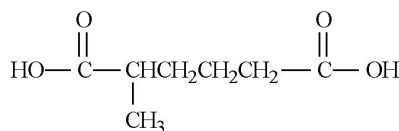


INSTRUCTIONS: Answer Question 1 and any other TWO questions

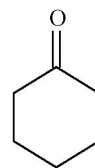
QUESTION ONE (Compulsory) (30 marks)

1. (a) Define the following terms:
- (i) Isomers
 - (ii) Aliphatic hydrocarbon
 - (iii) Halogenation
 - (iv) Alcohols
- [8 marks]
- (b) Differentiate between the following;
- (i) Structural and geometric isomers. [3 marks]
 - (ii) sp^2 and sp^3 hybridization [3 marks]
 - (iii) Homologous and functional group [3 marks]
 - (iv) Esters and ethers [3 marks]
2. (a) Using chemical reactions, show the product for the reaction of pentanal with;
- i) Tollens reagent
 - ii) $LiAlH_4$
- [6 marks]

(b) In an abandoned laboratory has been found a flammable liquid, A, in a bottle bearing only the label "Compound A: C_7H_{12} ." Government agents have offered you a considerable sum to determine the structure of this compound. After verifying the molecular formula by elemental analysis, you find that Compound A reacts with 1 mol equiv of hydrogen and, after treatment with acidic $KMnO_4$, gives the dicarboxylic acid C (see below). Another bottle from the same laboratory is labeled "Compound B (isomer of A)." Compound B also reacts with 1 mol equiv of hydrogen, but yields cyclohexanone as one of the products after treatment with acidic $KMnO_4$ and heating.



Compound C



cyclohexanone

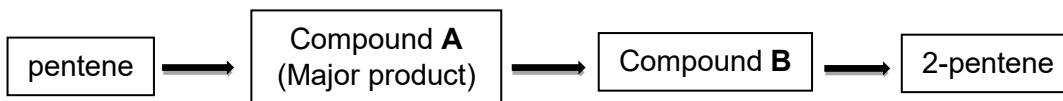
- i. Which group does Compound A fall in? [1 mark]
- ii. Predict the structure for A and B. [4 marks]
- iii. What was the other product formed in the $KMnO_4$ oxidation of B? [1 marks]

SECTION B
QUESTION TWO (20 marks)

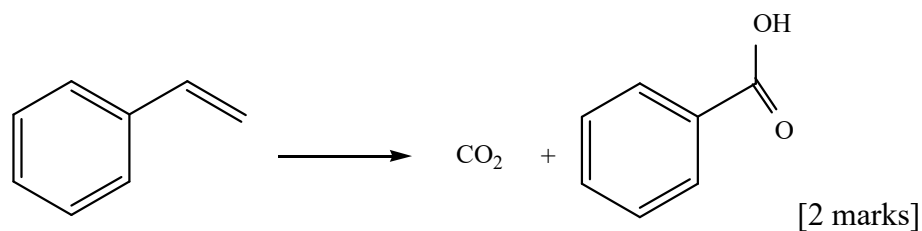
- (a) Draw structures for the following compounds;
- (i) 2,4-dimethyl-5-nitro-4-isopropylheptane
 - (ii) 4-ethyl-2-propyloctanoic acid
 - (iii) 5-isopropyl-3-octanol
 - (iv) 6-methyl-4-nitroheptan-2-one
 - (v) Ethyl butylamine
 - (vi) Methoxycyclobutane [12 marks]
- (b) Give the products formed when;
- a) 3,3-dimethylcyclopentene undergoes catalytic hydrogenation [2 marks]
 - b) 3,4-diethylheptyne reacts with hydrogen fluoride [2 marks]
- (c) State any **TWO** physical properties of;
- (i) Amides [2 marks]
 - (ii) Ethers [2 marks]

QUESTION THREE (20 marks)

- (a) Briefly, state any **TWO** uses of amines. [2 marks]
- (b) The flow diagram below shows the steps used to convert pentene to 2-pentene.



- (i) Draw the structure of pentene, using the line formula. [1 mark]
 - (ii) Compound **A** is formed when pentene reacts with $\text{HCl}_{(g)}$. Using the line formula draw the structure of compound **A**. [1 mark]
 - (iii) Compound **A** is converted to an alcohol, compound **B**. What is the name of the reactant used? [1 mark]
 - (iv) Is compound **B** a primary, secondary or tertiary alcohol? [1 mark]
 - (v) Compound **B** is converted to 2-pentene by heating the alcohol in the presence of concentrated H_2SO_4 . At what temperature does this occur? Draw this product. [2 marks]
- (c) Provide the reagents necessary to complete the following transformation.



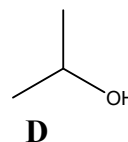
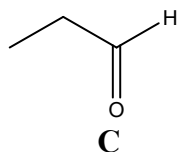
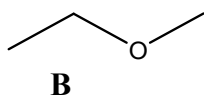
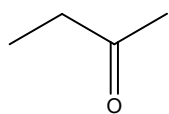
(d) Predict the products from the reaction of hexyne with each of the following;

- 2HBr
- Cl_2
- Excess H_2 , Pd catalyt
- 2I_2
- $\text{H}_3\text{O}^+ / \text{H}_2\text{O}$

[10 marks]

QUESTION FOUR (20 marks)

(a) Referring to the compounds below, answer the questions that follow.



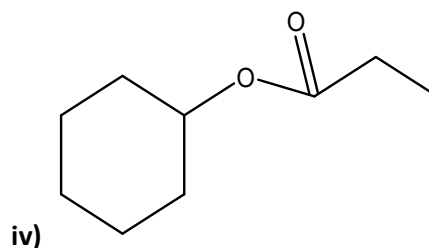
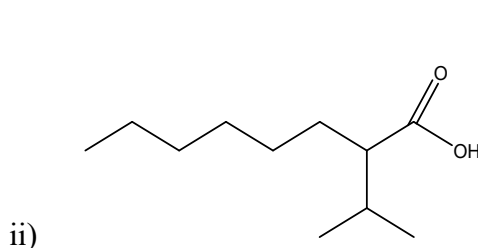
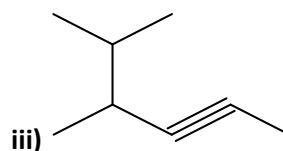
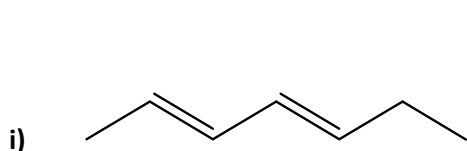
i.
above?

Identify the class of compounds of molecules A to D
[4 marks]

ii.

What is the molecular formula of compounds B and D?
[4 marks]

(b) Give the IUPAC name of the following compounds:



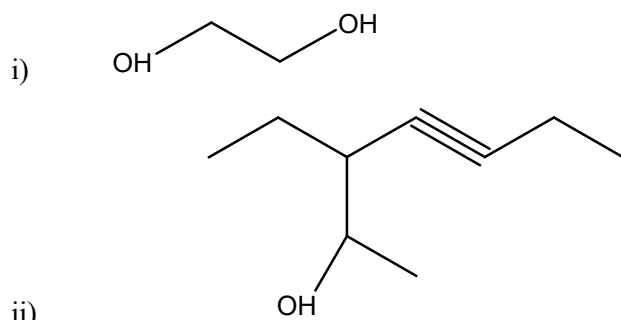
[8 marks]

(c) Explain the following;

- Pentyne is an unsaturated hydrocarbon [2 marks]
- 2-pentanol is comparatively having a high boiling point than hexane [2 marks]

QUESTION FIVE (20 marks)

(a) Give the IUPAC name for each of the following organic compounds:



[4 marks]

(b) Predict the product formed in the following reactions. (2 marks each)

