AS LEVEL CHEMISTRY

TOPIC 7 – INTRODUCTION TO ORGANIC CHEMISTRY

TEST

Answer all questions

Max 50 marks

Name ……..
Mark ……../50 ……....% Grade ……

1. (a) (i) Name the process used to separate petroleum into fractions.

.....

(ii) Give the molecular formula for an alkane with nine carbon atoms.

.....

.....

(iii) Write an equation for the complete combustion of the alkane $C_{11}H_{24}$

.....

(iv) Write an equation for the incomplete combustion of $C_{11}H_{24}$ to produce carbon and water only.

.....

(4)

(b) Alkenes can be produced by cracking the naphtha fraction obtained from petroleum.

(i) Write an equation for the thermal cracking of one molecule of $C_{10}H_{22}$ to give one molecule of propene and one molecule of an alkane only.

.....

(ii) Draw the structure of the chain isomer of but-1-ene.

(2)

(c) The alkanes and the alkenes are examples of homologous series of compounds. One feature of an homologous series is the gradual change in physical properties as the relative molecular mass increases. State **two** other general features of an homologous series of compounds.

Feature 1 .....

.....

Feature 2 .....

.....

(2)
(Total 8 marks)

2. **Q** and **R** have the molecular formula C_6H_{12}

Both are branched-chain molecules and none is cyclic.
Q can represent a pair of geometrical isomers.
R can represent another pair of geometrical isomers different from **Q**.

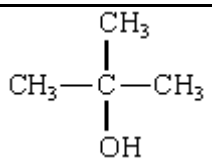
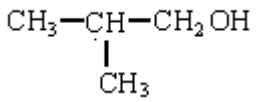
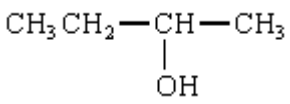
Draw one possible structure for one of the isomers of each of **Q** and **R**.

*Structure of **Q***

*Structure of **R***

(Total 2 marks)

3. Four isomers with the formula C_4H_9OH are given below:

Isomer	Name
$CH_3CH_2CH_2CH_2OH$	butan-1-ol
	2-methylpropan-2-ol
	
	

(i) Complete the naming of the isomers in the table above.

(ii) Name the type of isomerism shown by these four isomers.

.....

(Total 3 marks)

4. Draw and name the geometrical E-Z isomers of pent-2-ene.

Isomer 1 *Isomer 2*

Name .....…..... *Name* .....…..... **(Total 2 marks)**

5. Octane is the eighth member of the alkane homologous series.

(a) State **two** characteristics of a homologous series.

.....

.....

.....

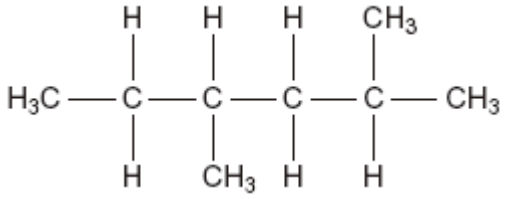
..... **(2)**

(b) Name a process used to separate octane from a mixture containing several different alkanes.

.....

..... **(1)**

(c) The structure shown below is one of several structural isomers of octane.



Give the meaning of the term structural isomerism.
Name this isomer and state its empirical formula.

.....

.....

.....

.....

.....

.....

(4)

(d) Suggest why the branched chain isomer shown above has a lower boiling point than octane.

.....

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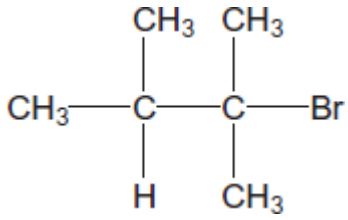
.....

.....

(2)
(Total 9 marks)

6. (a) The structure of the bromoalkane **Z** is



Give the IUPAC name for **Z**.

Give the general formula of the homologous series of straight-chain bromoalkanes that contains one bromine atom per molecule.

Suggest **one** reason why 1-bromohexane has a higher boiling point than **Z**.

.....

.....

.....

.....

.....

(3)

(b) Draw the displayed formula of 1,2-dichloro-2-methylpropane.

State its empirical formula.

.....

.....

(2)

(Total 5 marks)

7. (a) The hydrocarbon but-1-ene (C_4H_8) is a member of the homologous series of alkenes. But-1-ene has structural isomers.

(i) State the meaning of the term *structural isomers*.

.....

.....

.....

.....

(2)

(ii) Give the IUPAC name of the **position** isomer of but-1-ene.

.....

(1)

(iii) Give the IUPAC name of the **chain** isomer of but-1-ene.

.....

(1)

(iv) Draw the displayed formula of a **functional group** isomer of but-1-ene.

(1)

(b) But-1-ene burns in a limited supply of air to produce a solid and water only.

(i) Write an equation for this reaction.

.....

(1)

(ii) State **one** hazard associated with the solid product in part (b)(i).

.....

(1)

(c) One mole of compound **Y** is cracked to produce two moles of ethene, one mole of but-1-ene and one mole of octane (C_8H_{18}) only.

(i) Deduce the molecular formula of **Y**.

.....

(1)

(ii) Other than cracking, give **one** common use of **Y**.

.....

(1)

(d) In cars fitted with catalytic converters, unburned octane reacts with nitrogen monoxide to form carbon dioxide, water and nitrogen only.

(i) Write an equation for this reaction.

.....

(1)

(ii) Identify a catalyst used in a catalytic converter.

.....

(1)

(Total 11 marks)

8. Two stereoisomers of but-2-ene are formed when 2-bromobutane reacts with ethanolic potassium hydroxide.

(i) Explain what is meant by the term *stereoisomers*.

.....

.....

(ii) Draw the structures and give the names of the **two** stereoisomers of but-2-ene.

Stereoisomer 1 *Stereoisomer 2*

Name ..... *Name* .....

(iii) Name this type of stereoisomerism.

.....

(5)

(Total 5 marks)

9. The number of structural isomers of molecular formula C_4H_9Br is

A 5

B 4

C 3

D 2

(Total 1 mark)

10. An alkane contains 30 hydrogen atoms per molecule. Its empirical formula is

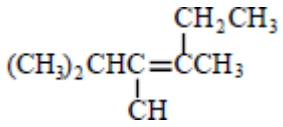
A C_6H_{15}

B C_7H_{15}

C $C_{14}H_{30}$

D $C_{15}H_{30}$

(Total 1 mark)

11. The correct systematic name for  is

A 2-ethyl-3,4-dimethylpent-2-ene

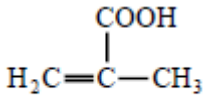
B 4-ethyl-2,3-dimethylpent-3-ene

C 2,3,4-trirnethylhex-3-ene

D 3,4,5-trimethylhex-3-ene

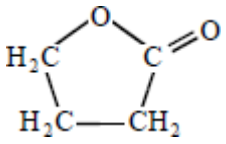
(Total 1 mark)

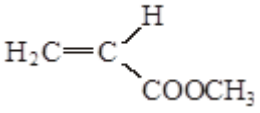
12.

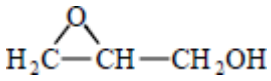


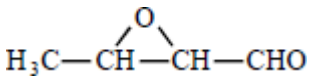
Compound **M**

Which one of the following is **not** a structural isomer of Compound **M**?

A 

B 

C 

D 

(Total 1 mark)

13. The number of structural isomers of $C_3H_2Cl_6$ is

A 2

B 3

C 4

D 5

(Total 1 mark)