

OCR A-Level Chemistry A

Alkanes

Questions only

The newest questions, about an hour. All 12 are in the exam generator.

Questions

9

Total marks

41

Time allowed

55 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	2019 P2 Q1	1	
2	2022 P2 Q13	1	
3	2022 P2 Q7	1	
4	2023 P2 Q8	1	
5	2024 P2 Q18	14	
6	2024 P2 Q8	1	
7	2025 P2 Q16	12	
8	2020 P2 Q16	9	
9	2021 P2 Q4	1	

Total _____ / 41 Percentage _____ %

Questions from OCR past papers, 2019–2025, reproduced for revision. Practise these topics online, with instant marking:

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

Questions

Alkanes · 9 questions · 41 marks · time allowed 55 min

Q1 · June 2019 · Paper 2 (Synthesis and analytical techniques) · Q1 · [1 mark]

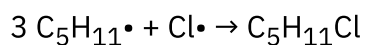
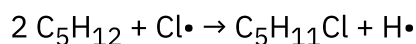
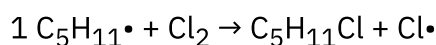
Which alkane has the highest boiling point?

Tick (✓) one box.

- ☐ **A** $\text{CH}_3(\text{CH}_2)_5\text{CH}_3$
- ☐ **B** $(\text{CH}_3)_3\text{CCH}(\text{CH}_3)_2$
- ☐ **C** $\text{CH}_3(\text{CH}_2)_3\text{CH}(\text{CH}_3)_2$
- ☐ **D** $(\text{CH}_3)_2\text{CHCH}_2\text{CH}(\text{CH}_3)_2$
-

Q2 · June 2022 · Paper 2 (Synthesis and analytical techniques) · Q13 · [1 mark]

Which equation(s) could be part of the propagation step in the radical substitution of C_5H_{12} to form $\text{C}_5\text{H}_{11}\text{Cl}$?



Tick (✓) one box.

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

Q3 · June 2022 · Paper 2 (Synthesis and analytical techniques) · Q7 · [1 mark]

Complete combustion of 0.050 mol of an alkane produces 5.40 g of H₂O.

What is the molecular formula of the alkane?

Tick (✓) one box.

- ☐ **A** C₂H₆
- ☐ **B** C₃H₈
- ☐ **C** C₄H₁₀
- ☐ **D** C₅H₁₂
-

Q4 · June 2023 · Paper 2 (Synthesis and analytical techniques) · Q8 · [1 mark]

For complete combustion, 0.100 mol of an alkane requires 22.8 dm³ of O₂, measured at RTP.

Which alkane has undergone complete combustion?

Tick (✓) one box.

- ☐ **A** pentane
- ☐ **B** hexane
- ☐ **C** heptane
- ☐ **D** octane
-

Q5 · June 2024 · Paper 2 (Synthesis and analytical techniques) · Q18 · [14 marks]

This question also needs Alcohols and haloalkanes, Amines, amino acids and polymers and Carbon–carbon bond formation and synthesis.

This question is about haloalkanes.

Haloalkanes can be synthesised by reacting alkanes with halogens in the presence of ultraviolet radiation.

An alkane reacts with bromine to form 2-bromo-2-methylpropane.

18(a)(i) Write the equation for this reaction, showing the structures of the organic compounds.

Name the reaction mechanism and the type of bond fission that occurs.

[3 marks]

Equation

Name of reaction mechanism

Type of bond fission

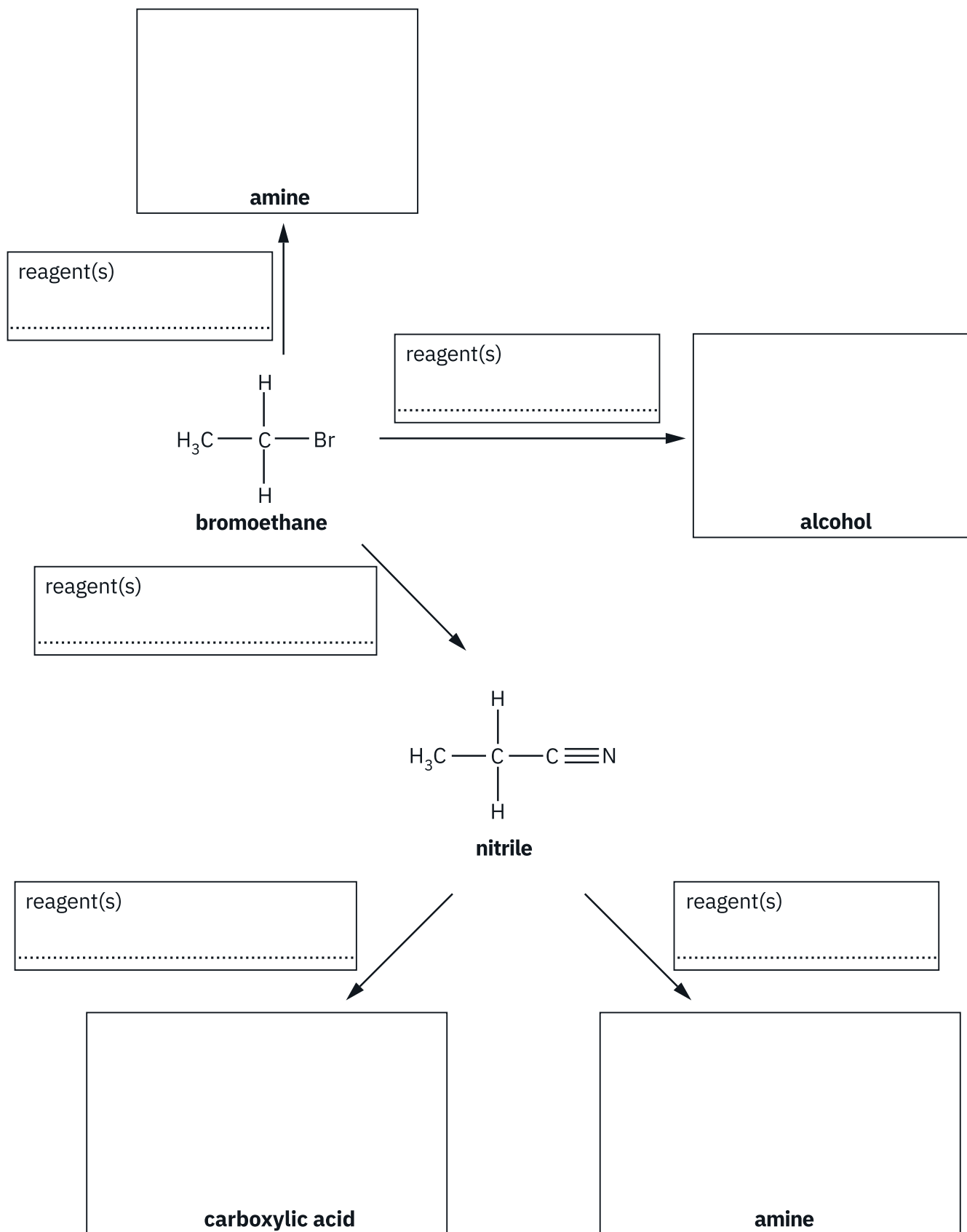
18(a)(ii) Describe **two** limitations of the synthesis of 2-bromo-2-methylpropane from an alkane and bromine.

[2 marks]

1

2

18(b) Complete the flowchart by filling in each box.



[9 marks]

Q6 · June 2024 · Paper 2 (Synthesis and analytical techniques) · Q8 · [1 mark]

This question also needs Alcohols and haloalkanes.

The CFC CCl_2F_2 can cause the breakdown of ozone in the upper atmosphere.

Which initiation step could occur with ultraviolet radiation to catalyse this breakdown?

Tick (✓) one box.

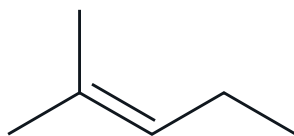
- ☐ **A** $\text{CCl}_2\text{F}_2 \rightarrow \cdot\text{C} + \cdot\text{Cl}_2\text{F}_2$
- ☐ **B** $\text{CCl}_2\text{F}_2 \rightarrow \cdot\text{F} + \cdot\text{CCl}_2\text{F}$
- ☐ **C** $\text{CCl}_2\text{F}_2 \rightarrow \cdot\text{Cl} + \cdot\text{CClF}_2$
- ☐ **D** $\text{CCl}_2\text{F}_2 \rightarrow \cdot\text{Cl}_2 + \cdot\text{CF}_2$

Q7 · June 2025 · Paper 2 (Synthesis and analytical techniques) · Q16 · [12 marks]

This question also needs Alkenes and addition polymers.

This question is about hydrocarbons with six carbon atoms.

16(a) Compound A is a hydrocarbon:



Compound A

What is the systematic name of compound A?

[1 mark]

16(b) The table below shows incomplete information about two hydrocarbons.

Complete the table.

Skeletal formula		
Molecular formula		
Number of σ bonds		
Number of π bonds		

[3 marks]

Compound B, $\text{CH}_3\text{CH}=\text{C}(\text{CH}_3)\text{CH}_2\text{CH}_3$, exists as E and Z stereoisomers.

16(c)(i) Draw the structures of the E and Z stereoisomers of compound B.

E	Z
---	---

[2 marks]

16(c)(ii) Explain why compound B can form E and Z stereoisomers.

[2 marks]

16(d) Hexane, C_6H_{14} , is used as a fuel.

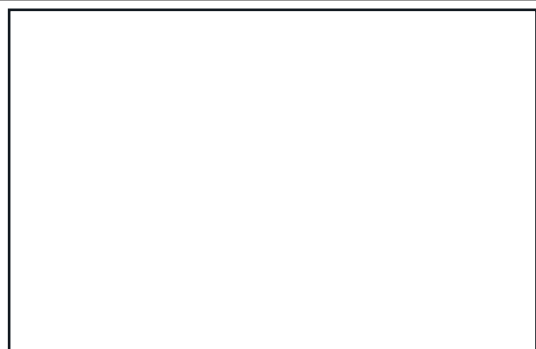
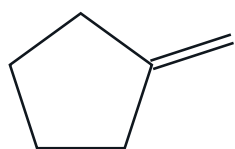
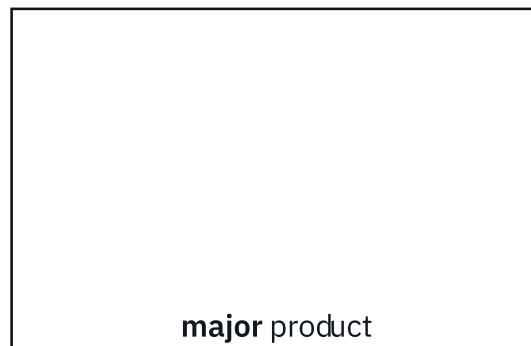
1.0 mol of hexane is mixed with 6.0 mol of oxygen and combusted.

Construct an equation for the **incomplete** combustion of 1.0 mol of hexane with 6.0 mol of oxygen.

[1 mark]

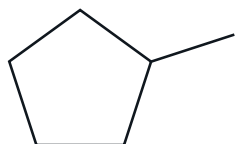
16(e) The flowchart below shows some reactions of compound C.

Complete the flowchart to show the missing reagent, catalyst and the structures of the organic products.

 Br_2 **Compound C** HCl 

reagent:

catalyst:

**[3 marks]**

Q8 · November 2020 · Paper 2 (Synthesis and analytical techniques) · Q16 · [9 marks]

This question also needs Alkenes and addition polymers and Basic concepts of organic chemistry.

The structure of hydrocarbon A is shown below.



16(a) Hydrocarbon A can be reacted with bromine in the presence of ultraviolet radiation to prepare $(\text{CH}_3)_3\text{CCHBrCH}_3$.

What is the systematic name for $(\text{CH}_3)_3\text{CCHBrCH}_3$?

[1 mark]

$(\text{CH}_3)_3\text{CCHBrCH}_3$ has stereoisomers.

16(b)(i) Explain the term stereoisomers and name this type of stereoisomerism.

Explanation:

Type of stereoisomerism:

[1 mark]

16(b)(ii) Draw 3D diagrams for the stereoisomers of $(\text{CH}_3)_3\text{CCHBrCH}_3$.

[2 marks]

16(c) Complete the table to show the mechanism for the reaction of hydrocarbon A with Br₂ to form (CH₃)₃CCHBrCH₃.

Use skeletal formulae for all organic compounds.

Use 'dots' (•) to show the position of unpaired electrons.

Initiation

.....

Propagation

+ → + ...

..... + ... → + ...

[3 marks]

16(d) State two limitations of using radical substitution in organic synthesis.

[2 marks]

1

2

Q9 • November 2021 • Paper 2 (Synthesis and analytical techniques) • Q4 • [1 mark]

What is the correct equation for the incomplete combustion of butan-1-ol?

Tick (✓) one box.

- ☐ **A** $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + 1\frac{1}{2}\text{O}_2 \rightarrow 4\text{CO} + 5\text{H}_2$
- ☐ **B** $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + 2\text{O}_2 \rightarrow 4\text{CO} + 5\text{H}_2$
- ☐ **C** $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + 4\text{O}_2 \rightarrow 4\text{CO} + 5\text{H}_2\text{O}$
- ☐ **D** $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + 4\frac{1}{2}\text{O}_2 \rightarrow 4\text{CO} + 5\text{H}_2\text{O}$

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Mark scheme:

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