

OCR A-Level Chemistry A

Basic concepts of organic chemistry

Questions only

The newest questions, about an hour. All 20 are in the exam generator.

Questions

9

Total marks

44

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 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 Q16	15	
2	2022 P2 Q16	17	
3	2022 P2 Q4	1	
4	2023 P2 Q13	1	
5	2023 P2 Q3	1	
6	2023 P2 Q5	1	
7	2023 P2 Q7	1	
8	2024 P2 Q16	6	
9	2025 P2 Q1	1	

Total _____ / 44 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=basic-concepts-of-organic-chemistry&len=0

Questions

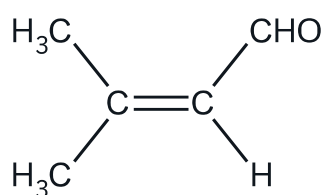
Basic concepts of organic chemistry · 9 questions · 44 marks · time allowed 59 min

Q1 · June 2019 · Paper 2 (Synthesis and analytical techniques) · Q16 · [15 marks]

This question also needs Alcohols and haloalkanes, Alkenes and addition polymers, Amines, amino acids and polymers and 2 other topics.

This question is about unsaturated aldehydes and alcohols.

3-Methylbut-2-enal, shown below, is used as a food flavouring.



3-methylbut-2-enal

3-Methylbut-2-enal is reacted with hydrogen bromide, forming a mixture of two organic products.

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

16(a)(i) Outline the reaction mechanism for the formation of one of the organic products.

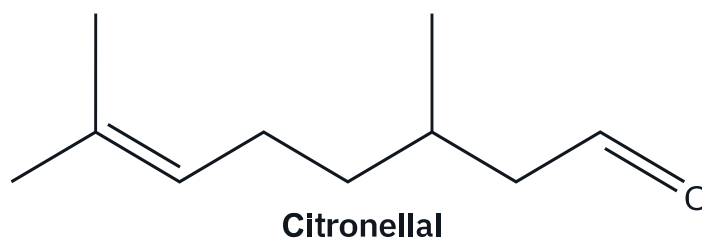
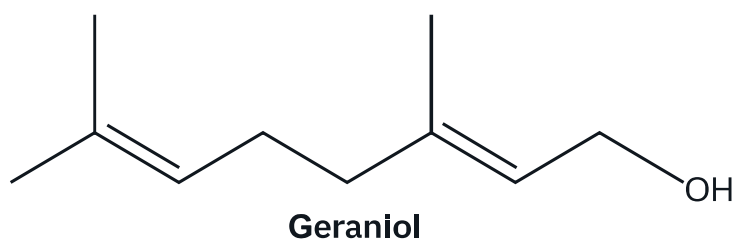
Include curly arrows and relevant dipoles.

[4 marks]

16(a)(ii) Explain why one of the organic products forms in a much greater quantity than the other organic product.

[2 marks]

Geraniol and citronellal, shown below, are isomers present in 'citronella oil', used as an insect repellent.



- Geraniol and citronellal are structural isomers of each other.
- They also show stereoisomerism.

16(b)(i) Describe how the observations from a chemical test would distinguish between geraniol and citronellal.

[2 marks]

16(b)(ii) What is the molecular formula of geraniol?

[1 mark]

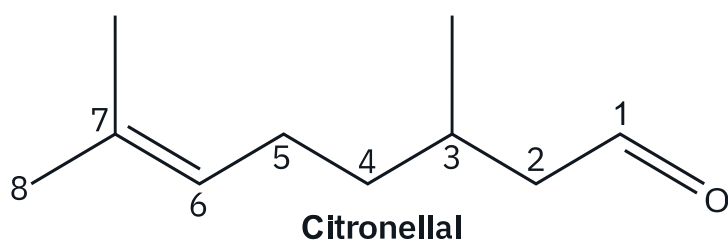
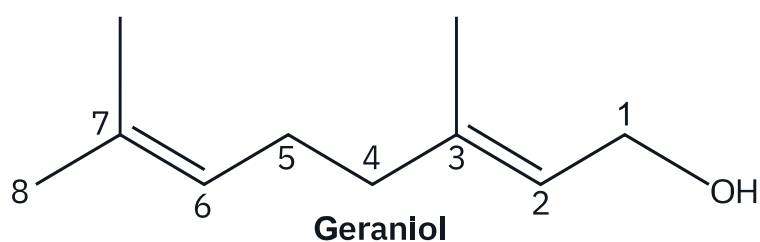
16(b)(iii) Explain why geraniol and citronellal are structural isomers of each other.

[1 mark]

16(b)(iv) Explain the term stereoisomerism.

[1 mark]

16(b)(v) The structures of geraniol and citronellal are repeated below with the carbon atoms numbered.



Explain the types of stereoisomerism shown by geraniol and citronellal.

In your answer,

- refer to the numbered carbon atoms in the structures above
- draw diagrams clearly showing any stereoisomers.

[4 marks]

Geraniol stereoisomers

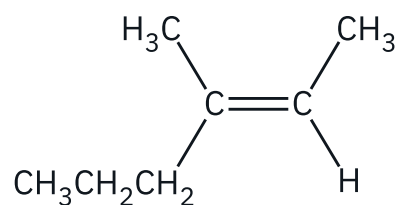
Citronellal stereoisomers

Q2 · June 2022 · Paper 2 (Synthesis and analytical techniques) · Q16 · [17 marks]

This question also needs Alkenes and addition polymers and Organic synthesis, IR and mass spectra.

This question is about unsaturated hydrocarbons.

The unsaturated hydrocarbon A, shown below, is reacted with bromine.



Hydrocarbon A

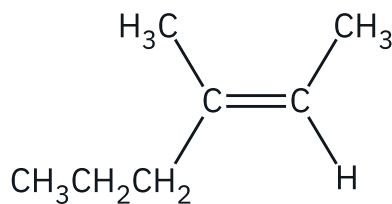
16(a)(i) What is the systematic name of hydrocarbon A?

[1 mark]

16(a)(ii) Outline the mechanism for the reaction of hydrocarbon A with bromine.

The structure of hydrocarbon A has been provided.

Include curly arrows and relevant dipoles.



[3 marks]

Compounds B and C are **branched** hydrocarbons that are structural isomers of C_6H_{12} .

Compounds B and C both have stereoisomers.

- Compound B has cis and trans isomers but does **not** have optical isomers.
- Compound C has optical isomers but does **not** have cis and trans isomers.

16(b)(i) What is meant by the term **structural isomers**?

[1 mark]

16(b)(ii) What is meant by the term **stereoisomers**?

[1 mark]

16(b)(iii) Draw structures for the cis and trans isomers of the branched hydrocarbon B.

cis isomer

trans isomer

[2 marks]

16(b)(iv) Draw 3D structures for the optical isomers of compound C.

Optical isomers

[2 marks]

16(b)(v) Compounds D and E are two more structural isomers of C_6H_{12} .

Compounds D and E do **not** show stereoisomerism.

Table 16.1 shows NMR and infrared (IR) spectral data for D and E.

	Number of peaks in ^1H NMR spectrum	Number of peaks in ^{13}C NMR spectrum	IR peak at 1620–1680 cm^{-1}
D	1	1	No
E	1	2	Yes

Table 16.1

Draw the structures of D and E and explain how the spectral data in Table 16.1 provides evidence for the structures.

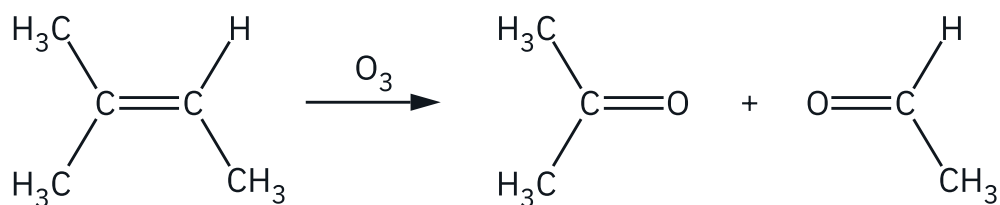
D	E
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[4 marks]

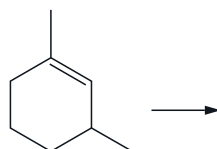
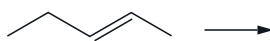
Draw your answer on the figure above.

'Ozonolysis' is used in organic synthesis. Ozone breaks C=C bonds to form carbonyl compounds.

For example, the complete ozonolysis of methylbut-2-ene is shown below.



16(c)(i) Draw the structures of the products you would expect from the ozonolysis of the **two** compounds below.

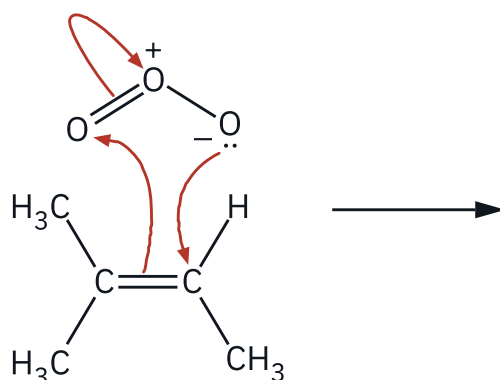


[2 marks]

16(c)(ii) The mechanism for ozonolysis takes place in several steps.

The curly arrows in the first step in the ozonolysis of methylbut-2-ene are shown below.

In the box, draw the structure(s) for the product(s) of this step.

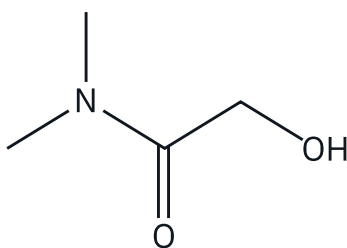


[1 mark]

Draw your answer on the figure above.

Q3 · June 2022 · Paper 2 (Synthesis and analytical techniques) · Q4 · [1 mark]

The skeletal formula of an organic compound is shown below.



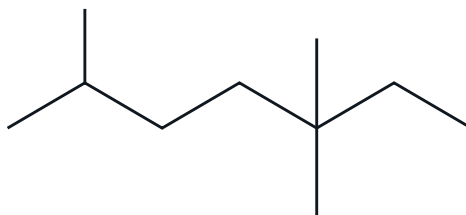
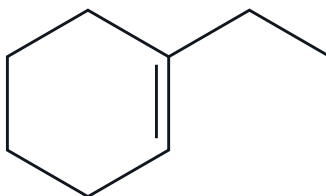
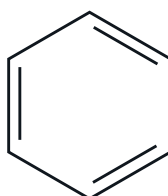
Which functional groups are present?

Tick (✓) one box.

- ☐ **A** amide and alcohol
- ☐ **B** amide and carboxylic acid
- ☐ **C** amine and carboxylic acid
- ☐ **D** amine, ketone and alcohol

Q4 · June 2023 · Paper 2 (Synthesis and analytical techniques) · Q13 · [1 mark]

Which compound(s) is/are aliphatic?

1**2****3**

Tick (✓) one box.

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

Q5 · June 2023 · Paper 2 (Synthesis and analytical techniques) · Q3 · [1 mark]

Propyne, $\text{CH}_3\text{C}\equiv\text{CH}$, is a member of the alkynes homologous series with the $\text{C}\equiv\text{C}$ functional group.

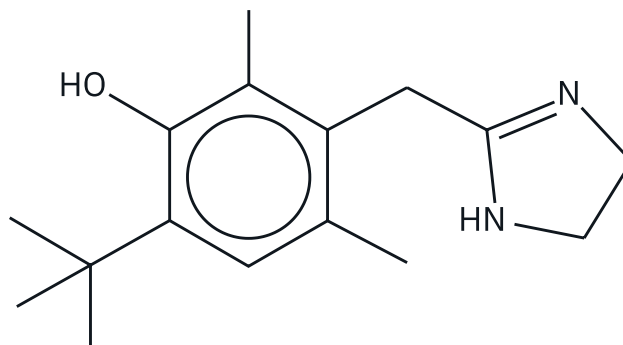
What is the general formula of the alkynes?

Tick (✓) one box.

- ☐ **A** $\text{C}_n\text{H}_{2n-4}$
- ☐ **B** $\text{C}_n\text{H}_{2n-2}$
- ☐ **C** C_nH_{2n}
- ☐ **D** $\text{C}_n\text{H}_{2n+2}$

Q6 · June 2023 · Paper 2 (Synthesis and analytical techniques) · Q5 · [1 mark]

Oxymetazoline, shown below, is used as a decongestant in the treatment of colds.



Oxymetazoline

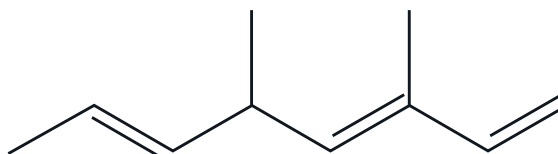
How many H atoms are in one molecule of oxymetazoline?

Tick (✓) one box.

- ☐ **A** 23
- ☐ **B** 24
- ☐ **C** 25
- ☐ **D** 26

Q7 · June 2023 · Paper 2 (Synthesis and analytical techniques) · Q7 · [1 mark]

What is the systematic name for the compound below?



Tick (✓) one box.

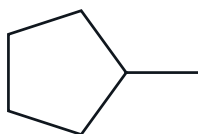
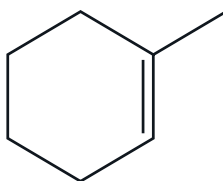
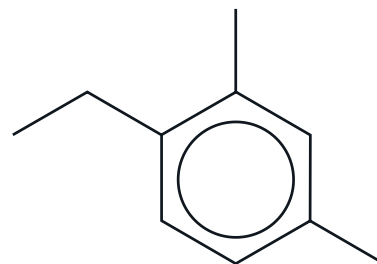
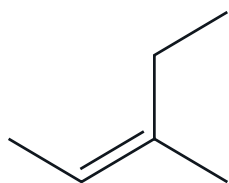
- ☐ **A** 3,5-dimethylocta-1,3,6-triene
- ☐ **B** 3,5-dimethylocta-2,5,7-triene
- ☐ **C** 4,6-dimethylocta-1,3,6-triene
- ☐ **D** 4,6-dimethylocta-2,5,7-triene

Q8 · June 2024 · Paper 2 (Synthesis and analytical techniques) · Q16 · [6 marks]

This question also needs Alkenes and addition polymers.

This question is about hydrocarbons.

The structures of hydrocarbons A–E are shown below.

**A****B****C****D****E**

16(a) Which hydrocarbons are unsaturated?

[1 mark]

16(b) Which hydrocarbons are alicyclic?

[1 mark]

16(c) Which hydrocarbons have the general formula C_nH_{2n} ?

[1 mark]

16(d) What is the systematic name of hydrocarbon C?

[1 mark]

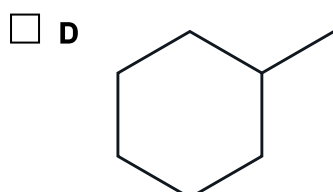
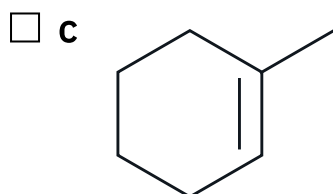
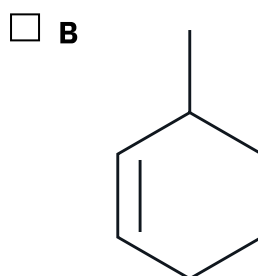
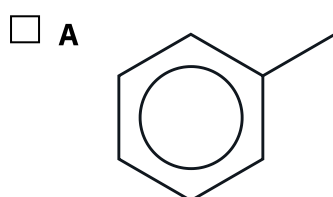
16(e) Explain why hydrocarbon D is a Z-stereoisomer.

[2 marks]

Q9 · June 2025 · Paper 2 (Synthesis and analytical techniques) · Q1 · [1 mark]

Which compound is alicyclic **and** unsaturated?

Tick (✓) one box.



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Mark scheme:

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