

AQA A-Level Chemistry

Carboxylic acids

Questions only

The newest questions, about an hour. All 24 are in the exam generator.

Questions

11

Total marks

46

Time allowed

1 h

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	2022 A-level P3 Q26	1	
2	2022 A-level P2 Q7	6	
3	2024 A-level P3 Q30	1	
4	2024 A-level P2 Q4	13	
5	2024 A-level P3 Q25	1	
6	2021 A-level P3 Q31	1	
7	2021 A-level P3 Q28	1	
8	2021 A-level P3 Q17	1	
9	2025 A-level P2 Q4	14	
10	2025 A-level P3 Q18	1	
11	2025 A-level P3 Q6	6	

Total _____ / 46 Percentage _____ %

Questions from AQA past papers, 2021–2025, reproduced for revision. Practise these topics online, with instant marking:

whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions?topics=carboxylic-acids-and-derivatives&len=0

Questions

Carboxylic acids · 11 questions · 46 marks · time allowed 1 h

Q1 · June 2022 · Paper 3 · Q26 · [1 mark]

Which compound is an amide?

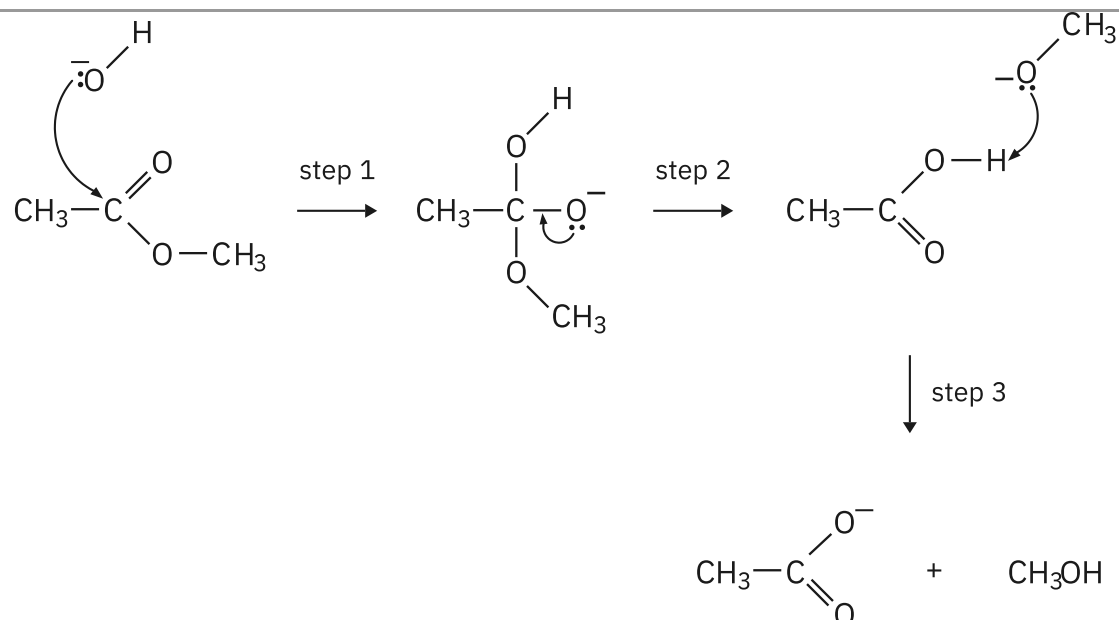
Tick (✓) one box.

- ☐ **A** $\text{CH}_3\text{CH}_2\text{CH}_2\text{CN}$
- ☐ **B** $\text{CH}_3\text{CONHCH}_2\text{CH}_3$
- ☐ **C** $\text{CH}_3\text{COOCH}_2\text{CH}_3$
- ☐ **D** $\text{CH}_3\text{NHCH}_2\text{CH}_2\text{CH}_3$
-

Q2 · June 2022 · Paper 2 · Q7 · [6 marks]

This question is about esters.

The diagram below shows an incomplete mechanism for the reaction of an ester with aqueous sodium hydroxide.



(a) Add three curly arrows to complete the mechanism in above diagram.

[3 marks]

Draw your answer on the figure above.

(b) Name the type of reaction shown in the diagram above.

[1 mark]

(c) Deduce the role of the CH_3O^- ion in step 3 shown in the diagram above.

[1 mark]

(d) A triester in vegetable oil reacts with sodium hydroxide in a similar way.

Give a use for a product of this reaction.

[1 mark]

Q3 • June 2024 • Paper 3 • Q30 • [1 mark]

Which compound is formed by the acid hydrolysis of phenyl benzenecarboxylate?

Tick (✓) one box.

☐ A $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$

☐ B $\text{C}_6\text{H}_5\text{CHO}$

☐ C $\text{C}_6\text{H}_5\text{COCH}_3$

☐ D $\text{C}_6\text{H}_5\text{COOH}$

Q4 • June 2024 • Paper 2 • Q4 • [13 marks]

This question is about the preparation of an ester.

(a) Ester F can be prepared from propan-2-ol and ethanoic acid.

Give an equation for this reaction.

Name ester F.

[2 marks]

Equation

Name

This method is used to prepare a sample of ester F.

Step 1

Mix 10 cm^3 of propan-2-ol with 10 cm^3 of ethanoic acid.

Add 5 drops of concentrated sulfuric acid.

Reflux this reaction mixture for 20 minutes.

Step 2

Transfer the cooled reaction mixture to a separating funnel.

Add 20 cm^3 of aqueous sodium carbonate and shake the mixture.

Step 3

Transfer the organic layer to a beaker and add 5 g of anhydrous magnesium sulfate.

Decant off the organic liquid.

Step 4

Collect the ester using simple distillation.

(b) Describe how Step 1 should be done.

In your description you should

- give details of suitable equipment used to add each reagent to the reflux apparatus
- draw a labelled diagram of the apparatus used for refluxing the reaction mixture

- explain any safety precautions needed other than eye protection.

[6 marks]

(c) In Step 2 the reaction mixture from Step 1 is shaken with aqueous sodium carbonate.

State the purpose of the sodium carbonate.

Suggest a precaution that should be taken while this mixture is shaken in the separating funnel.

Give a reason for your suggested precaution.

[3 marks]

Purpose of sodium carbonate

Precaution

Reason

(d) Give the reason for the use of anhydrous magnesium sulfate in Step 3.

[1 mark]

(e) Suggest how the purity of the ester can be confirmed during the distillation in Step 4.

[1 mark]

Q5 • June 2024 • Paper 3 • Q25 • [1 mark]

Compound Y has the structural formula $\text{CH}_3\text{COOCH}_2\text{CH}(\text{CH}_3)_2$ Which compound is a position isomer of Y?

Tick (✓) one box.

- ☐ **A** 5-hydroxyhexan-3-one
- ☐ **B** butyl ethanoate
- ☐ **C** hexanoic acid
- ☐ **D** propyl propanoate
-

Q6 • November 2021 • Paper 3 • Q31 • [1 mark]

Which compound reacts with warm dilute aqueous sodium hydroxide?

Tick (✓) one box.

- ☐ **A** C_6H_6
- ☐ **B** $\text{CH}_3\text{CH}=\text{CH}_2$
- ☐ **C** $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
- ☐ **D** $(\text{CH}_3\text{CO})_2\text{O}$
-

Q7 • November 2021 • Paper 3 • Q28 • [1 mark]

Which compound forms a white precipitate when added to aqueous silver nitrate?

Tick (✓) one box.

- ☐ **A** bromoethane
- ☐ **B** ethanal
- ☐ **C** ethanoic anhydride
- ☐ **D** ethanoyl chloride

Q8 • November 2021 • Paper 3 • Q17 • [1 mark]

Which statement about $(\text{CH}_3)_2\text{CHCH}_2\text{COOH}$ is correct?

Tick (✓) one box.

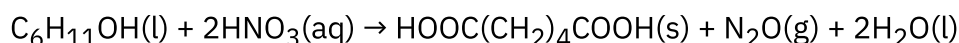
- ☐ **A** In aqueous solution it reacts with magnesium to form carbon dioxide.
- ☐ **B** It can form hydrogen bonds.
- ☐ **C** It has optical isomers.
- ☐ **D** It has the IUPAC name 2-methylbutanoic acid.

Q9 • June 2025 • Paper 2 • Q4 • [14 marks]

Hexanedioic acid is an important compound used in organic synthesis.

Hexanedioic acid can be prepared from cyclohexanol.

The equation for the reaction is



Method

Step 1 Add 5 cm^3 of concentrated nitric acid to a boiling tube.

Step 2 Place the boiling tube in a beaker of water at $85\text{ }^\circ\text{C}$

Step 3 Add 2 cm^3 of cyclohexanol dropwise to the boiling tube.

Step 4 Leave the reaction mixture for 10 minutes.

Step 5 Cool the boiling tube in a beaker of cold water for a further 10 minutes.

Step 6 Filter the contents of the boiling tube and collect the impure solid.

Step 7 Recrystallise the impure solid using methanol.

Step 8 Wash the purified crystalline product with some ice-cold distilled water, and dry.

Step 9 Measure the melting point of the hexanedioic acid.

04.1 Suggest why the apparatus should be set up in a fume cupboard.

[1 mark]

04.2 Deduce the role of the concentrated nitric acid in the reaction.

[1 mark]

04.3 Outline how Steps 7 and 8 should be done to obtain the purified crystalline product.

[5 marks]

04.4 In Step 8, the distilled water must be ice-cold.

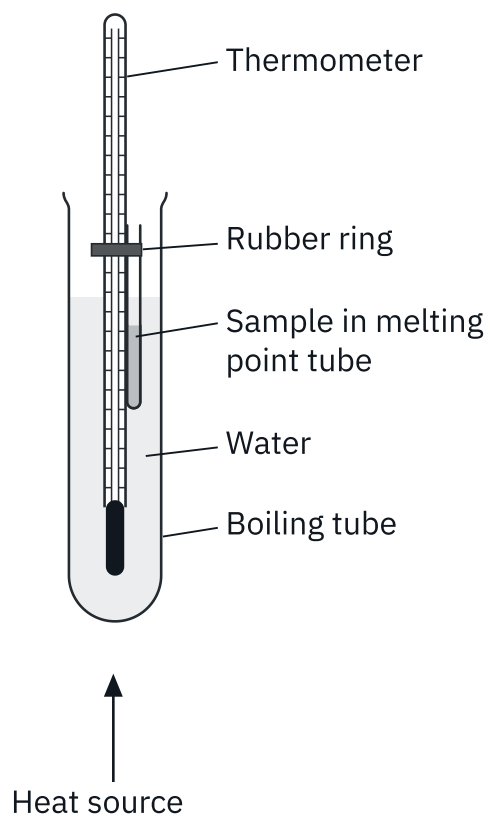
Suggest why using water at room temperature lowers the recorded yield of product.

[1 mark]

04.5 Figure 4 shows how a student set up the apparatus for measuring the melting point of hexanedioic acid in Step 9 (data book value 152 °C).

The apparatus is supported by clamps but these are not shown.

Figure 4



Identify two mistakes the student made in setting up this apparatus.

State the problem caused by each mistake.

[4 marks]

Mistake 1

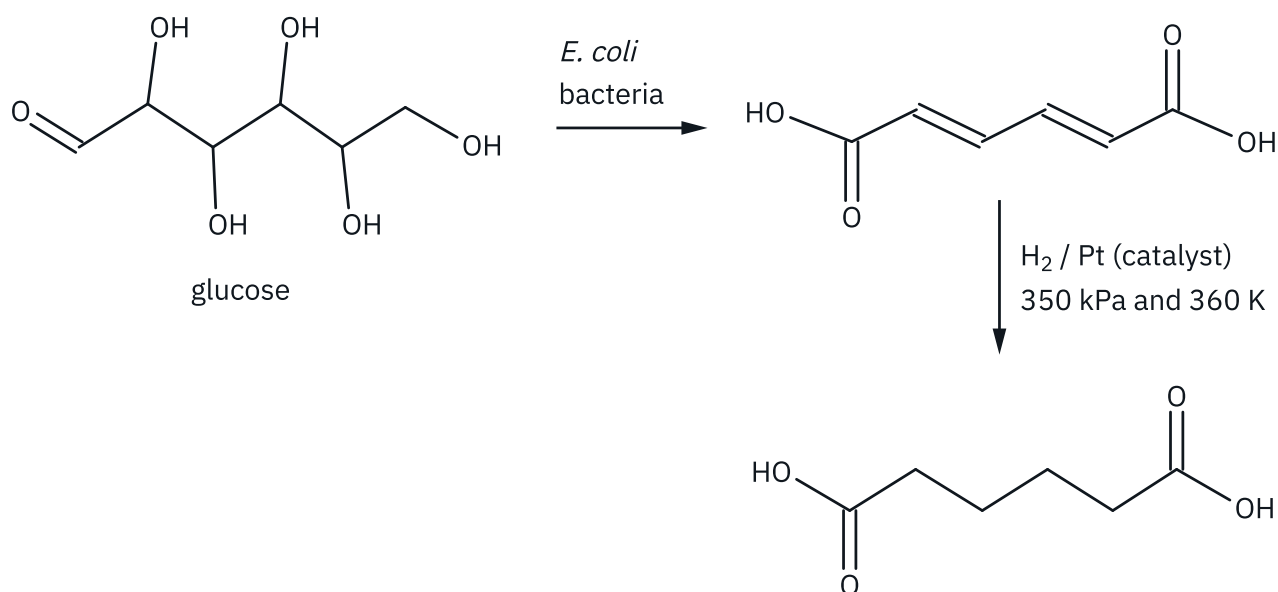
Problem caused

Mistake 2

Problem caused

Figure 5 shows an alternative process to make hexanedioic acid.

Figure 5



04.6 Scientists disagree about whether this alternative process is more sustainable or less sustainable than the process starting from cyclohexanol.

Use the information given in Figure 5 to provide a justification for each point of view.

Justification for alternative process being more sustainable

Justification for alternative process being less sustainable

[2 marks]

Q10 • June 2025 • Paper 3 • Q18 • [1 mark]

What is the correct structural formula for 4-chloro-2-methylpent-2-enoic acid?

Tick (✓) one box.

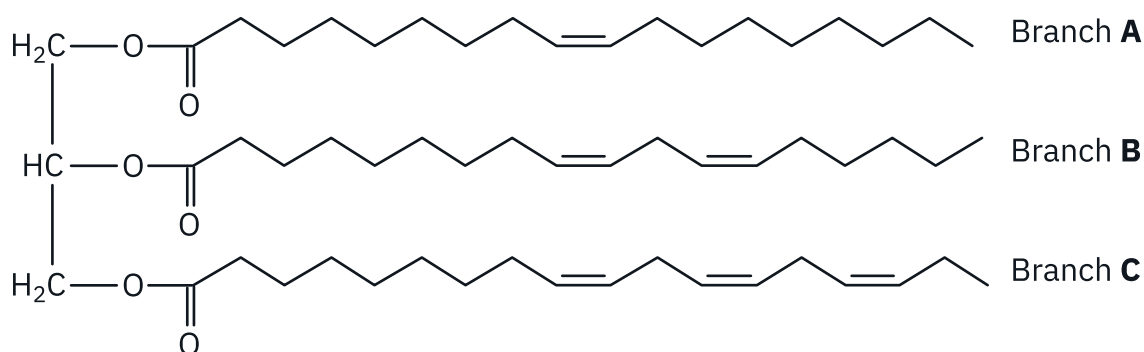
- ☐ **A** $\text{CH}_3\text{CCl}=\text{CHCH}(\text{CH}_3)\text{COOH}$
- ☐ **B** $(\text{CH}_3)_2\text{C}=\text{CHCHClCOOH}$
- ☐ **C** $\text{CH}_3\text{CHClCH}=\text{C}(\text{CH}_3)\text{COOH}$
- ☐ **D** $(\text{CH}_3)_2\text{CHCH}=\text{CClCOOH}$

Q11 • June 2025 • Paper 3 • Q6 • [6 marks]

This question is about rapeseed oil.

Figure 2 shows the structure of compound Q found in rapeseed oil. Each branch in the molecule is formed from a different long-chain carboxylic acid.

Figure 2



06.1 State the type of stereoisomerism shown in Branch A.

[1 mark]

06.2 Q can be reacted with methanol to form three different esters.

State the number used to identify the position of the C=C bond in the name of the ester formed from Branch A.

State the number of different stereoisomers of the ester formed from Branch B.

Give a use for these esters.

[3 marks]

Number used in the name of the ester

Number of stereoisomers

Use for esters

06.3 Q also reacts with NaOH

State the formula of the product, formed by Branch B in Figure 2, in this reaction.

State a use for this product.

[2 marks]

Formula

Use for product

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Mark scheme:

[whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions/pdf/carboxylic-acids-and-derivatives-mark-scheme.pdf](https://www.whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions/pdf/carboxylic-acids-and-derivatives-mark-scheme.pdf)