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90698

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

National Certificate of Educational Achievement
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Level 3 Chemistry, 2005

90698 Describe the structure and reactions of organic compounds containing selected organic groups

Credits: Four
9.30 am Wednesday 23 November 2005

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.

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 2–9 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 the structure and reactions of organic compounds containing selected functional groups.	Apply principles of the organic chemistry of selected functional groups.	Analyse information and apply principles of organic chemistry to problems that require integration of ideas.
Overall Level of Performance		

You are advised to spend 35 minutes answering the questions in this booklet.

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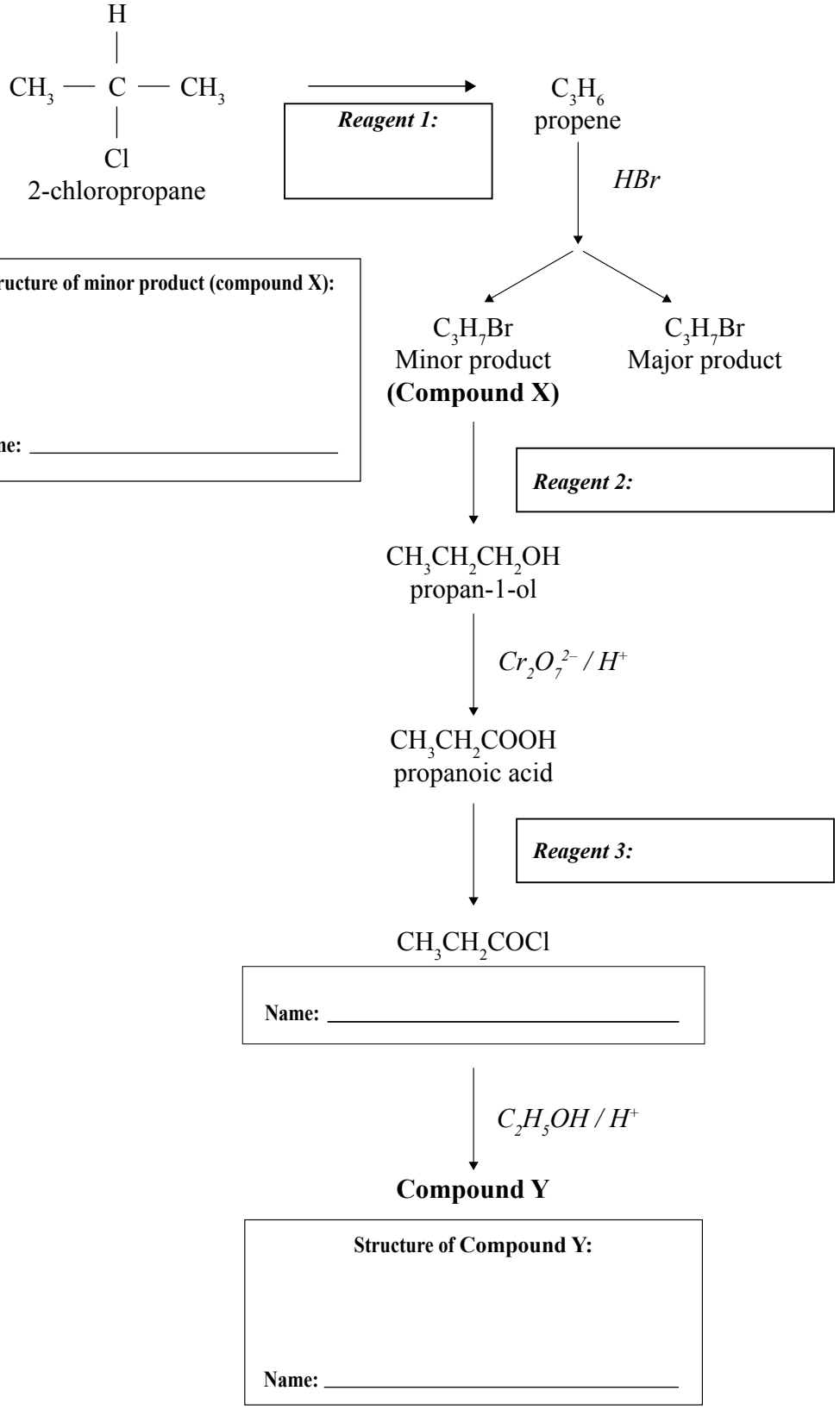
QUESTION ONE: ORGANIC REACTIONS

(a) Complete the reaction scheme below by:
- (i) identifying the three reagents
- (ii) drawing the structures of compounds X and Y
- (iii) naming organic compounds X and Y, and the compound with formula CH_3CH_2COCl



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(b) Each of the parts (i) – (iii) below refers to one step in the reaction scheme on page 2. For each part, identify the **type of reaction** (from the given list) and use the reaction in that step to explain the term.

addition, elimination, oxidation, polymerisation, substitution

(i) 2-chloropropane is converted to propene.

This reaction is _____ because

_____

_____

(ii) Compound X (the minor product) is converted to propan-1-ol.

This reaction is _____ because

_____

_____

(iii) Propan-1-ol is converted to propanoic acid.

This reaction is _____ because

_____

_____

(c) When HBr is reacted with propene, there are TWO possible products. Discuss how the compounds formed in this reaction scheme (on page 2) would vary if these two products were not separated before reagent 2 is added.

_____

_____

_____

_____

_____

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_____

QUESTION TWO: ISOMERS

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Compounds A to F are all isomers of molecular formula $\mathbf{C_4H_8O}$.

(a) **Compound A** can exist as two **enantiomers** (optical isomers). It contains two different functional groups – an alcohol (OH^-) group and an alkene group.

Draw 3-dimensional structures for **both enantiomers** that clearly show the relationship between them.

(b) Two compounds **(B and C)** have the same molecular formula, C_4H_8O. They are ***cis-trans* isomers** that contain a primary alcohol group. Both compounds rapidly decolourise bromine solution.

Draw the structural formulae of compounds B and C.

Compound B is the ***cis*** isomer

Compound C is the ***trans*** isomer

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(c) **Compound D**, an isomer of compound A with molecular formula C_4H_8O, will react with both Tollens' reagent and Benedict's solution.

(i) Draw the structural formula of compound D and give its systematic name.

Compound D

Name: _____

(ii) State the observations that would be expected when compound D reacts with:

1. Tollens' reagent

_____

_____

_____

2. Benedict's solution

_____

_____

_____

(d) **Compounds E and F** have molecular formula C_4H_8O. Compounds E and F do not have the same functional group. Neither of these compounds reacts with Tollens' reagent or Benedict's solution and they do not rapidly decolourise bromine solution. Only **compound F** reacts with acidified potassium dichromate.

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Give the structural formulae for compound E and compound F.

Compound E	**Compound F**

QUESTION THREE: POLYMERS

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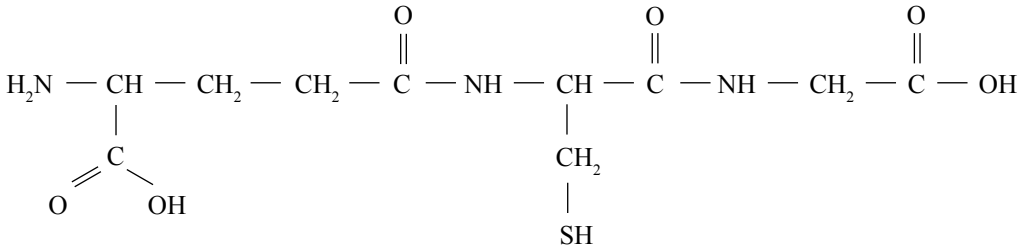
(a) Gluthathione (GSH) is one of the most common small peptides in animals, plants and bacteria.



(i) Draw a circle around one of the amide (peptide) groups.

(ii) Draw structures of the products of the hydrolysis of this compound using alkaline conditions (NaOH) **and** compare with the structures of the hydrolysis products under acidic conditions.

(b) Consider the following statement.

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Polyesters *are* ***polymers*** *that can be made from two different* ***monomers*** *or from a single monomer.*

Discuss this statement, using the structures of specific monomers and the polyesters that can be made from them, to illustrate your answer. Your answer should demonstrate a clear understanding of the highlighted terms.

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

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Question number	