

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE AGRICULTURAL EDUCATION AND EXTENSION, AGRICULTURAL ECONOMICS, AGRICULTURE, FOOD SCIENCE & TECHNOLOGY, ENVIRONMENTAL SCIENCE, NATURAL RESOURCES, WILDLIFE ENTERPRISE & MANAGEMENT, ANIMAL SCIENCE & HORTICULTURE

CHEM 103: GENERAL ORGANIC CHEMISTRY

STREAMS: "AS ABOVE"

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 15/04/2020

8.30 A.M. – 10.30 A.M.

INSTRUCTIONS: Answer question ONE and any other TWO questions

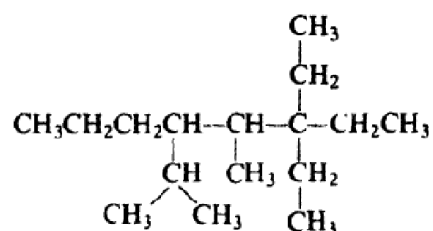
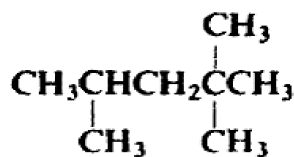
QUESTION ONE (30 MARKS)

a) Define the following terms (2 marks)

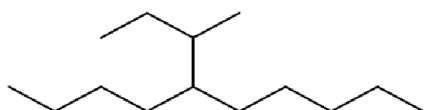
- i. Pyrolysis
- ii. Catenation

b) Give systematic IUPAC names of the following organic compounds (10 marks)

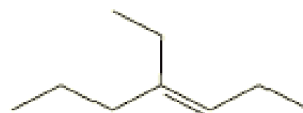
i) ii)



iii)

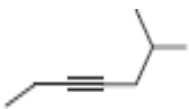


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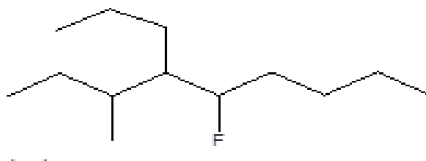


CHEM 103

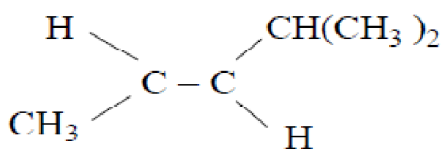
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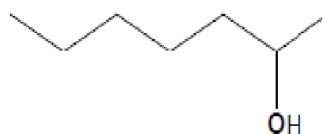
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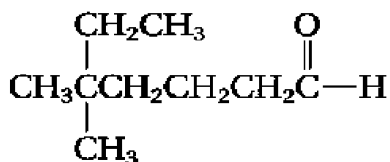
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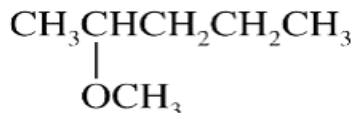
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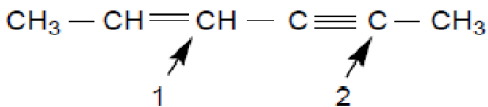
ix)



x)

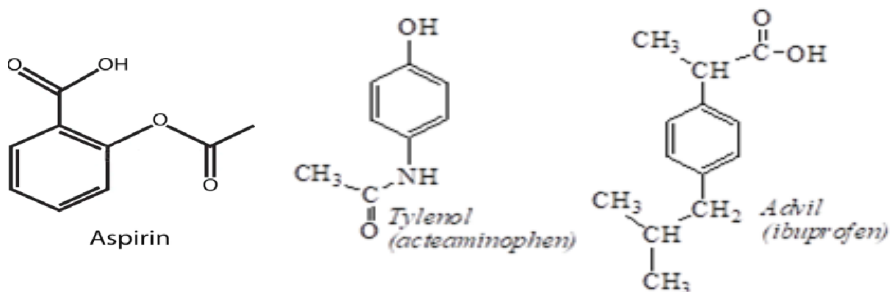


- c) Briefly explain a test that can be used to distinguish between alkenes and alkanes in a laboratory (2 marks)
- d) Give the correct hybridization for the indicated carbon atoms (2 marks)



- e) The following compounds are the active ingredients in over-the-counter drugs used as analgesics (to relieve pain without decreasing sensibility or consciousness), antipyretics (to reduce the body temperature when it is elevated), and/or anti-inflammatory agents (to counteract swelling or inflammation of the joints, skin, and eyes). Identify the functional groups in each molecule. (3 marks)

CHEM 103



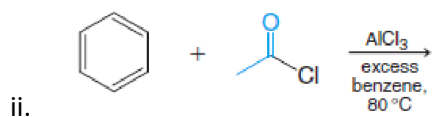
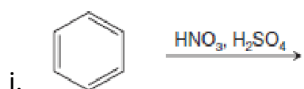
f) Rank the following sets of substituents in order of priority according to Cahn-Ingold-Prelog sequence rules (4 marks)

- (i) $-\text{CH}_3$, $-\text{Br}$, $-\text{H}$, $-\text{I}$
- (ii) $-\text{OH}$, $-\text{OCH}_3$, $-\text{H}$, $-\text{CO}_2\text{H}$
- (iii) $-\text{CO}_2\text{H}$, $-\text{CO}_2\text{CH}_3$, $-\text{CH}_2\text{OH}$, $-\text{CH}_3$
- (iv) $-\text{CH}=\text{CH}_2$, $-\text{CN}$, $-\text{CH}_2\text{NH}_2$, $-\text{CH}_2\text{Br}$

g) Draw the structures of the following compounds (3 marks)

- i. Toluene
- ii. m-nitrobenzoic acid
- iii. 1,2,4-Tribromobenzene

h) Give the products of the following reactions (2 marks)



i) Briefly explain two physical properties of alkenes (2 marks)

QUESTION TWO (20 MARKS)

(a) (i) Define the Zaitsev's rule (1 mark)

(ii) When 2-chlorobutane is treated with alcoholic potassium hydroxide two products are produced. Write the equation for the reaction and identify the major and minor products. Apply the Zaitsev's rule to account for the major product. (3 marks)

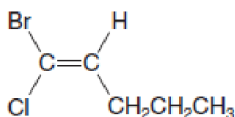
CHEM 103

- b) Briefly explain the following methods of synthesizing alcohols from alkenes. Use the appropriate equations for your explanation
- Acid catalyzed addition of water (3 marks)
 - Oxymercuration-demercuration (4 marks)
- c) Predict the more stable alkene of each pair. Justify your answers. (6 marks)
- 2-methylpent-2-ene or 2,3-Dimethylbut-2-ene
 - Cis-3-hexene or trans-3-hexene
 - 1-Hexene or cis-3-hexene.
- d) Briefly explain the Lucas test for differentiating between the primary, secondary and tertiary alcohols (3 marks)

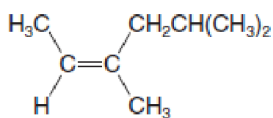
QUESTION THREE (20 MARKS)

- a) Write the structural formula for all the constitutional isomers with the molecular formula C_5H_{12} and name them by IUPAC system (3 marks)
- b) Give the IUPAC names for each of the following using E/Z designation (4 marks)

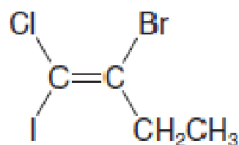
i.



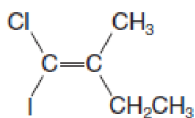
ii.



iii.



iv.



- c) Give the mechanism of reaction when methane reacts with chlorine in presence of light showing initiation, propagation and termination steps. (6 marks)
- d) For each of the following pair of compounds, predict the one with a higher boiling point. Justify your answers. (4 marks)
- (i) Cis-1,2-dichloroethene or cis-1,2-dibromoethene
- (ii) Cis or trans-2,3-dichlorobut-2-ene
- e) Briefly explain the test used to differentiate ketones from aldehydes (3 marks)

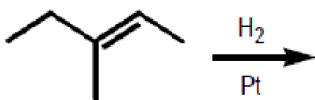
QUESTION FOUR (20 MARKS)

Draw the structures of the following compounds (7 marks)

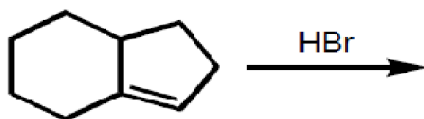
- (a) (i) 4-isopropyl-3,5,6-trimethyloctane
- (ii) Cis-1-ethyl-3-methylcyclopentane
- (iii) Trans-1-ethyl-3-methylcycloheptane
- (iv) 2,2-dimethylhex-3-yne
- (v) 2,4-dimethylpentan-3-one
- (vi) Pent-4-en-2-ol
- (vii) Cyclohexylamine

- b) Draw the structure of the major products for each of the following reactions. (9 marks)

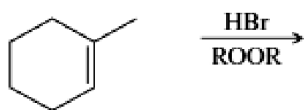
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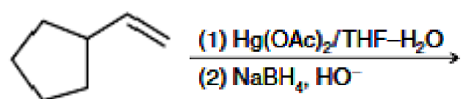
ii.



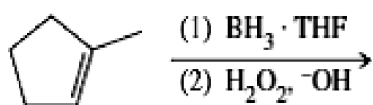
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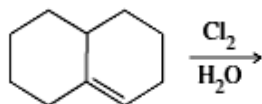
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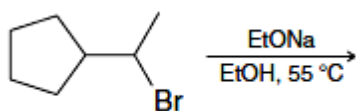
v.



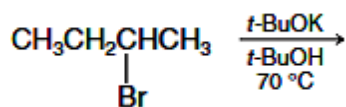
vi.



vii.



viii.



ix.



c) Briefly discuss the synthesis of alkynes from acetylides giving an example (4 marks)
