



MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS 2018/2019 ACADEMIC YEAR FIRST YEAR SECOND SEMESTER

SCHOOL OF SCIENCE AND INFORMATION SCIENCES BACHELOR OF SCIENCE AND BACHELOR OF EDUCATION (SCIENCE)

COURSE CODE: CHE 1205

COURSE TITLE: ORGANIC CHEMISTRY I

DATE: 4TH MAY 2019

TIME: 8.30 AM – 10:30 PM

INSTRUCTIONS TO CANDIDATES

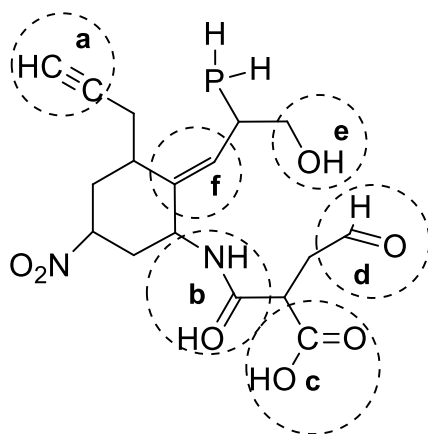
This examination paper consist of two sections **A** and **B**. Section **A** is compulsory. Answer any other TWO questions in section **B**.

This paper consists of 5 printed pages. Please turn over:

SECTION A

Question ONE (30 marks)

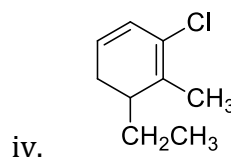
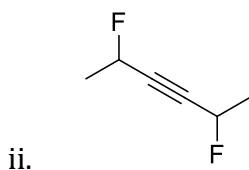
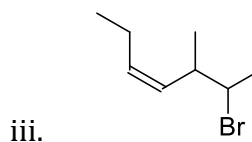
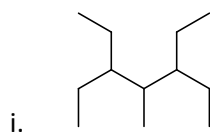
- a) Name the indicated functional groups. (6 marks)



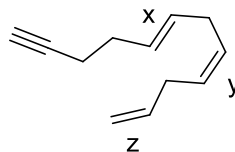
- b) Define the following organic chemistry terminologies. (4 marks)

- i. Constitutional isomer (give examples)
- ii. Substitution (give examples)
- iii. Electronegativity
- iv. Hybridization

- c) Provide IUPAC names for the following compounds paying attention to stereochemistry. (8 marks)



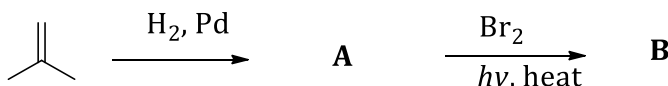
- d)
- i. How many π bonds are present in the following molecule? Classify the labeled unsaturated bonds as either *cis*- or *trans*-. (4 marks)



- ii. Arrange the following compounds in order of decreasing boiling points: 2-methylpentane, *n*-hexane, 2,2-dimethylbutane. Briefly explain your reasoning. (2 marks)

e)

- i. Provide the structural formulas and IUPAC names for the products A and B. (4 marks)



- ii. Account for the fact that treating 1-bromopropene with hydrochloric acid exclusively gives 1-bromo-1-chloropropane product. (2 marks)

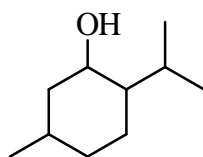
SECTION B

Question TWO (20 marks)

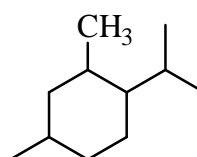
- a) Draw the structural formulas for the following compounds. (8 marks)

- iii. *trans*-4-bromopent-2-ene
- iv. 3,3-dimethylbut-1-yne
- v. 2-chloro-4-isopropylcyclohexanol
- vi. Three isomers with molecular formula C₅H₁₂

- b) Throat sprays and lozenges use menthol (common name) to temporarily soothe inflamed tissues. The structure of menthol is given below. Closely related to structure of menthol is structure B, also given below.



Menthol

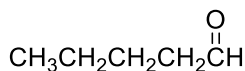


Structure B

- i. Name menthol and structure B according to the IUPAC system of nomenclature. (4 marks)
- ii. Will menthol have higher or lower boiling point than B? Explain. (2 marks)
- iii. Explain why menthol is not a member of a special alcohol family called phenols. (2 marks)

c)

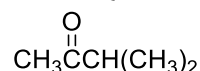
- i. For the following molecules, identify isomeric species and indicate which compound(s) will decolorize a solution mixture of KMnO_4 , H_2SO_4 and H_2O .
(2 marks)



I



II



III

- ii. Give the two functional group isomers with a molecular formula, $\text{C}_5\text{H}_{12}\text{O}$.
(2 marks)

Question THREE (20 marks)

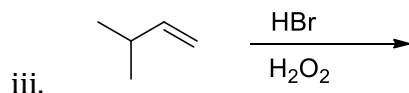
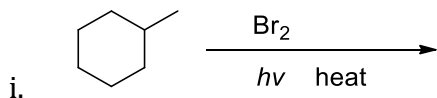
- a) Chege was given two unknown hydrocarbons X and Y to analyze and report their identities. Both compounds have a general molecular formula C_5H_{10} . He simultaneously treated the unknowns with hydrobromic acid, HBr (at 25°C) and with bromine water (in the dark and in presence of sunlight).

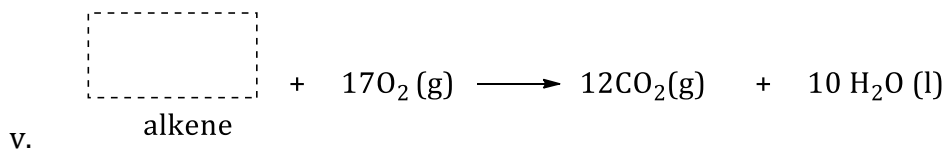
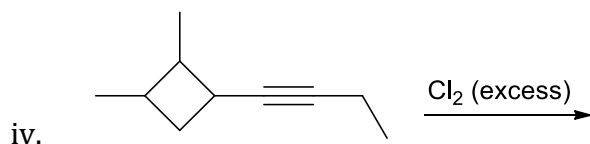
Chemical test	Observation
Bromine water (in the dark)	Only X decolorized bromine water
Bromine water (in presence of sunlight)	Both X and Y decolorized bromine water
HBr (at 25°C)	Only X reacted and produced a compound which was identified as 2-bromo-2-methylbutane

With this information, provide the structural formulas for compounds X and Y.

(5 marks)

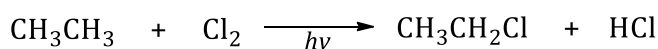
- b) For the following short reactions provide the major product/reactant. You do not need to show all stereoisomers formed.
(15 marks)



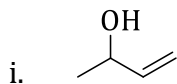


Question FOUR (20 marks)

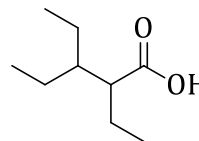
- a) Ethane can undergo radical halogenation. Draw the arrow pushing mechanism for this reaction, including the initiation step, two propagation steps, and three termination different termination steps. (6 marks)



- b) Provide the IUPAC names or structural formulas for the following compounds. (8 marks)

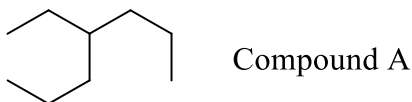


- ii. 4-bromo-2-isopropylcyclopentanone



- iv. 4-methylpent-3-enal

- c) The relative reactivity of alkane carbons to halogenation is in the order: tertiary > secondary > primary > methyl, (primary carbon being the least reactive). Monochlorination of compound A (shown below) generates alkyl halide compound B. (6 marks)



- Provide the IUPAC name of compound A and draw its condensed structural formula.
- Draw the line-angle structural formula of compound B and provide its IUPAC name.
- Compare the boiling points of compounds A and B