AQA A-Level Chemistry

Alcohols mark scheme · goes with “Alcohols” · whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions

Mark schemes

Alcohols · 12 questions

Q1 · June 2022 · AS Paper 2 · Q15 · [1 mark]

Answer: **D**

3-methylbutan-2-ol

Q2 · June 2022 · AS Paper 2 · Q12 · [1 mark]

Answer: **D**

pentan-2-ol

Q3 · June 2023 · Paper 3 · Q32 · [1 mark]

Answer: **D**

$C_6H_5CH(OH)CH_3 + [O] \rightarrow C_6H_5COCH_3 + H_2O$

Q4 · June 2023 · AS Paper 2 · Q7 · [11 marks]

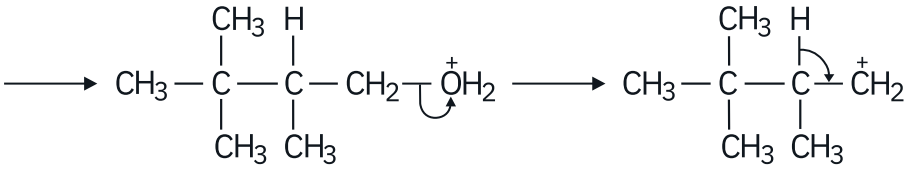
(a) M1 idea of ensuring condenser fills with water

M2 idea that condenser is cool(er) or

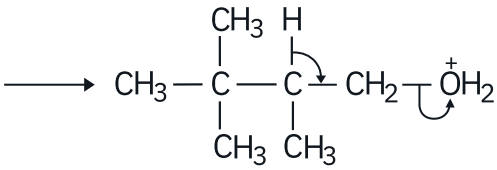
ensuring (more) vapour condenses

[2 marks]

(b) M1 elimination



OR



M1 ignore dehydration; ignore reference to acid-catalysed

M2 correct protonated intermediate with OH_2^+

M3 loss of H_2O: correct arrow from middle of C–O bond to the O

M4 loss of H^+: correct arrow from middle of correct C–H bond to correct C–C bond

M2 + charge anywhere on OH_2 group

M3 and M4 can be two separate steps or all in one step - if two steps shown then the correct carbocation is part of M4

Ignore structure of product

For M3/4, penalise extra arrows on the original structure (or elsewhere) that contradict “correct” ones

[4 marks]

(c) Correct answer scores 5

M1 mass of alcohol = 12 × 0.818 (= 9.816 g)

M2 amount of alcohol =

$$\frac{\text{M1}}{116(.0)}$$

(= 0.0846 mol)

M3 M_r of alkene = 98(.0)

M4 mass of alkene expected = M2 × M3 (= 8.29 g)

M5 % yield =

$$\frac{6.12}{\text{M4}}$$

× 100 = 73.8% (at least 2sf)

Alternative

M4 mol of alkene formed =

$$\frac{6.12}{\text{M3}}$$

(= 0.0624 mol)

M5 % yield =

$$\frac{\text{M4}}{\text{M2}}$$

× 100 = 73.8% (at least 2sf)

Allow ECF at each stage

M5 should be an attempt at (their) mass (or moles) of alkene achieved divided by their mass (or moles) of alkene expected x 100

[5 marks]

Q5 · June 2023 · AS Paper 2 · Q22 · [1 mark]

Answer: **B**

CH_3COCH_3

Q6 · June 2024 · Paper 3 · Q29 · [1 mark]

Answer: **D**

An increase in pressure, at constant temperature, increases the equilibrium yield of ethanol.

Q7 · June 2024 · AS Paper 2 · Q13 · [1 mark]

Answer: **B**

Q8 · June 2025 · AS Paper 2 · Q11 · [1 mark]

Answer: **D**

3-methylbutan-2-ol

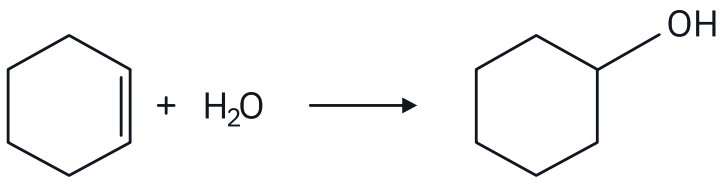
Q9 · June 2025 · AS Paper 2 · Q13 · [1 mark]

Answer: **C**

$C_6H_{10}O_4$

Q10 · June 2025 · AS Paper 2 · Q6 · [16 marks]

06.1



Do not allow equations with H_3PO_4 or H^+ on both

sides

Ignore any acids (or attempt at formula of an acid)

on the arrow.

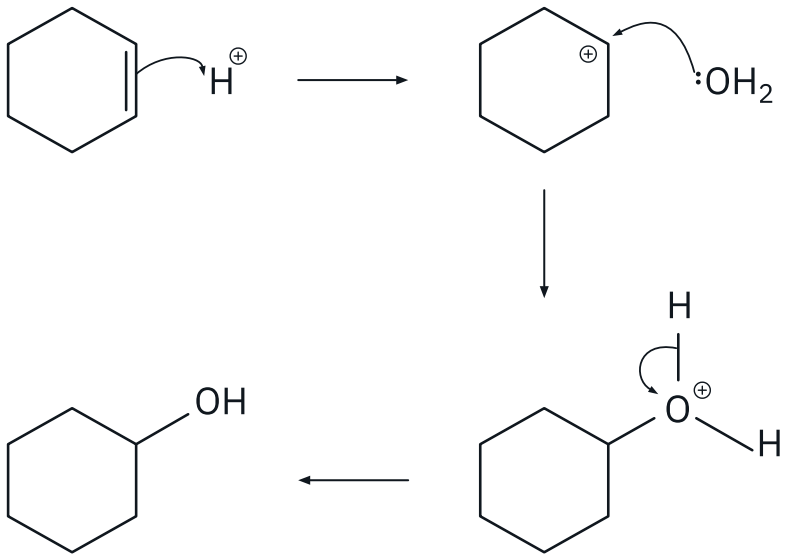
[1 mark]

06.2

M1 curly arrow from C=C to H^+

M2 curly arrow from lone pair on O to positive C atom

M3 curly arrow from an O–H bond to O



Mark each of the three stages independently. Any extra curly arrows within each of the three steps of the mechanism would contradict the correct arrow within that step.

[3 marks]

06.3

M1 Mass of concentrated phosphoric acid = 6.0 × 1.69 (= 10.14 g)

M2 Amount of H_3PO_4 = $\frac{(M1 \times 0.85)}{(98.0)}$ = 0.0879 mol (at least 2sf)

0.10(3) scores 1 mark (at least 2 sf) for not using

85%

Allow 1 mark for = 6.0 x 1.69 x 0.85 (= 8.619 g)

Allow 1 mark for = $\frac{(6.0 \times 1.69 \times 0.85)}{(\text{incorrect } Mr)}$ = $\frac{(8.619)}{(\text{incorrect } Mr)}$

[2 marks]

06.4

M1 idea of ensuring the condenser fills with water

M2 idea that condenser is cool(er) or ensuring (more) vapour condenses

M1 allow idea of no air bubbles

M2 not water vapour; ignore cyclohexene

[2 marks]

06.5

to produce smaller bubbles / prevent the formation of large bubbles

[1 mark]

06.6

as the mixture / cyclohexanol is flammable

Igno0re to control temperature

[1 mark]

06.7

M1 System is closed / sealed

M2 idea of vent or opening on or near the collection flask

M1 allow build-up of pressure

[2 marks]

06.8

elimination

Allow acid catalysed elimination

Ignore dehydration

Not acid-based elimination

[1 mark]

06.9

$C_6H_{11}OH + 8½O_2 \rightarrow 6CO_2 + 6H_2O$

Allow multiples / fractions

Allow $C_6H_{12}O$

Ignore state symbols

[1 mark]

06.10

M1 (A carbon-neutral fuel results in) no net emissions of carbon dioxide to the atmosphere/air

M2 (Extra CO_2 will be emitted) because of use of fossil fuels in processing / transport

OR contains diesel which is non-renewable/fossil fuel/not biofuel

[2 marks]

Q11 · June 2025 · Paper 3 · Q24 · [1 mark]

Answer: **D**

It is anaerobic and the ethanol is separated by fractional distillation

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Q12 · June 2025 · Paper 3 · Q5 · [10 marks]

05.1

This question is marked using Levels of Response.

Level 3 All stages are covered and the explanation of each

5–6 marks stage is correct and virtually complete

Answer communicates the whole explanation, including equations, coherently and shows a logical progression through all three stages.

Level 2 All stages are covered but the explanation of each

3–4 marks stage may be incomplete or may contain inaccuracies.

OR

two stages covered and the explanations are generally correct and virtually complete.

Answer is coherent and shows some progression through all three stages. Some steps in each stage may be incomplete.

Level 1 Two stages are covered but the explanation of each

1–2 marks stage may be incomplete or may contain inaccuracies.

OR

only one stage is covered but the explanation is generally correct and virtually complete.

Answer shows some progression between two stages.

0 mark Insufficient correct chemistry to gain a mark.

Stage 1: Oxidation of the alcohols

(covered = 1/3; virtually complete = 2/3)

1a – use acidified potassium dichromate(VI) to oxidise both samples

1b – $CH_3CH_2CH_2OH + [O] \rightarrow CH_3CH_2CHO + H_2O$

1c – $CH_3CH(OH)CH_3 + [O] \rightarrow CH_3COCH_3 + H_2O$

NOT *molecular formulae*

Stage 2: Testing the aldehyde/ketone formed by the oxidation

(covered = 1/3; virtually complete = 2/3)

2a – test both samples using Fehling's solution / Tollens' reagent / acidified potassium dichromate(VI)

2b – propanal (or product of oxidation of propan-1-ol) will form brick red precipitate / silver mirror / (orange to) green (solution)

2c – propanone (or product of oxidation of propan-2-ol) will have no visible change / no reaction

Stage 3: Use of IR spectroscopy

(covered = 1/3; virtually complete = 2/3)

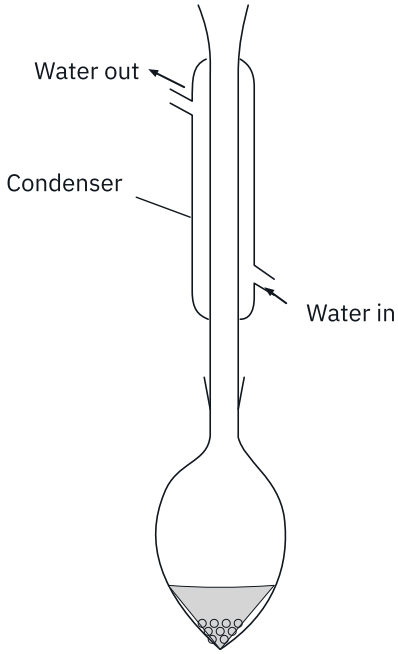
3a – Both show absorption at 3230-3550 (for O–H alcohol)

3b – use the fingerprint region of each sample

3c – find an (exact) match to a database / idea that fingerprint region is unique to an individual compound

[6 marks]

05.2



M1 Condition = (heat under) reflux

M2 Must have a vertical condenser open at the very top AND no gap between the pear-shaped flask and the condenser

M3 Minimum labels must be water in, water out (or arrows) and condenser

ALLOW *heat/boil if diagram looks like reflux*

NOT *ECF to incorrect diagram*

NOT *lines across water in/out tubes (that would seal openings)*

NOT *lines across the condenser at any height (that would seal off the reaction mixture)*

NOT *thermometer drawn anywhere in diagram*

[3 marks]

05.3

To produce (a steady stream of) tiny/small(er) bubbles

OR

To prevent large bubbles

IGNORE *"to prevent bumping"*

[1 mark]

Source: AQA A-Level Chemistry past papers. Reproduced for revision at whiteboardchemistry.com.

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