks)

- i) Bent ii) trigonal planer iii) trigonal pyramidal iv) tetrahedral
v) linear

c) Complete the reactions below:



d) Write the initiation, propagation and termination steps that occur when one mole of HBr is added to 2-methylpropene in presence of a peroxide. (7 marks)

Question Five

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 S_N2 reaction and illustrate its S_N2 and E2 mechanisms when it reacts with sodium methoxide (NaOCH_3). **(6 marks)**

ii) Select the isomer that will be most reactive in an S_N1 reaction and illustrate its S_N1 and E1 mechanisms when it reacts with methanol (CH_3OH) **(9 marks)**

b) State the differences between S_N1 and S_N2 Reactions **(5 marks)**