CHUKA  UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE

CHEM 103: GENERAL ORGANIC CHEMISTRY

STREAMS: BSC **TIME: 2 HOURS**

DAY/DATE: TUESDAY 06/04/2021 **8.30 A.M – 10.30 A.M.**

INSTRUCTIONS: Answer QUESTION ONE and any OTHER TWO questions.

QUESTION ONE (30 MARKS)

a) i) Explain hybridization briefly (2 marks)

ii) Using orbital diagrams discuss the hybridization of methane (4 marks)

b) Explain why the C-H bond lengths of Ethyne is 1.06 Å, ethene is 1.09 Å and ethane 1.10 Å (2 marks)

c) Define

i) Catenation (1 mark)

ii) Functional group (1 mark)

d) Using an equation give two methods for preparation of alkanes (4 marks)

e) Draw the structures of the following molecules (5 marks)

i) 3-methylhexane

ii) 2,3-dimethylheptane

iii) 3-ethyl-2,4-dimethyloctane

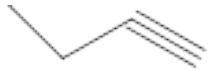
iv) 2,3-dimethyloctane

f) Give the IUPAC names of the following structures (5 marks)

i) $CH_3CH=CH_2$

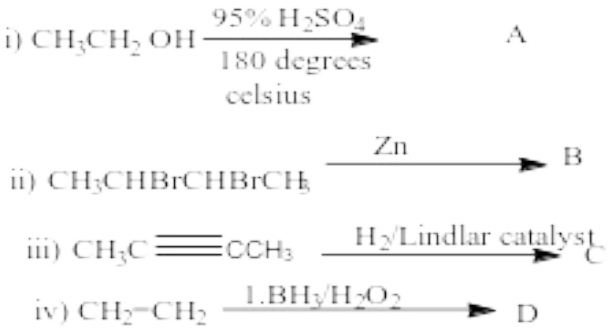
ii) $CH_3CH(CH_3)CH_2=CH_2$

iii) $CH_3CH_2CH=C(CH_2)CH(Cl)CH_3$

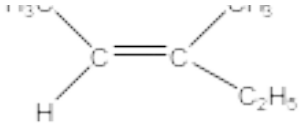
iv) 

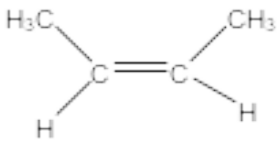
v) $CH_3CH_2CH(CH_3)CH_2OH$

g) Complete the following reactions giving the major product(s) A, B, C and D (4 marks)



h) Assign the E/Z nomenclature of the following alkenes (2 marks)

i) 

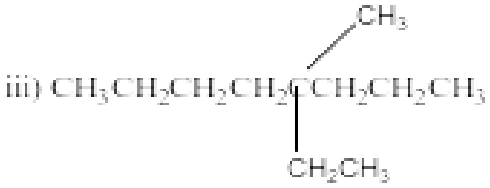
ii) 

QUESTION TWO (20 MARKS)

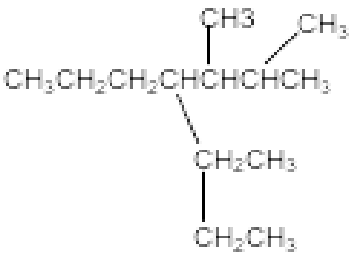
a) Give the IUPAC name of the following alkanes (5 marks)

i) $CH_3CH_2CH(CH_3)CH(CH_3)CH_3$

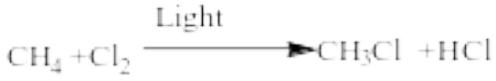
ii) 

iii) 

iv) $CH_3(CH_2)_5CH_3$

v) 

b) Draw the mechanism of the following reaction (5 marks)



c) Using an equation give two methods for synthesis of alkene (4 marks)

d) Draw the following hydrocarbons (4 marks)

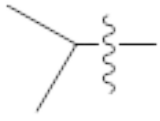
i) Cyclopropane

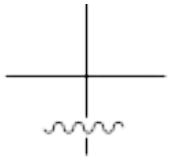
ii) Cyclobutane

iii) 1,3-dimethylcyclohexane

iv) 3-cyclobutylpentane

e) Name the following substituents (2 marks)

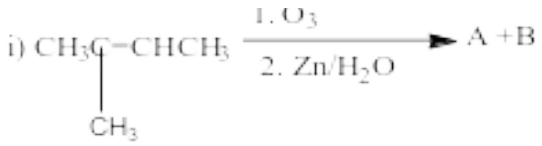
i) 

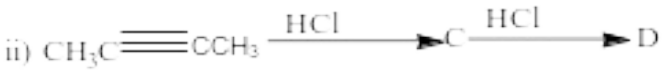
ii) 

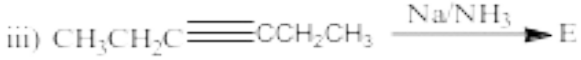
QUESTION THREE (20 MARKS)

a) State three physical properties of alkanes (3 marks)

b) Name the major product(s) of the following reactions (5 marks)





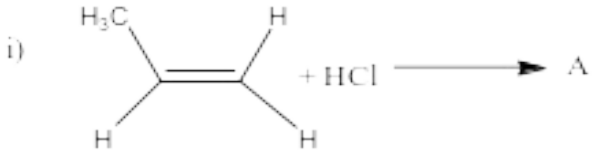


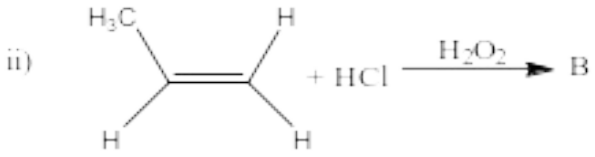
c) i) Define isomers (1 mark)

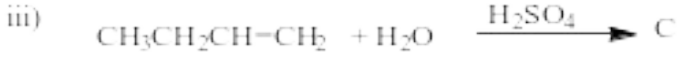
ii) Write the isomers of with the molecular C_6H_{14} (5 marks)

d) (i) Define Markonikov's rule (1 mark)

ii) Give the products of the following reactions (3 marks)







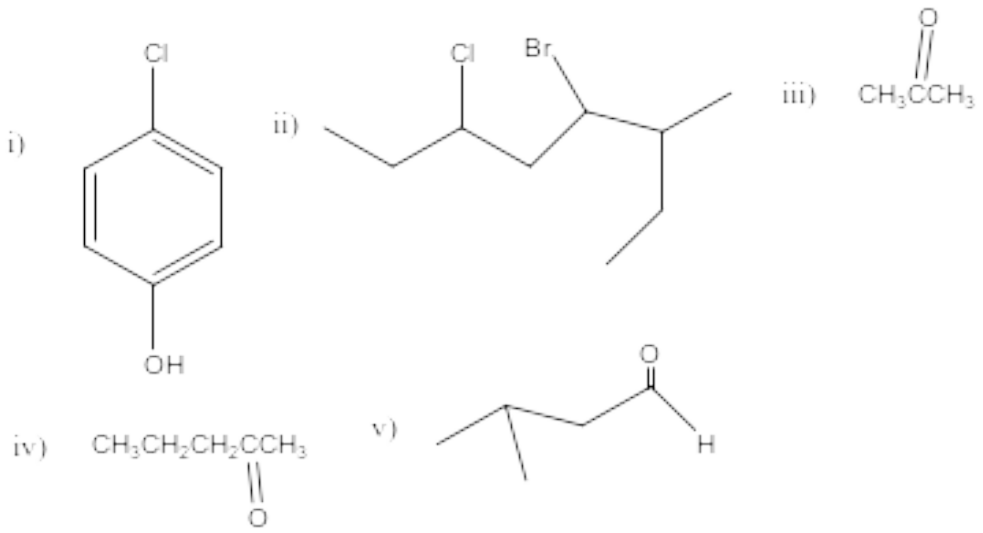
e) Name the following compounds according to IUPAC system of nomeclature (2 marks)

j) $CH_3CH(OH)CH_3$

ii) $CH_3CH_2CH(CH_3)CH_2C(C_2H_5)CH_2CH_2OH$

QUESTION FOUR (20 MARKS)

a) Name the following compounds according to IUPAC system of nomenclature (5 marks)



b) Write a method for laboratory differentiation between an aldehyde and a ketone (2 marks)

c) Draw the structure for the following compounds (5 marks)

i) Methanal

ii) 2-methylhexanal

iii) Ethylamine

iv) 2-methyl-1-propanamine

v) Diethyl ether

d) Using a suitable equation give two methods of preparation of alkynes (4 marks)

e) Design a stepwise method for synthesis of pent-2-yne starting from ethyne and any other reagents (4 marks)
