

AQA A-Level Chemistry

Organic analysis

Questions only

The newest questions, about an hour. All 15 are in the exam generator.

Questions

12

Total marks

40

Time allowed

52 min

Name

Class or teacher

Date

Instructions

- Answer all questions in the spaces provided.
- Use black ink. Show your working for every calculation.
- You may use a scientific calculator and the AQA Data Sheet.
- Print the separate mark scheme when you are ready to mark your answers.

For marking

Q	Source	Marks	Score
1	2023 AS P2 Q1	9	
2	2024 A-level P2 Q5	5	
3	2023 A-level P3 Q33	1	
4	2024 AS P2 Q1	6	
5	2024 AS P2 Q18	1	
6	2017 AS P2 Q20	1	
7	2019 A-level P3 Q23	1	
8	2025 AS P2 Q5	7	
9	2022 AS P2 Q2	6	
10	2023 AS P2 Q14	1	
11	2020 A-level P3 Q24	1	
12	2020 AS P2 Q13	1	

Total _____ / 40 Percentage _____ %

Questions from AQA past papers, 2017–2025, reproduced for revision. Practise these topics online, with instant marking:
whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions?topics=organic-analysis&len=0

Questions

Organic analysis · 12 questions · 40 marks · time allowed 52 min

Q1 · June 2023 · AS Paper 2 · Q1 · [9 marks]

This question is about the analysis of organic compounds.

For each pair of compounds in parts (a) and (b), give a reagent (or combination of reagents) that could be added separately to each compound in a single reaction to distinguish between them.

State what is observed in each case.

(a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$ and $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$

[3 marks]

Reagent(s)

Observation with $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$

Observation with $\text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}_3$

(b) Cyclohexane and cyclohexene**[3 marks]**

Reagent(s)

Observation with cyclohexane

Observation with cyclohexene

(c) The table below gives the precise relative molecular masses (M_r) of some organic compounds measured using high resolution mass spectrometry.

Molecular formula	C_5H_{12}	C_5H_{10}	C_6H_6
M_r	72.1416	70.1260	to be calculated

Use these data to find the relative atomic masses (A_r) of hydrogen and carbon. Give your answers to 4 decimal places.

Use these calculated A_r values to find the relative molecular mass (M_r) of C_6H_6 . Give your answer to 4 decimal places.

[3 marks]

A_r of hydrogen

A_r of carbon

M_r of C_6H_6

Q2 · June 2024 · Paper 2 · Q5 · [5 marks]

This question also needs Alcohols, Carboxylic acids and Halogenoalkanes.

This question is about simple test-tube reactions to identify organic liquids.

(a) Silver nitrate solution can be used to distinguish between propanoyl chloride and 1-chloropropane.

Give the observations you would expect when a few drops of silver nitrate solution are added to separate samples of propanoyl chloride and 1-chloropropane.

[2 marks]

Observation with propanoyl chloride

Observation with 1-chloropropane

(b) Three unlabelled bottles are known to contain either propan-1-ol, propanal, or propanone.

A sample of each liquid is warmed with a few drops of Fehling's solution.

Identify the liquid that reacts with Fehling's solution and give the expected observation.

Suggest a further simple test-tube reaction that can be used to distinguish between the remaining two liquids.

Give the expected observation with the liquid that reacts.

[3 marks]

Liquid that reacts with Fehling's solution

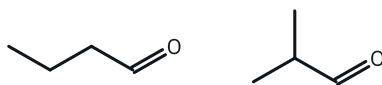
Observation

Further test

Observation

Q3 · June 2023 · Paper 3 · Q33 · [1 mark]

The skeletal formulas of two compounds are shown.



Which method would distinguish between samples of these compounds?

Tick (✓) one box.

- ☐ **A** comparing fingerprint regions of their infrared spectra
- ☐ **B** obtaining molecular masses from their high resolution mass spectra
- ☐ **C** warming with acidified potassium dichromate(VI) solution
- ☐ **D** warming with Tollens' reagent

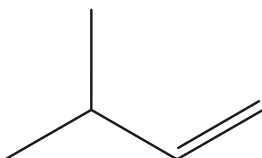
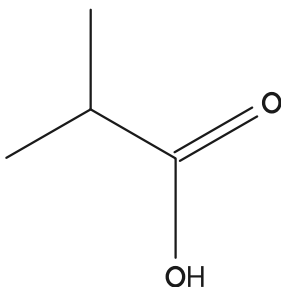
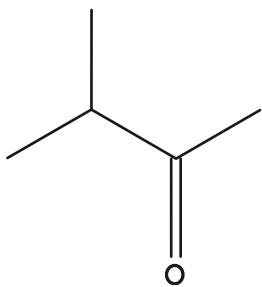
Q4 · June 2024 · AS Paper 2 · Q1 · [6 marks]

This question also needs Amount of substance.

This question is about the analysis of organic compounds.

(a) The table below shows the results of chemical tests on three organic compounds.

Complete the empty boxes in the table.

Chemical test			
Add bromine water	orange to colourless		no visible change
	no visible change	bubbles of gas	no visible change
Warm with Fehling's solution	no visible change	no visible change	

[3 marks]

(b) 0.500 g of a hydrocarbon is analysed.

The hydrocarbon contains 0.450 g of carbon.

Calculate the empirical formula of this hydrocarbon.

Empirical formula

[3 marks]

Q5 • June 2024 • AS Paper 2 • Q18 • [1 mark]

High resolution mass spectrometry can be used to determine the precise relative molecular mass of compounds. Which compound has a precise relative molecular mass that is different from the precise relative molecular mass of butanone?

Tick (✓) one box.

- ☐ **A** But-3-en-1-ol
- ☐ **B** Cyclobutanol
- ☐ **C** Methylpropanal
- ☐ **D** Prop-2-enoic acid

Q6 • June 2017 • AS Paper 2 • Q20 • [1 mark]

Which compound forms a molecular ion with a different precise molecular mass from the other three?

Tick (✓) one box.

- ☐ **A** butanone
- ☐ **B** cyclobutanol
- ☐ **C** dimethylpropane
- ☐ **D** methylpropanal

Q7 • June 2019 • Paper 3 • Q23 • [1 mark]

Three reagents are added separately to four organic compounds.

Which row shows the correct observations?

Acidified

Sodium hydrogen potassium carbonate dichromate(VI)	Tollens' reagent	no
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Tick (✓) one box.

- ☐ **A** Propan-1-ol • Sodium hydrogen carbonate: effervescence • Acidified potassium dichromate(VI): orange solution turns green • Tollens' reagent: no visible change
- ☐ **B** Propanal • Sodium hydrogen carbonate: no visible change • Acidified potassium dichromate(VI): orange solution turns green • Tollens' reagent: silver mirror
- ☐ **C** Propanone • Sodium hydrogen carbonate: no visible change • Acidified potassium dichromate(VI): no visible change • Tollens' reagent: silver mirror
- ☐ **D** Propanoic acid • Sodium hydrogen carbonate: effervescence • Acidified potassium dichromate(VI): no visible change • Tollens' reagent: silver mirror

Q8 • June 2025 • AS Paper 2 • Q5 • [7 marks]

This question is about determining the relative molecular mass (M_r) of different compounds.

05.1 The M_r of a compound can be determined by mass spectrometry.

Propanone, prop-2-en-1-ol and butane each have $M_r = 58.0$

Give the reason why high resolution mass spectrometry can distinguish between propanone and butane, but cannot distinguish between propanone and prop-2-en-1-ol.

[2 marks]

05.2 A student does an experiment to determine the M_r of a volatile liquid X.

In this experiment a conical flask of known volume is filled with vaporised X which is then condensed back into a liquid in the flask.

Method

1. Place a piece of aluminium foil over the opening of a conical flask.
2. Record the mass of the conical flask and foil.
3. Remove the foil and add 5 cm^3 of liquid X to the flask.
4. Replace the foil and use a pin to make a tiny hole in the middle of the foil.
5. Place the conical flask in a large beaker of boiling water (see Figure 1) until all of liquid X has vaporised. The flask is now full of vaporised X (the air and some of X escaped through the tiny hole).
6. Allow the conical flask to cool so that the vaporised X that was in the flask cools and condenses (air returns to the flask).
7. Record the mass of the conical flask with foil and condensed X.

Figure 1

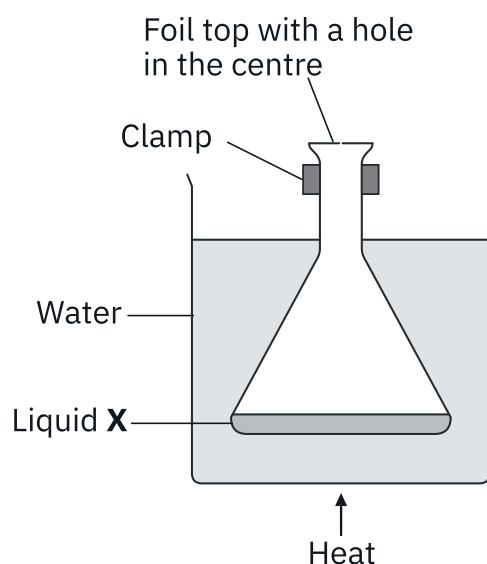


Table 1 shows the student's results.

Table 1

Volume of conical flask / cm ³	272
Temperature of boiling water / °C	100
Pressure / Pa	102 000
Mass of flask + foil in step 2 / g	105.872
Mass of flask + foil + X in step 7 / g	106.633

Calculate the M_r of X.

Assume that the mass of air in the flask is the same in steps 2 and 7.

Gas constant, $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$

M_r

[5 marks]

Q9 • June 2022 • AS Paper 2 • Q2 • [6 marks]

A student has samples of these four compounds but does not know which is which:

- butanoic acid
- 2-methylpropanal
- 2-methylpropanoic acid
- 2-methylpropan-1-ol

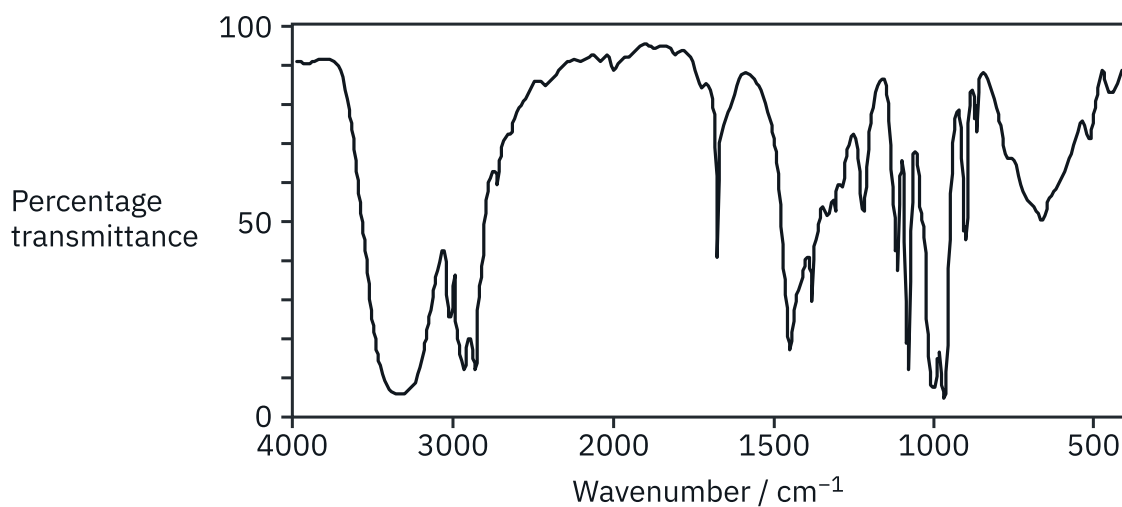
Step 1: Two of these compounds can be identified by simple chemical tests.

Step 2: The other two compounds, that contain the same functional group as each other, can then be distinguished using a spectroscopic technique.

Describe how these two steps could be used to identify which compound is which.

Q10 • June 2023 • AS Paper 2 • Q14 • [1 mark]

The infrared spectrum of an organic compound is shown.



Which compound could produce this spectrum?

Tick (✓) one box.

- ☐ **A** but-1-ene
- ☐ **B** but-2-en-1-ol
- ☐ **C** butanoic acid
- ☐ **D** butan-2-ol

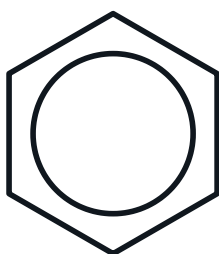
Q11 • November 2020 • Paper 3 • Q24 • [1 mark]

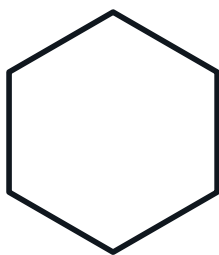
Which compound decolourises bromine water in the absence of sunlight?

Tick (✓) one box.

- ☐ **A** $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$

- ☐ **B**



☐ **C**☐ **D** $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$

Q12 · November 2020 · AS Paper 2 · Q13 · [1 mark]

Which can be used to distinguish between these two compounds? $(\text{CH}_3)_2\text{CHCH}_2\text{CHO}$ and $(\text{CH}_3)_3\text{CCHO}$

Tick (✓) one box.

- ☐ **A** Acidified potassium dichromate(VI)
- ☐ **B** Fingerprint region of infrared spectrum
- ☐ **C** M_r value in high resolution mass spectrometry
- ☐ **D** Tollens' reagent

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Mark scheme:

whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions/pdf/organic-analysis-mark-scheme.pdf