

OCR A-Level Chemistry A

Aromatic compounds and phenols

Questions only

The newest questions, about an hour. All 21 are in the exam generator.

Questions

8

Total marks

37

Time allowed

50 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 OCR Data Sheet.
- Print the separate mark scheme when you are ready to mark your answers.

For marking

Q	Source	Marks	Score
1	2022 P2 Q3	1	
2	2023 P2 Q4	1	
3	2023 P2 Q6	1	
4	2024 P2 Q21	14	
5	2025 P2 Q20	17	
6	2020 P2 Q7	1	
7	2021 P2 Q14	1	
8	2021 P2 Q15	1	

Total _____ / 37 Percentage _____ %

Questions from OCR past papers, 2020–2025, reproduced for revision. Practise these topics online, with instant marking:

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

Questions

Aromatic compounds and phenols · 8 questions · 37 marks · time allowed 50 min

Q1 · June 2022 · Paper 2 (Synthesis and analytical techniques) · Q3 · [1 mark]

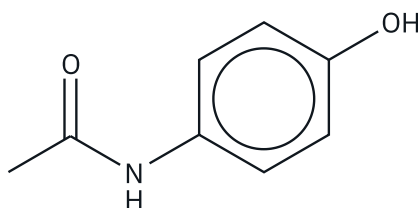
What is the number of sigma bonds in a molecule of methylbenzene?

Tick (✓) one box.

- ☐ **A** 7
- ☐ **B** 10
- ☐ **C** 12
- ☐ **D** 15

Q2 · June 2023 · Paper 2 (Synthesis and analytical techniques) · Q4 · [1 mark]

The structure of the painkiller paracetamol is shown below.



Paracetamol

Which functional groups are present in paracetamol?

Tick (✓) one box.

- ☐ **A** alcohol, amide
- ☐ **B** alcohol, arene, ketone, amine
- ☐ **C** phenol, amide
- ☐ **D** phenol, ketone, amine

Q3 · June 2023 · Paper 2 (Synthesis and analytical techniques) · Q6 · [1 mark]

Which statement supports the delocalised model of benzene and **not** the Kekulé model?

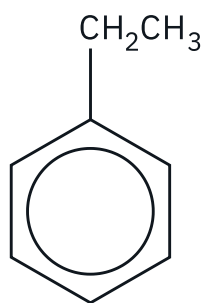
Tick (✓) one box.

- ☐ **A** Sigma bonds overlap to form a π -system.
- ☐ **B** The carbon-carbon bond lengths are all the same.
- ☐ **C** The enthalpy change of hydrogenation is more exothermic than expected.
- ☐ **D** Benzene is more reactive than alkenes with bromine.

Q4 · June 2024 · Paper 2 (Synthesis and analytical techniques) · Q21 · [14 marks]

This question is about aromatic compounds.

Ethylbenzene, $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_3$, can be prepared by reacting benzene with chloroethane, $\text{CH}_3\text{CH}_2\text{Cl}$, in the presence of AlCl_3 . The AlCl_3 acts as a halogen carrier.



Ethylbenzene

In the mechanism, chloroethane reacts with the halogen carrier to form a carbocation, which acts as the electrophile.

21(a)(i) What is meant by the term **electrophile**?

[1 mark]

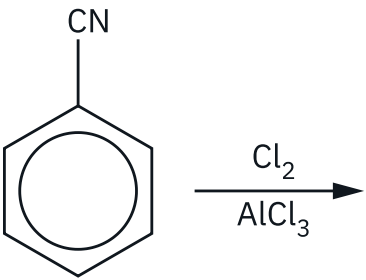
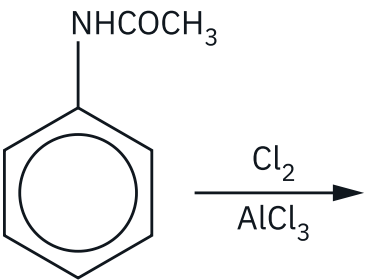
21(a)(ii) Outline the mechanism for this reaction, including the role of AlCl_3 as a halogen carrier.

[5 marks]

The table shows directing effects for different groups in the electrophilic substitution of aromatic compounds.

Directing effect	2- and 4- directing	3-directing
Group	-OH	-NO ₂
	-NH ₂	-COCH ₃
	-NHCOCH ₃	-CN

21(b)(i) Draw all organic products formed from monosubstitution reactions of the substituted benzene compounds shown below.

Reaction	Monosubstituted Product(s)
 Reaction of benzonitrile (a benzene ring with a -CN group) with Cl₂ and AlCl₃ catalyst.	
 Reaction of N-phenylacetamide (a benzene ring with an -NHCOCH₃ group) with Cl₂ and AlCl₃ catalyst.	

[3 marks]

21(b)(ii) The reactions of $\text{C}_6\text{H}_5\text{NH}_2$ are similar to the reactions of phenol.

Write an equation for the tri-substitution of $\text{C}_6\text{H}_5\text{NH}_2$ with chlorine.

[2 marks]

21(b)(iii) Explain why chlorine reacts much more readily with $\text{C}_6\text{H}_5\text{NH}_2$ than with benzene.

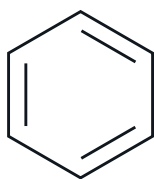
[3 marks]

Q5 · June 2025 · Paper 2 (Synthesis and analytical techniques) · Q20 · [17 marks]

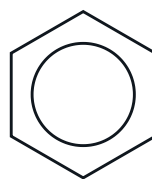
This question also needs Amines, amino acids and polymers.

This question is about aromatic compounds.

20(a) The diagrams show the Kekulé and delocalised models of benzene.



Kekulé



Delocalised

One piece of evidence for the delocalised model is that benzene does **not** decolourise aqueous bromine.

Suggest **two other** pieces of evidence which support the delocalised model of benzene.

[2 marks]

A student investigates the reactions of benzene and phenol with excess bromine.

The student's observations are given in Table 20.1.

Table 20.1

Compound	Benzene	Phenol
Observation with excess bromine	no change	decolourises and forms a white precipitate

20(b)(i) Explain the difference in the relative reactivities of benzene and phenol with bromine.

[3 marks]

20(b)(ii) The white precipitate has a relative molecular mass of 330.7.

Construct an equation for the reaction of phenol with excess bromine shown in Table 20.1.

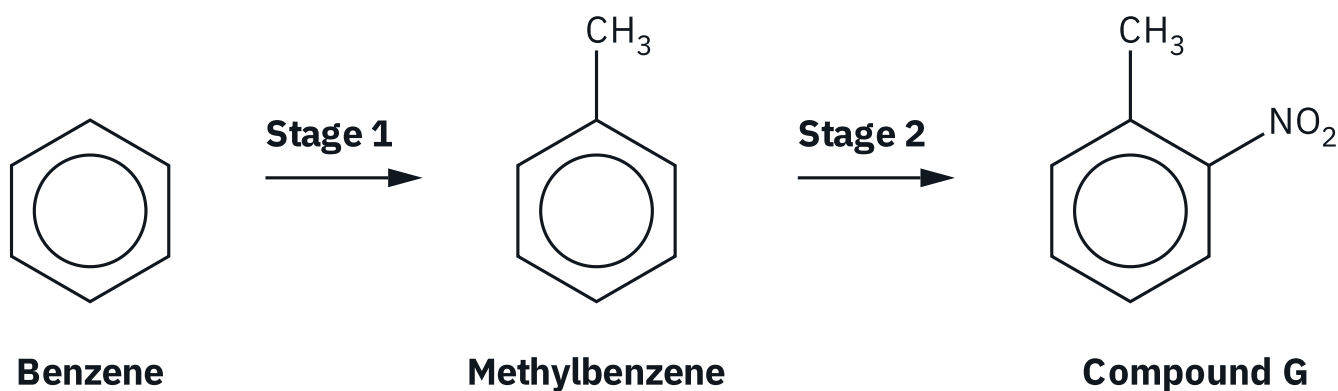
Show the structure of the organic species.

[2 marks]

Compound G is an organic compound used in the production of pesticides.

Compound G can be synthesised from benzene in the two-stage process shown.

Synthesis 1



20(c)(i) Suggest a reagent and halogen carrier that could be used in Stage 1 of Synthesis 1.

[1 mark]

20(c)(ii) Stage 2 of Synthesis 1 is the conversion of methylbenzene to compound G.

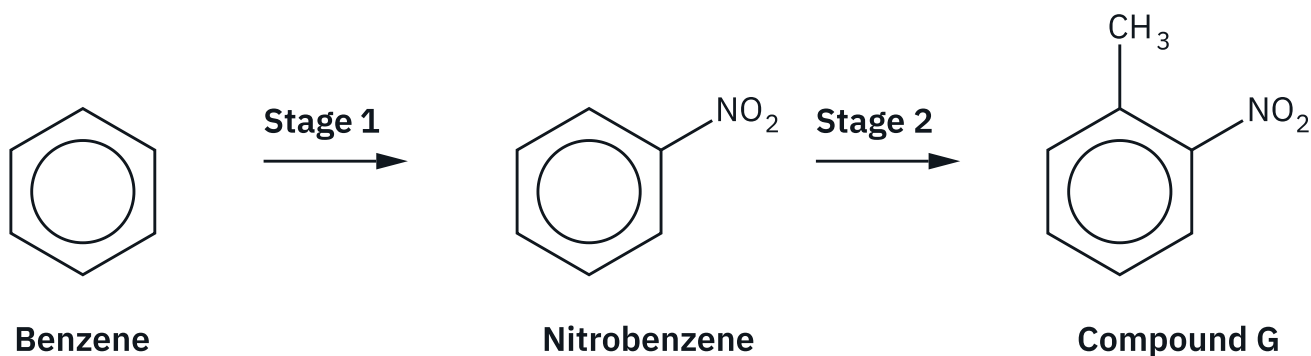
Outline the mechanism for the reaction in Stage 2.

Show the role of H_2SO_4 as a catalyst.

[5 marks]

20(c)(iii) A student suggested an alternative two-stage synthesis of compound G from benzene.

Synthesis 2



When Synthesis 2 is attempted, the synthesis is **not** successful and a different organic compound from compound G is produced.

- Suggest why Synthesis 1 is successful but Synthesis 2 is **not** successful.
- Suggest the structure of the different organic compound that is formed in Synthesis 2.

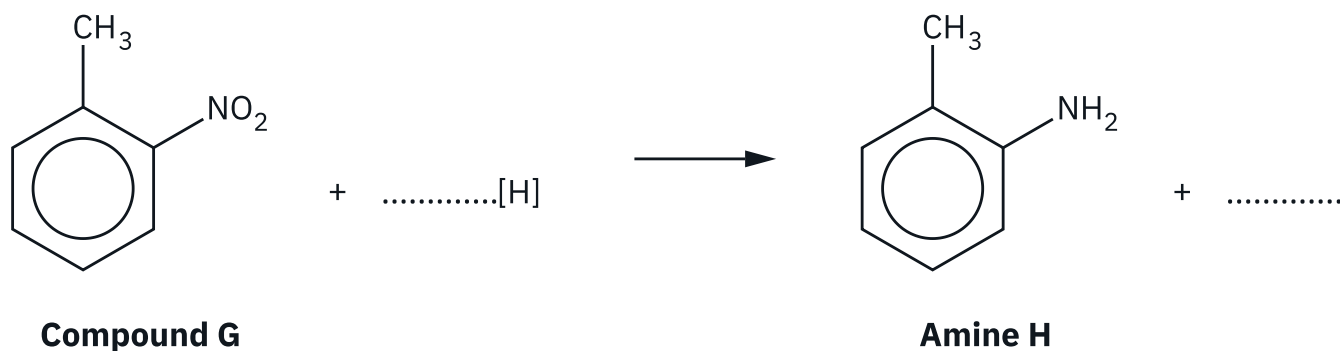
[2 marks]

20(c)(iv) In the production of a pesticide, compound G is reduced to amine H.

Suggest suitable reagents and complete the equation for this reduction.

Reagents

Equation:



[2 marks]

Q6 · November 2020 · Paper 2 (Synthesis and analytical techniques) · Q7 · [1 mark]

This question also needs Acids and redox reactions and Reaction rates and equilibrium.

Which one of the following reacts with ethanoic acid and with phenol?

Tick (✓) one box.

- ☐ **A** Aqueous potassium hydroxide
- ☐ **B** Bromine
- ☐ **C** Calcium carbonate
- ☐ **D** Methanol and an acid catalyst

Q7 · November 2021 · Paper 2 (Synthesis and analytical techniques) · Q14 · [1 mark]

This question also needs Enthalpy changes and Group 2 and the halogens.

Which of the following statement(s) provide(s) evidence for the delocalised model of benzene rather than the Kekulé model?

- 1 The enthalpy change of hydrogenation is more exothermic than expected.
- 2 Benzene only reacts with bromine in the presence of a halogen carrier.
- 3 The carbon-carbon bonds all have the same length.

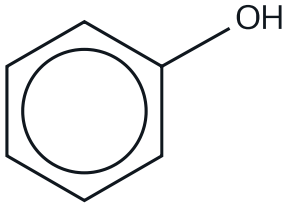
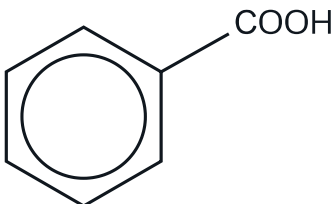
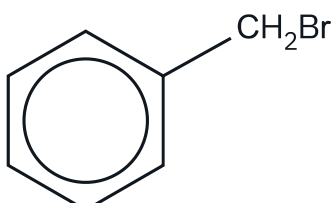
Tick (✓) one box.

- ☐ **A** 1, 2 and 3
- ☐ **B** Only 1 and 2
- ☐ **C** Only 2 and 3
- ☐ **D** Only 1

Q8 · November 2021 · Paper 2 (Synthesis and analytical techniques) · Q15 · [1 mark]

Compounds 1, 2 and 3 are heated with NaOH(aq).

Which compound(s) react(s)?

1	
2	
3	

Tick (✓) one box.

- ☐ **A** 1, 2 and 3
- ☐ **B** Only 1 and 2
- ☐ **C** Only 2 and 3
- ☐ **D** Only 1

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Mark scheme:

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