

90698

Level 3 Chemistry, 2006

90698 Describe aspects of organic chemistry

Credits: Five

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 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.

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: $\begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}_2-\text{NH}_2 \\ \\ \text{CH}_3 \end{array}$
Name:

(ii) Structural formula:
Name: butanamide

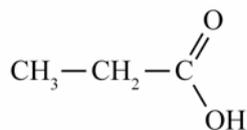
(iii) Structural formula: $\begin{array}{c} \text{O} \\ \parallel \\ \text{H}-\text{C}-\text{CH}_2-\text{CH}-\text{CH}-\text{CH}_3 \\ \quad \\ \text{CH}_3 \quad \text{CH}_3 \end{array}$
Name:

(iv) Structural formula:
Name: propanoyl chloride

- (b) An alcohol ($\text{C}_4\text{H}_{10}\text{O}$) can exist as **optical** isomers (enantiomers).

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

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



Structural formula of isomer:

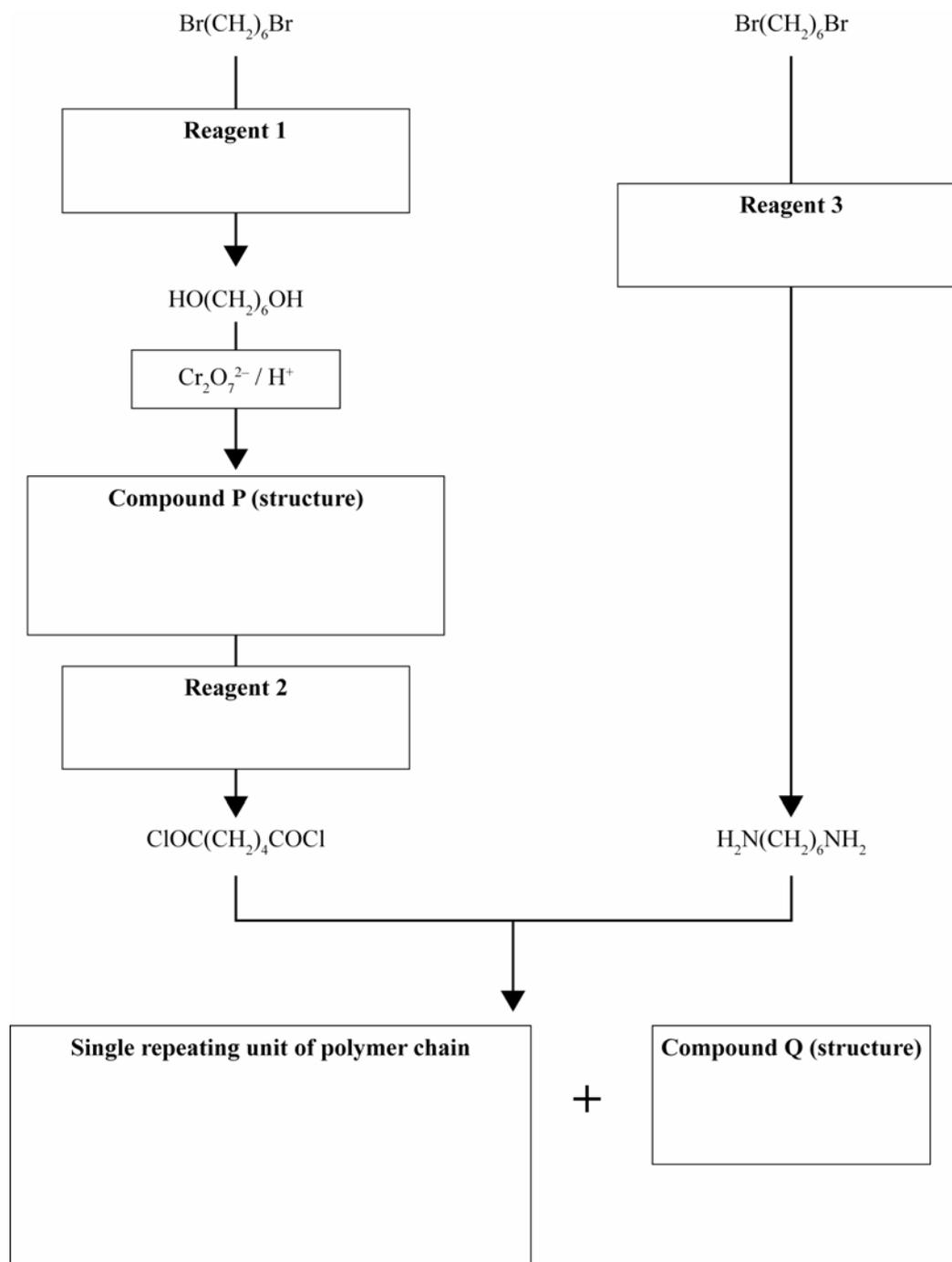
Name of isomer:

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

QUESTION TWO: POLYMERS

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

- identifying reagents 1, 2 and 3,
- drawing the structures of compounds P and Q,
- 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.

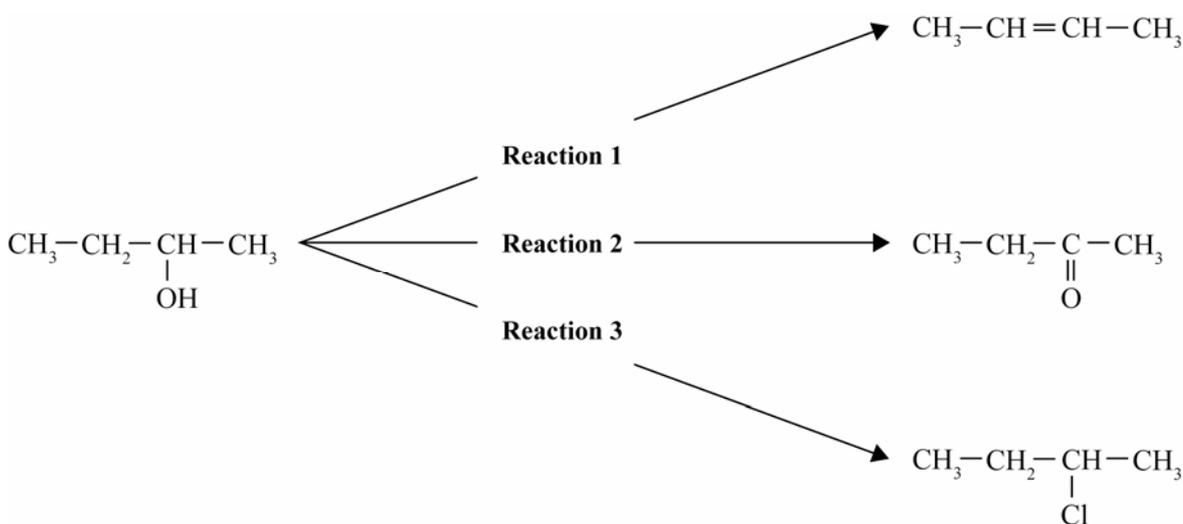
Teflon is a polymer formed from $F_2C=CF_2$ and is not affected by contact with acidic solutions.

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

QUESTION THREE: REACTIONS

(a) For each reaction below, identify:

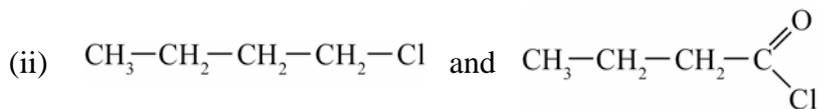
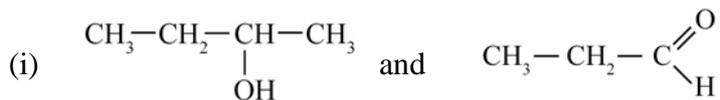
- (i) the type of reaction,
- (ii) the reagent required to carry out the reaction.



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.



(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.

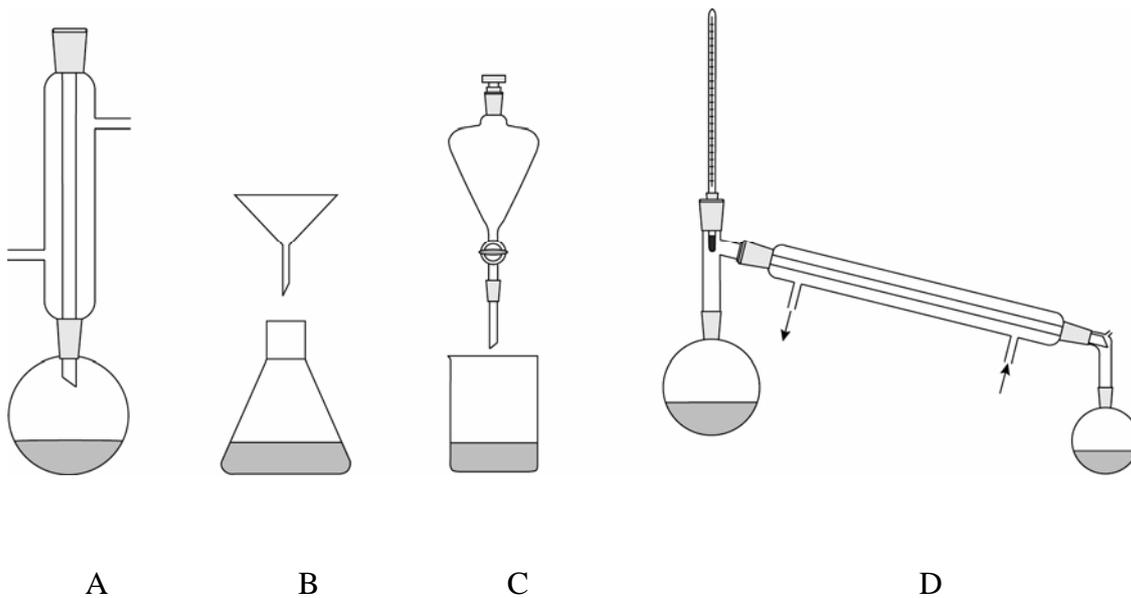
Structure:
Name:

(iii) In the preparation above, 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.



- (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.