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# Level 1 Chemistry 2020

## 90932 Demonstrate understanding of aspects of carbon chemistry

9.30 a.m. Friday 4 December 2020
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.**

A periodic table and other reference material are provided in the Resource Booklet L1–CHEMR.

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 2–11 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.**

**TOTAL**

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## QUESTION ONE

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(a) Pentane can be used as a fuel.

(i) What conditions are required for the complete combustion of pentane?

(ii) Write a word and a balanced symbol equation for the complete combustion of pentane.

Word equation:

pentane + oxygen →

Balanced symbol equation:

(b) Hexene, $C_6H_{12}$, can undergo incomplete combustion. Two of the four equations below show incomplete combustion of hexene.

(i) Circle the letters of the two equations that show the incomplete combustion of hexene.

| | |
|---|---|
| A | $C_6H_{12} + 6O \rightarrow 6CO + 6H_2$ |
| B | $C_6H_{12} + 9O_2 \rightarrow 6CO_2 + 6H_2O$ |
| C | $C_6H_{12} + 6O_2 \rightarrow 6CO + 6H_2O$ |
| D | $C_6H_{12} + 6O_2 \rightarrow CO_2 + 4CO + C + 6H_2O$ |

(ii) Explain your choices, with reference to all four equations.

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(c) Both the complete and incomplete combustion of pentane can cause environmental effects.

Explain the effects on the environment of both the complete and incomplete combustion of pentane.

## QUESTION TWO

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Ethanol can be made from plants or from crude oil.

(a) **Process 1: from plants**


Elaborate on the process which turns glucose into ethanol.

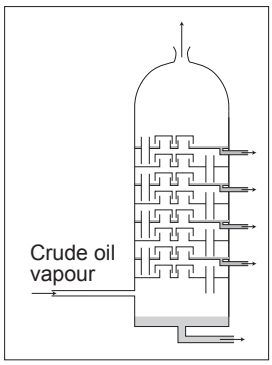
In your answer, you should include:

- the name and a description of the process
- explanations of any conditions required
- a balanced symbol equation for the reaction occurring.

Balanced symbol equation:

(b) **Process 2: from crude oil**

alkanes → ethene → ethanol




The first step in this process involves the separation of crude oil into alkanes, as shown in the diagram on the right.

Name the process by which crude oil is separated into alkanes, and explain why it is carried out in tall towers.

In your answer, you should link the process to the physical properties and chemical structure of the hydrocarbons in crude oil.

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(c) The process of cracking can turn long chain alkanes into alkenes and other products.

(i) Why is the process of cracking necessary when forming ethanol from crude oil?

(ii) Complete the following balanced equations.

The alkane, $C_{12}H_{26}$, forms hexene, ($C_6H_{12}$), butane, and ethene:

$C_{12}H_{26} \rightarrow$

The alkane, $C_{18}H_{38}$, forms butene ($C_4H_8$), hexane, propene, and ethene:

$C_{18}H_{38} \rightarrow$

## QUESTION THREE

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(a) Three hydrocarbons are ethene, propene and propane.

(i) Draw the structural formulae of ethene, propene and propane in the boxes below.

| ethene | propene | propane |
|---|---|---|
| | | |

(ii) Why can polymers be made from ethene and propene, but not from propane?

In your answer, you should:

- describe how the polymers are made from ethene or propene, including any conditions required
- refer to the structures of the different hydrocarbons.

(iii) In the box below, draw TWO repeating units of the polymer made from **propene**.

**Question Three continues on the following page.**

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(iv) Plastic bags can be made of the polymer polyethene. Supermarkets in New Zealand no longer give out these bags.

Explain why polyethene is useful for making plastic bags, and why they are no longer given out in supermarkets.

In your answer, you must refer to the physical and / or chemical properties of polyethene.

(b) An unknown liquid is known to be methanol or octane. When a sample of the unknown liquid is added to water in a test tube, two layers form. When a small sample of the unknown liquid is heated on the end of a spatula, a smoky flame is seen.

Circle the unknown liquid below:

**Methanol** **Octane**

Explain your choice.

In your answer, you should refer to both methanol and octane.

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

QUESTION NUMBER

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