

Spectroscopy and Chromatography - Questions by Topic

Q1.

In gas chromatography (GC), which one of the following would **increase** the retention time for an alcohol?

(1)

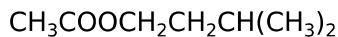
- A increasing the flow rate of the mobile phase
- B increasing the polarity of the stationary phase
- C decreasing the polarity of the stationary phase
- D increasing the polarity of the mobile phase

(Total for question = 1 mark)

Q2.

One of the compounds responsible for the characteristic smell of bananas is 3-methylbutyl ethanoate.

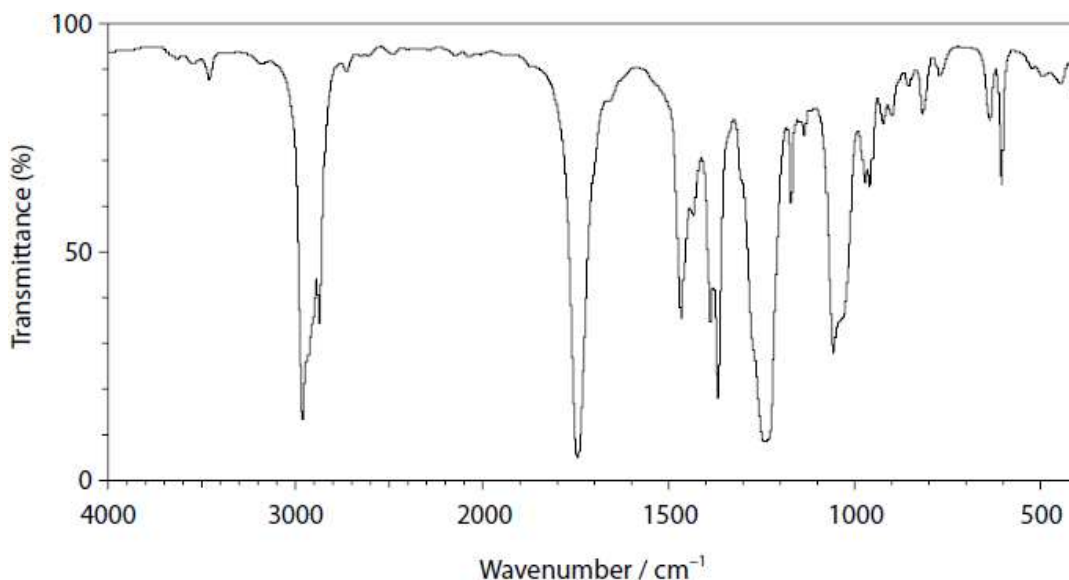
The structural formula of this compound is:



(a) Draw the **skeletal** formula for 3-methylbutyl ethanoate.

(1)

(b) The infrared spectrum of a sample of 3-methylbutyl ethanoate is shown below.



(i) Use this spectrum to identify one peak resulting from a bond in the ester group of 3-methylbutyl ethanoate. Include the relevant bond and its wavenumber range.

(1)

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(ii) 3-methylbutyl ethanoate was synthesised by reacting a suitable carboxylic acid with an alcohol.

Show that its infrared spectrum confirms there is no alcohol remaining in the sample.

(1)

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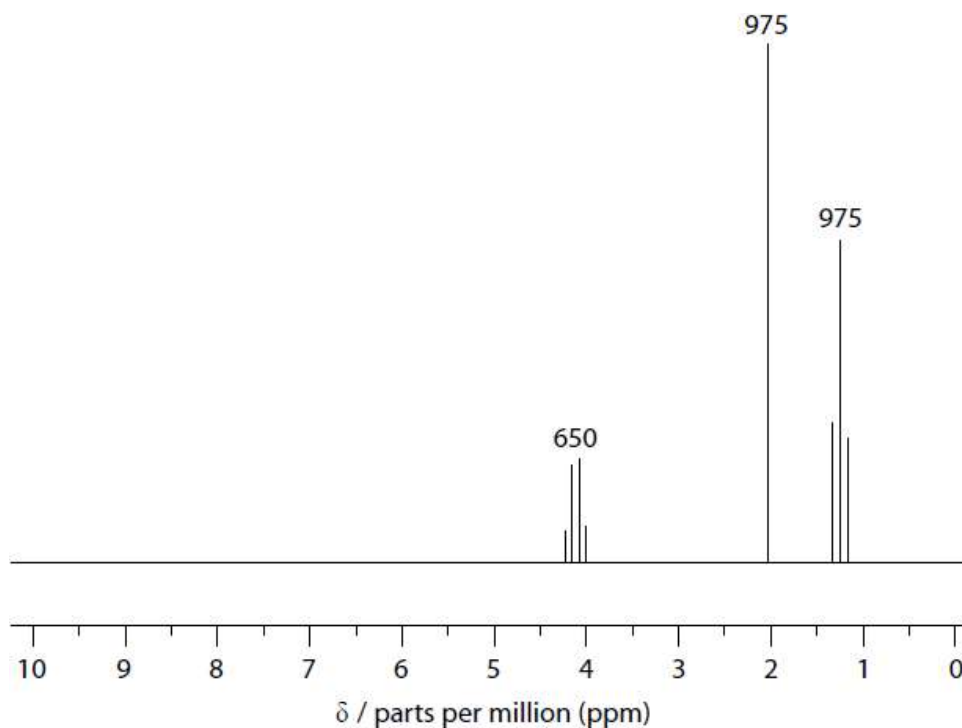
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*(c) The high resolution proton nuclear magnetic resonance (NMR) spectrum of a different ester, ethyl ethanoate, $\text{CH}_3\text{COOCH}_2\text{CH}_3$, is shown.

The numbers over each peak represent their approximate relative areas.



(d) Ethyl ethanoate has three isomers which are also esters.

(i) Draw the structures of these three isomers.

(2)

(ii) Explain to what extent it is possible to distinguish between the three isomers using carbon-13 NMR spectroscopy.

(2)

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(Total for question = 13 marks)