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MAIN EXAMINATION

JANUARY - APRIL 2017 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF CHEMISTRY

SCHOOL FOCUSED PROGRAMME

CHEM 101: ORGANIC CHEMISTRY I

Date: APRIL 2017	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and any other Two Questions	

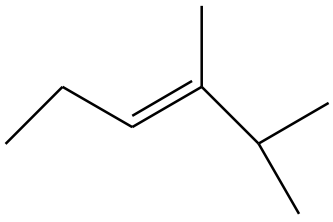
QUESTION ONE (30 MARKS)

a. Draw the structures of the following compounds. **(6 marks)**

i. 2-methylhex-2-ene
ii. Pentan-2-one
iii. 1,2,3-trichloropropene
iv. 4-(1-methylethyl)-5,5-dimethylnonane
v. Propylethanoate
vi. 3-iodocyclopentene

b. Give the IUPAC names of the following compounds. **(3 marks)**

i.



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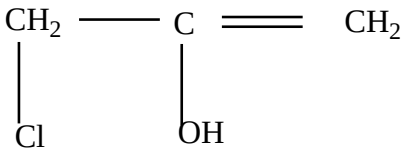

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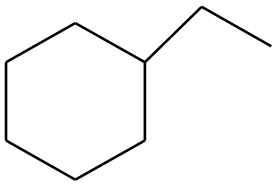
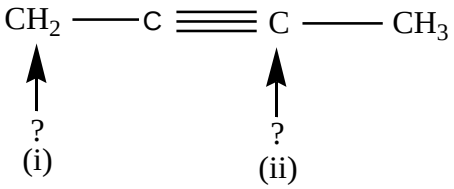


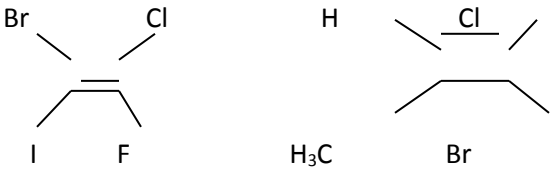
c. Indicate the type of hybridization of each carbon atom in the following structure: **(2 marks)**

(i.)



d. Write the structural formulas and the names of the isomeric C_6H_{14} alkanes. **(8 marks)**

e. Name the following compounds using the E, Z nomenclature: **(3 marks)**



f. A compound is found to contain 85.63% C and 14.37% H by mass. In another experiment its molar mass is found to be 56.1g/mol. What is its molecular formula? **(5 marks)**

g. Classify the following as primary, secondary or tertiary alcohols . **(3 marks)**

i. $CH_3\ CHOH\ CH_3$
ii. $(CH_3)_2OH\ CH_3$
iii. $CH_3\ CH_2CH_2OH$

QUESTION TWO (20 MARKS)

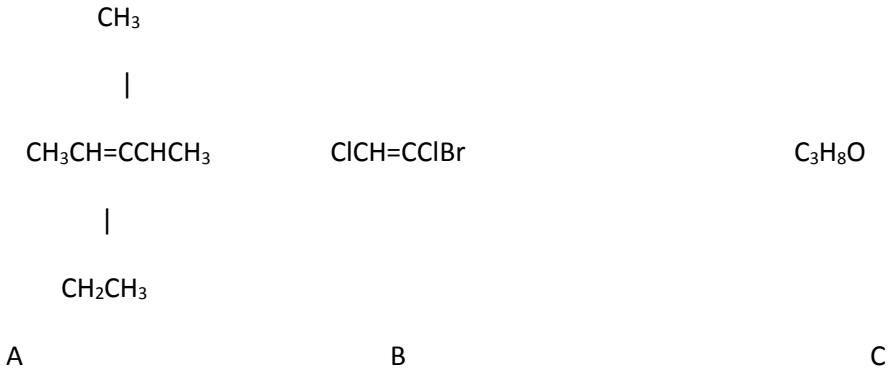
a. Define catenation and give examples of the catenation of carbon. **(3 marks)**

b. Briefly describe the mode of hybridization observed in alkanes. **(6 marks)**

c. (i) What is a functional group? **(1 mark)**

(ii) Briefly discuss a carbonyl group as a functional group. **(3 marks)**

d. The molecular formulae of three different organic compounds are represented as A, B, C. studies show that each of these compounds can have different arrangements of atoms on the main carbon chain



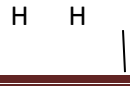
i. Draw the structures of isomeric compounds represented by compound C **(3 marks)**

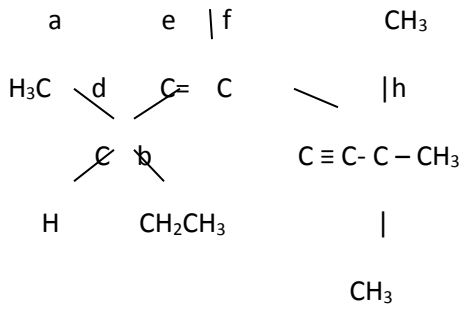
ii. For compound A; draw the trans isomer **(2 marks)**

iii. For compound B; draw the Z isomer **(2 marks)**

QUESTION THREE (20 MARKS)

a. You are provided with the following structure of an organic compound.





i. Name the type of bonds between carbon atoms labeled e and f . **(2 marks)**

ii. Indicate the type of hybridization for carbon atoms labeled a and e . **(2 marks)**

iii. Which of the carbon atoms would you classify as primary, or secondary . **(2 marks)**

b. i. Briefly explain the meaning of the term hybridization. **(3 marks)**

ii.Explain the bonding in alkanes in terms of hydridization. **(5 marks)**

c. Define electronegativity, hence arrange the following in increasing electronegativity: **(3 marks)**

Cl, F, O

C, N, Br

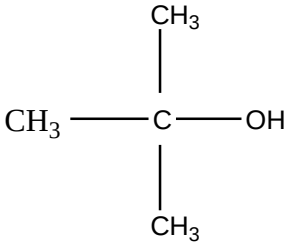
d. Describe a chemical test to differentiate the following pairs of compounds ? **(4 marks)**

i. Ethene and ethyne

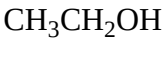
ii. Propanal and propanone

QUESTION FOUR (20 MARKS)

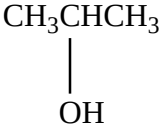
a. Arrange the following compounds in increasing order of acidity and explain your answer.
(4 marks)



A



B

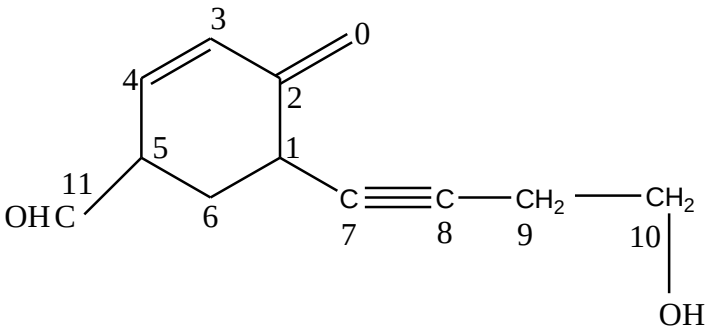


D

b. How many 1°, 2° and 3° hydrogens are in isobutene **(3 marks)**

c. Briefly describe fractional distillation of crude oil. **(5 marks)**

d. Below is a structure of a hypothetical organic compound.



i. Write down the names of the functional groups at carbon atoms numbered 2, 3, 6, 7, and 11. **(4 marks)**

ii. How would you distinguish between the functional groups at carbon atoms 2 and 10? **(2 marks)**

iii. Identify any 2 carbon-carbon π (pi) bonds and any 2 carbon-carbon σ (sigma) bonds. **(2 marks)**

QUESTION FIVE (20 MARKS)

a. With clear diagrams and illustrations explain the mechanism of chlorination of methane. **(6 marks)**

b. An alcohol S, $C_4H_{10}O$ was oxidized to give a carboxylic acid P, $C_4H_{10}O_2$. The alcohol can also be dehydrated to form compound Q, C_4H_8. An isomer of S is resistant to oxidation. Identify compound S, Q, P and the isomer of S. **(8 marks)**

c. $4.8g$ of a sample of compound of Carbon, hydrogen and Oxygen gave on combustion $7.04g$ of $CO_{2(g)}$ and $2.88g$ of H_2O .The relative molecular mass of the compound was found to be 60 (C=12, H=1, O=16)

i. What are the masses of carbon, hydrogen and oxygen in the compound? **(4 marks)**

ii. Determine the molecular formular of the compound. **(2 marks)**

END