91391M

913915

3

SUPERVISOR'S USE ONLY

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

Te Mātauranga Matū, Kaupae 3, 2015

91391M Te whakaatu māramatanga ki ngā āhuatanga o ngā pūhui whaiwaro

2.00 i te ahiahi Rāapa 11 Whiringa-ā-rangi 2015
Whiwhinga: Rima

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā āhuatanga o ngā pūhui whaiwaro.	Te whakaatu māramatanga hōhonu ki ngā āhuatanga o ngā pūhui whaiwaro.	Te whakaatu māramatanga matawhānui ki ngā āhuatanga o ngā 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 KATOA kei roto i tēnei pukapuka.

He taka pūmotu kua whakaritea ki te Puka Rauemi L3-CHEMMR.

Mēnā ka hiahia whārangi atu anō koe mō ō tuhinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i te tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–21 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

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

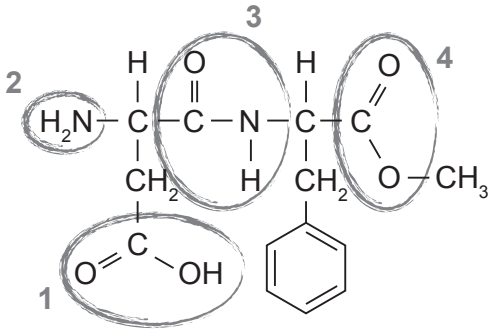
TAPEKE

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI

MĀ TE KAIMĀKA ANAKE

(a) E whakaaturia ana te hanganga o te aspartame i raro. E whakamahia ana te aspartame hei whakareka horihori i roto i ngā inu.



Tautuhia ngā rōpū mahinga rerekē e WHĀ i roto i te rāpoi ngota aspartame e porohitatia, kua whai tau hoki i runga:

1	
3	

2	
4	

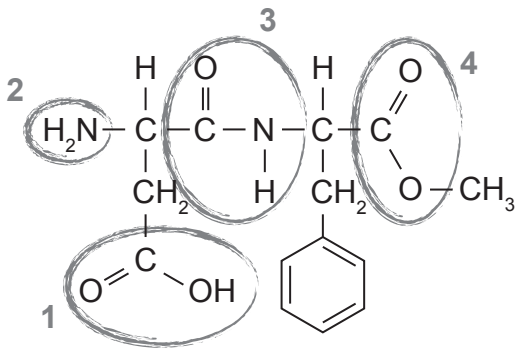
(b) Whakaotihia te tūtohi i raro mā te tātuhi i te ture tātai hanganga mō ngā pūhui kua whakaingoatia.

Ingoa nahanaha IUPAC	Ture tātai hanganga
powaro pūhaumāota (propanoyl chloride)	
3-pūkane hāparo-rua-pēwaro-2 (3-bromopentan-2-one)	
2-mewaro hāparo-tahi-pūwaro (2-methylbutanal)	

QUESTION ONE

ASSESSOR'S USE ONLY

(a) The structure of aspartame is given below. Aspartame is often used as an artificial sweetener in drinks.



Identify the FOUR different functional groups within the aspartame molecule that are circled and numbered above:

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

(b) Complete the table below by drawing the structural formula for the named compounds.

IUPAC systematic name	Structural formula
propanoyl chloride	
3-bromopentan-2-one	
2-methylbutanal	

(c) (i) Ki ngā pouaka i raro, tātuhia ngā poinahanaha hanganga e toru o te C_4H_9Cl e tohu ana i tētahi waiwaro tahi whāpāhare tuatahi, tuarua me te tuatoru.

MĀ TE KAIMĀKA ANAKE

Waiwaro tahi whāpāhare tuatahi	Waiwaro tahi whāpāhare tuarua

Waiwaro tahi whāpāhare tuatoru

(ii) Whakawhānuitia ngā tauhohenga e puta ana i te wā e hohe ana ia poinahanaha waiwaro tahi whāpāhare i (c)(i) ki te KOH i roto i te waiwaihā.

I tō tuhinga me whakauru e koe:

- ngā hua whaiwaro KATOA ka puta
- tētahi whakamāramatanga o te momo tauhohenga kei te mahi
- ngā putake mō te hanganga o ngā hua nui, iti rānei mēnā ka puta ētahi.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei te whārangi 6.

ASSESSOR'S USE ONLY

(c) (i) In the boxes below, draw the three structural isomers of C_4H_9Cl that represent a primary, secondary and tertiary haloalkane.

Primary haloalkane	Secondary haloalkane

Tertiary haloalkane

(ii) Elaborate on the reactions occurring when each of the haloalkane isomers from (c)(i) reacts with KOH in alcohol.

In your answer you should include:

- the identification of ALL organic products formed
- an explanation of the type of reaction taking place
- reasons for the formation of any major and minor products.

There is more space for your answer to this question on page 7.

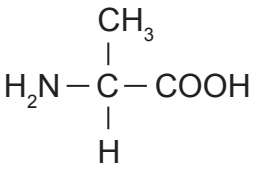
MĀ TE KAIMĀKA ANAKE

ASSESSOR'S USE ONLY

TŪMAHI TUARUA

MĀ TE KAIMĀKA ANAKE

Ko te aranina (alanine) he waikawa amino. E whakaaturia ana i raro nei tōna hanganga.



(a) (i) Whakaahuahia te āhuatanga hanganga e hiahiatia ana kia noho hei poinanaha whakaata (poinanaha ōmata).

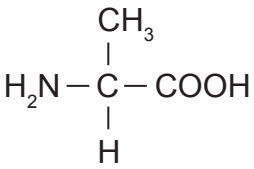
(ii) Tautuhia tētahi āhuatanga ōkiko e ōrite ana mō ngā poinanaha whakaata e rua o te aranina, me tētahi mea rerekē, mā te whakaahua he pēhea te whakamahi i tēnei āhuatanga hei wehewehe i ngā poinanaha whakaata.

(b) Tātuhia ngā hanganga ahu-3 o ngā poinanaha whakaata o te aranina ki ngā pouaka i raro.

QUESTION TWO

ASSESSOR'S USE ONLY

Alanine is an amino acid. Its structure is shown below.



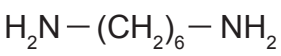
(a) (i) Describe the structural feature necessary for a compound to exist as enantiomers (optical isomers).

(ii) Identify one physical property that is the same for both enantiomers of alanine, and one that is different, clearly describing how this property could be used to distinguish between the enantiomers.

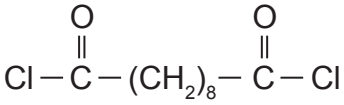
(b) Draw 3-D structures of the enantiomers of alanine in the boxes below.

(c) Ka taea tētahi tūmomo o te waerau ngaiaku (nylon) te mahi mai i ngā waetahi e rua i raro.

1,6-aminorua owaro



Hepakoira pūhaumāota (decanedioyl dichloride)



(i) Ki te pouaka i raro tātuhia te wae tāruarua o te waerau ka puta mēnā ka whakamahia ngā waetahi e rua.

Me whai whakaaro ki te hanganga o tēnei momo ngaiaku i roto i tētahi taiwhanga.

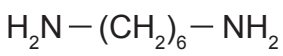
(ii) Whakaahuatia te momo tauhohenga ka puta me te whakamārama hoki i te take ko te otinga o tēnei tauhohenga he waerau.

(iii) Whakamāramahia te take ka memeha te hepakoira pūhaumāota i roto i tētahi tāmeha whaiwaro pitokore kē, kaua i te wai.

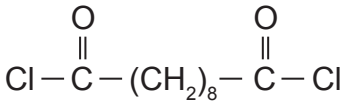
ASSESSOR'S USE ONLY

(c) A form of the polymer nylon can be made from the two monomers below.

1,6-diaminohexane



Sebacoyl chloride (decanedioyl dichloride)



(i) In the box below draw the repeating unit of the polymer formed if these two monomers are used.

Consider the formation of this form of nylon in a laboratory.

(ii) Describe the type of reaction occurring, and explain why this reaction results in a polymer.

(iii) Explain why sebacoyl chloride is dissolved in a non-polar organic solvent rather than in water.

(iv) Āta whakamāramahia ngā kōrero mō te tauhohenga ka puta mēnā ka whakaranutia he waikawa waimeha ki te waerau hou.

MĀ TE KAIMĀKA ANAKE

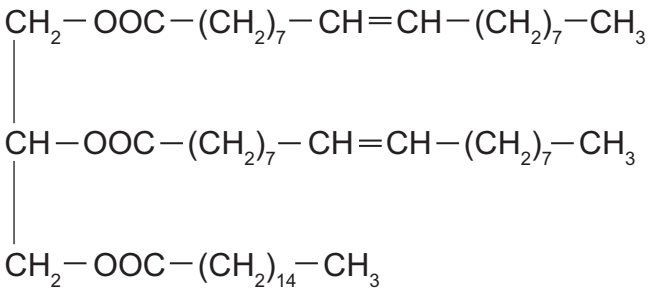
(iv) Elaborate on the reaction that will occur if a dilute aqueous solution of acid is mixed with the newly formed polymer.

ASSESSOR'S USE ONLY

TŪMAHI TUATORU

MĀ TE KAIMĀKA ANAKE

(a) Kei te hākawa toru nonireka (triglyceride) te hanganga e whai ake:



(i) Porohitatia tētahi o ngā rōpū waiwaro rua i roto i te rāpoi ngota hākawa toru nonireka.

E kīia ana tēnei hākawa toru nonireka he hamanga.

(ii) Whakaahuahia tētahi whakamātautau matū ka taea te whakamahi hei whakaatu he hamanga te rāpoi ngota.

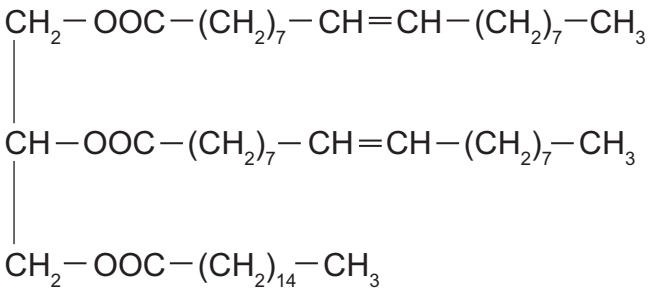
Tukuna mai ngā kitenga, ā, ka tuhi i te momo tauhohe kei te puta.

(iii) Tātuhia te ture tātai hanganga o ngā hua whaiwaro ka puta i te whakapāheko ā-wai (hydrolysis) o tēnei hākawa toru nonireka mā te whakamahi i te konutai waihā waiwai.

QUESTION THREE

ASSESSOR'S USE ONLY

(a) A triglyceride has the following structure:



(i) Circle one of the alkene groups in the triglyceride molecule.

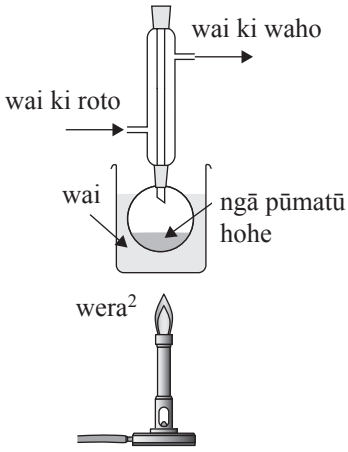
This triglyceride is described as unsaturated.

(ii) Describe a chemical test that can be used to show that the molecule is unsaturated.
Give any observations, and state the type of reaction occurring.

(iii) Draw the structural formulae of the organic products formed by hydrolysis of this triglyceride using aqueous sodium hydroxide.

(iv) Whakamāramahia te take ka whakamahia ngā utauta[1] i raro mō te whakapāheko ā-wai o te hākawa toru nonireka.

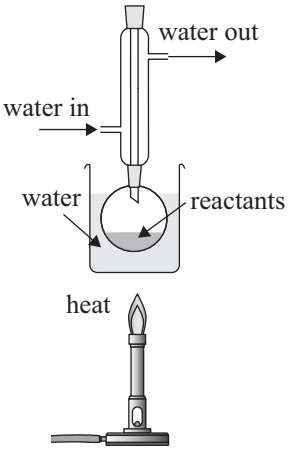
MĀ TE KAIMĀKA ANAKE



[1] taputapu
[2] pōkākā

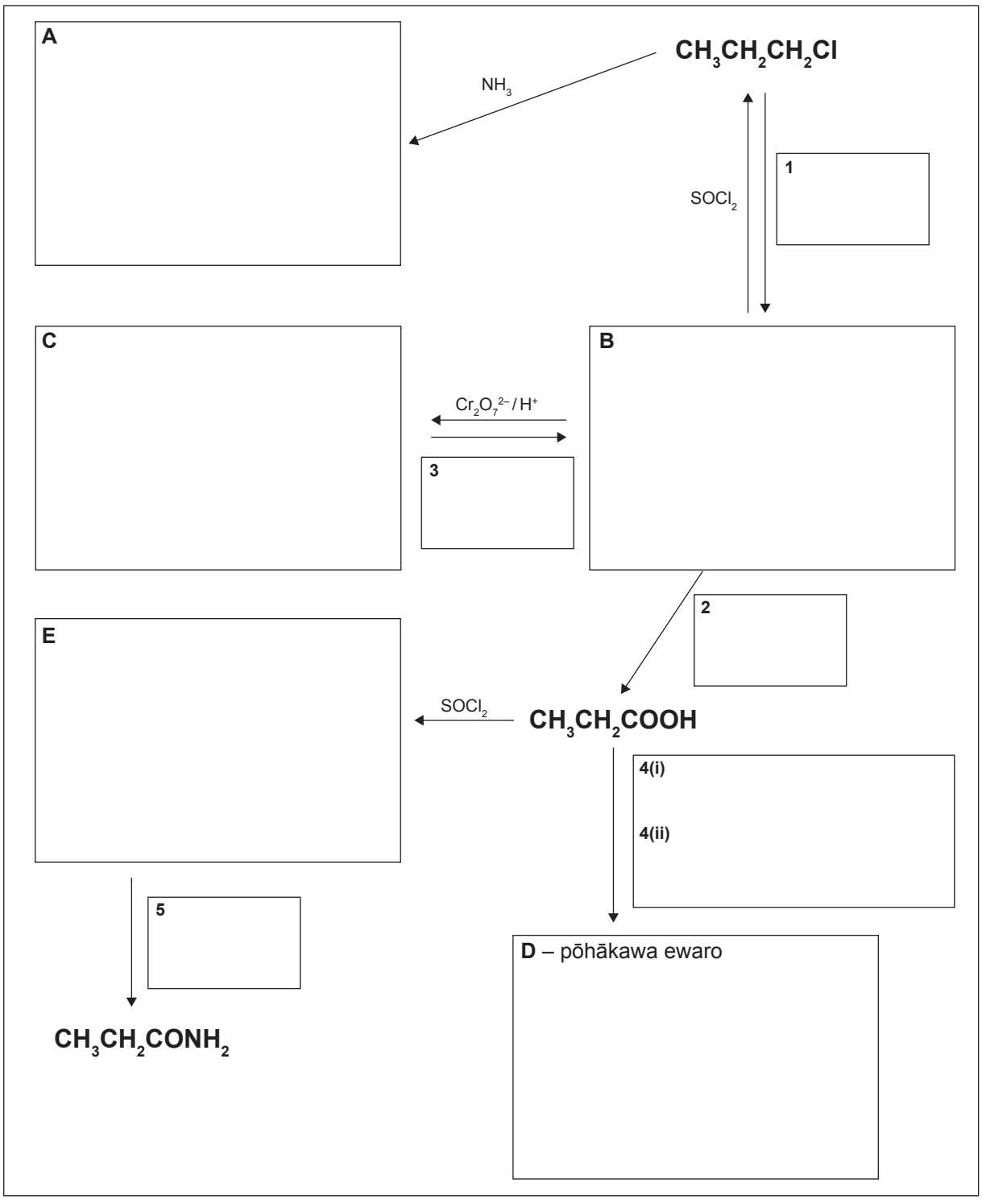
(iv) Explain why the equipment below is used for hydrolysis of the triglyceride.

ASSESSOR'S USE ONLY



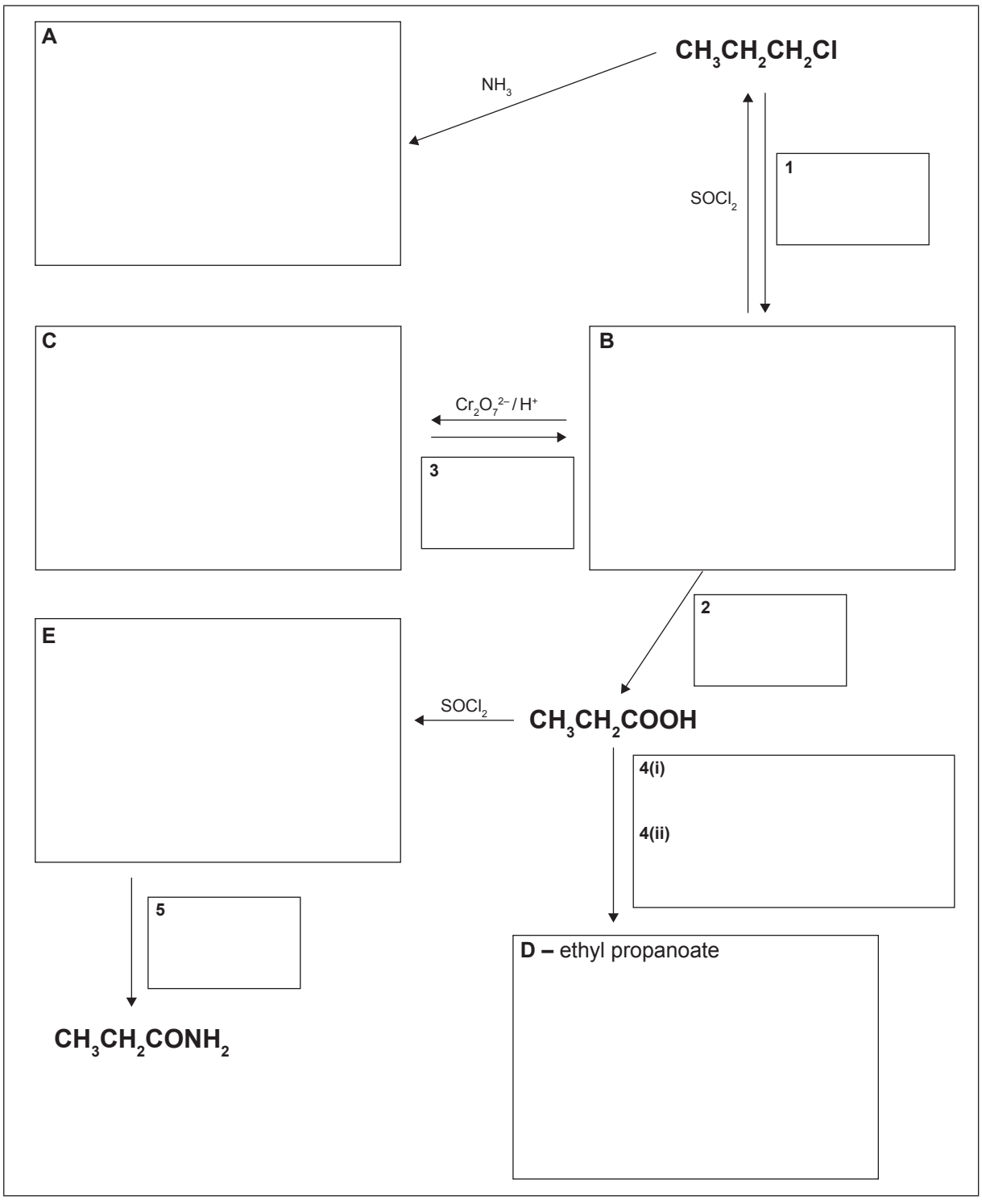
(b) Whakaotia te mahere tauhohe e whai ake mā te tātuhi i ngā ture tātai hanganga o ngā pūhui whaiwaro **A** ki te **E**, me te tautuhi i ngā whakahohe **1** ki te **5**.

MĀ TE KAIMĀKA ANAKE



(b) Complete the following reaction scheme by drawing the structural formulae of the organic compounds **A** to **E**, and identifying reagents **1** to **5**.

ASSESSOR'S USE ONLY



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

TAU TŪMAHI

MĀ TE KAIMĀKA ANAKE

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

English translation of the wording on the front cover

Level 3 Chemistry, 2015

91391M Demonstrate understanding of the properties of organic compounds

2.00 p.m. Wednesday 11 November 2015
Credits: Five

91391M

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of the properties of organic compounds.	Demonstrate in-depth understanding of the properties of organic compounds.	Demonstrate comprehensive understanding of the properties of 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 on the Resource Sheet L3–CHEMMR.

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 2–21 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.