

OCR A-Level Chemistry A

Alkenes and addition polymers

Questions only

The newest questions, about an hour. All 16 are in the exam generator.

Questions

8

Total marks

29

Time allowed

39 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	2024 P2 Q19	6	
2	2024 P2 Q2	1	
3	2025 P2 Q10	1	
4	2025 P2 Q8	1	
5	2020 P2 Q1	1	
6	2020 P2 Q2	1	
7	2020 P2 Q5	1	
8	2021 P2 Q16	17	

Total _____ / 29 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=alkenes&len=0

Questions

Alkenes and addition polymers · 8 questions · 29 marks · time allowed 39 min

Q1 · June 2024 · Paper 2 (Synthesis and analytical techniques) · Q19 · [6 marks]

This question also needs Carbonyls, carboxylic acids and esters.

19 Alkenes and carbonyl compounds take part in addition reactions.

Describe **one** addition reaction of an alkene and **one** addition reaction of a carbonyl compound.

Include reagents and reaction mechanisms.

[6 marks]

Q2 · June 2024 · Paper 2 (Synthesis and analytical techniques) · Q2 · [1 mark]

Hydrogen reacts much more readily with alkenes than with alkanes.

Why is this?

Tick (✓) one box.

- ☐ **A** Alkenes are polar molecules whereas alkanes are not.
- ☐ **B** All atoms in an alkane have a full outer shell of electrons.
- ☐ **C** The bond enthalpy of C–C σ bonds is **higher** than that of π bonds.
- ☐ **D** The bond enthalpy of C–C σ bonds is **lower** than that of π bonds.

Q3 · June 2025 · Paper 2 (Synthesis and analytical techniques) · Q10 · [1 mark]

How many stereoisomers does the compound $\text{CH}_3\text{CH}(\text{Br})\text{CH}=\text{CHCH}(\text{Cl})\text{CH}_3$ have?

Tick (✓) one box.

- ☐ **A** 2
- ☐ **B** 4
- ☐ **C** 6
- ☐ **D** 8

Q4 · June 2025 · Paper 2 (Synthesis and analytical techniques) · Q8 · [1 mark]

Ethene can be reacted with hydrogen bromide.

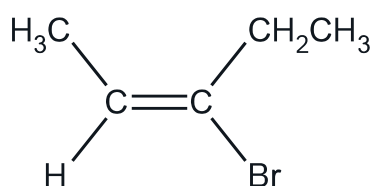
Which statement about this reaction is correct?

Tick (✓) one box.

- ☐ **A** H^- acts as a nucleophile.
- ☐ **B** Br^+ acts as an electrophile.
- ☐ **C** $\text{H}^{\delta+}-\text{Br}^{\delta-}$ acts as an electrophile.
- ☐ **D** $\text{H}^{\delta+}-\text{Br}^{\delta-}$ acts as a nucleophile.

Q5 · November 2020 · Paper 2 (Synthesis and analytical techniques) · Q1 · [1 mark]

What is the name of the compound below?



Tick (✓) one box.

- ☐ **A** E-3-bromopent-2-ene
- ☐ **B** E-3-bromopent-3-ene
- ☐ **C** Z-3-bromopent-2-ene
- ☐ **D** Z-3-bromopent-3-ene

Q6 • November 2020 • Paper 2 (Synthesis and analytical techniques) • Q2 • [1 mark]

This question also needs Alkanes and Electrons, bonding and structure.

Which statement about bonds is correct?

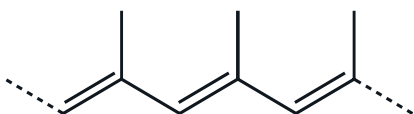
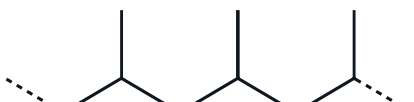
Tick (✓) one box.

- ☐ **A** The C=C bond in ethene is more polar than the C–C bond in ethane.
- ☐ **B** A σ -bond is stronger than a π -bond.
- ☐ **C** The H–C–H bond angle in ethane is greater than the H–C–H bond angle in ethene.
- ☐ **D** A σ -bond is formed from sideways overlap of p orbitals.

Q7 • November 2020 • Paper 2 (Synthesis and analytical techniques) • Q5 • [1 mark]

Which structure shows a section of poly(propene)?

Tick (✓) one box.

- ☐ **A** 
- ☐ **B** 
- ☐ **C** 
- ☐ **D** 

Q8 • November 2021 • Paper 2 (Synthesis and analytical techniques) • Q16 • [17 marks]

This question also needs Alkanes and Basic concepts of organic chemistry.

But-1-ene, $\text{H}_2\text{C}=\text{CHCH}_2\text{CH}_3$, and buta-1,3-diene, $\text{H}_2\text{C}=\text{CH}-\text{CH}=\text{CH}_2$, are unsaturated compounds used to make many organic products.

But-1-ene and buta-1,3-diene have σ -bonds and π -bonds.

16(a)(i) Explain what is meant by the terms σ -bond and π -bond.

σ -bond:

π -bond:

[2 marks]

16(a)(ii) How many σ - and π -bonds are in one molecule of buta-1,3-diene?

σ -bonds: π -bonds:

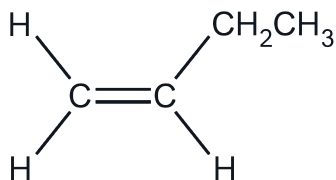
[2 marks]

But-1-ene is reacted with hydrogen bromide, forming a mixture of two saturated organic products.

One of the organic products is formed in a much greater quantity than the other organic product.

16(b)(i) Outline the reaction mechanism for the formation of this major organic product. The structure of but-1-ene has been provided.

Include curly arrows and relevant dipoles.



[4 marks]

16(b)(ii) Explain why one organic product is formed in a much greater quantity than the other organic product.

[2 marks]

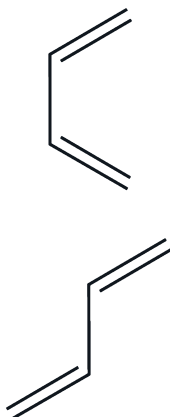
16(b)(iii) Buta-1,3-diene is reacted with an excess of hydrogen bromide, forming a mixture of saturated organic products.

How many saturated organic products could be present in this mixture?

[1 mark]

A student thought that buta-1,3-diene can show stereoisomerism.

The student drew out skeletal formulae for the stereoisomers of buta-1,3-diene:



16(c)(i) Explain the term stereoisomerism.

[1 mark]

16(c)(ii) Explain, with a reason, whether the student is correct or incorrect.

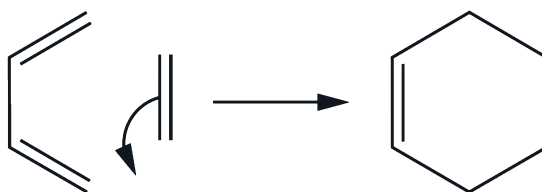
[1 mark]

'Diels-Alder' reactions are used in the synthesis of many important organic compounds.

The Diels-Alder reaction of buta-1,3-diene with ethene is shown below.



16(d)(i) Add curly arrows to the diagram below to complete the mechanism for this Diels-Alder reaction.

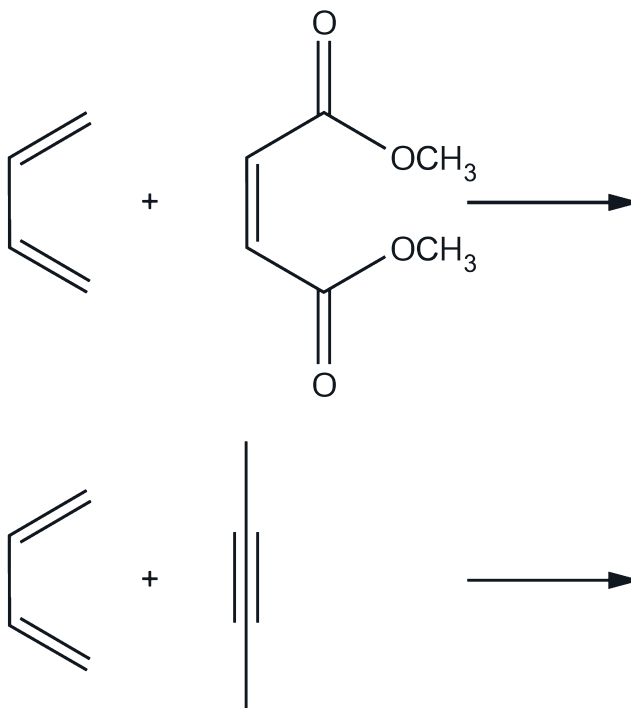


[2 marks]

Draw your answer on the figure above.

16(d)(ii) Two more Diels-Alder reactions of buta-1,3-diene are shown below.

In the boxes, draw the organic product of each reaction.



[2 marks]

Draw your answer on the figure above.

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Mark scheme:

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