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NZQA

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Level 1 Chemistry, 2015

90932 Demonstrate understanding of aspects of carbon chemistry

9.30 a.m. Tuesday 24 November 2015
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of carbon chemistry.	Demonstrate in-depth understanding of aspects of carbon chemistry.	Demonstrate comprehensive understanding of aspects of carbon chemistry.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–10 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

Not Achieved

TOTAL 6

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Annotated Exemplar: Not Achieved

Not Achieved exemplar for 90932 2015		Total score	06
Q	**Grade score**	**Annotation**	
1	N1	The candidate has stated that propane undergoes incomplete combustion when there is a shortage of oxygen. If the candidate had given a product and an observation of incomplete combustion, as well as recognised that propane is a gas at room temperature, this would have provided evidence towards A3.	
2	A3	The candidate has named two processes in part (a), identified that ethene has a double bond, stated one condition for Process 2, and completed the symbol equation for the cracking of dodecane. If the candidate had recognised that crude oil is a mixture of hydrocarbons and named two products of fractional distillation, this would have provided evidence towards A4.	
3	N2	The candidate has drawn the structure of ethanol, identified that alcohols cannot be hydrocarbons because they contain oxygen, and given global warming as an environmental effect from the complete combustion of ethanol. If the candidate had stated that ethanol undergoes complete combustion and given the products, this would have provided evidence towards A3.	

QUESTION ONE

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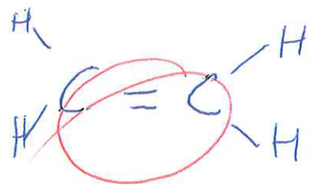
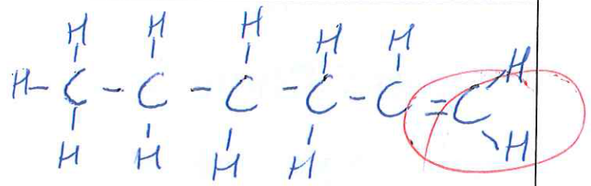
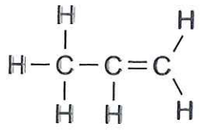
(a) Complete the table below by naming or drawing the structure of each organic compound.

Name	Structure
Methane	
Hexane	
Propane	

(b) Butane and propane are both used as fuel in camping burners.
Propane has a boiling point of −42°C.

(i) What state would propane be at room temperature (18°C)?

Liquid

(ii) State whether the boiling point of butane will be higher or lower than propane.

Give a reason for your answer using your knowledge of the structure and properties of alkanes.

Boiling point of butane would be: **higher** **lower**
(*circle correct answer*)

Reason: There are less particles needing to be heated, so it wouldn't take as long.

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(c) Camping burners usually have a warning notice instructing people to always use them in a well-ventilated place (plenty of oxygen) otherwise serious injury or death may occur.

http://www.huntingandfishing.co.nz/camping-tramping/cookware-coolers/msr-pocket-rocket-stove.html

Elaborate on why this warning is given on camping burners.

Use a burner that contains **propane** as an example.

In your answer, you should:

1. state the type of combustion reaction that occurs when there is a shortage of oxygen
2. describe the observations that may be seen if there was a shortage of oxygen, and link these to the reaction occurring
3. explain two effects that the combustion products can have on human health when there is a shortage of oxygen
4. write a word equation and a balanced symbol equation for the reaction occurring.

1. Incomplete combustion as there needs to be enough Oxygen to combust.
2. The burner would have trouble starting and wouldn't last very long.
3. Humans need Oxygen to breath so if there is a shortness then they will just be breathing in Propane fumes and could be harmful to the body.

4.

Word equation:

propane + oxygen + flame → combustion

Balanced symbol equation:

C_3H_6

N1

QUESTION TWO

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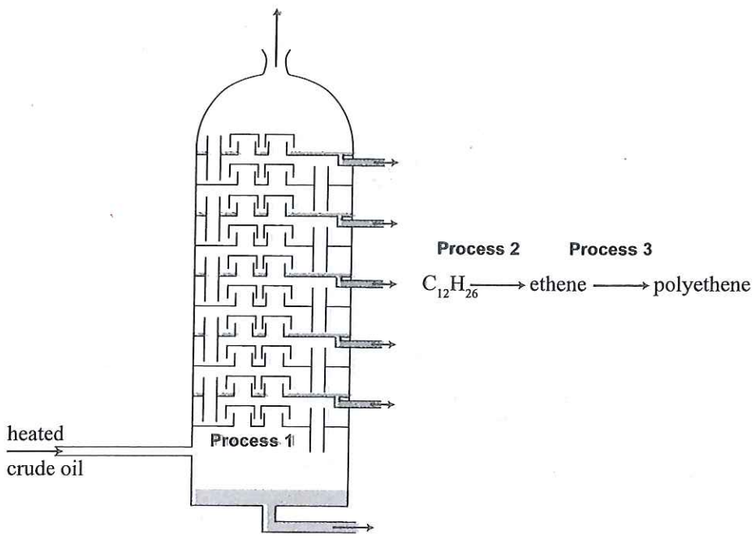
Crude oil, a mixture of many compounds, undergoes several processes to produce useful products. The diagram below shows three of the processes that may be involved.



(a) (i) Give the name of each of the processes identified in the diagram above.

Process	Name of process
1	~~Cracking~~ Distilling
2	Cracking
3	Polymerising

(ii) Explain how the structure of ethene allows it to undergo **Process 3**, to form polyethene.

There is a double bond allowing it to ~~pe~~ break off a bond to connect with the next ethene

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(b) Dodecane, $C_{12}H_{26}$, can be reacted in **Process 2**, to form ethene and octane.

(i) State one condition that is needed during **Process 2**.

heat

(ii) Complete the following symbol equation for the reaction of dodecane during **Process 2**.

Remember to balance the equation.

$C_{12}H_{26} \rightarrow C_2H_4 \; C_2H_4 \; C_8H_{18}$

(c) Give a detailed account of **Process 1**, as shown in the diagram on the opposite page.

In your answer, you should:

- explain why **Process 1** is necessary
- elaborate on what occurs during **Process 1**, and link this to the structure and properties of the hydrocarbons in crude oil.
- name two products, other than dodecane, that are formed during **Process 1**.

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A3

QUESTION THREE

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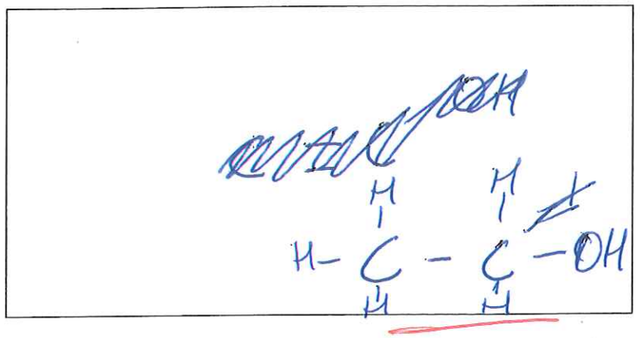
Alcohols, such as ethanol, are carbon compounds, but are not hydrocarbons like alkanes and alkenes.

(a) (i) Draw the structural formula of ethanol in the box below.



(ii) Explain why alcohols are not hydrocarbons, but alkanes and alkenes are.

Because alcohols have an Oxygen so they can't be hydrocarbons.

(iii) Describe how a sample of ethanol could be distinguished from a sample of octane using only water.

Explain how the physical properties of the compounds allow them to be identified in this way.

The ethanol would float to the top, while the octane would sink to the bottom, separating them and ~~disg~~ distinguishing themselves from each other.

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(b) One method of producing ethanol is by fermentation.

Explain how ethanol is produced by fermentation.

In your answer, you should:

- complete the following word equation and balanced symbol equation
- identify and elaborate on any conditions required for fermentation to occur.

Word equation:

glucose + sugar + ~~alcohol~~ juice → ethanol

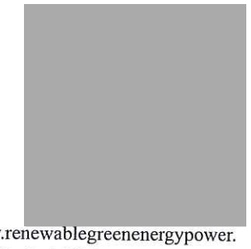
Balanced symbol equation:

$C_6H_{12}O_6 - C_4H_6O_5 \rightarrow C_2OH_6$

heat

(c) Ethanol made from sugar cane can be mixed with petrol to produce a biofuel for cars.

Ethanol burns in air with an almost invisible flame, and has some useful advantages as a biofuel compared to some hydrocarbons found in petrol, such as heptane, C_7H_{16}.



www.renewablegreenenergypower.com/biofuel-101/

Evaluate the use of ethanol in biofuels for cars.

In your answer, you should:

1. state the type of combustion reaction that ethanol usually undergoes, and name the products formed
2. explain two effects that the combustion products of ethanol can have on the environment
3. elaborate on the advantages of using ethanol as a biofuel compared to hydrocarbon fuels, such as those containing heptane
4. include a balanced symbol equation for the combustion of ethanol.

1. ~~Full combustion~~ Full combustion/incomplete //
2. Global warming/pollution.
3. It is more efficient and better for the ~~e~~environment. //

4. Balanced symbol equation:

N2

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Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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