

Carboxylic Acid Derivatives - Questions by Topic

Q1.

Polyesters can be made by the reaction of:

(1)

- A** diprotic carboxylic acids with a primary alcohol
- B** diprotic carboxylic acids with diols
- C** monoprotic carboxylic acids with triols
- D** monoprotic carboxylic acids with a secondary alcohol

(Total for question = 1 mark)

Q2.

Carboxylic acids and acyl chlorides both react with alcohols to produce esters. Acyl chlorides are often preferred to carboxylic acids for this reaction because the yield of the ester is usually higher.

Which of the following statements is the best explanation for the higher yield?

(1)

- A** acyl chlorides react to remove any water produced
- B** the reaction is not reversible
- C** the reaction is less exothermic
- D** the reaction has a higher atom economy

(Total for question = 1 mark)

Q3.

Which reaction does **not** produce a carboxylic acid?

(1)

- A** hydrolysis of an acyl chloride with cold water
- B** hydrolysis of an ester by refluxing with dilute hydrochloric acid
- C** hydrolysis of a nitrile by refluxing with aqueous potassium hydroxide
- D** oxidation of a primary alcohol by refluxing with excess acidified potassium dichromate

(Total for question = 1 mark)

Q4.

The organic product of the reaction of ethanoyl chloride with ammonia gas is:

(1)

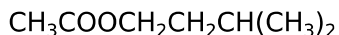
- A** ammonium ethanoate
- B** ethanamide
- C** ethanenitrile
- D** methanenitrile

(Total for question = 1 mark)

Q5.

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

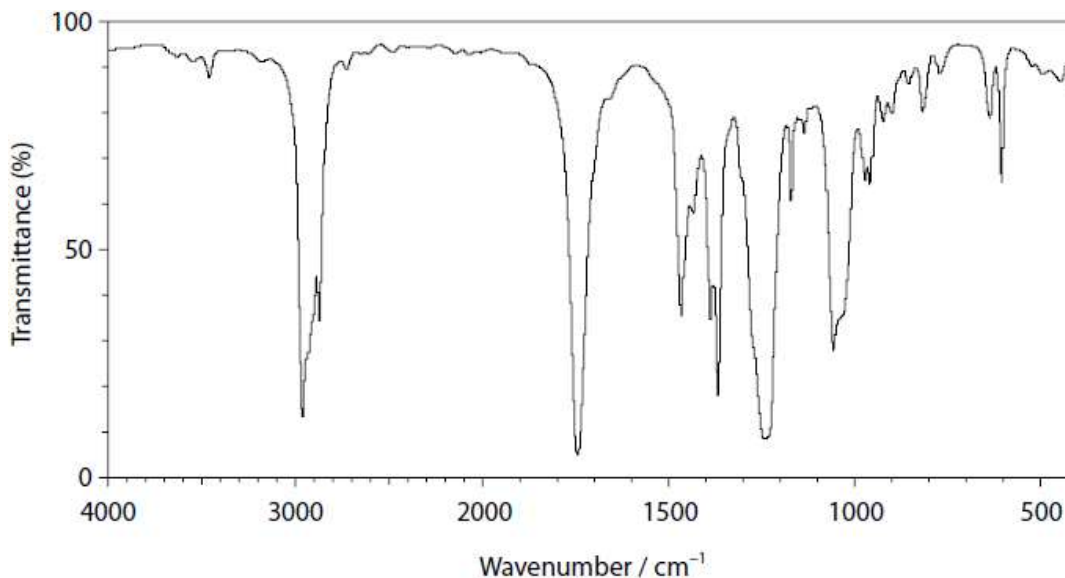
The structural formula of this compound is:



(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.

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

(1)

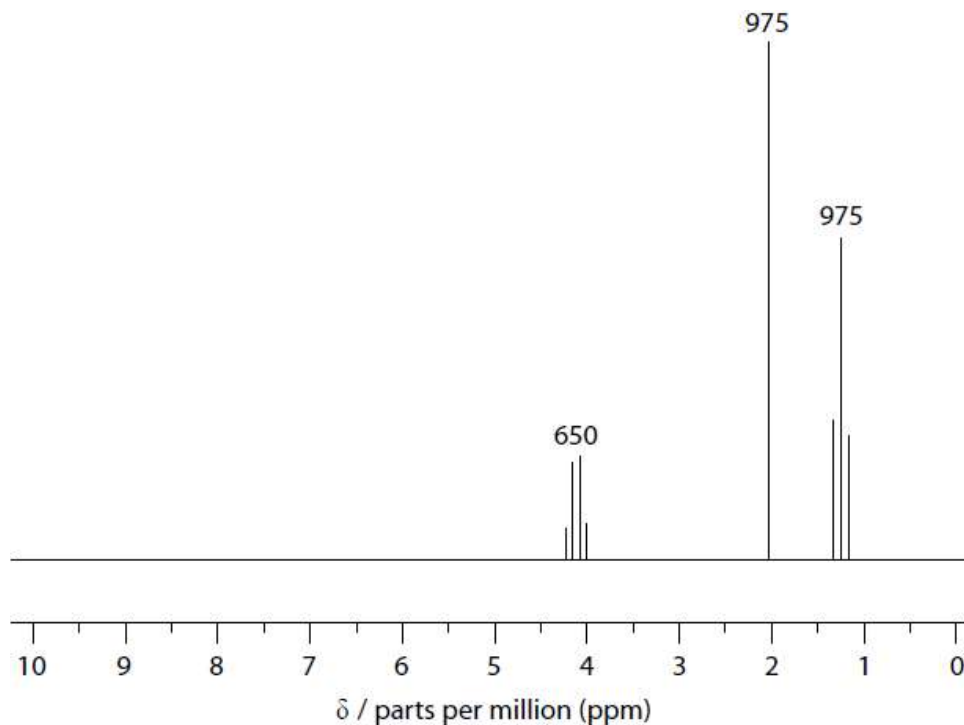
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*(c) The high resolution proton nuclear magnetic resonance (NMR) spectrum of a different ester, ethyl ethanoate, $\text{CH}_3\text{COOCH}_2\text{CH}_3$, is shown.

The numbers over each peak represent their approximate relative areas.



Show that the structure of ethyl ethanoate is consistent with this NMR spectrum, using all the data in the spectrum

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(6)

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(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)