For Supervisor's use only

3

90698

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Level 3 Chemistry, 2006

90698 Describe aspects of organic chemistry

Credits: Five
9.30 am Monday 27 November 2006

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 answer ALL the questions in this booklet.

Show all working for all calculations.

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 2–11 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.

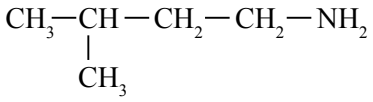
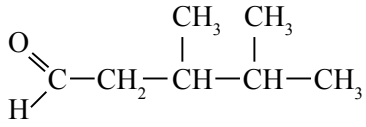
For Assessor's use only	**Achievement Criteria**				
Achievement		**Achievement with Merit**		**Achievement with Excellence**	
Describe aspects of organic chemistry.		Explain and apply aspects of organic chemistry.		Discuss aspects of organic chemistry.	
Overall Level of Performance					

You are advised to spend 40 minutes answering the questions in this booklet.

Assessor's use only

QUESTION ONE: ISOMERS

(a) Complete the following table to show the systematic (IUPAC) name and structural formula for each of the four compounds.

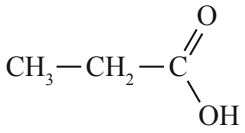
(i) Structural formula: 	(ii) Structural formula:
Name:	Name: butanamide
(iii) Structural formula: 	(iv) Structural formula:
Name:	Name: propanoyl chloride

(b) An alcohol ($C_4H_{10}O$) can exist as **optical** isomers (enantiomers).

Draw three-dimensional structures that show the relationship between the two enantiomers.

Assessor's use only

(c) (i) Draw and name a **structural** (constitutional) isomer of



Structural formula of isomer:
Name of isomer:

(ii) Discuss the differences in chemical and physical properties between samples of these two structural isomers.

QUESTION TWO: POLYMERS

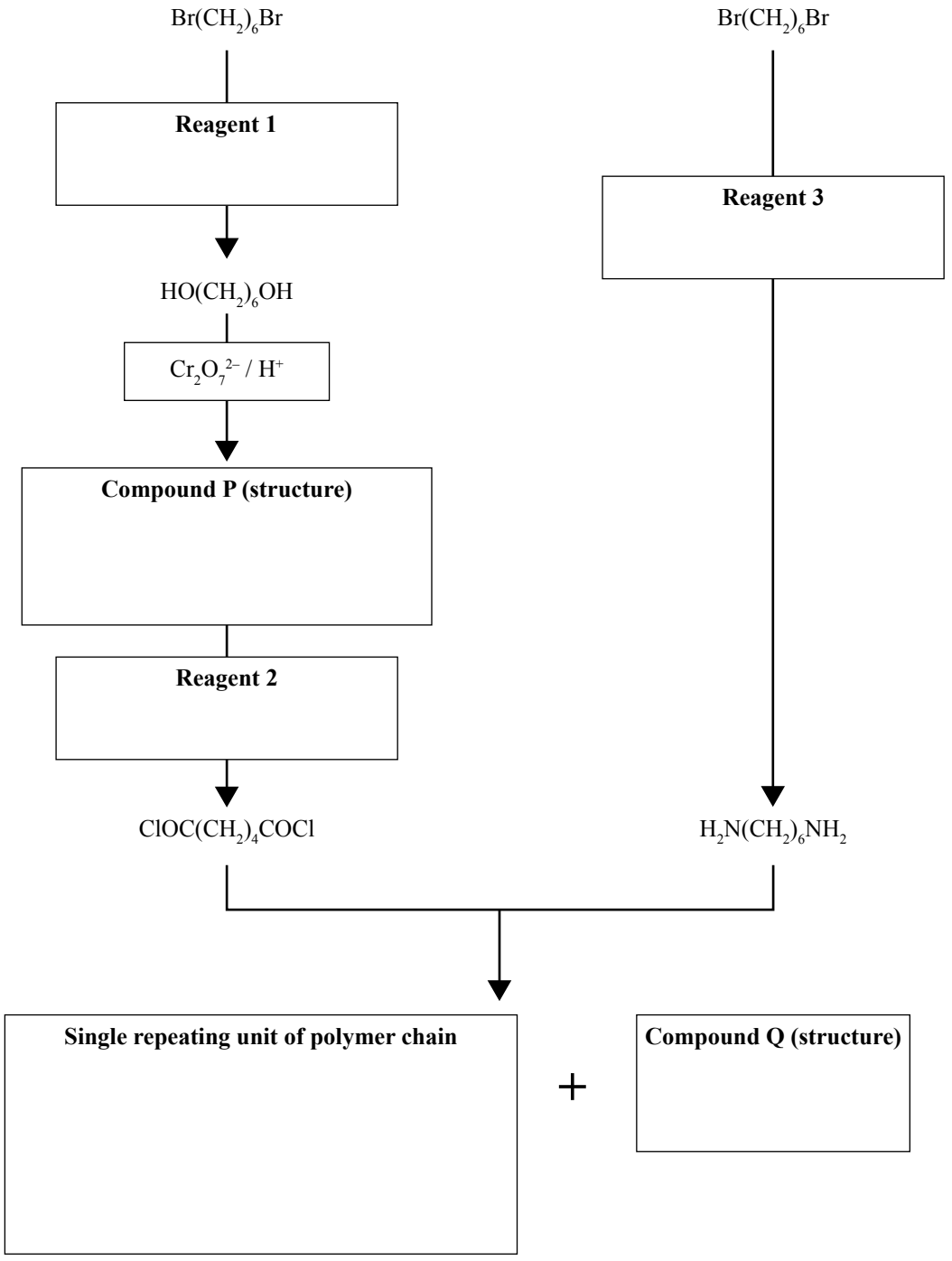
Assessor's use only

(a) The reaction scheme below shows formation of a section of a nylon polymer chain. Complete the reaction scheme by:

(i) identifying reagents 1, 2 and 3,

(ii) drawing the structures of compounds P and Q,

(iii) drawing a single repeating unit for the nylon polymer formed.



(b) Nylon is used as a fibre to manufacture ropes and fabrics. These products can be damaged if they come into contact with acidic solutions.

Teflon is a polymer formed from $F_2C=CF_2$ and is not affected by contact with acidic solutions.

Discuss why nylon is affected by acidic solutions while Teflon is not. Use structural formulae and equations where appropriate.

Assessor's use only

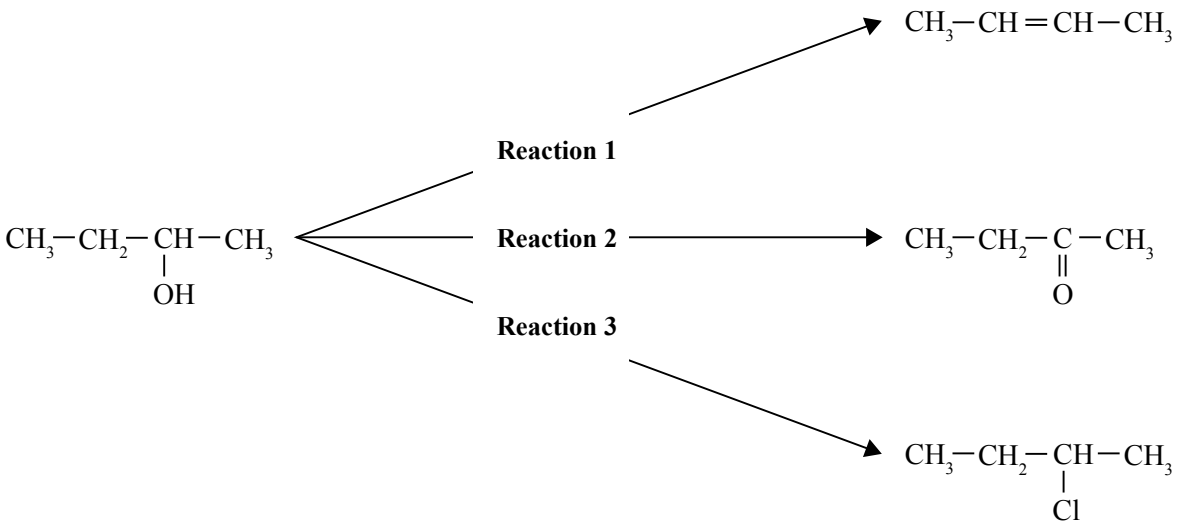
QUESTION THREE: REACTIONS

Assessor's use only

(a) For each reaction below, identify:

(i) the type of reaction,

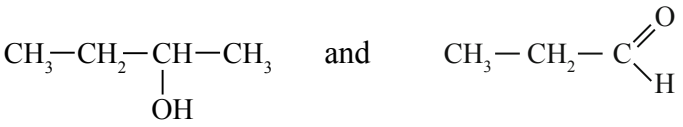
(ii) the reagent required to carry out the reaction.

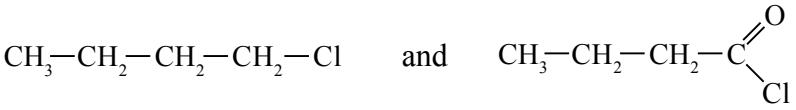


Reaction	(i) Type of reaction	(ii) Reagent required
1		
2		
3		

(b) Describe a chemical test that would distinguish between each of the following pairs of substances. For each test, identify the **reagents** used, and link the **observations** to any reactions that may or may not occur.

Assessor's use only

(i)  and

(ii)  and

Assessor's use only

(c) A student thoroughly mixed 20 mL of concentrated hydrochloric acid with 10 mL of 2-methylpropan-2-ol.

(i) Describe any observation that could be made as a result of the reaction occurring.

_____

_____

_____

(ii) Draw and name the structure of the organic product.

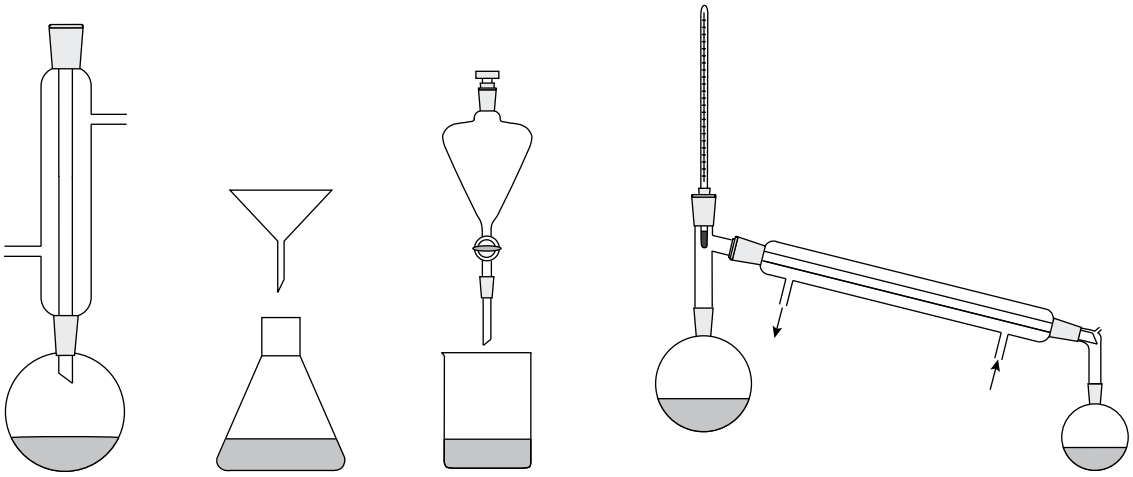
Structure:
Name:

Assessor's use only

(iii) In the preparation on page 8, the *impure organic product was initially separated* from the reaction mixture. **Aqueous sodium carbonate** was added to the organic product and when reaction ceased, the *organic product was again separated*. **Anhydrous magnesium sulfate** was added to the organic product, which was then transferred to a flask and *purified by distillation*.

(1) Explain why each of the substances identified in **bold** above was added.

The diagrams below show four different experimental arrangements of equipment.



A B C D

(2) Using one or more of the sets of apparatus shown, discuss how each of the separation processes, identified in *italics* above, is carried out.

Assessor's use only

Extra paper for continuation of answers if required.
Clearly number the question.

Assessor's use only

Question number	