

ALLIANCE GILRS' HIGH SCHOOL

ORGANIC CHEMISTRY I

(Form Three NOV-DEC Holiday assignment)

By the end of this chapter, the learner should be able to:

- (a) Define organic chemistry.
- (b) Define hydrocarbons and classify them according to their structure and bonding.
- (c) Write molecular and structural formulae of alkanes, alkenes and alkynes.
- (d) Name and draw the structures of alkanes, alkenes and alkynes.
- (e) Define an isomer, name and draw the structures of the isomers of hydrocarbons with up to five carbon atoms in their molecules.
- (f) Describe the general methods of preparing different hydrocarbons.
- (g) Explain the gradual change in properties among the members of a homologous series. (h) State some uses of hydrocarbons.

1. Define. Organic chemistry?

2. Explain why carbon forms a very large number of organic compounds? 3. Define

i).Hydrocarbons

ii).Classify the three groups depending on type of bond that exist

4. ALKANES

Alkanes.

a).Sources of Alkanes

b).Cracking of Alkanes

READ ON. Nomenclature (Naming) of Alkanes.

5. General formula C_nH_{2n+2} where n is 1, 2, 3...

Alkanes have names which end with the suffix, – **ane**; Define the following terms.

A molecular formula

A structural formula

A homologous series

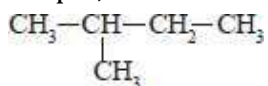
6. Isomerism in Alkanes

i).Isomers

ii).Draw all isomers of hexane

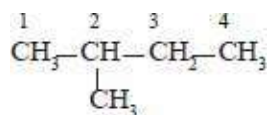
Rules for naming of the branched alkanes

1. Identify the longest continuous carbon chain to determine the name of the parent alkane. For example, in the structure,



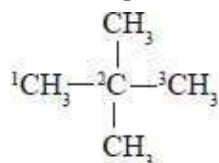
The longest chain has four carbon atoms hence the parent name is butane.

2. Number the longest chain from the end of the chain that is near the branching. For example, in the structure above, numbering should start from the left, thus:



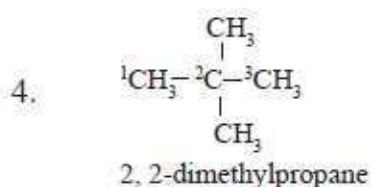
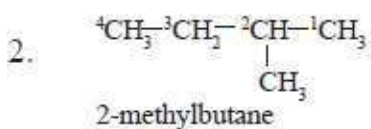
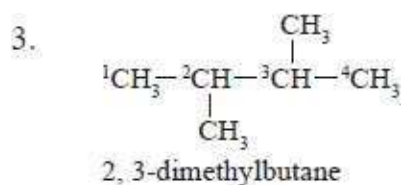
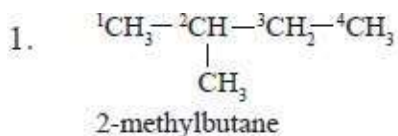
The branching is therefore on carbon 2 of the longest chain and the substituent group is a methyl.

3. In case there are two or more similar substituent groups in the chain, they are indicated by the prefixes; **di-**, **tri-**, **tetra-**, ... Comas are used to separate the numbers for example, in the following:

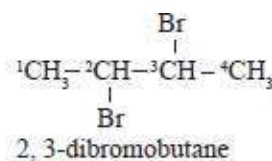
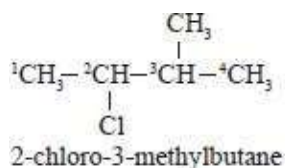


There are two methyl groups attached to carbon number two of the longest chain hence, 2, 2 -dimethyl. When naming the Isomers of an alkane, the position of the substituent group is written first followed by the name of the substituent group and finally the name of the parent alkane.

Examples

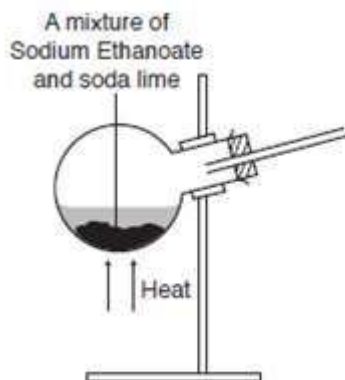


4. When the substituent groups are a halogen and an alkyl group, the halogen is always placed before the alkyl group. For example;



5. Preparation of Alkanes

In the laboratory, alkanes are prepared by the reaction between sodalime (mixture of sodium hydroxide and calcium oxide) and an appropriate alkanoate. Complete the set-up to collect Methane gas



Equation..

a).Physical Properties of methane gas

b).Chemical Properties

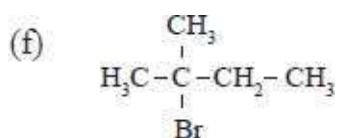
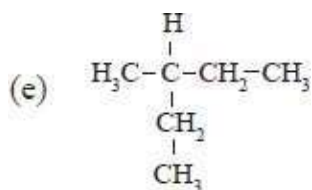
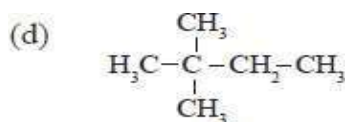
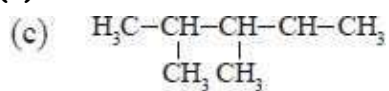
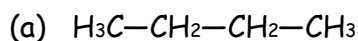
i).Combustion

ii).Substitution reactions

d).Uses of Alkanes

Review Questions:

1. Name each of the following compounds:



2. Draw the structural formula for each of the following compounds:

(a) 2-methylheptane.

(b) 3-ethylhexane.

(c) 2, 2, 4-trimethylpentane.

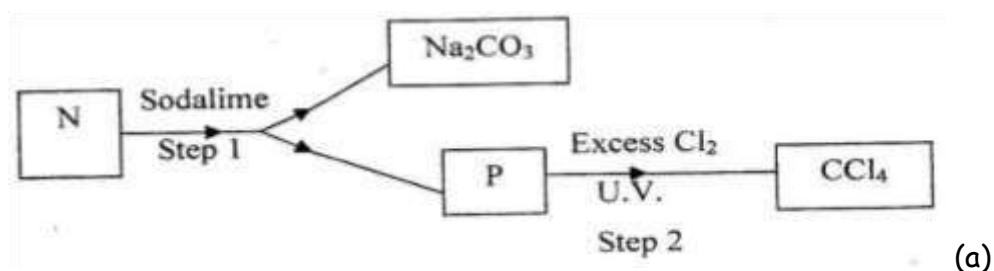
(d) 2, 3-dichlorobutane.

3. Draw and name the structures of all the isomers of:

4. Draw and name all the possible isomers of an alkane with the molecular formula C_6H_{14} .

5. Give the name and draw the structural formula of the compound formed when one mole of ethane reacts with one mole of chlorine gas.

6. Study the flow chart below and answer the questions that follow



Identify N and P

(b) What name is given to the type of halogenations/ chlorination reaction in step 2?

7. (a) What is meant by isomerism? (1 mark)
- (b) Draw and name two isomers of butane. (2 marks)

N/B. Follow the steps above:

I). GO THROUGH ALKENES AND ALKYNES,

READ AND WRITE NOTES

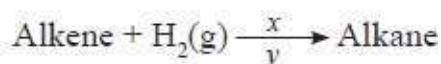
II) ANSWER THE FOLLOWING QUESTIONS.

Review Questions: Alkenes

- Name the following compounds:
 - $\text{H}_3\text{C} - \text{CH} = \text{CH} - \text{CH}_3$
 - $\text{H}_2\text{C} = \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$
 - $\text{H}_2\text{C} = \text{CH} - \text{CH} = \text{CH} - \text{CH}_3$
 - $\text{H}_2\text{C} = \text{CH} - \text{CH} = \text{CBr} - \text{CH}_3$
- Draw the structural formula of the following compounds:
 - 2-methylpent - 2-ene.
 - 3-methylbut-1-ene.
 - 1-chloro - 2 -methylpentane.
 - 1 - bromo - 3 - ethylpentene.
- Define the following terms:
 - monomer.
 - polymer.

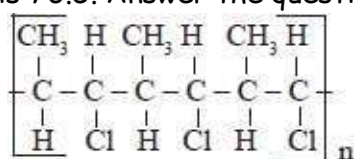
4. Alkenes undergo hydrogenation to form alkanes as shown by the following equation;

equation;

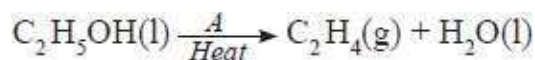


Identify catalyst x and condition y.

5. State four uses of alkenes.
6. State a chemical test carried out to show evidence for the unsaturation in hydrocarbons.
7. The following structure represents part of a polymer. Given that the molecular mass of the monomer is 76.5. Answer the questions below.

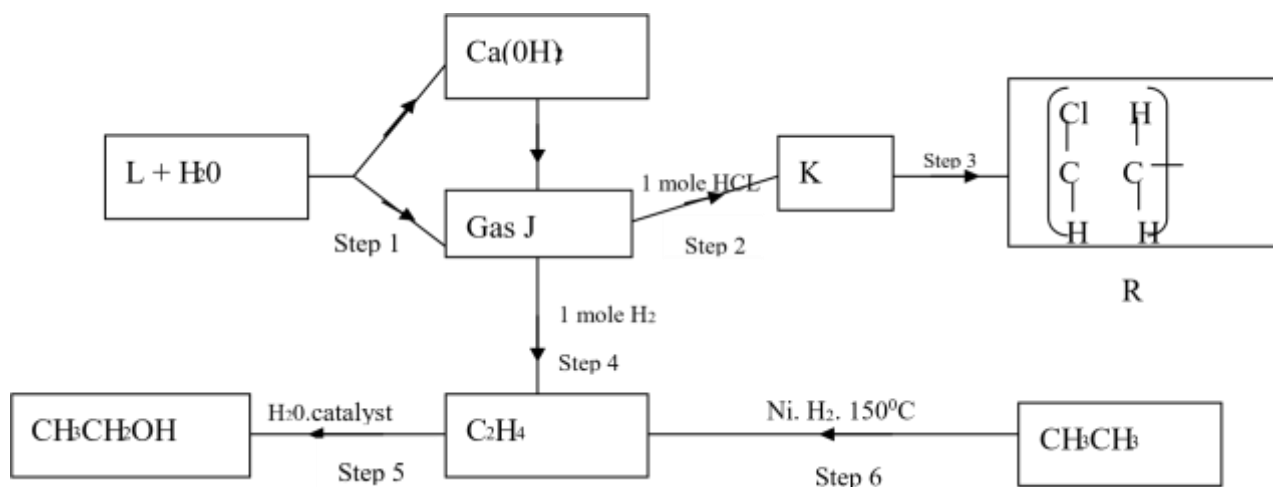


- (a) Identify and draw the structure of the repeat unit.
- (b) Name the monomer.
- (c) Write the molecular formula of the monomer.
8. The following equation represents the reaction for the preparation of ethene from ethanol;



- (a) Name reagent A.
- (b) Name the process by which ethene is produced in the reaction represented by the equation.

9. Study the flow chart below and answer the questions that follow.



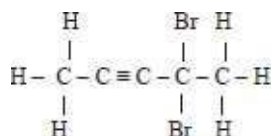
- Identify reagent L.
- Name the catalyst used in step 5.
- Draw the structural formula of gas J.
- What name is given to the process that takes place in step 5?
- Propane can be changed into methane and ethane as shown in the equation below;



Name the process undergone by propane.

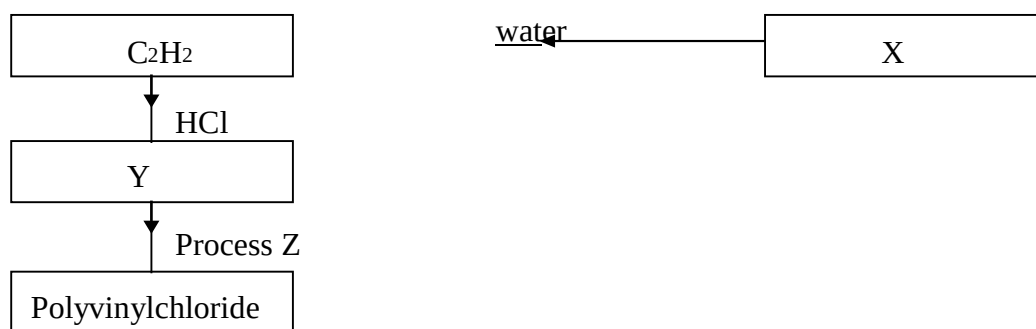
Review Questions: Alkynes

- Write the molecular formula of butyne.
 - Draw the open structural formula of butyne.
 - Butyne burns with a yellow sooty flame in a limited supply of air. Explain. (d) Write the equation for the reaction in (c).



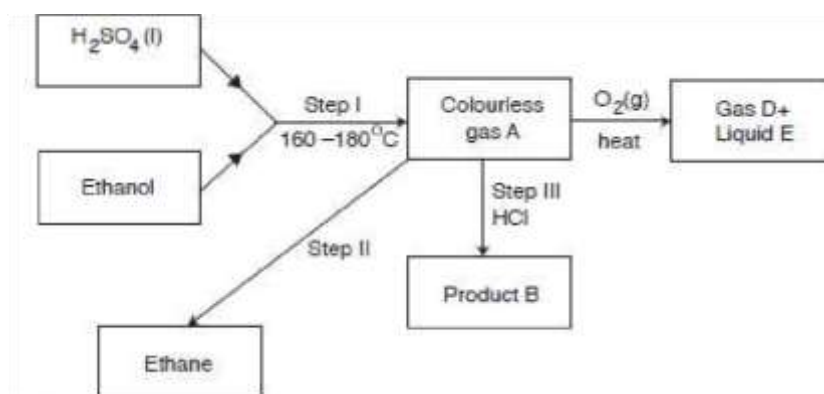
- Name the compound represented by the following structure.

- Draw the open structure of the compound with the following molecular structure: C_6H_{10}
- The reaction between bromine vapour and ethyne is faster than with ethene. Explain.
- The relative formula mass of a hydrocarbon is 58. Draw and name two possible structures of the hydrocarbon ($C=12.0$; $H=1.0$)
- Alkanes, alkenes and alkynes can be obtained from crude oil. Draw the structure of the second member of the alkyne homologous series.
- Draw and name the structure of the compound formed when one Mole of ethyne reacts with one mole of hydrogen bromide.
- Draw the structures of the alkynes whose molecular formula is C_4H_6
- Study the flowchart below and answer the questions that follow:



- Identify X and Y
 - State two uses of polyvinylchloride
- Draw and name the isomers of butyne
 - State one use of polystyrene

- Study the following reaction scheme and answer the questions that follow:



- (a) Name:
- (i) Colourless gas A.
 - (ii) Product B.
 - (iii) Gas D.
 - (iv) Liquid E.
- (b) Write balanced equations for each of the reactions forming the products in (a).
- (c) Name the type of reactions taking place in Step I and II.
- (d) State the importance of the reaction taking place in Step II.
4. Explain why an organic compound with formula C_3H_6 burns with a more sooty flame than C_3H_8
5. A hydrocarbon Q, was found to decolourise potassium manganate(VII) solution. When two moles of Q are burnt completely, six moles of carbon(IV) oxide and six moles of water were formed.
- (a) Write the structural formula of Q.
 - (b) Name the homologous series to which Q belongs.
 - (c) Name one industrial source of Q.