

Infra-red

Question Paper

Level	Pre U
Subject	Chemistry
Exam Board	Cambridge International Examinations
Topic	Infra-red
Booklet	Question Paper

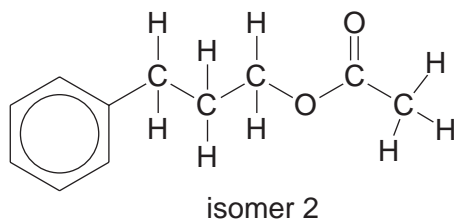
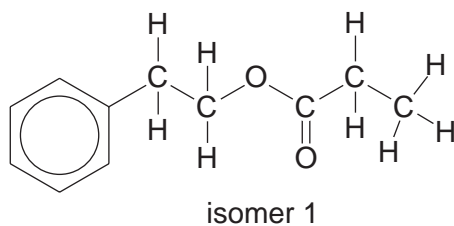
Time Allowed: 48 minutes

Score: /40

Percentage: /100

Grade Boundaries:

1. The structures of a pair of isomers are shown.



- (a) Give the molecular formula of these isomers.

.....[1]

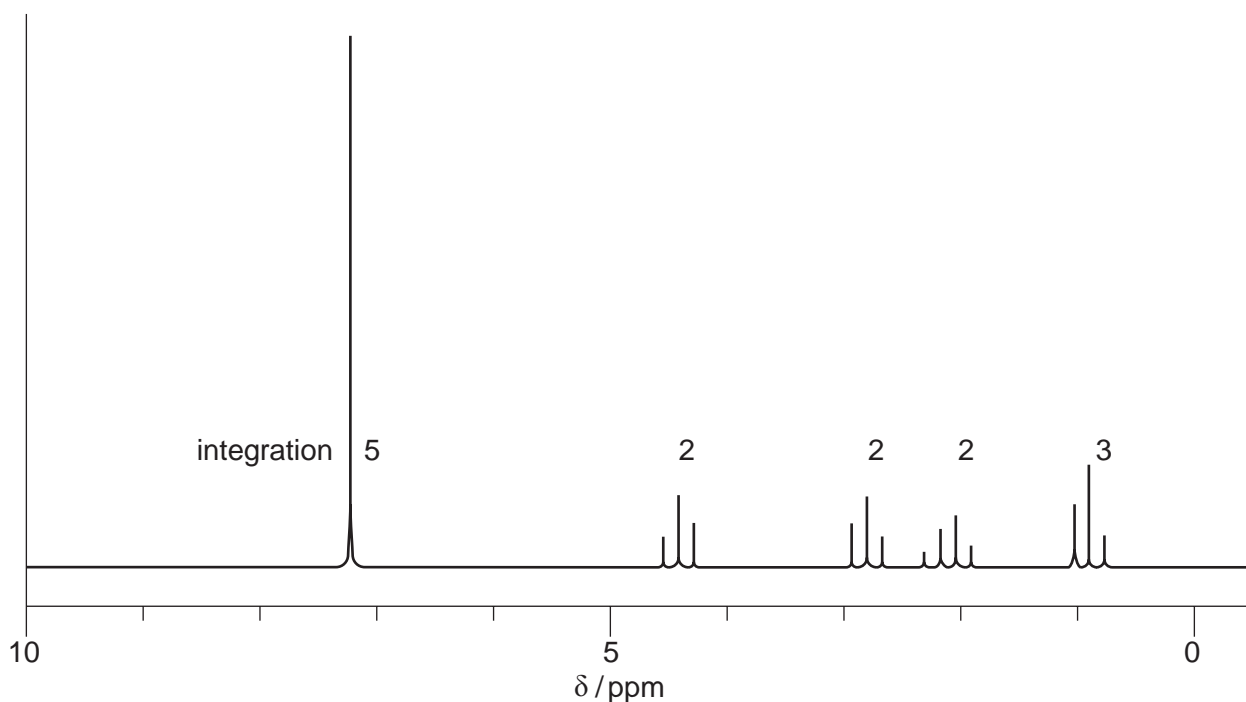
- (b) What type of isomerism is shown by these two isomers?

.....[1]

- (c) Isomer 1 is called 2-phenylethyl propanoate. Give the name of isomer 2.

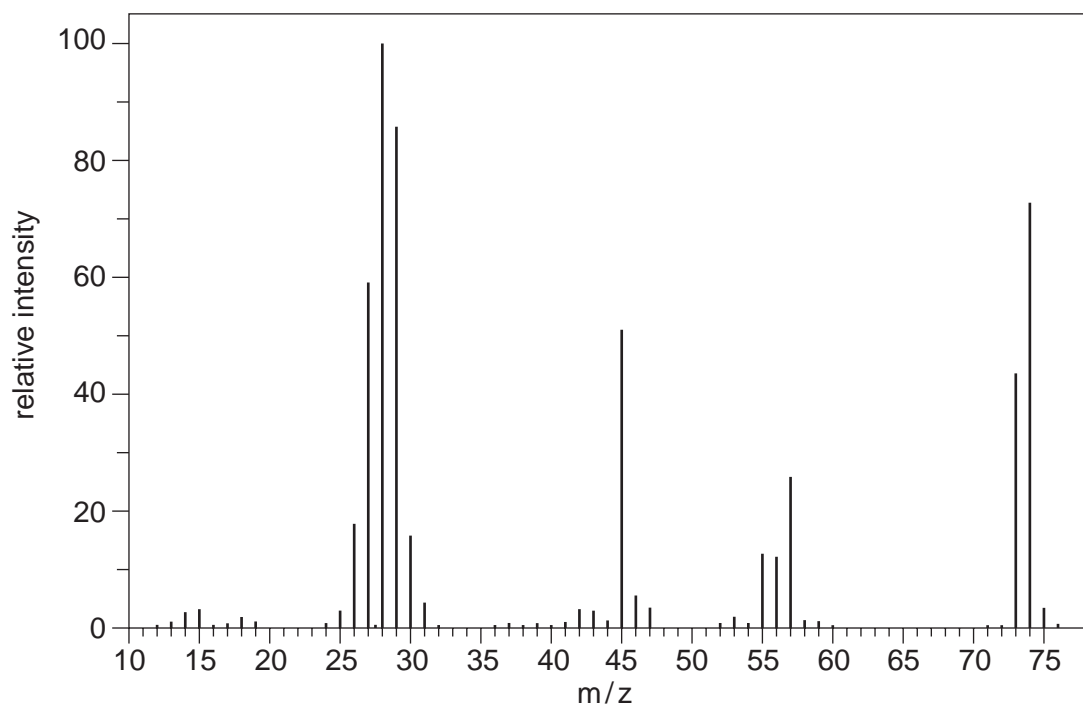
.....[1]

- (d) The ^1H NMR spectrum of one of the isomers is shown.



(e) X and Y are two compounds that can be made by hydrolysis of isomer 1.

X has the composition by mass C, 48.6%; H, 8.11%; O, 43.2%. The mass spectrum of X is shown.



(i) Calculate the empirical formula of X.

empirical formula of X [2]

(ii) Deduce the molecular formula of X.

molecular formula of X [1]

(iii) Identify the particle responsible for the peak at m/z 45.

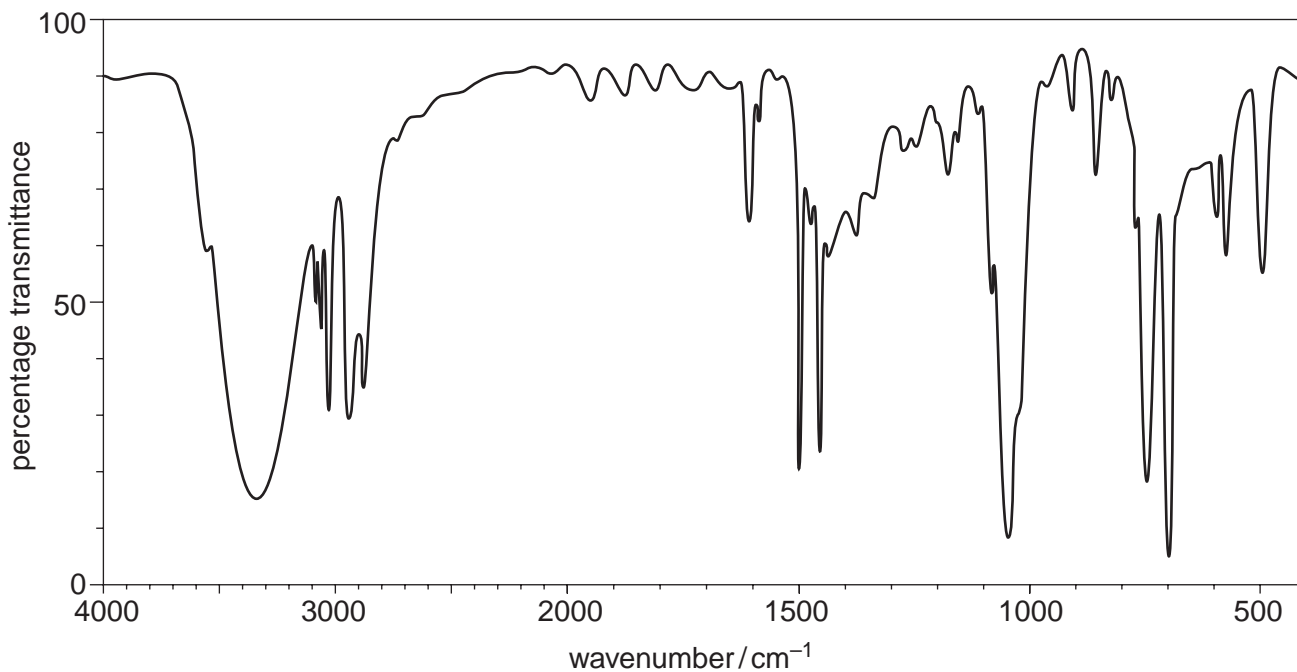
..... [2]

(iv) Explain the origin and relative intensity of the peak at m/z 75.

.....

 [2]

(f) The IR spectrum of **Y** is shown.



(i) Show the structure of **Y** and explain how the IR spectrum confirms the identity of the functional group present.

.....

 [2]

(ii) Show the structure of **X** and explain how its spectrum will compare to that of **Y**.

.....

 [2]

[Total: 20]

2. Fig. 6.1 shows the structures of a pair of isomers.

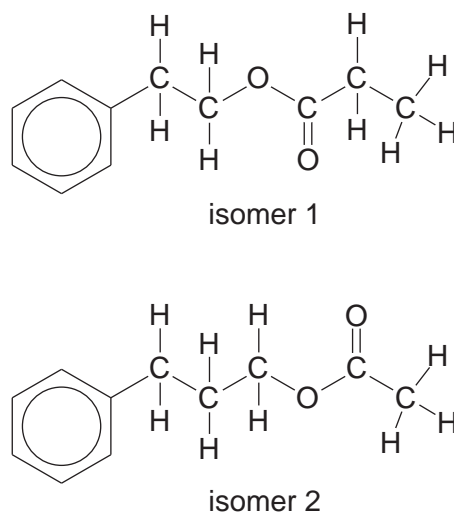


Fig. 6.1

(a) Give the molecular formula of these isomers.

..... [1]

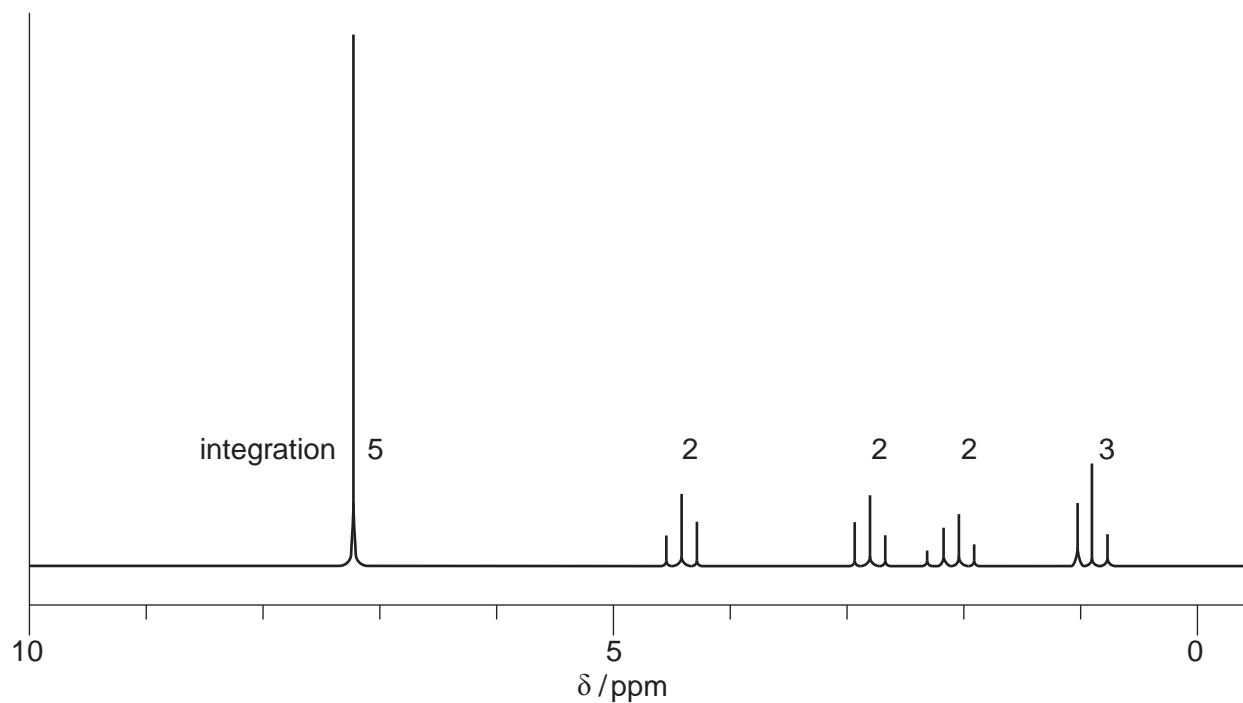
(b) What type of isomerism is shown by these two isomers?

..... [1]

(c) Isomer 1 is named 2-phenylethyl propanoate. Give the name of isomer 2.

..... [1]

(d) The ^1H NMR spectrum of one of the isomers is shown in Fig. 6.2.



(e) X and Y are two compounds that can be made by hydrolysis of isomer 1 in Fig. 6.1.

X has the composition by mass C, 48.6%; H, 8.11%; O, 43.2%. The mass spectrum of X is shown in Fig. 6.3.

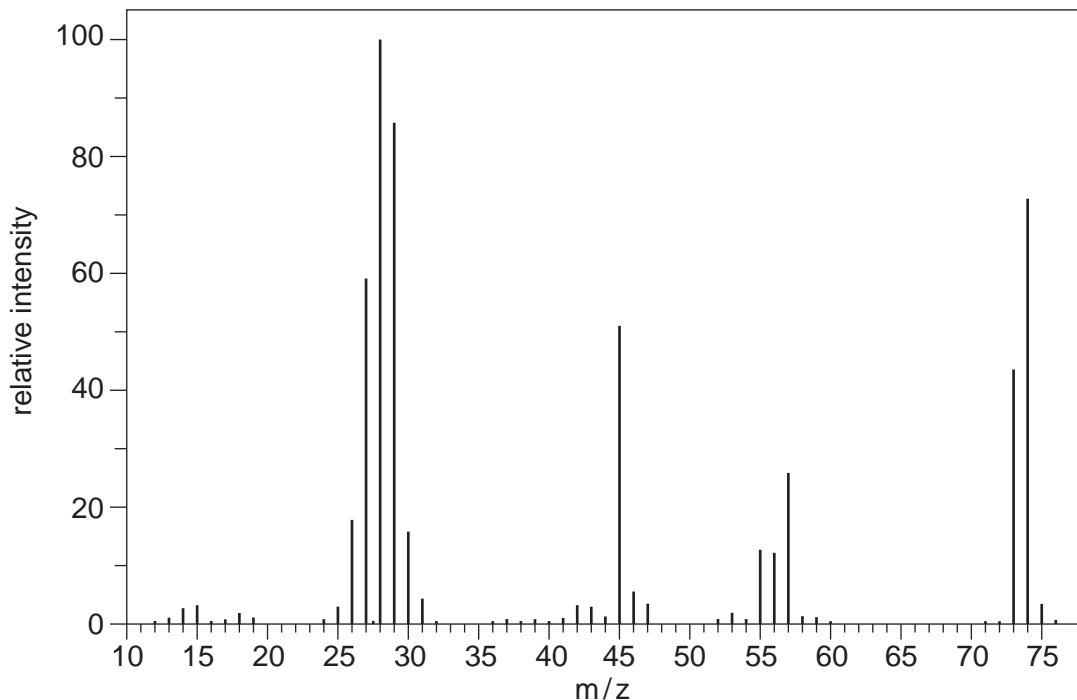


Fig. 6.3

(i) Calculate the empirical formula of X.

empirical formula of X [2]

(ii) Deduce the molecular formula of X.

molecular formula of X [1]

(iii) Identify the particle responsible for the peak at m/z 45.

..... [2]

(iv) Explain the origin and relative intensity of the peak at m/z 75.

.....

 [2]

(f) The IR spectrum of **Y** is shown in Fig. 6.4.

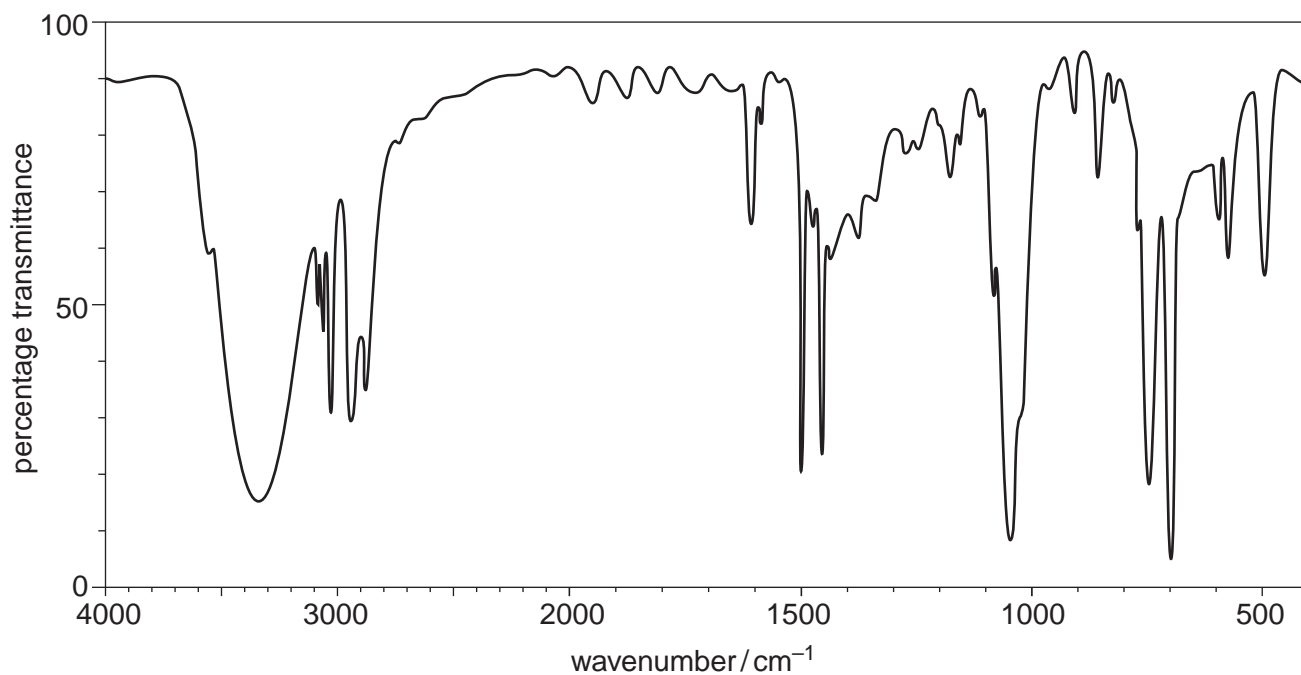


Fig. 6.4

(i) Show the structure of **Y** and explain how the spectrum in Fig. 6.4 confirms the identity of the functional group present.

.....

 [2]

(ii) Show the structure of **X** and explain how its IR spectrum will compare to that of **Y**.

.....

 [2]