



## **CHEMISTRY 3.5**

An assessment for AS91391

Demonstrate understanding of the properties of organic compounds

Credits: Five

### **INSTRUCTIONS**

Answer **ALL** questions.

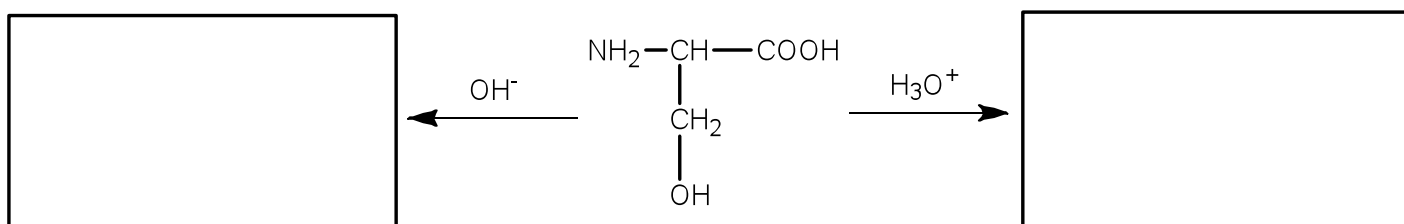
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### Question 1

- (a) Complete the table below by giving the IUPAC systematic name or the structural formula for each compound.

Compound	Structural Formula	IUPAC systematic name
<b>A</b>	$\begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{C}-\text{CH}_2-\text{C}-\text{NH}_2 \\   \quad \quad \quad    \\ \text{CH}_3 \quad \quad \quad \text{O} \end{array}$	
<b>B</b>		2-hydroxy-3-methylbutanoyl chloride
<b>C</b>	$\begin{array}{c} \text{NH}_2-\text{CH}-\text{COOH} \\   \\ \text{CH}_2 \\   \\ \text{OH} \end{array}$	
<b>D</b>		4-chloropentan-2-one

- (b) Compound C, in the table above, can react with both acid and base solutions. Write structural formulae for products of the acid and base reactions in the boxes below.



- (c) Compare and contrast the reactions of Compound A and Compound C with acid and base solutions. Describe any similarities and differences and give a reason for your answers

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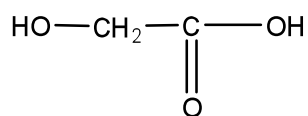


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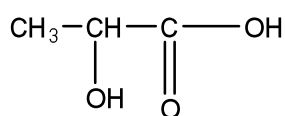


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- (d) Glycolic and lactic acid molecules are both used as monomers in the manufacture of biodegradable polymers. Lactic acid molecules form enantiomers (optical isomers) but glycolic acid do not.



glycolic acid



lactic acid

- (i) Describe the feature of the lactic acid molecule that causes it to have enantiomers.

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- (ii) Draw three-dimensional structures for the two enantiomers of lactic acid (use  $-\text{COOH}$  to represent the acid group in your diagram)

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- (iii) Describe how the two different enantiomers of any compound could be identified.

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- (iv) Lactic acid and glycolic acid polymerise to form polylactic acid and polyglycolic acid respectively. When the two acids are mixed, under the right conditions, a copolymer, poly(lactic-co-glycolic acid) or PLGA is formed.

1. Explain the reaction that takes place to form these polymers and give a reason why these acids are able to polymerise.

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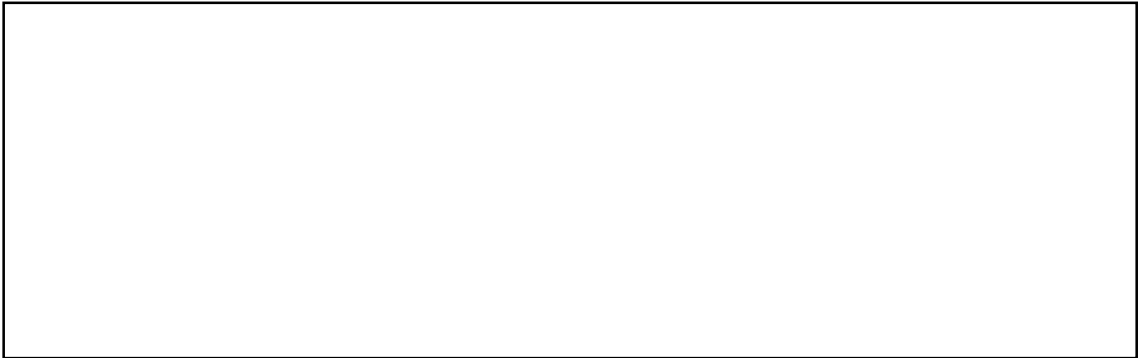


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2. Draw a repeating unit of the copolymer to show how lactic acid and glycolic acid combine to make the PLGA polymer chain.

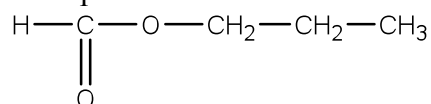






**Question 3**

- (a) Propyl methanoate is a compound found in different fruits.

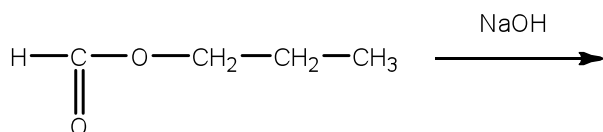
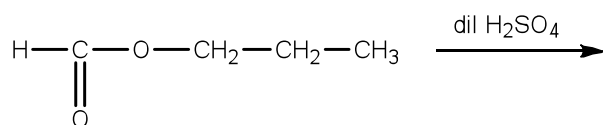


- (i) Draw and name two constitutional isomers of propyl methanoate, one with the same functional group and one with a different functional group.

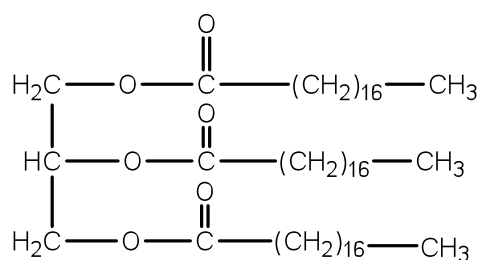
Structure		
Name		

- (ii) Propyl methanoate reacts with both acids and bases.

Complete the reactions below by writing the structural formula of the products formed.



- (iii) Fats and oils belong to a class of compounds known as triglycerides. An example is given below.



Explain the reaction that occurs when a fat is reacted with aqueous potassium hydroxide to form soap. Include the structural formulae of the products in your answer.

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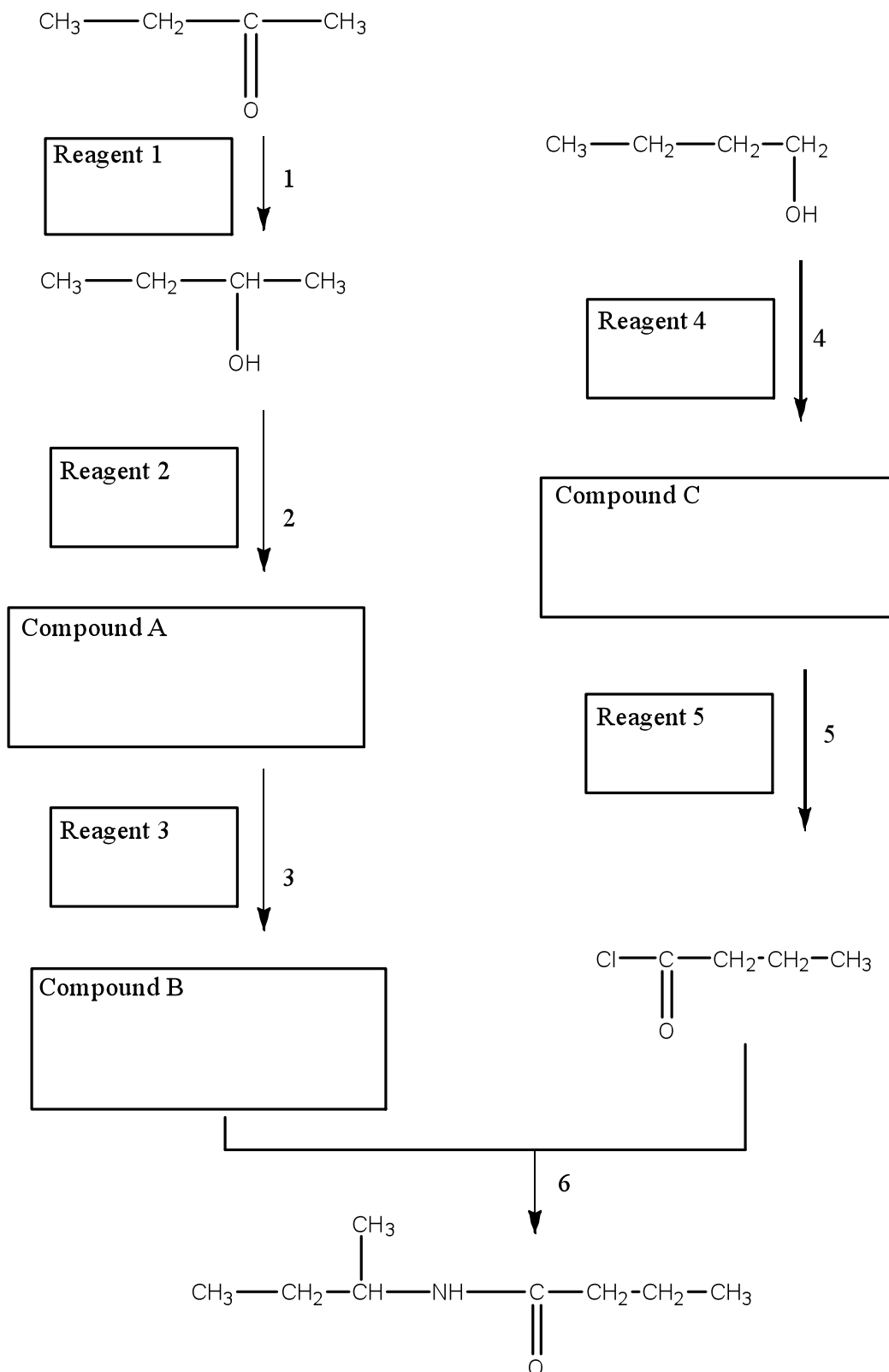


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- (b) (i) Complete the following reaction scheme by drawing the structural formulae of the organic **Compounds A to C** and the **Reagents 1 to 5**.



(ii) Give examples of the following types of reactions from step **1** to **6** in the scheme above

Reduction: \_\_\_\_\_

Oxidation: \_\_\_\_\_

Substitution: \_\_\_\_\_