90932M

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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Te Mātauranga Matū, Kaupae 1, 2014

90932M Te whakaatu māramatanga ki ētahi āhuatanga o te matū ā-waro

9.30 i te ata Rāapa 19 Whiringa-ā-rangi 2014
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ētahi āhuatanga o te matū ā-waro.	Te whakaatu māramatanga hōhonu ki ētahi āhuatanga o te matū ā-waro.	Te whakaatu māramatanga matawhānui ki ētahi āhuatanga o te matū ā-waro.

Tirohia mehemea e ōrite ana te Tau Ākonga ā-Motu (NSN) kei tō pepa whakauru ki te tau kei runga ake nei.

Me whakautu e koe ngā pātai KATOA kei roto i te pukapuka nei.

Ki te hiahia koe ki ētahi atu wāhi hei tuhituhi whakautu, whakamahia te (ngā) whārangi kei muri i te pukapuka nei, ka āta tohu ai i ngā tau pātai.

Tirohia mehemea kei roto nei ngā whārangi 2–21 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

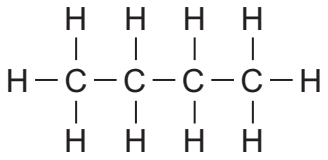
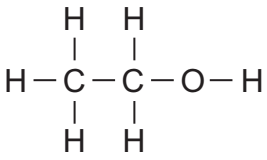
TAPEKE

MĀ TE KAIMĀKA ANAKE

PĀTAI TUATAHI: NGĀ PŪHUI WHAIWARO

MĀ TE KAIMĀKA ANAKE

(a) Whakaotia te tūtohi e whai nei mā te whakaingoa, te tātuhi rānei i te hanganga o ia pūhui whaiwaro.

	Ingoa	Hanganga
(i)		
(ii)	hewaro	
(iii)	waiwaro rua pōwaro	
(iv)		

QUESTION ONE: ORGANIC COMPOUNDS

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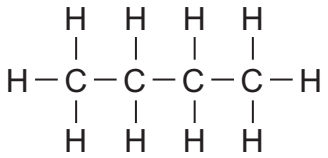
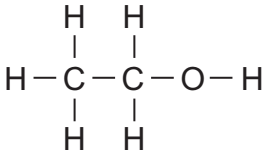
(a) Complete the following table by naming or drawing the structure of each organic compound.

	Name	Structure
(i)		
(ii)	heptane	
(iii)	propene	
(iv)		

He pūhui whaiwaro ngā waiwaro tahi me ngā waiwaro rua i takea mai i ngā ngota waro me te hauwai.

MĀ TE KAIMĀKA ANAKE

(b) Whakaingoatia te momo honohono ka puta i waenga i ngā ngota i roto i ēnei pūhui whaiwaro.

Whakamāramahia tō whakautu.

(c) Whakamāramahia mai he pēhea te pānga o te honohono matū i roto i ngā waiwaro tahi me ngā waiwaro rua ki te āhua o te whakamahitanga.

I tō whakautu:

- hōmai ngā tikanga tātai whānui o ngā waiwaro tahi me ngā waiwaro rua
- whakaahuahia ngā ōritetanga me ngā rerekētanga i roto i te honohono matū
- tautohua kia KOTAHI te whakamahitanga o ngā waiwaro tahi, o ngā waiwaro rua hoki
- tūhonoa te honohono matū ki te āhuatanga, ngā āhuatanga rānei o ia momo pūhui e pai ai mō te whakamahitanga kua tohua.

Alkanes and alkenes are organic compounds made up of carbon and hydrogen atoms.

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(b) Name the type of bonding that occurs between the atoms in these organic compounds.

Explain your answer.

(c) Explain how the chemical bonding in alkanes and alkenes affects the way they are used.

In your answer:

- give the general formulae of alkanes and alkenes
- describe the similarities and differences in chemical bonding
- identify ONE common use for each of alkanes and alkenes
- link the chemical bonding to the property or properties of each type of compound that makes them suitable for the identified use.

PĀTAI TUARUA: TE WĀWĀHITANGA ME NGĀ WAERAU

MĀ TE KAIMĀKA ANAKE

Ko te wāwāhitanga he tukanga e whakamahia ana ki te wāwāhi haere i ngā waiwaro tahi mekameka roa e kitea ana i roto i te hinu nuku[1], ki ngā rāpoi ngota iti ake.

(a) Whakaotia tētahi whārite tohu taurite hei whakaatu he pēhea te wāwāhi a te waiwaro tahi mekameka roa, a te ngawaro, $C_{10}H_{22}$, ki te hanga i te pēwaro, te waiwaro rua ewaro, me te waiwaro rua pōwaro.

$$C_{10}H_{22} \xrightarrow{\text{whākōkī whakawera}} \quad + \quad +$$

(b) Whakamāramahia te take me wāwāhi ētahi waiwaro tahi mekameka roa.

He rāpoi ngota tino nui ngā waerau i hangaia mai i ngā wae tāruarua tino iti.

(c) Whakamārama mai he aha i taea ai te whakamahi tētahi waiwaro rua pēnei i te waiwaro rua ewaro ki te hanga waerau, engari kāore e taea e te waiwaro tahi pēnei i te ewaro.

Ka taea e koe te tuhi hoahoa hoki mō tō whakamārama.

[1] hinu māori

MĀ TE KAIMĀKA ANAKE

(d) Whakamahia ai ngā waerau ki te mahi kirihou.

He raruraru nō te ao whānui te parahanga kirihou, ā, ko te nuinga o te para kirihou ka mutu atu ki roto i ō tātau moana. Ka rewa[2] te waiwaro rua ewarorau (polyethene*) me te waiwaro rua pōwarorau (polypropene**) i runga moana, me te huihui hei moutere para kirihou nui e rewa ana i te tūtakitanga o ngā ia moana.

Whakamārama mai he aha ngā waerau waiwaro rua ewarorau me te waiwaro rua pōwarorau i hono ai hei moutere kirihou e rewa ana.

I tō whakautu:

- whakaahuahia te hanganga matū me te honohono o ēnei waerau
- whakamāramahia te tauhohenga matū o ēnei waerau.

[2] mānu
*polythene
**polypropylene

QUESTION TWO: CRACKING AND POLYMERS

ASSESSOR'S USE ONLY

Cracking is a process used to break down the long-chain alkanes found in crude oil, into smaller molecules.

(a) Complete a balanced symbol equation to show how the long-chain alkane decane, $C_{10}H_{22}$, breaks down to form pentane, ethene, and propene.

$$C_{10}H_{22} \xrightarrow{\text{heated catalyst}} \quad + \quad +$$

(b) Explain why some long-chain alkanes need to undergo cracking.

Polymers are very large molecules made up of many small repeating units.

(c) Explain why an alkene such as ethene can be used to make polymers, while an alkane such as ethane cannot.

You may draw diagrams as part of your explanation.

ASSESSOR'S USE ONLY

(d) Polymers are used in the production of plastics.

Plastic pollution is becoming a planet-wide problem, with much of the waste plastic ending up in our oceans. Polyethene (polythene) and polypropene (polypropylene) both float on the ocean's surface, forming part of the large floating islands of plastic waste that form where ocean currents meet.

Explain why the polymers polyethene and polypropene form part of these floating islands of plastic.

In your answer:

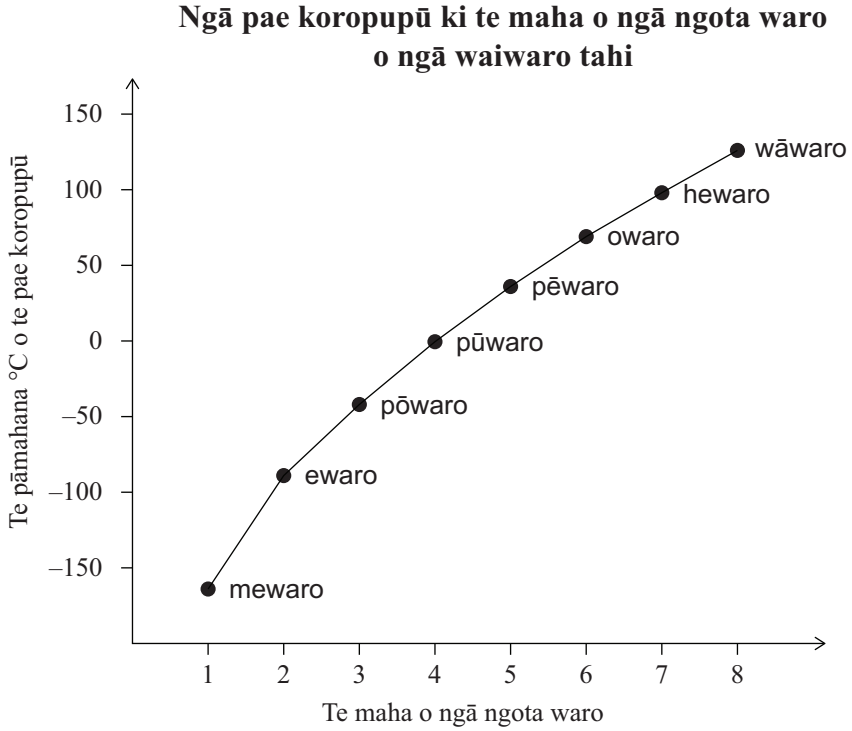
- describe the chemical structure and bonding of these polymers
- explain the chemical reactivity of these polymers.

PĀTAI TUATORU: NGĀ ĀHUATANGA ŌKIKO

MĀ TE KAIMĀKA ANAKE

(a) Tautuhia te tikanga o te kōrero 'pae koropupū'.

E whakaaturia ana ngā pae koropupū o ētahi waiwaro tahi ki te kauwhata i raro.



(b) Tātarihia te ia o ngā pae koropupū o ngā waiwaro tahi tuatahi e waru, e ai ki te kauwhata i runga.

I tō whakautu:

- whakaahuahia te ia
- whakamāramahia he aha i puta ai tēnei ia.

MĀ TE KAIMĀKA ANAKE

(c) Ka memeha katoa te waihā ewaro i roto i te wai, kaua te ewaro. He iti ake te pae koropupū o te ewaro i tō te waihā ewaro.

Whakatauritea ngā hanganga matū me te honohono o te ewaro me te waihā ewaro hei whakamārama i te rerekētanga i roto i ēnei āhuatanga ōkiko.

I tō whakautu:

- whakaahuahia ngā hanganga me te honohono matū o te ewaro me te waihā ewaro
- tūhonoa te honohono matū me te hanganga ki ia āhuatanga ōkiko, arā, te mehameha i roto i te wai me te pae koropupū, mō te ewaro me te waihā ewaro.

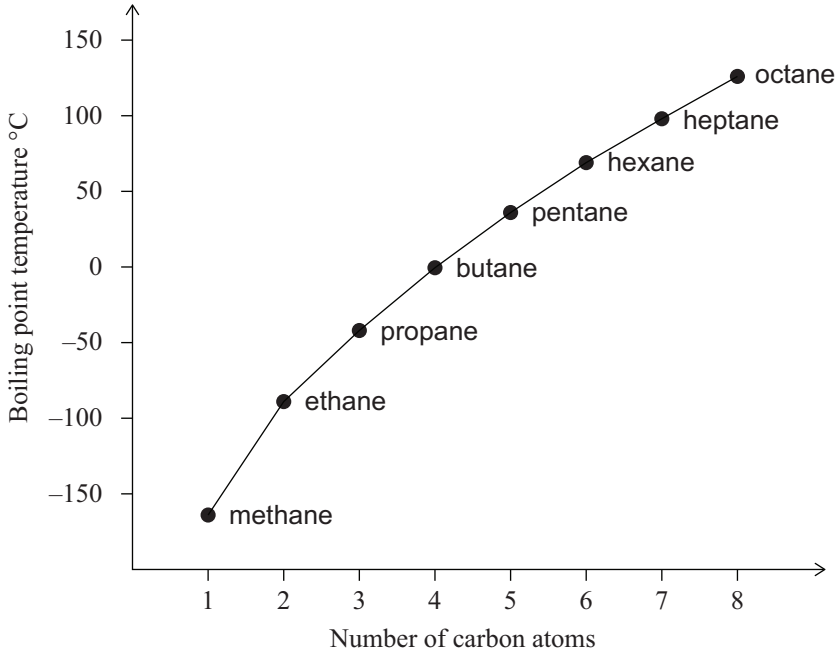
QUESTION THREE: PHYSICAL PROPERTIES

ASSESSOR'S USE ONLY

(a) Define the term 'boiling point'.

The boiling points of some alkanes are shown in the graph below.

Boiling points vs number of carbon atoms of alkanes



(b) Analyse the trend in boiling points of the first eight alkanes, as shown in the graph above.
In your answer:

- describe the trend
- explain why this trend occurs.

ASSESSOR'S USE ONLY

(c) Ethanol is soluble in water, ethane is not. Ethane has a much lower boiling point than ethanol.

Compare and contrast the chemical structures and bonding of ethane and ethanol to explain the difference in these physical properties.

In your answer:

- describe the structures and chemical bonding of ethane and ethanol
- link the chemical bonding and structure to each of the physical properties – solubility in water and boiling point – for both ethane and ethanol.

PĀTAI TUAWHĀ: TE WAIHĀ MEWARO MAI I TE KAPUNI

MĀ TE KAIMĀKA ANAKE

Ka whakaputaina te waihā mewaro i Aotearoa mai i te kapuni, arā, te mewaro, i ngā papa kapuni o Taranaki.

(a) Tātuhia ngā hanganga matū mō te mewaro me te waihā mewaro

Mewaro	Waihā mewaro

(b) Tuhia ngā whārite tohu taurite mō ngā tauhohenga e rua e pā ana ki te whakanaotanga o te waihā mewaro mai i te mewaro.

(i) **Tauhohenga 1:** Ka tauhohea te mewaro me te korohū mā te whakamahi i tētahi whākōkī konukōreko, Ni, me tētahi whakawera kaha, kia puta ai te haukino me te hauwai.

(ii) **Tauhohenga 2:** Ka tauhohea te haukino me te hauwai i te 250^{o}C mā te whakamahi i tētahi whākōkī konukura-konutea, Cu-Zn, kia puta ai te waihā mewaro.

QUESTION FOUR: METHANOL FROM NATURAL GAS

ASSESSOR'S USE ONLY

In New Zealand methanol is produced from natural gas, methane, extracted from the Taranaki gas fields.

(a) Draw the chemical structures for methane and for methanol.

Methane	Methanol

(b) Write balanced symbol equations for both of the reactions involved in the production of methanol from methane.

(i) **Reaction 1:** Methane and steam are reacted using a nickel catalyst, Ni, and a strong heat source, to form carbon monoxide gas and hydrogen gas.

(ii) **Reaction 2:** Carbon monoxide gas and hydrogen gas are reacted at 250^{o}C using a copper-zinc catalyst, Cu-Zn, to form methanol.

(c) E tino whakamahia ana te waihā mewaro me te mewaro i roto i ngā kora.

Ka tahu te waihā mewaro me tētahi mura kua tata te kanokore. Mēnā he iti te hāora, he karaka te mura o te mewaro.

Whakamāramahia te tukanga me ngā pānga o te tauhohe ngingiha[3] oti me te tauhohe ngingiha otikore, mā te whakamahi i te waihā mewaro me te mewaro hei tauira.

I tō whakautu:

- whakaahuahia ngā momo tauhohenga ngingiha e rua
- āta whakamāramahia tētahi pānga KOTAHI o te ngingiha oti ME te ngingiha otikore ki te hauora tangata, ki te taiao RĀNEI
- me hāngai tō whakamāramatanga ki te ngingiha o te waihā mewaro me te mewaro
- tuhia kia KOTAHI te whārite tohu taurite tōtika.

Whārite tohu taurite:

He wāhi anō mō tō whakautu ki tēnei pātai kei te whārangi 18.

MĀ TE KAIMĀKA ANAKE

[3] tahu

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(c) Methanol and methane are commonly used in fuels.

Methanol burns with an almost colourless flame. Methane, if there is a limited supply of oxygen, burns with an orange flame.

Explain the process and effects of complete and incomplete combustion reactions, using methanol and methane as examples.

In your answer:

- describe both types of combustion reactions
- elaborate on ONE effect each of complete AND incomplete combustion can have on EITHER human health OR the environment
- relate your explanation to the combustion of methanol and methane
- write ONE appropriate balanced symbol equation.

Balanced symbol equation:

There is more space for your answer to this question on page 19.

MĀ TE KAIMĀKA ANAKE

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He puka anō mēnā ka hiahiatia.
Tuhia te (ngā) tāu pātai mēnā e hāngai ana.

TAU PĀTAI

MĀ TE KAIMĀKA ANAKE

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

QUESTION NUMBER

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English translation of the wording on the front cover

Level 1 Chemistry, 2014

90932 Demonstrate understanding of aspects of carbon chemistry

9.30 am Wednesday 19 November 2014
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.

90932M

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 space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–21 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.