

# Acidity and Basicity

## Question Paper

Level	Pre U
Subject	Chemistry
Exam Board	Cambridge International Examinations
Topic	Acidity and basicity- Organic chemistry
Booklet	Question Paper

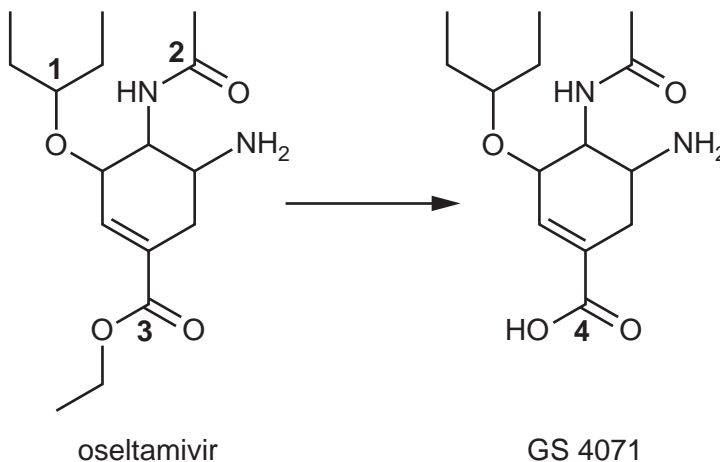
**Time Allowed:** 23 minutes

**Score:** /19

**Percentage:** /100

**Grade Boundaries:**

1. Oseltamivir is an anti-viral drug that is converted to its active form, GS 4071, in the body after being administered.



- (a) State the names of the functional group levels of the carbon atoms numbered **1** and **2** in the structure of oseltamivir.

carbon **1** .....

carbon **2** ..... [2]

- (b) With reference to the functional group levels of the carbon atoms numbered **3** and **4**, what type of reaction is involved in the conversion of oseltamivir into GS 4071? Explain your answer.

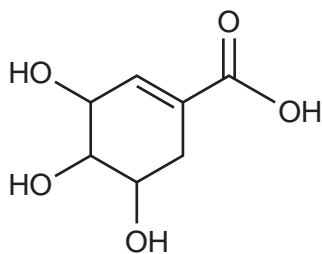
.....

.....

..... [2]

- (c) Use skeletal formulae to give the structures of all three products formed from the hydrolysis of the ester and amide links in oseltamivir by hot aqueous hydrochloric acid.

Oseltamivir can be produced from shikimic acid, which occurs naturally in star anise.

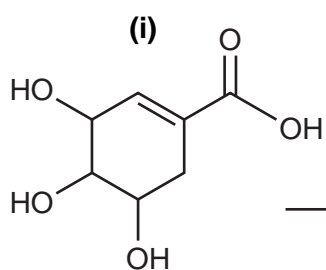


shikimic acid

(d) Give the molecular formula of shikimic acid.

..... [1]

(e) Give the structure of the organic product when shikimic acid reacts with each of the following reagents.

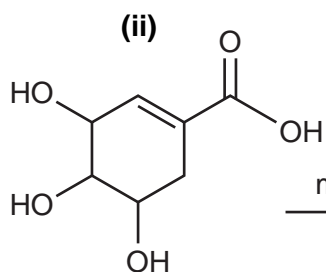


shikimic acid

bromine,  $\text{Br}_2(\text{l})$



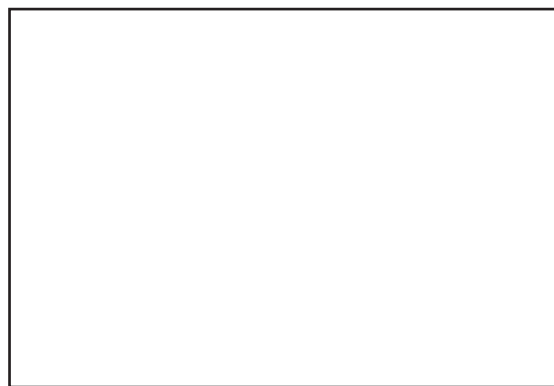
[1]



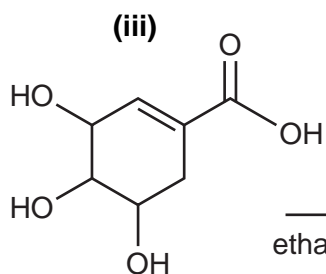
shikimic acid

methanol,  $\text{CH}_3\text{OH}$

conc.  $\text{H}_2\text{SO}_4$



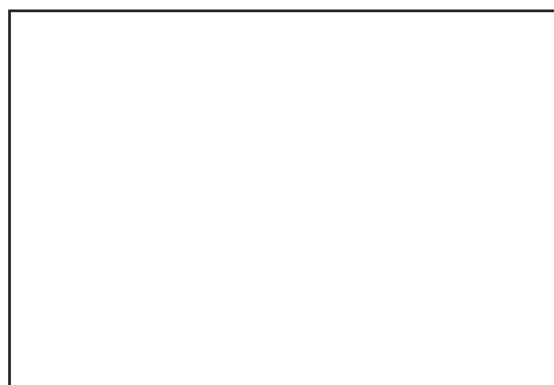
[1]



shikimic acid

excess

ethanoyl chloride  $\text{CH}_3\text{COCl}$



[2]

- (f) Using the numbers on the diagram of shikimic acid's structure in Fig. 5.1 indicate (by putting numbers in the boxes) which carbon atoms in the molecule are responsible for each signal in its  $^{13}\text{C}$  NMR spectrum in Fig. 5.2. The precise order of carbons within the group of two and the group of three are not required.

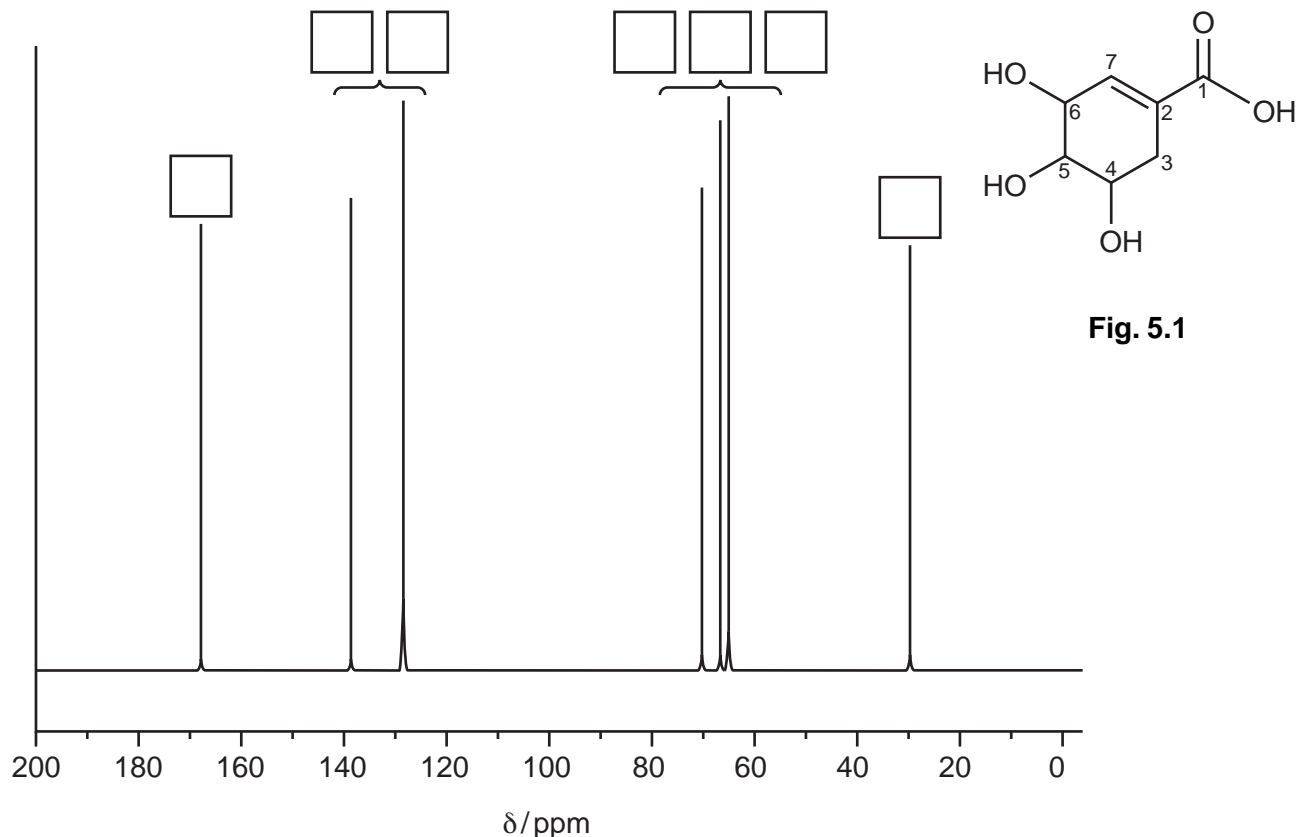


Fig. 5.1

Fig. 5.2

[3]

- (g) Under suitable conditions shikimic acid reacts with HBr in a 1:1 ratio to produce a mixture of two products each with the molecular formula  $\text{C}_7\text{H}_{11}\text{BrO}_5$ .

- (i) Give the full name of the mechanism of this reaction.

..... [1]

- (ii) Draw the structures of the two possible products.

[2]

- (iii) Suggest why one of the two products will be present in greater quantities.

.....  
 .....  
 ..... [2]

[Total: 21]

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