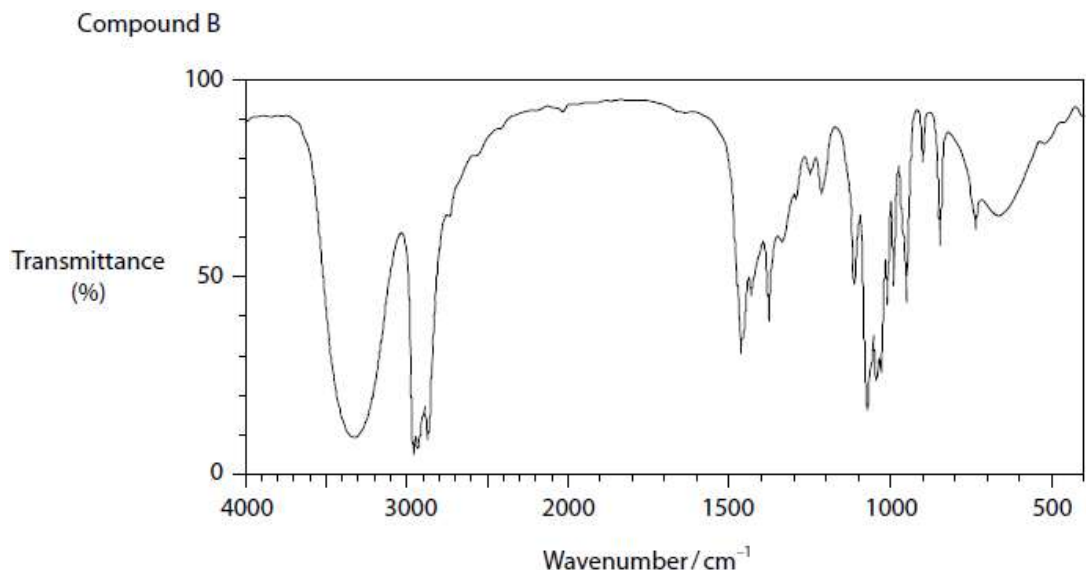
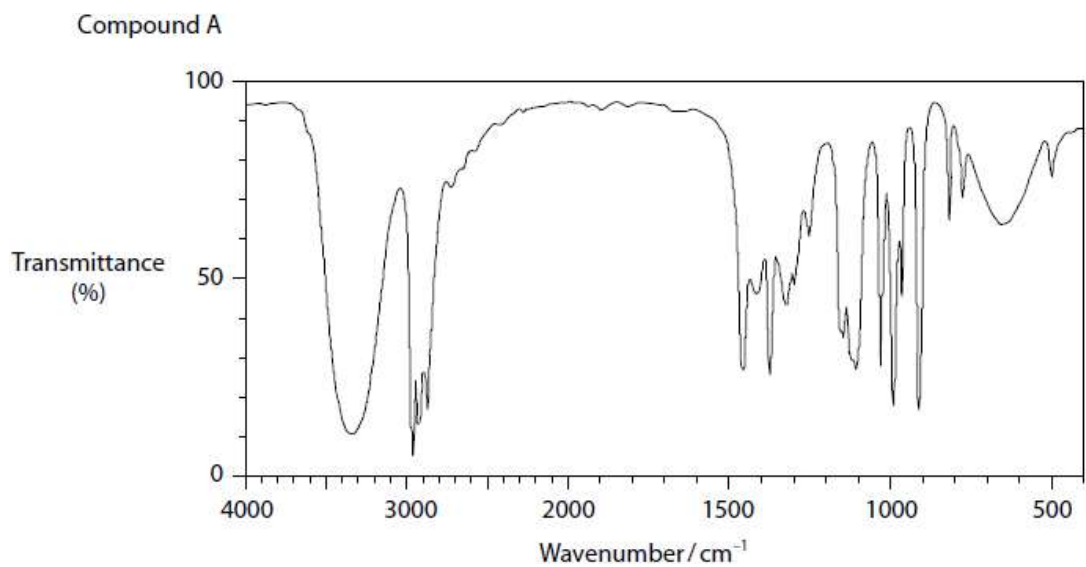


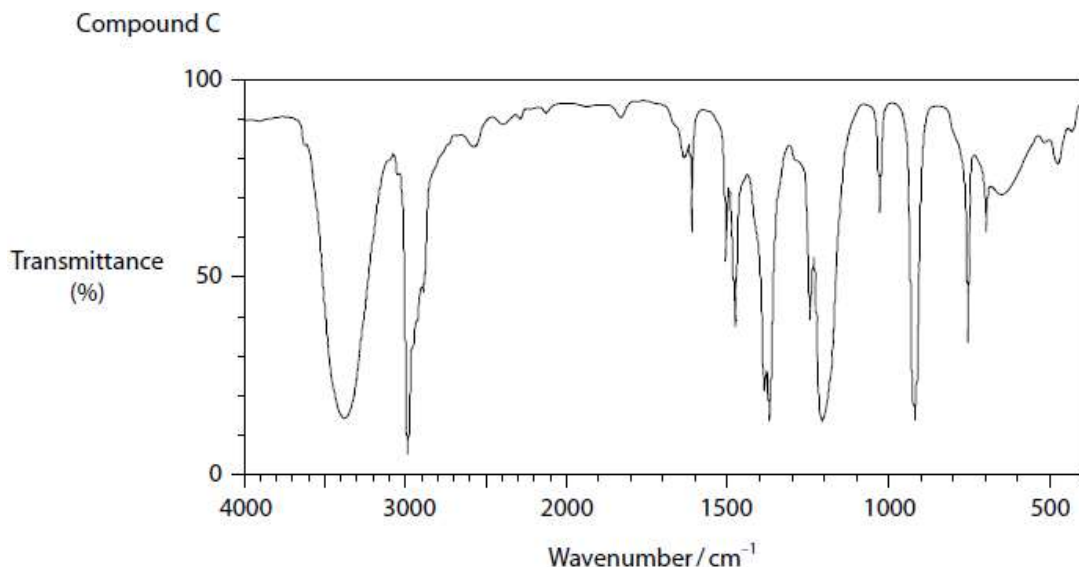
Mass Spectra and IR - Questions by Topic

Q1.

Three compounds, A, B and C, each have the same molecular formula $C_4H_{10}O$ and are known to be alcohols.

(a) The infrared spectra of compounds A, B and C are shown.





(i) Identify one feature, common to all three infrared spectra, which shows that A, B and C are all alcohols.

(1)

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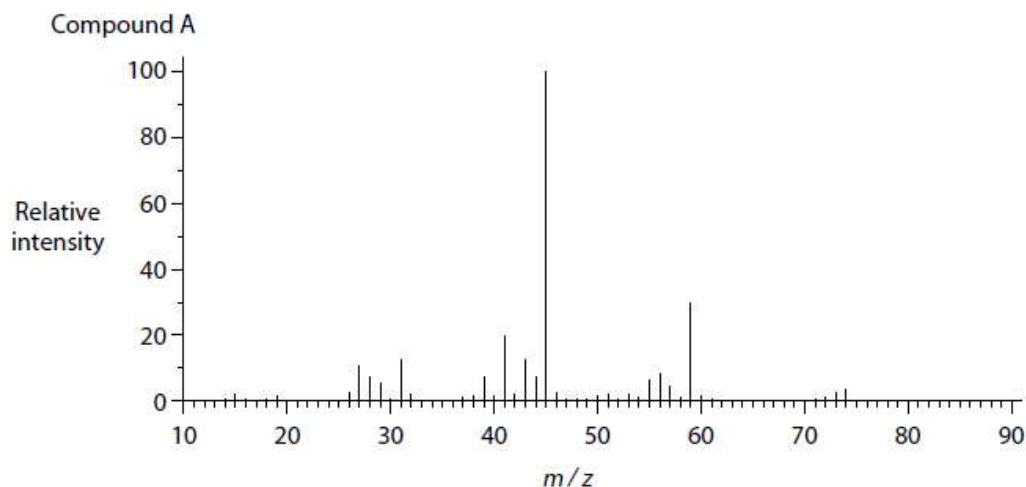
(ii) State, giving a reason for your answer, if it is possible to identify each of these three alcohols on the basis of the infrared spectra alone.

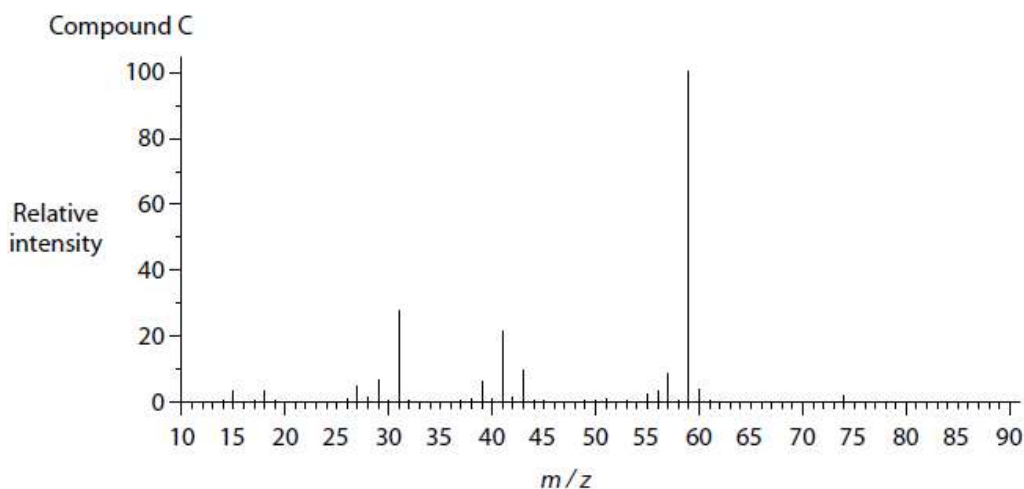
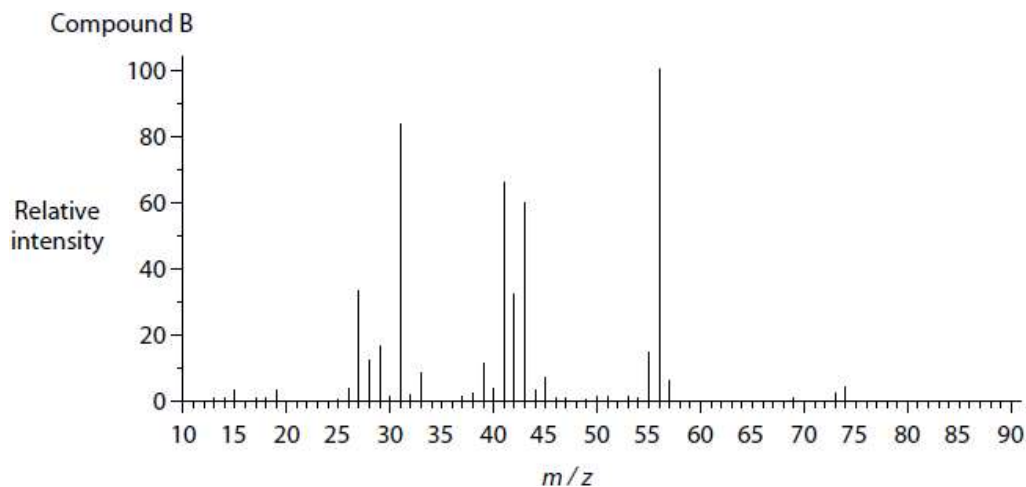
(1)

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(b) The mass spectra of the compounds A, B and C are shown.





(i) Identify one feature common to the mass spectra of compounds A, B and C which shows that the molecular formula is $C_4H_{10}O$.

(1)

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(ii) Using the fragmentation patterns, a student proposed that:

- compound A is butan-2-ol
- compound B is butan-1-ol
- compound C is 2-methylpropan-2-ol

State how the appearance in the spectra of the following peaks supports the student's conclusion.

(3)

the fragment causing the peak at $m/z = 45$ for compound A

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the fragment causing the peak at $m/z = 31$ for compound B

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the fragment causing the peak at $m/z = 59$ for compound C

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(c) To help with the identification of compounds A and B, the student decided to mix each of them with potassium dichromate(VI) and dilute sulfuric acid solutions, and then distil the mixture immediately.

(i) Identify, by name and structural formula, the organic compound present at the conclusion of each of these two oxidation reactions.

(3)

Organic compound used	Name of oxidation product	Structural formula of oxidation product
A, butan-2-ol		
B, butan-1-ol		

(ii) To identify A and B, the student decided that one further chemical test should be used on their oxidation products.

Give a suitable reagent and expected observations that could be used to distinguish between the oxidation products of A and B.

(3)

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(Total for question = 12 marks)