



KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR**

**SECOND YEAR SECOND SEMESTER
SPECIAL/SUPPLEMENTARY EXAMINATIONS**

FOR THE DEGREE OF BSC (CHEMISTRY)

COURSE CODE: SCH 230

COURSE TITLE: ORGANIC CHEMISTRY I

DURATION: 2 HOURS

DATE: 18TH OCTOBER, 2018 TIME: 11.30 – 13.30 PM

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 ONE [30 MARKS]

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

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

b) Define the following terms (5 marks)

- i) Chiral carbon ii) Isomers iii) Electrophile iv) Nucleophile v) Catenation

c) Draw **all** the possible resonance structures and the resonance stabilized hybrid of these organic molecules.

i) O_3 (3 marks)

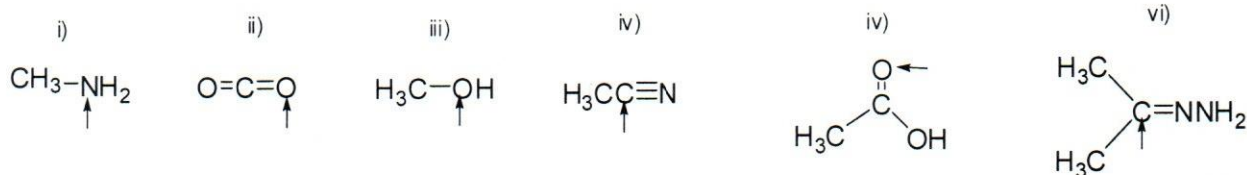
ii) CH_2NH_2 (3

marks)

d) Draw Lewis structures of the following: (5 Marks)

i) $CH_3NH_3^+$ ii) CO_3^{2-} iii) ^-OH iv) C_2H_2 v) H_2O

e) What is the hybridization of the indicated atom in each of the molecules below? (3 marks)



f) 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)

g) Give two uses of methane

(2 marks)

QUESTION TWO [20 MARKS]

a) Differentiate between an S_N1 and an S_N2 reaction.

(6 marks)

b) For each of the following pairs of S_N2 reactions, indicate which reaction occurs faster and give explanation.

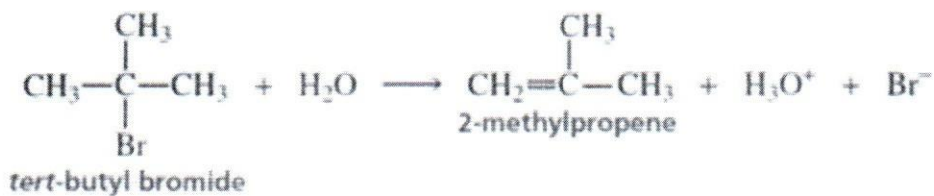
(8 marks)

- a. $\text{CH}_3\text{CH}_2\text{Br} + \text{H}_2\text{O}$ or $\text{CH}_3\text{CH}_2\text{Br} + \text{HO}^-$
- b. $\text{CH}_3\underset{\text{CH}_3}{\text{CH}}\text{CH}_2\text{Br} + \text{HO}^-$ or $\text{CH}_3\text{CH}_2\underset{\text{CH}_3}{\text{CH}}\text{Br} + \text{HO}^-$
- c. $\text{CH}_3\text{CH}_2\text{Cl} + \text{CH}_3\text{O}^-$ or $\text{CH}_3\text{CH}_2\text{Cl} + \text{CH}_3\text{S}^-$
(in ethanol)
- d. $\text{CH}_3\text{CH}_2\text{Cl} + \text{I}^-$ or $\text{CH}_3\text{CH}_2\text{Br} + \text{I}^-$

c) Show all the carbocations formed, processes involved and name the products produced when 3-bromo-2,2-dimethylbutane undergoes $\text{S}_{\text{N}}1$ reaction with H_2O and also when it undergoes $\text{S}_{\text{N}}2$ with OH^- . (6 marks)

QUESTION THREE [20 MARKS]

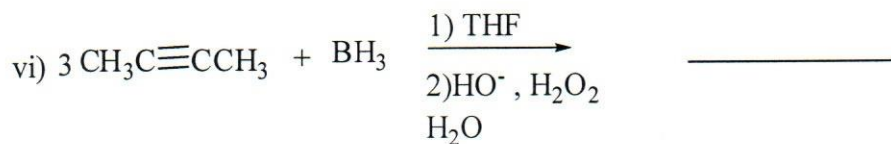
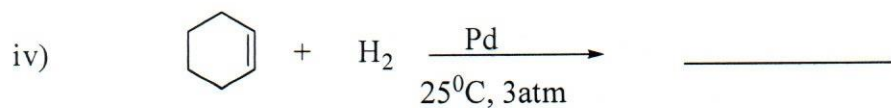
a) The reaction of *tert*-butyl bromide with water to form 2-methylpropene is an example of an E_1 reaction. Write the mechanism of this reaction. (4 marks)



- b) i) Write an equation showing the products of reaction 2-bromopentane in methanol proceeding via an E_2 reaction mechanism. (1 mark)
- ii) Name the major and minor products (2 marks)
- c) State Zaitsev's rule (1 mark)
- d) State the rate law for the E_1 and E_2 reactions respectively. (2 marks)
- e) i) Using radical substitution reaction mechanism, show the steps involved in the bromination of methane. (9 marks)
- ii) Name the type of cleavage that occurs to bromine molecule in presence of light. (1 mark)

QUESTION FOUR [20 MARKS]

a) Give the products of the following reactions (6 marks)



b) Draw Lewis structures for the four alcohols with molecular formula $\text{C}_4\text{H}_{10}\text{O}$. Classify each as a 1° , 2° or 3° alcohol **(8 marks)**

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

