

90698

Level 3 Chemistry, 2005

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

Credits: Four

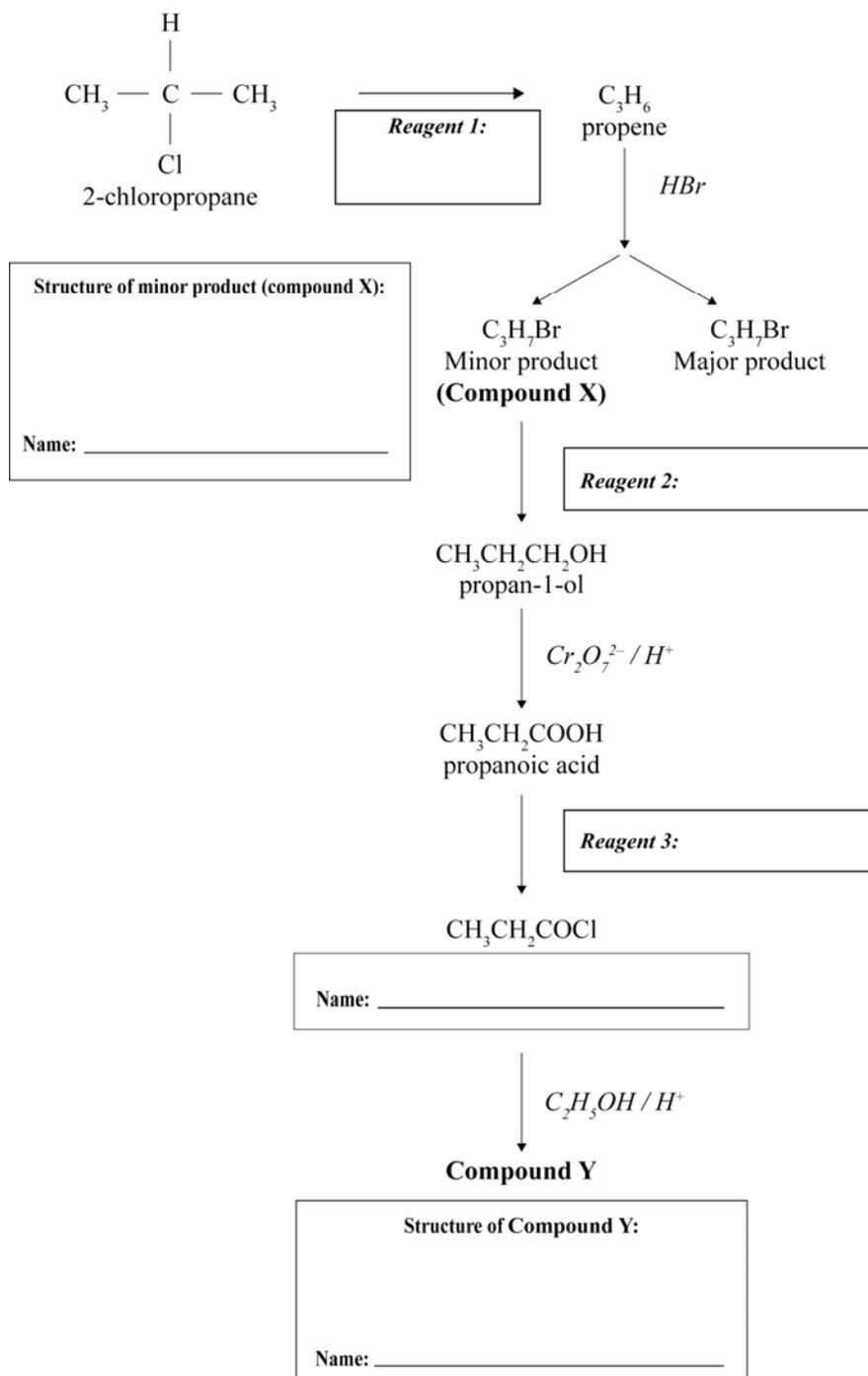
You should answer ALL the questions in this booklet.

<i>For Assessor's use only</i>		
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.

QUESTION ONE: ORGANIC REACTIONS

- (a) Complete the reaction scheme below by:
- identifying the three reagents
 - drawing the structures of compounds X and Y
 - naming organic compounds X and Y, and the compound with formula $\text{CH}_3\text{CH}_2\text{COCl}$



- (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.

QUESTION TWO: ISOMERS

Compounds A to F are all isomers of molecular formula **C₄H₈O**.

- (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

- (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.

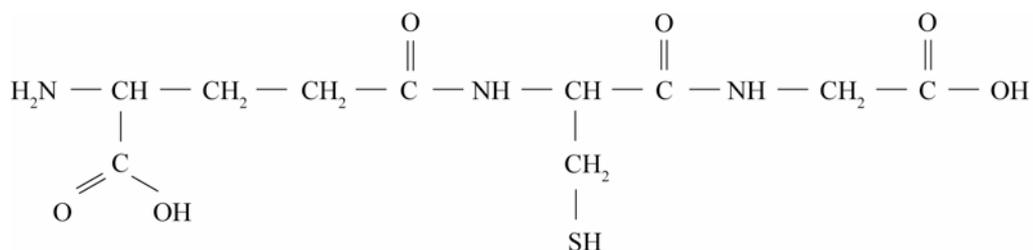
Give the structural formulae for compound E and compound F.

Compound E

Compound F

QUESTION THREE: POLYMERS

- (a) Glutathione (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.

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.