OCR A-Level Chemistry A

Basic concepts of organic chemistry mark scheme · goes with “Basic concepts of organic chemistry” · whiteboardchemistry.com/revision/exam-questions/ocr-a-level-chemistry/

Mark schemes

Basic concepts of organic chemistry · 9 questions

Q1 · June 2022 · Paper 2 (Synthesis and analytical techniques) · Q16 · [17 marks]

OCR MARK SCHEME

16(a)(i)

3-methylhex-2-ene ✓

[1 mark]

EXAMINER GUIDANCE

IGNORE *lack of hyphens, or addition of commas*

DO NOT ALLOW *3-methyhex-2-ene*

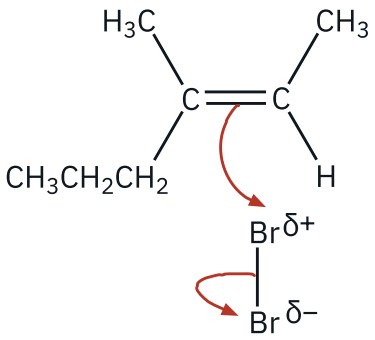
OR 3-methhex-2-ene

OR 3-methlyhex-2-ene

OR 3-methylhexan-2-ene

IGNORE *references to E/Z or cis/trans*

16(a)(ii)



Curly arrow from C=C bond to $Br^{\delta+}$ of Br–Br

AND

Correct dipole on Br–Br

AND

curly arrow for breaking of Br–Br bond ✓

Correct carbocation to match mechanism

AND curly arrow from Br^- to C^+ of carbocation

ALLOW *any combination of skeletal* ***OR*** *structural* ***OR*** *displayed formula as long as unambiguous*

IGNORE *connectivity of $CH_3CH_2CH_2$ and CH_3 groups in carbocation and product*

ALLOW *C_3H_7 for $CH_3CH_2CH_2$*

DO NOT ALLOW *half headed or double headed arrows but allow* ***ECF*** *if seen more than once*

DO NOT ALLOW *use of HBr but ECF for subsequent use*

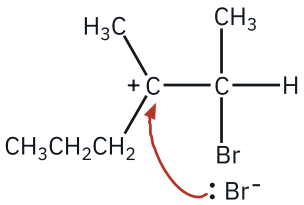
For curly arrows, ALLOW straight or snake-like arrows and small gaps (see examples):

DO NOT ALLOW *partial charge on C=C*

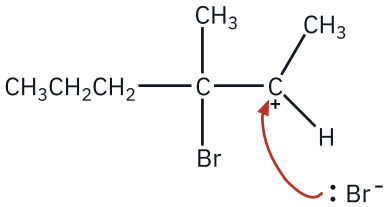
1st curly arrow must

- go to a Br atom of Br–Br

AND



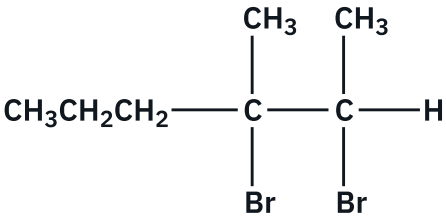
OR



✓

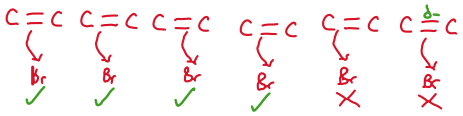
i.e. **ALLOW** carbonium + on either C atom

Correct product to match mechanism ✓



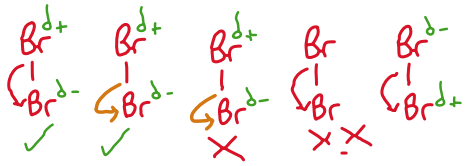
[3 marks]

start from, **OR** be traced back to any point across width of C=C



2nd curly arrow must

- start from, **OR** be traced back to, any part of $^{\delta+}$Br–Br$^{\delta-}$ bond
- **AND** go to Br $^{\delta-}$

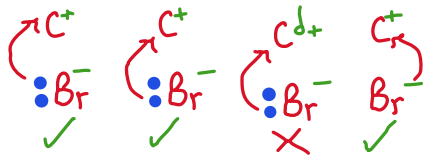


3rd curly arrow must

- go to the C^+ of carbocation

AND

- start from, **OR** be traced back to any point across width of lone pair on :Br^-
- **OR** start from – charge on Br^- ion



(Lone pair **NOT** needed if curly arrow shown from – charge on Br^-)

ALLOW *bromonium ion*

16(b)(i)

Same molecular formula

AND

Different structural formulae ✓

OR

Both have the molecular formula C_6H_{12}

AND

Different structural formulae ✓

Same formula is not sufficient

(no reference to molecular)

Different arrangement of atoms is not sufficient

(no reference to structure/structural)

For 'structural formulae',

ALLOW *structure/displayed/skeletal formulae/ functional groups*

[1 mark]

DO NOT ALLOW *any reference to spatial/space*

16(b)(ii)

Same structural formula

AND

Different arrangement (of atoms) in space

OR different spatial arrangement (of atoms) ✓

[1 mark]

ALLOW *structure/displayed/skeletal formula*

DO NOT ALLOW *same empirical formula*

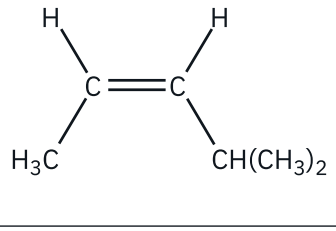
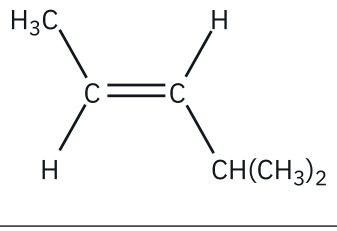
OR same general formula

IGNORE *same molecular formula*

Reference to *E*/*Z* isomerism or optical isomerism is not sufficient

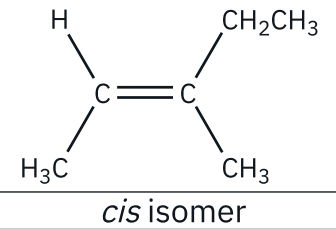
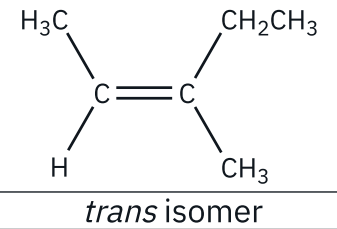
16(b)(iii)

Correct identification of *cis* **AND** *trans* isomers of 4-methylpent-2-ene ✓✓

	
cis isomer	*trans* isomer

OR

Identification of 3-methylpent-2-ene as *cis* **AND** *trans* isomers ✓✓

	
cis isomer	*trans* isomer

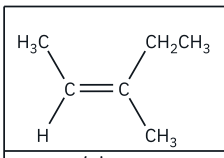
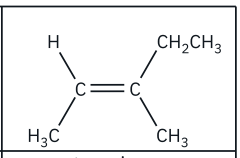
[2 marks]

ALLOW *any combination of skeletal* ***OR*** *structural* ***OR*** *displayed formula as long as unambiguous*

C_3H_7 is not sufficient (could be unbranched)

ALLOW *one mark if cis* ***AND*** *trans isomers of 4-methylpent-2-ene are in the wrong boxes*

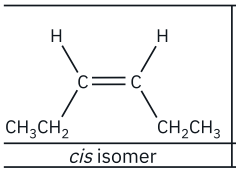
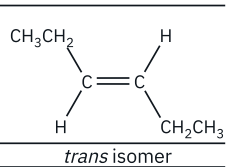
ALLOW *the isomers of 3-methylpent-2-ene in either box*

	
cis isomer	*trans* isomer

Ambiguity with *cis*/*trans* identification system

ALLOW *one mark for correct identification of cis* ***AND*** *trans isomers of unbranched* C_6H_{12}

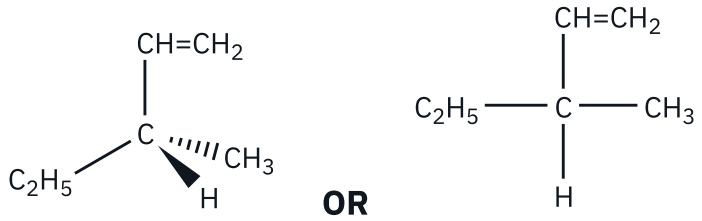
e.g.

	
cis isomer	*trans* isomer

16(b)(iv)

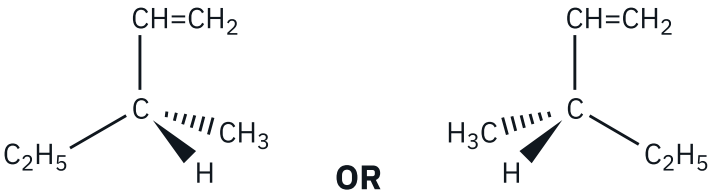
Correct groups attached to chiral carbon of compound C seen once e.g.

ALLOW *any combination of skeletal* ***OR*** *structural* ***OR*** *displayed formula as long as unambiguous*



✓

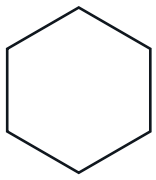
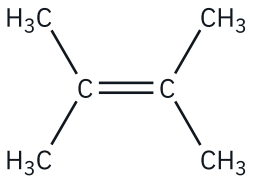
Two 3D structures of compound C that are mirror images with correct connectivity in both



✓

[2 marks]

16(b)(v)

	
D	**E**

✓ ✓

Two of the following for D ✓

- All H are equivalent/in the same chemical environment/ the same type
- All C are equivalent/ in the same chemical environment/ the same type
- No C=C present

Two of the following for E ✓

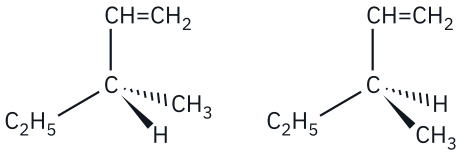
For C_2H_5–, **ALLOW** CH_3CH_2–

For –$CH{=}CH_2$, **ALLOW** –C_2H_3 **OR** –$CHCH_2$

For bond into paper accept:

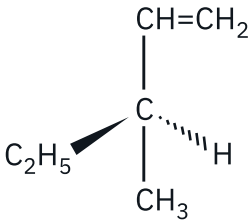


ALLOW *two 3D structures with 2 groups swapped e.g.*



DO NOT ALLOW *a bond angle of 180°*

e.g.



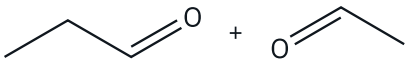
ALLOW *1 mark for structures if shown in wrong boxes.*

CHECK table 16.1 for annotations that may be worthy of credit

- All H are equivalent/ in the same chemical environment/ the same type
- 2 C environments
- C=C present

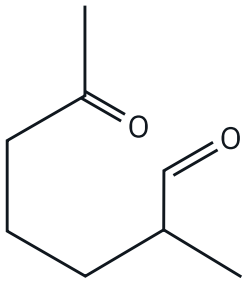
[4 marks]

16(c)(i)



BOTH structures required for ✓

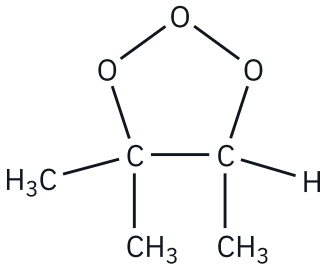
***ALLOW** any combination of skeletal **OR** structural **OR** displayed formula as long as unambiguous*



✓

[2 marks]

16(c)(ii)



✓

***ALLOW** any combination of skeletal **OR** structural **OR** displayed formula as long as unambiguous*

[1 mark]

Q2 · June 2023 · AS Paper 1 (Breadth in chemistry) · Q15 · [1 mark]

Answer: **D**

Q3 · June 2024 · AS Paper 1 (Breadth in chemistry) · Q14 · [1 mark]

Answer: **C**

3-chloro-2-methylbutan-1-ol

Q4 · June 2024 · AS Paper 1 (Breadth in chemistry) · Q15 · [1 mark]

Answer: **B**

Aliphatic and alicyclic

Q5 · June 2024 · Paper 2 (Synthesis and analytical techniques) · Q16 · [6 marks]

OCR MARK SCHEME

16(a)

B, C, D AND E only ✓

[1 mark]

EXAMINER GUIDANCE

ALLOW *letters in any order*

16(b)

A AND B only ✓

[1 mark]

ALLOW *letters in any order*

16(c)

A AND D only ✓

[1 mark]

ALLOW *letters in any order*

16(d)

1-ethyl-2,4-dimethylbenzene ✓

[1 mark]

ALLOW *other unambiguous names using smallest numbering.*

e.g. **ALLOW** 1,3-dimethyl-4-ethylbenzene

2,4-dimethylethylbenzene

ethyl-2,4-dimethylbenzene

2,4-dimethyl-1-ethylbenzene

IGNORE *alphabetical order of methyl and ethyl*

IGNORE *lack of hyphens, extra hyphens, full stops instead of commas, extra spaces*

DO NOT ALLOW *1,5-dimethyl-2-ethylbenzene* ***OR*** *1,3-dimethyl-6-ethylbenzene*

Needs smallest numbers

DO NOT ALLOW *the following for dimethyl: dimethy, dimeth, dimethly, dimethanyl*

DO NOT ALLOW *the following for ethyl: ethy, eth, ethly, ethanyl*

16(e)

Priority groups are on the same side

(Highest) priority groups are CH_3 AND C_2H_5

ALLOW *suitable alternatives to 'priority'*

OR

Low(est) priority groups CH_3 AND H

[2 marks]

e.g. Groups with highest atomic number or more important groups or major groups etc.

IGNORE *references to (relative) mass of groups including A_r or M_r*

ALLOW *suitable alternatives to 'same side'*

e.g. priority groups are both on the top **OR** above the C=C

IGNORE *priority groups in same plane* ***OR*** *adjacent*

IGNORE *Use of 'molecules' instead of groups*

ALLOW *identification by name e.g. ethyl and methyl*

IF *'priority' is not mentioned* ***ALLOW*** *one mark for 'CH_3CH_2 and CH_3 are on same side'* ***OR*** *'H and CH_3 are on same side'*

Q6 · June 2025 · AS Paper 1 (Breadth in chemistry) · Q14 · [1 mark]

Answer: **C**

W and Z

Q7 · June 2025 · AS Paper 1 (Breadth in chemistry) · Q15 · [1 mark]

Answer: **C**

Z-3-fluoropent-2-ene

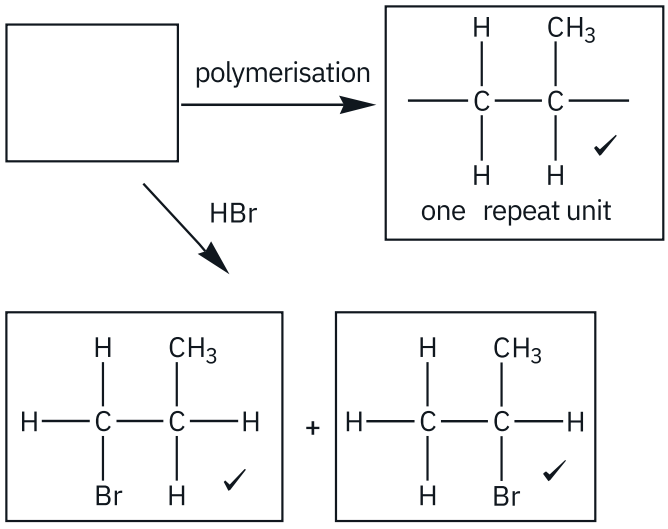
Q8 · June 2025 · Paper 2 (Synthesis and analytical techniques) · Q1 · [1 mark]

Answer: **C**

Q9 · November 2020 · AS Paper 1 (Breadth in chemistry) · Q25 · [15 marks]

OCR MARK SCHEME EXAMINER GUIDANCE

25(a)



ALLOW *any combination of skeletal* ***OR*** *structural* ***OR*** *displayed formula as long as unambiguous*

For repeat unit,

- 'side bonds' required on either side of repeat unit from C atoms
- **DO NOT ALLOW** > one repeat unit

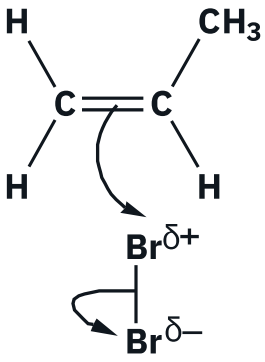
IGNORE *brackets*

- **IGNORE** *n*

ALLOW *in either order*

[3 marks]

25(b)



1st curly arrow

Curly arrow from double bond to Br of Br–Br ✓

DO NOT ALLOW *partial charge on C=C*

2nd curly arrow

Correct dipole on Br–Br

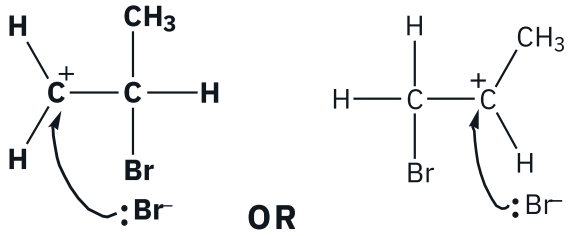
AND curly arrow for breaking of Br–Br bond ✓

3rd curly arrow

Correct carbocation with + charge on C with 3 bonds

AND curly arrow from Br^- to C^+ of carbocation

DO NOT ALLOW *δ+ on C of carbocation*



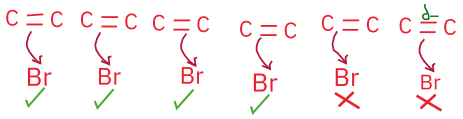
For curly arrows, ALLOW straight or snake-like arrows and small gaps (see examples)

1st curly arrow must

- go to a Br atom of Br–Br

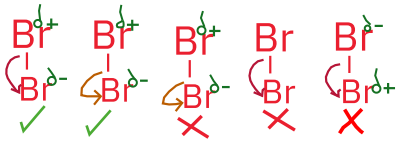
AND

- start from, **OR** be traced back to any point across width of C=C



2nd curly arrow must

- start from, **OR** be traced back to, any part of $^{\delta+}Br–Br^{\delta-}$ bond
- **AND** go to $Br^{\delta-}$



3rd curly arrow must

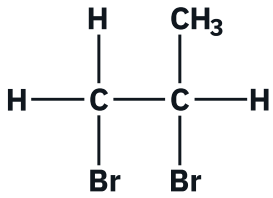
- go to the C^+ of carbocation

AND

✓

i.e. **ALLOW** carbonium + on either C atom

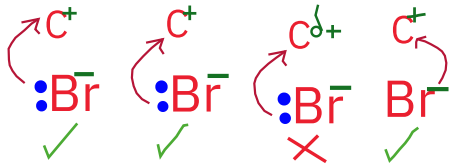
Correct product to match mechanism ✓



DO NOT ALLOW *half headed or double headed arrows but allow* ***ECF*** *if seen more than once*

[4 marks]

- start from, **OR** be traced back to any point across width of lone pair on :Br^-
- **OR** start from – charge on Br^- ion



(Lone pair **NOT** needed if curly arrow shown from – charge on Br^-)

ALLOW *bromonium ion*

ALLOW *any combination of skeletal* ***OR*** *structural* ***OR*** *displayed formula as long as unambiguous*

NOTE*: For a mechanism with HBr,*

ALLOW *all marks EXCEPT for final product*

25(c)(i)

(series of organic compounds with the) same functional group

OR same/similar reactions / chemical properties ✓

each successive member differs by CH_2 ✓

[2 marks]

IGNORE *reference to physical properties*

IGNORE *same general formula*

DO NOT ALLOW *same empirical* ***OR*** *molecular formula*

Differs by CH_2 is not sufficient (no successive)

ALLOW *differs by* CH_2 *each time AW*

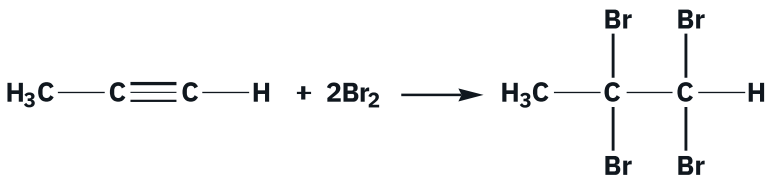
25(c)(ii)

C_nH_{2n-2} ✓

[1 mark]

ALLOW $C_nH_{2(n-1)}$

25(c)(iii)



Left-hand side, i.e. Reactants, balanced with $2Br_2$ ✓

Right-hand side, i.e. Product ✓

ALLOW *any combination of skeletal* ***OR*** *structural* ***OR*** *displayed formula as long as unambiguous*

ALLOW C_3H_4 *for* $H_3CC{\equiv}CH$

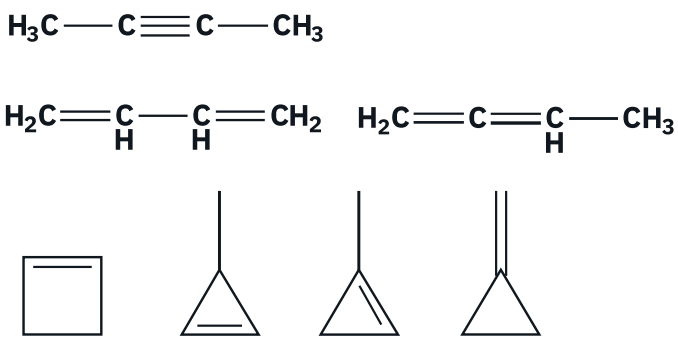
Question asks only for structure of product

[2 marks]

ALLOW $H_3CCBr_2CHBr_2$ ***OR*** $H_3CCBr_2CBr_2H$

25(c)(iv)

Any 2 structures from:

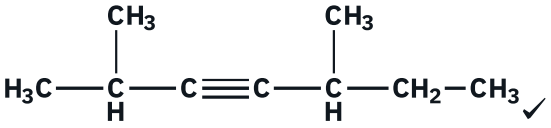


ALLOW *any combination of skeletal* ***OR*** *structural* ***OR*** *displayed formula as long as unambiguous*

✓ ✓

[2 marks]

25(c)(v)



ALLOW *any combination of skeletal* ***OR*** *structural* ***OR*** *displayed formula as long as unambiguous*

[1 mark]

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