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91165M



911655



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## Te Mātauranga Matū, Kaupae 2, 2021

### 91165M Te whakaatu māramatanga ki ngā āhuatanga o ētahi pūhui whaiwaro

Ngā whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā āhuatanga o ētahi pūhui whaiwaro.	Te whakaatu māramatanga hōhonu ki ngā āhuatanga o ētahi pūhui whaiwaro.	Te whakaatu māramatanga matawhānui ki ngā āhuatanga o ētahi pūhui whaiwaro.

Tirohia mēnā e rite ana te Tau Ākonga ā-Motu (NSN) kei runga i tō puka whakauru ki te tau kei runga i tēnei whārangi.

**Me whakamātau koe i ngā tūmahi KATOĀ kei roto i tēnei pukapuka.**

He taka pūmotu kua whakaritea ki te Pukapuka Rauemi L2–CHEMMR.

Ki te hiahia koe ki ētahi atu wāhi hei tuhituhi whakautu, whakamahia te wāhi wātea kei muri i te pukapuka nei.

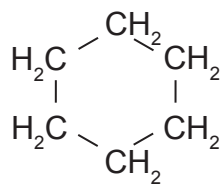
Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–25 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

Kaua e tuhi ki roto i tētahi wāhi kauruku whakahāngai (X). Ka tapahia pea tēnei wāhi ina mākahia te pukapuka.

**ME HOATU RAWA KOE I TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE Ā TE MUTUNGA O TE WHAKAMĀTAUTAU.**

## TŪMAHI TUATAHI

E whakaaturia ana ētahi waiwaro tahi me ētahi waiwaro rua i te tūtohi i raro nei. Kōrerohia mō ēnei pūhui hei whakautu i ngā wāhanga (a) ki (c).

$\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{CH}_3$ <p style="text-align: center;"><b>Pūhui 1</b></p>	 <p style="text-align: center;"><b>Pūhui 2</b></p>
$\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_2 - \text{CH}_3$ <p style="text-align: center;"><b>Pūhui 3</b></p>	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$ <p style="text-align: center;"><b>Pūhui 4</b></p>

(a) E RUA ngā pūhui kei te tūtohi i runga ake he poinanaha hanganga tētahi i tētahi.

(i) Porohitatia aua pūhui e rua i raro.

**Pūhui 1      Pūhui 2      Pūhui 3      Pūhui 4**

(ii) Parahautia ō kōwhiringa.

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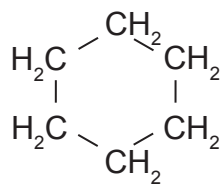
(b) Ka taea te **Pūhui 3** mai i te tūtohi te waihanga poinanaha āhuahanga (*cis/trans*).

(i) Tātuhia ngā poinanaha āhuahanga o taua pūhui.

Poinanaha <i>Cis</i>	Poinanaha <i>Trans</i>

### QUESTION ONE

A variety of alkanes and alkenes are shown in the table below. Refer to these compounds in order to answer parts (a) to (c).

$\text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}_3$ <p style="text-align: center;"><b>Compound 1</b></p>	 <p style="text-align: center;"><b>Compound 2</b></p>
$\text{CH}_3-\text{CH}_2-\text{CH}=\text{CH}-\text{CH}_2-\text{CH}_3$ <p style="text-align: center;"><b>Compound 3</b></p>	$\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3$ <p style="text-align: center;"><b>Compound 4</b></p>

(a) TWO compounds in the table above are constitutional (structural) isomers of one another.

(i) Circle these two compounds below.

**Compound 1**

**Compound 2**

**Compound 3**

**Compound 4**

(ii) Justify your choices.

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(b) **Compound 3** from the table can form geometric (*cis*/*trans*) isomers.

(i) Draw the geometric isomers of this compound.

<i>Cis</i> isomer	<i>Trans</i> isomer

- |   |   |
|---|---|
| $\text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}_3$ <p style="text-align: center;"><b>Pūhui 1</b></p> | $\text{CH}_3-\text{CH}_2-\text{CH}=\text{CH}-\text{CH}_2-\text{CH}_3$ <p style="text-align: center;"><b>Pūhui 3</b></p> |
|---|---|

I tō tuhinga me:

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(ii) Elaborate on the features of **Compound 3** that allow it to form geometric isomers.

(c) **Compound 1** and **Compound 3** will both react with hydrogen bromide, HBr. However, in one case, two organic products are formed, while in the other, only one organic product is produced.

$\text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}_3$ <p style="text-align: center;"><b>Compound 1</b></p>	$\text{CH}_3-\text{CH}_2-\text{CH}=\text{CH}-\text{CH}_2-\text{CH}_3$ <p style="text-align: center;"><b>Compound 3</b></p>
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Analyse the reactions of **Compound 1** and **Compound 3** with hydrogen bromide, HBr.

In your answer you should:

- state the type of reaction occurring and justify your choice
- give the structural formulae of all products, and identify major/minor products where appropriate
- explain how the major and minor products were identified.

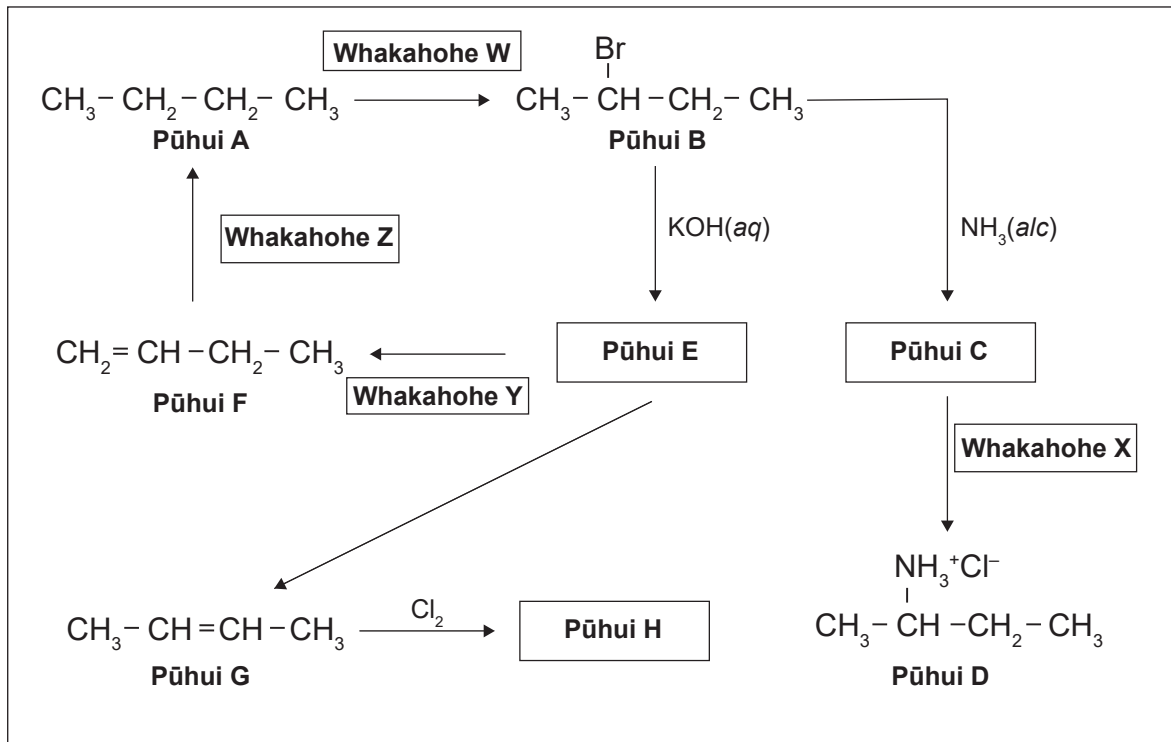
*There is more space for  
your answer to this question  
on the following pages.*





## TŪMAHI TUARUA

(a) Kei raro ko tētahi mahere tauhohe otikore.



(i) Tātuhia ngā ture tātai hanganga o ngā **Pūhui C**, **E** me te **H** i te tūtohi i raro.

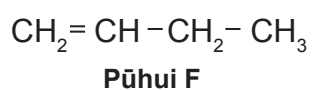
<b>Pūhui C</b>	<b>Pūhui E</b>	<b>Pūhui H</b>



- (ii) Tuhia ngā ture tātai mō ngā **Whakahohe W, X, Y** me te **Z** tae atu ki ngā āhuatanga e hiahiatia ana mō ngā **Whakahohe W** me te **Z**.

	Ture tātai mō te whakahohe	Ngā āhuatanga e hiahiatia ana
<b>Whakahohe W</b>		
<b>Whakahohe X</b>		
<b>Whakahohe Y</b>		
<b>Whakahohe Z</b>		

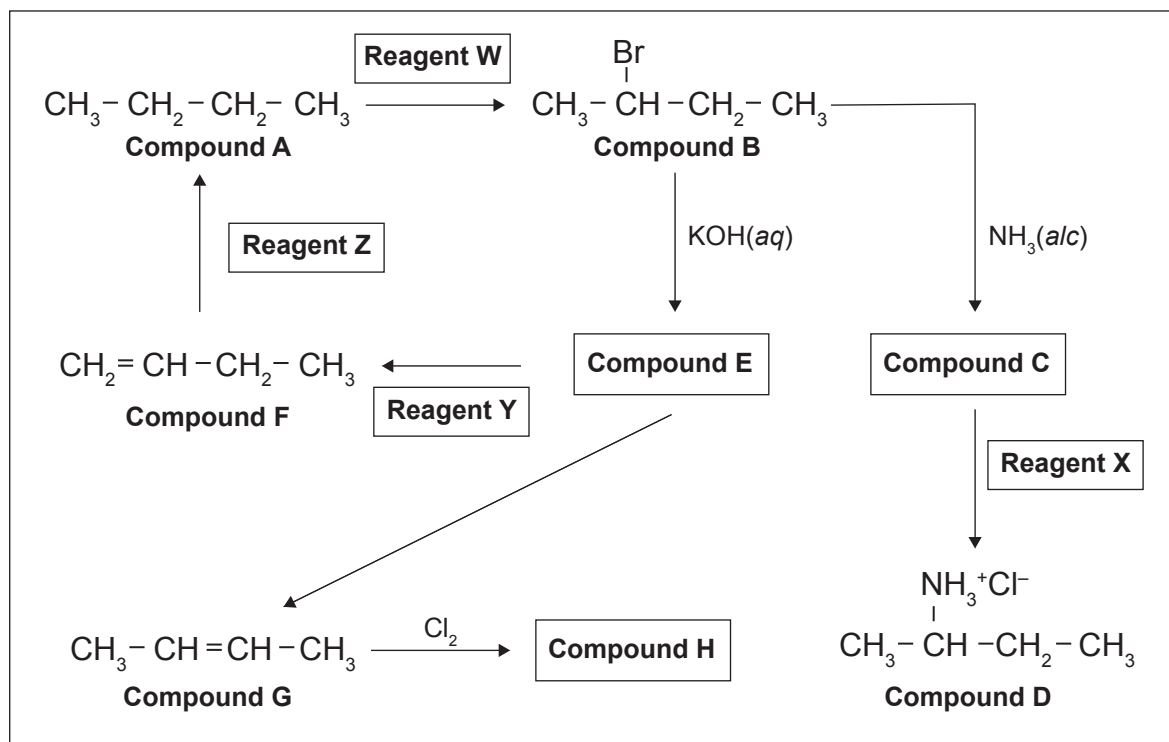
- (b) Kōrerotia te hoahoa tauhohenga kei te wāhanga (a) mō ngā wāhanga (i) me te (ii) i raro.  
Ka taea e te **Pūhui F** te whakahaere tauhohe whakawaerautanga tāpiri.



- (i) Tātuhia ngā wae tāruarua e TORU o te waerau i hangaia mai i te **Pūhui F**.

## QUESTION TWO

(a) An incomplete reaction scheme is given below.



(i) Draw the structural formulae of **Compounds C, E, and H** in the table below.

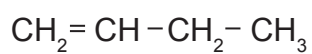
<b>Compound C</b>	<b>Compound E</b>	<b>Compound H</b>

- (ii) Give the formulae of **Reagents W**, **X**, **Y**, and **Z** along with any necessary conditions for **Reagents W** and **Z**.

	Formula of reagent	Conditions required
<b>Reagent W</b>		
<b>Reagent X</b>		
<b>Reagent Y</b>		
<b>Reagent Z</b>		

- (b) Refer to the reaction scheme in part (a) for parts (i) and (ii) below.

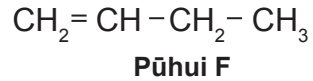
**Compound F** can undergo addition polymerisation reactions.



**Compound F**

- (i) Draw THREE repeat units of the polymer formed from **Compound F**.

- (ii) Tē taea e te **Pūhui A** te whakawaerautanga tāpiri.



I tō tuhinga me:



(c) Whakaotihia te tūtohi e whai ake nei.

Pūhui	Ingoa nahanaha IUPAC
$\text{CH}_3 - \text{CH}_2 - \text{NH}_2$	
	2,2-haukōwhai-rua pūwaro
	waikawa pūwaro 3-mewaro
$  \begin{array}{c}  \text{CH}_3 - \text{CH}_2 - \text{CH} - \text{CH}_2 - \text{CH}_3 \\    \\  \text{CH}_2 \\    \\  \text{CH}_3  \end{array}  $	

(c) Complete the following table.

Compound	IUPAC (systematic name)
$\text{CH}_3 - \text{CH}_2 - \text{NH}_2$	
	2,2-difluorobutane
	3-methylbutanoic acid
$  \begin{array}{c}  \text{CH}_3 - \text{CH}_2 - \text{CH} - \text{CH}_2 - \text{CH}_3 \\    \\  \text{CH}_2 \\    \\  \text{CH}_3  \end{array}  $	

## TŪMAHI TUATORU

- (a) Kei roto ngā ingoa me ngā hanganga tōtā o ētahi waiwaihā me ētahi waiwaro tahi whāpāhare i te tūtohi i raro.
- (i) Whakaotihia te tūtohi mā te whakarōpū i ia matū hei waiwaihā/waiwaro tahi whāpāhare tuatahi, tuarua, tuatoru rānei.

Pūhui	Hanganga	Whakarōpūtanga (tuatahi, tuarua, tuatoru rānei)
waihā-1-pōwaro	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{OH}$	
waihā-2-pōwaro mewaro	$\begin{array}{c} \text{OH} \\   \\ \text{H}_3\text{C} - \text{C} - \text{CH}_3 \\   \\ \text{CH}_3 \end{array}$	
pēwaro-3-pūhaumāota	$\begin{array}{c} \text{Cl} \\   \\ \text{CH}_3 - \text{CH}_2 - \text{CH} - \text{CH}_2 - \text{CH}_3 \end{array}$	
waihā ewaro	$\text{CH}_3 - \text{CH}_2 - \text{OH}$	

- (ii) Whakamāramatia te rerekētanga o te whakarōpūtanga o te waihā-1-pōwaro ina whakatauritea ki te waihā-2-pōwaro mewaro.

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### QUESTION THREE

(a) The names and condensed structures of several alcohols and haloalkanes are given in the table below.

(i) Complete the table by classifying each as primary, secondary, or tertiary alcohols/haloalkanes.

Compound	Structure	Classification (primary, secondary, or tertiary)
propan-1-ol	$\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{OH}$	
methylpropan-2-ol	$\begin{array}{c} \text{OH} \\   \\ \text{H}_3\text{C} - \text{C} - \text{CH}_3 \\   \\ \text{CH}_3 \end{array}$	
3-chloropentane	$\begin{array}{c} \text{Cl} \\   \\ \text{CH}_3 - \text{CH}_2 - \text{CH} - \text{CH}_2 - \text{CH}_3 \end{array}$	
ethanol	$\text{CH}_3 - \text{CH}_2 - \text{OH}$	

(ii) Explain the difference in classification of propan-1-ol compared with methylpropan-2-ol.

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- (b) Whakamāramatia mai me pēhea tō wehewehe i waenga i te takirua e whai ake o ngā pūhui mā te whakamahi i ngā āhuatanga matū.

Whakaurua ngā kitenga me ngā ture tātai hanganga o ngā hua whaiwaro katoa.

E whāiti ana te tautohu matū ki te whakamahinga o te mehanga wai pūkane,  $\text{Br}_2(aq)$ , te konurehu pāporo waiwai RĀNEI kua whakawaikawatia,  $\text{KMnO}_4/\text{H}^+(aq)$ .

- (i) waihā-1-pōwaro me te pēwaro-3-pūhaumāota

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- (ii) waihā-1-pōwaro me te waiwaro rua-1-pēwaro ( $\text{CH}_2=\text{CHCH}_2\text{CH}_2\text{CH}_3$ )

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- (b) Explain how you could distinguish between the following pairs of compounds using their chemical properties.

Include observations and the structural formulae of any organic product(s).

Chemical identification is limited to the use of bromine water solution,  $\text{Br}_2(aq)$ , OR aqueous acidified potassium permanganate,  $\text{KMnO}_4/\text{H}^+(aq)$ .

- (i) propan-1-ol and 3-chloropentane

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- (ii) propan-1-ol and pent-1-ene ( $\text{CH}_2=\text{CHCH}_2\text{CH}_2\text{CH}_3$ )

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- He wē ngā matū e toru katoa i te pāmahana rūma.

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- All three substances are liquids at room temperature.

Question Three  
continues on page 23.

- tuhi ngā āhuatanga e hiahiatia ana mō ia tauhohe
- tuhi ngā ture tātai hanganga o ngā hua whaiwaro mō ia tauhohe
- tautohu te momo tauhohenga ka puta i ia wā, me te parahau i tō kōwhiringa.

- Give an account of the chemical process that occurs in each reaction.  
In your answer you should:

**He whārangi anō ki te hiahiatia.  
Tuhia te (ngā) tau tūmahi mēnā e tika ana.**

TAU TŪMAHI



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

QUESTION  
NUMBER





*English translation of the wording on the front cover*

## Level 2 Chemistry 2021

### 91165M Demonstrate understanding of the properties of selected organic compounds

Credits: Four

91165MM

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of the properties of selected organic compounds.	Demonstrate in-depth understanding of the properties of selected organic compounds.	Demonstrate comprehensive understanding of the properties of selected organic compounds.


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 is provided in the Resource Booklet L2–CHEMMR.

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

Check that this booklet has pages 2–25 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (). This area may be cut off when the booklet is marked.

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