CHEMISTRY 3.5

An assessment for AS91391

Demonstrate understanding of the properties of organic compounds

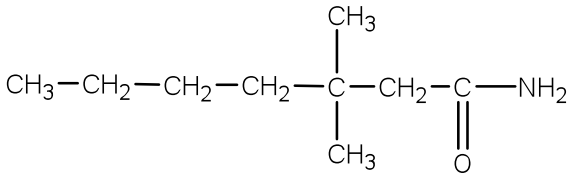
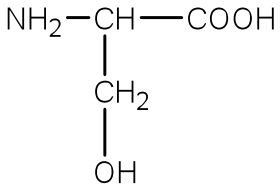
Credits: Five

INSTRUCTIONS

Answer **ALL** questions.

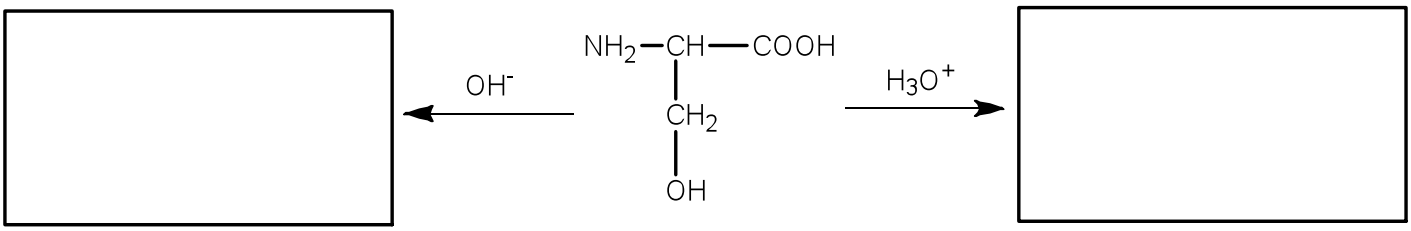
Question 1

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

Compound	Structural Formula	IUPAC systematic name
A		
B		2-hydroxy-3-methylbutanoyl chloride
C		
D		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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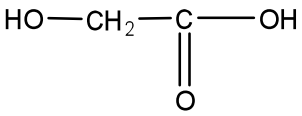
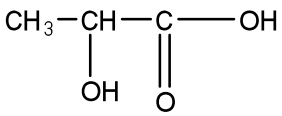
(d) Glycolic and lactic acids are both used as monomers in the manufacture of biodegradable polymers. Lactic acid molecules form enantiomers (optical isomers) but glycolic acid do not.



glycolic acid



lactic acid

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

(ii) Draw three-dimensional structures for the two enantiomers of lactic acid (use –COOH to represent the acid group in your diagram)

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

(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.

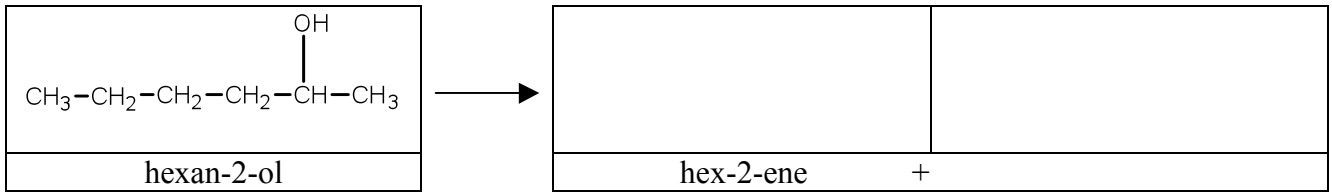
2. Draw a repeating unit of the copolymer to show how a lactic acid and a glycolic acid combine to make the PLGA polymer chain.

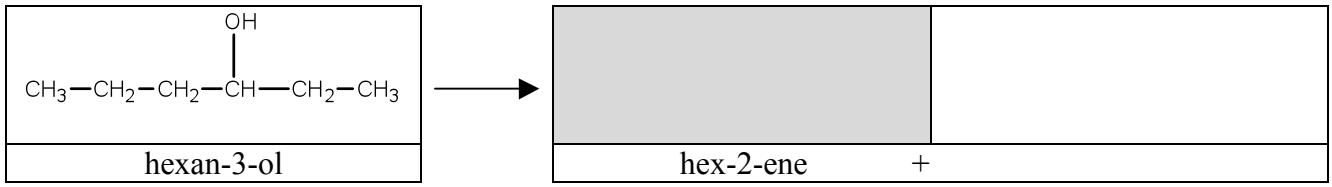
Question 2

(a) The dehydration of hextan-2-ol and hexan-3-ol both produce hex-2-ene and a second organic product.

(i) State the reagent used for these reactions: _____

(ii) Write structural formulae for the products of the two reactions in the boxes below. In each case, give the name of the second product (hex-2-ene only needs to be drawn once).





(iii) When hexan-3-ol is used as the starting material, both reaction products are formed in equal amounts. When hexan-2-ol is used, one product is formed in a greater amount than the other.

Compare and contrast these two reactions by considering the structures of the reactant and product molecules. Include in your answer an outline of how the major product for the hexan-2-ol reaction is determined from the structures.

(b) Five bottles of colourless liquids are known to each contain one of the following five compounds:

hexane, ethanol, ethanoyl chloride, propanone and propanal.

The reagents that could be used are: water, acidified potassium dichromate solution and Tollens' reagent. A piece of moist blue litmus paper is also available.

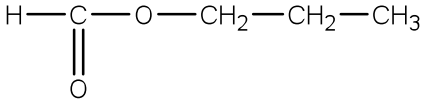
Outline a method, using the reagents provided, to identify the contents of each bottle.

In your answer you should

- Identify the functional groups in the molecules
- Outline the method, including the reactions to be carried out and the expected observations
- Give structures for the organic products of any reactions that occur.

Question 3

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

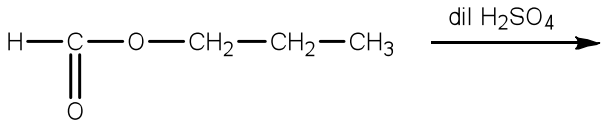


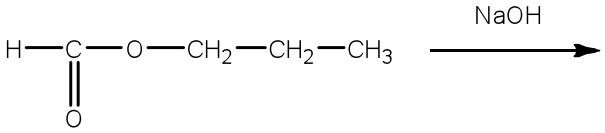
(i) Draw and name two constitutional isomers of propyl methanoate, one with the same functional group and one with a different functional group.

Structure		
Name		

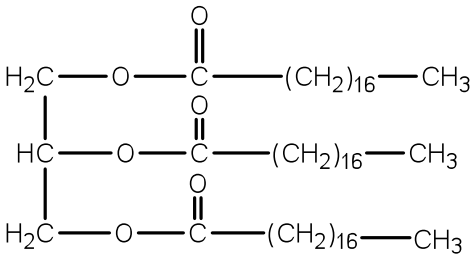
(ii) Propyl methanoate reacts with both acids and bases.

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 trigylcerides. An example is given below.



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

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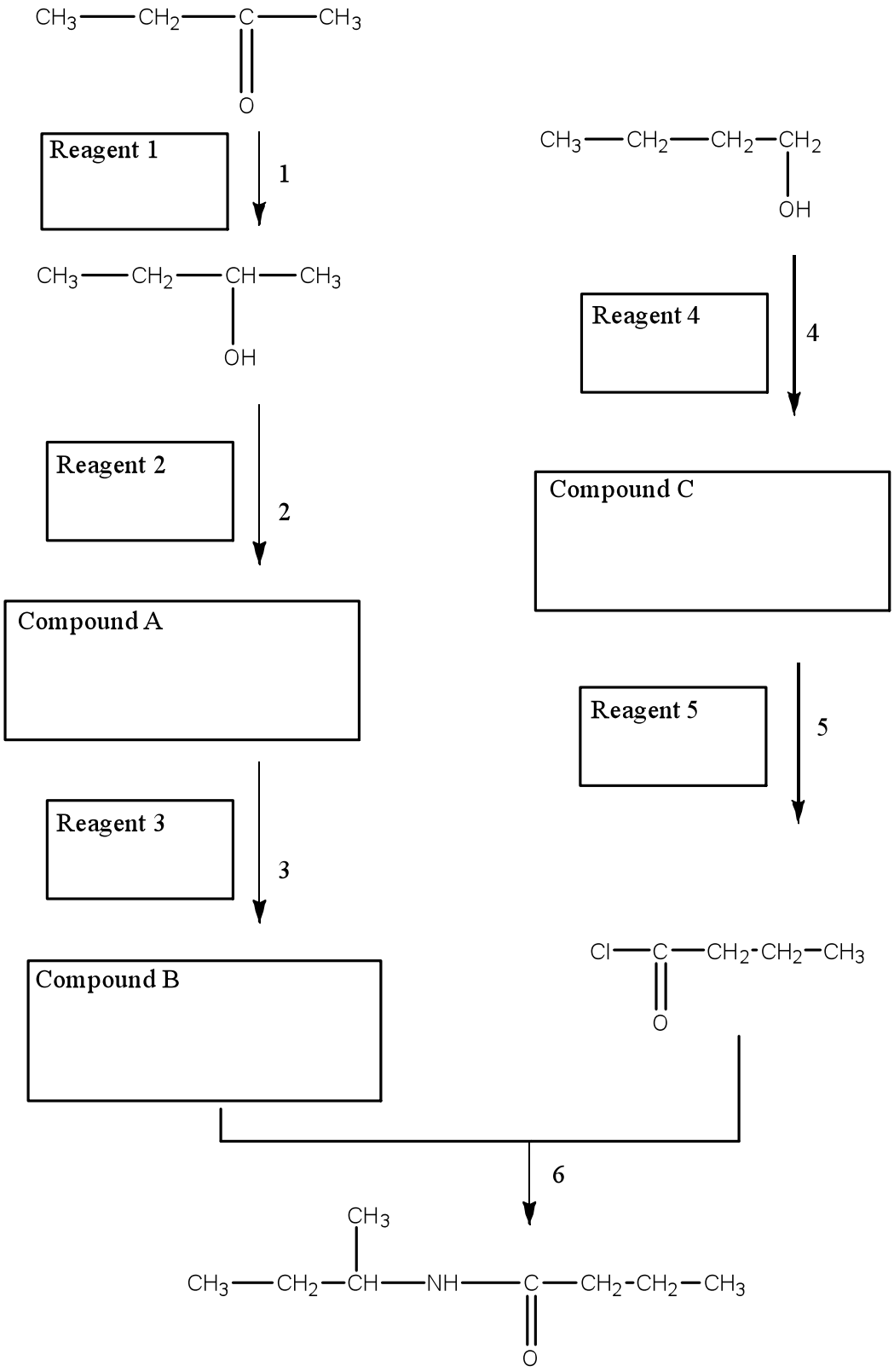
(b) (i) Complete the following reaction scheme by drawing the structural formulae of the organic **Compounds A** to **C** and the **Reagents 1** to **5**.



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

Reduction: _____

Oxidation: _____

Substitution: _____