



# KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS  
2020/2021 ACADEMIC YEAR**

**FIRST YEAR FIRST SEMESTER  
SUPPLEMENTARY EXAMINATIONS**

**FOR THE DEGREE OF BACHELOR OF CHEMISTRY AND BACHELOR  
OF EDUCATION**

**COURSE CODE: SCH 112/113**

**COURSE TITLE: INTRODUCTION TO ORGANIC CHEMISTRY**

**DURATION: 2 HOURS**

**DATE: 29/09/2021**

**TIME: 2:00-4:00PM**

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## 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.

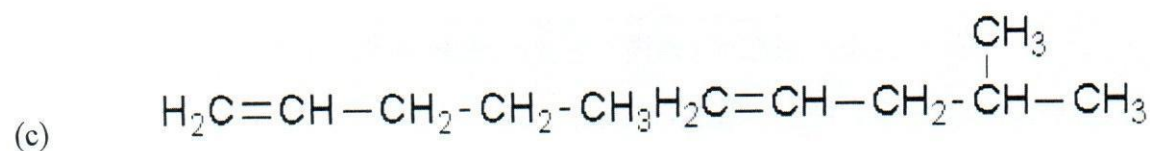
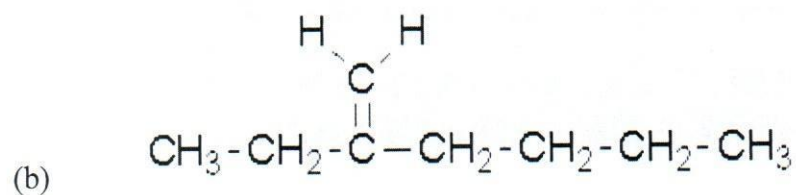
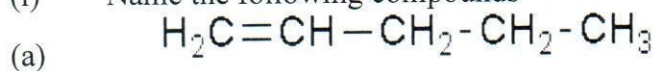
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**Question 1 (Compulsory Question 30 marks)**

(i) Name the following compounds [3marks]



(d) Draw a structure for 4-methyl-2-pentene [2marks]

(ii) Each of the following descriptions applies to more than one alkane. In each case, draw and name two structures that match the description. [10 marks]

- (a) sec-butylheptane
- (b) trans-dimethylcyclobutane
- (c) cis-di-tert-butylcyclohexane
- (d) isopropyloctane
- (e) (1, 2-dimethylpropyl)cycloalkane

(iii) Write structures for a homologous series of alcohols (R-OH) having from one to five carbons [5marks]

(iv) In each pair of compound, which compound has the higher boiling point? Explain your answer [6 marks].

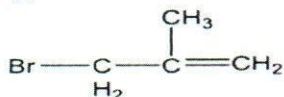
- (a) Nonane or 3-ethylhexane
- (b) Pentane or 2-methylbutane

(c) Octane or 2,2,4-trimethylpentane

**Question 2 (20 marks)**

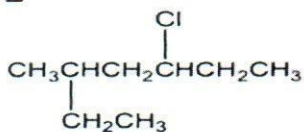
Give the names of the compounds whose structures are given below:

1.



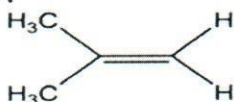
Name of compound:

2



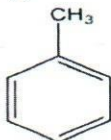
Name of compound:

3.



Name of compound:

4.



Name of compound:

5.



Name of compound:

(b) Draw the structures of the seven constitutional isomers that have the formula  $\text{C}_4\text{H}_{10}\text{O}$ .  
Classify the isomers as either alcohols or ethers [8mks].

(c) Consider the compounds in question 2(b) above;

(i) Between the alcohols and the ether, which class of compound would have higher boiling? Explain [2mks]

- (ii) Name the intermolecular bonding involved both in the alcohols and ethers. [2 marks]
- (iii) Which of the alcohols do you expect to have the higher melting point? Explain. [3 marks]

**QUESTION 3 (20 marks)**

(a) Consider the two compounds below;

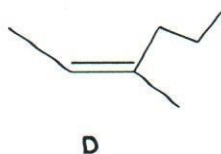
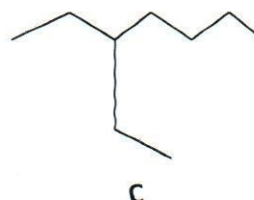
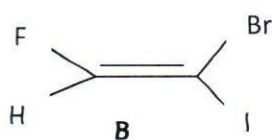
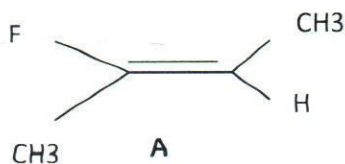


2-methyl - butene



methylcyclopentane

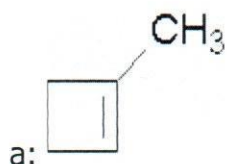
- (i) Give at least four structural isomers for each of the compound [ 4marks]
- (ii) For each case identify a pair of geometric isomers [ 2marks]
- (b) Determine the double bond stereochemistry (E or Z) for the following molecules and give the systematic names of the following compounds [6 marks].



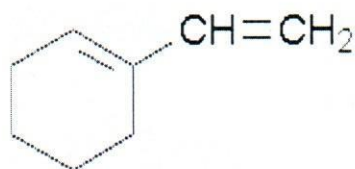
- (c) Alkenes such as ethene and propene have been described as the building blocks of the organic chemical industry. Discuss this statement giving examples. What particular features of the chemistry of the alkenes make them suitable for this role and why are alkanes unsuitable? [ 8 marks].

**Question 4 (20 marks)**

- (i) Name the following compounds: [2 marks]



b:



- (ii) Draw structures for the following 2-vinyl-1,3-cyclohexadiene [2 marks]
- (iii) How would you distinguish between the compounds in each of the following pairs using simple test tube reactions? [3 marks]
- (a)  $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CH}$  and  $\text{CH}_2=\text{CHCH}=\text{CH}_2$
- (b) Hex - 1 ene and cyclohexane
- (c)  $\text{CH}_3\text{CH}_2\text{C}\equiv\text{CH}$  and  $\text{CH}_3\text{C}\equiv\text{CCH}_3$
- (iv) A hydrocarbon has a molecular weight of approximately 60 and contains 17.2% of hydrogen. Work out the molecular formula of the hydrocarbon and write down all of the structural isomers which have this formula [7 marks]
- (v) In each pair of compound, which compound has the higher boiling point? Explain your answer (6 marks).

(a) Nonane or 3-ethylhexane

(b) Pentane or 2-methylbutane

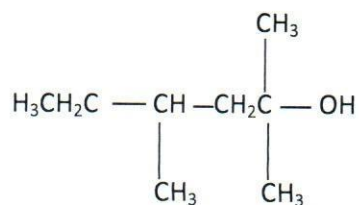
(c) Octane or 2, 2, 4-trimethylpentane

### Question 5 (20 marks)

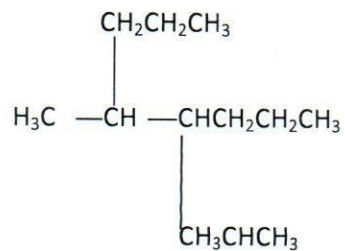
- (a) Write a lewis structure for each of the following organic molecules. [2mks]



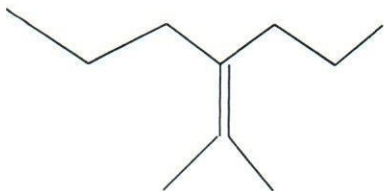
(b) Give systematic names for compounds with the following structure. [5mks]



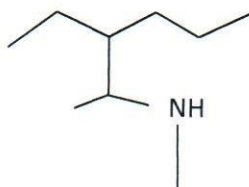
A



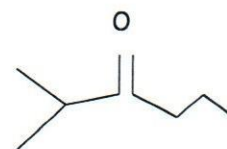
B



D

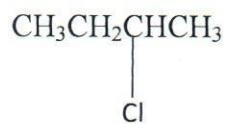


E



C

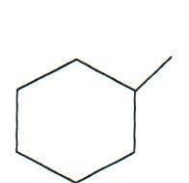
(c) Give two IUPAC names for each of the haloalkanes given below and tell whether each is primary, secondary or tertiary. [6 mks]



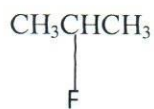
A



B



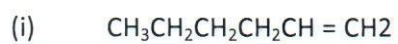
C



D

(d) Name the following compounds  
mks]

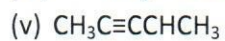
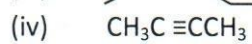
[ 6



(ii)



(iii)



(e) The heat of combustion of hexane is 4163.2 kJ/mol. Heat of combustion of neohexane is 4159.5 kJ/mol. Predict the relative stability of these two compounds? [1marks]