

AQA A-Level Chemistry

Aromatic chemistry

Questions only

The newest questions, about an hour. All 8 are in the exam generator.

Questions

7

Total marks

45

Time allowed

59 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 A-level P2 Q3	12	
2	2024 A-level P2 Q10	12	
3	2022 A-level P2 Q8	7	
4	2022 A-level P3 Q30	1	
5	2018 A-level P3 Q23	1	
6	2019 A-level P3 Q20	1	
7	2025 A-level P2 Q5	11	

Total _____ / 45 Percentage _____ %

Questions from AQA past papers, 2018–2025, reproduced for revision. Practise these topics online, with instant marking:

whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions?topics=aromatic-chemistry&len=0

Questions

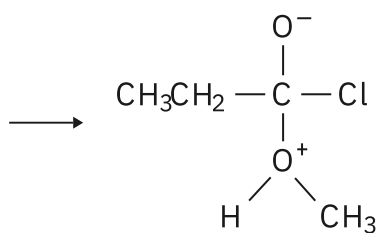
Aromatic chemistry · 7 questions · 45 marks · time allowed 59 min

Q1 · June 2023 · Paper 2 · Q3 · [12 marks]

This question is about intermediates in reaction mechanisms.

(a) Figure 1 shows an intermediate formed in the first step of a nucleophilic addition–elimination mechanism.

Figure 1



Complete Figure 1 to show the structures of the two reactant species with curly arrows and relevant lone pairs of electrons involved in the formation of the intermediate.

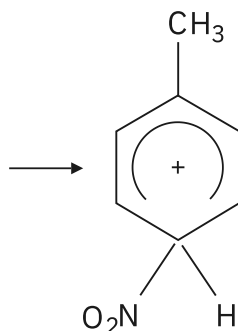
Draw curly arrows and relevant lone pairs of electrons on the intermediate to show how the final products are formed.

[4 marks]

Draw your answer on the figure above.

(b) Figure 2 shows an intermediate formed in the first step of a reaction mechanism of methylbenzene.

Figure 2



Complete Figure 2 to show the reactant species and any curly arrows involved in the formation of the intermediate.

Draw a curly arrow on the intermediate to show how the product is formed.

Give the name of the reaction mechanism.

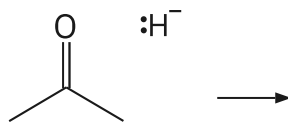
Name of mechanism

[4 marks]

Draw your answer on the figure above.

(c) Figure 3 shows the reactant species involved in the first step of a mechanism.

Figure 3



Complete Figure 3 to show the structure of the intermediate formed with curly arrows involved in its formation.

Give the name of the reaction mechanism.

Name of mechanism

[4 marks]

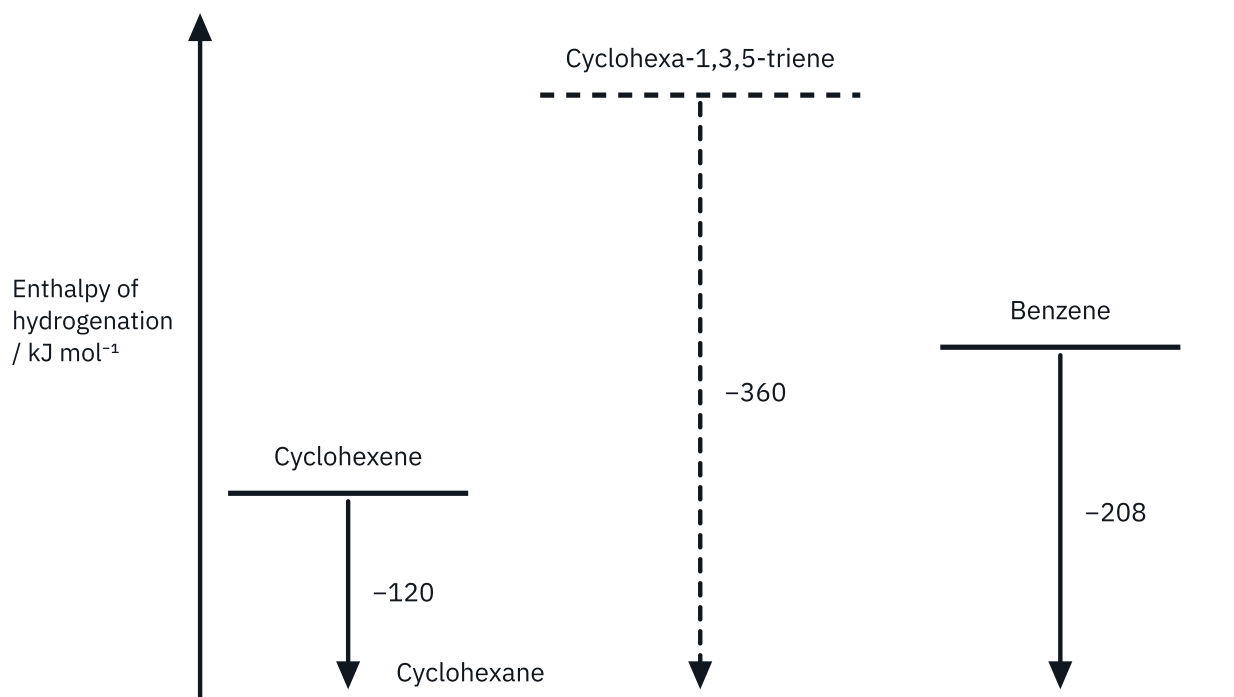
Draw your answer on the figure above.

Q2 · June 2024 · Paper 2 · Q10 · [12 marks]

This question also needs Amines.

The figure below shows enthalpy of hydrogenation data for cyclohexene and benzene.

It also shows predicted data for the theoretical molecule cyclohexa-1,3,5-triene.



(a) Compare benzene and the theoretical molecule cyclohexa-1,3,5-triene in terms of:

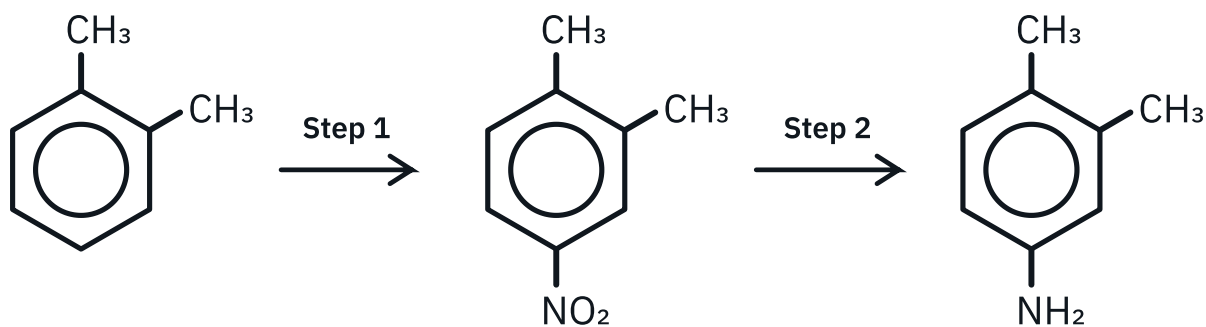
- stability
- shape
- carbon-carbon bond lengths.

For each of these properties, suggest reasons for any differences.

Use data from the figure above in your answer.

[5 marks]

Two steps in the synthesis of an aromatic amine are shown.



(b) State the two reagents needed for Step 1.

Give an equation to show the formation of the reactive intermediate from these two reagents.

[2 marks]

Reagents

Equation

(c) Outline a mechanism for Step 1.

[3 marks]

(d) State the reagent(s) needed for Step 2.

[1 mark]

(e) State a possible use for the amine formed in Step 2.

[1 mark]

Q3 · June 2022 · Paper 2 · Q8 · [7 marks]

Benzene reacts with methanoyl chloride (HCOCl) in the presence of a catalyst.

(a) Give an equation for the overall reaction when benzene reacts with methanoyl chloride.

Name the organic product.

[2 marks]

Equation

Name

(b) Identify the catalyst needed in this reaction.

Give an equation to show how the catalyst is used to form the electrophile, $[\text{HCO}]^+$

[2 marks]

Catalyst

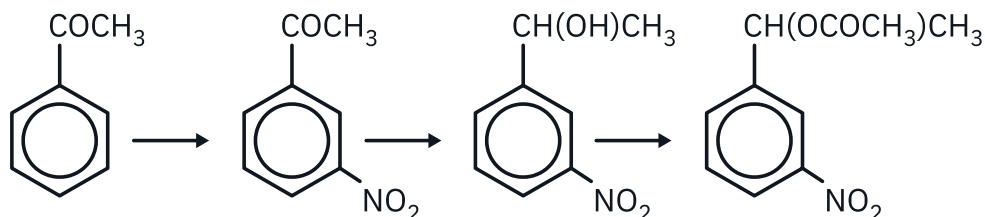
Equation

(c) Outline the mechanism for the reaction of benzene with the electrophile, $[\text{HCO}]^+$

[3 marks]

Q4 • June 2022 • Paper 3 • Q30 • [1 mark]

This question also needs Carboxylic acids.



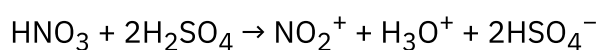
Which type of reaction is not involved in this reaction sequence?

Tick (✓) one box.

- ☐ **A** esterification
- ☐ **B** hydrolysis
- ☐ **C** nitration
- ☐ **D** reduction

Q5 • June 2018 • Paper 3 • Q23 • [1 mark]

The nitration of benzene uses a nitrating mixture of concentrated nitric acid and concentrated sulfuric acid.



Which statement is correct?

Tick (✓) one box.

- ☐ **A** HNO_3 acts as a base.
- ☐ **B** HNO_3 acts as a catalyst.
- ☐ **C** HNO_3 acts as an electrophile.
- ☐ **D** HNO_3 acts as a reducing agent.

Q6 • June 2019 • Paper 3 • Q20 • [1 mark]

Methylbenzene reacts with a mixture of concentrated nitric acid and concentrated sulfuric acid.

What is the name of the mechanism for this reaction?

Tick (✓) one box.

- ☐ **A** Electrophilic addition
- ☐ **B** Electrophilic substitution
- ☐ **C** Nucleophilic addition
- ☐ **D** Nucleophilic substitution

Q7 • June 2025 • Paper 2 • Q5 • [11 marks]

This question also needs Amount of substance.

This question is about making the explosive 2-methyl-1,3,5-trinitrobenzene, commonly known as TNT.

TNT can be made by reacting methylbenzene with concentrated nitric acid in the presence of concentrated sulfuric acid.

05.1 Give the overall equation for the reaction between methylbenzene and nitric acid.

[2 marks]

05.2 The yield of TNT in this reaction is 42.5%.

Calculate the mass, in g, of TNT ($M_r = 227.0$) obtained from

1050 cm³ of methylbenzene.

Methylbenzene has density = 0.867 g cm⁻³ and $M_r = 92.0$

Mass of TNT g

[4 marks]

05.3 In the mechanism for this reaction, concentrated nitric acid reacts with concentrated sulfuric acid to produce the nitronium ion O_2N^+

Give an equation for the reaction to produce the nitronium ion.

State the role of the nitronium ion in the reaction with methylbenzene.

Outline the mechanism for the reaction of the nitronium ion with methylbenzene to give 2-methyl-1-nitrobenzene.

[5 marks]

Equation

Role of nitronium ion

Mechanism

Source: AQA A-Level Chemistry past papers. Reproduced for revision at whiteboardchemistry.com.

Mark scheme:

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