AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.7.1.4

Cracking and alkenes

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**27**
Available paper years	**2007–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.7.1.4 Cracking and alkenes

Answer 01 · Mark scheme January 2007 | CHY1F | Original Q5 | Legacy

Question 5

	answers	extra information	mark
(a)(i)	poly(ethene)	accept polythene	1
(ii)	cracking		1
(iii)	hydrogen		1
(b)(i)	bar labelled 9 bar drawn to correct height		1 1
(ii)	(boiling point) increases		1
(iii)	heat / evaporate (the crude oil) cool / condense (hydrocarbons at different temperatures)	accept separate by boiling point accept smaller molecules go to top / larger molecules stay at bottom accept fractional distillation for two marks **or** distillation / fractionation for **one** mark	1 1

Continued on next page

4.7.1.4 Cracking and alkenes

Answer 01 · Mark scheme

	answers	extra information	mark
(c)	**yes** any **two** from: • because plastic does not biodegrade **or** running out of space for landfills **or** land cannot be used for a long time • it provides heat energy • which can be used to generate electricity / heat homes or greenhouses • any other advantage of burning • any other disadvantage of landfill **or** **no** • burning plastic produces carbon dioxide / carbon emissions / toxic gases • causes global warming / climate change / increase greenhouse effect / global dimming / acid rain • any other disadvantage of burning • any other advantage of landfill	accept landfill does not produce carbon dioxide / carbon emissions	2
total			10

4.7.1.4 Cracking and alkenes

Answer 02 · Mark scheme

March 2007 | CHY1B | Original Q1 | Legacy

One	**A**	alkanes	**2**
	B	fuels	**1**
	C	monomers	**4**
	D	polymers	**3**

Answer 03 · Mark scheme

November 2007 | CHY1B | Original Q5 | Legacy

Five	**A**	alkene with the smallest molecules	**2**
	B	alkene with the largest molecules	**3**
	C	alkane	**1**
	D	polymer	**4**

4.7.1.4 Cracking and alkenes

Answer 04 · Mark scheme January 2008 | CHY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
(a)(i)	monomers		1
(a)(ii)	crude oil		1
(b)	any **three** from: • metal may not corrode away / remains • plastic remains / does not break down (decay) / not affected by microorganisms • should recycle / conserve resources / mend the kettle / burn (plastic) as a fuel • landfill sites are limited / filling up • water pollution	accept non-biodegradable accept it is a waste of materials / resources ignore harms wildlife / habitats **or** problems caused by burning the kettle	3
total			5

4.7.1.4 Cracking and alkenes

Answer 04 · Mark scheme January 2008 | CHY1F | Original Q4 | Legacy

CHY1F

Answer 05 · Mark scheme March 2008 | CHY1BP | Original Q4 | Legacy

Four	**A**	alkanes	**2**
	B	alkenes	**1**
	C	catalysts	**4**
	D	polymers	**3**

Answer 06 · Mark scheme March 2008 | CHY1BP | Original Q6 | Legacy

Six	**A**	Molecule A	**1**
	B	Molecule B	**4**
	C	Molecule C	**2**
	D	Molecule D	**3**

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

Answer 07 · Mark scheme November 2008 | CHY1BP | Original Q1 | Legacy

One	**A**	combustion	**2**
	B	condensation	**1**
	C	cracking	**3**
	D	hardening	**4**

Answer 08 · Mark scheme June 2009 | CHY1BP | Original Q5 | Legacy

Five	**A**	Molecule **A**	**1**
	B	Molecule **B**	**4**
	C	Molecule **C**	**2**
	D	Molecule **D**	**3**

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

4.7.1.4 Cracking and alkenes

Answer 09 · Mark scheme

June 2009 | CHY1F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)(i)	calcium oxide / quicklime	allow calcium monoxide do **not** accept calcium dioxide ignore chemical formulae	1
7(a)(ii)	any **three** from: • carbon dioxide / CO_2 • (carbon dioxide) reacts (with the calcium hydroxide / slaked lime / plaster) • limestone / calcium carbonate / $CaCO_3$ forms • water is lost / evaporates	it = plaster allow reaction 3 identified do **not** allow incorrect reaction ignore mixes, unless they state the correct product allow marble / chalk allow moisture ignore dries	3
7(b)(i)	as the amount / volume of sand decreases the strength of the mortar increases	accept as sand decreases the mortar is stronger / harder to crack allow as sand decreases the mortar increases allow converse ignore references to height of metal ball	1

Question 7 continues on the next page…

CHY1F

Question 7 Continued

question	answers	extra information	mark
7(b)(ii)	any **two** from: • 400 / 5th result is anomalous • the interval between the others is similar or the interval is about 6/7 • he has only one set of results	accept two results (36 and 37 / 400 and 500 / 4th and 5th) are almost the same accept result at 400 should be 42 allow the other results fit a pattern / are on a straight line allow he has only done it once ignore reliable	2
Total			**7**

4.7.1.4 Cracking and alkenes

Answer 10 · Mark scheme

January 2010 | CHY1F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	any **one** from: • bond / join (together) • double bond opens	ignore polymerisation / heat	1
5(a)(ii)	any **one** from: • heat / energy • cost of fuels / the crude oil • construction of the factory / plant • wages / salaries	ignore many processes / distillation / cracking / polymerisation	1
5(a)(iii)	any **two** from: • non-biodegradable • landfill sites are filling up / limited • waste of a resource / could be recycled / reused	ignore gases released / burning / habitats accept remains a long time accept land / space used up accept crude oil is running out	2
5(b)	any **two** from: • renewable / sustainable • less fuel burned • biodegradable • natural resource • plants absorb carbon dioxide	ignore recycling ignore crude oil is running out accept less energy / heat needed	2
Total			**6**

4.7.1.4 Cracking and alkenes

Answer 10 · Mark scheme

January 2010 | CHY1F | Original Q5 | Legacy

CHY1F

Answer 11 · Mark scheme

November 2010 | CHY1BP | Original Q1 | Legacy

Question	Key		
One	**A**	Crack	**2**
	B	Evaporate	**1**
	C	Polymerise	**4**
	D	Burn	**3**

4.7.1.4 Cracking and alkenes

Answer 12 · Mark scheme

January 2011 | CHY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	carbon hydrogen	accept in either order ignore number eg 2 carbons 4 hydrogens	1 1
4(a)(ii)	(a carbon carbon) double (bond)		1
4(b)	poly(ethene)		1
4(c)	any **two** from: • made from crude oil • non–renewable resources • litter • not biodegradable • use energy to make • when burned or biodegraded carbon dioxide is released • encourage customers to reuse bags / use their own bags	ignore pollution / cost / global warming / harms environment / recycling accept resources are running out accept go to landfill accept reduces carbon emissions / footprint	2
Total			**6**

4.7.1.4 Cracking and alkenes

Answer 12 · Mark scheme

January 2011 | CHY1F | Original Q4 | Legacy

CHY1F

Answer 13 · Mark scheme

March 2011 | CHY1BP | Original Q5 | Legacy

Five	**A**	Formula **A**	**2**
	B	Formula **B**	**3**
	C	Formula **C**	**1**
	D	Formula **D**	**4**

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

Answer 14 · Mark scheme

June 2011 | CHY1BP | Original Q4 | Legacy

Four	**A**	alkenes	**2**
	B	polymers	**3**
	C	monomers	**4**
	D	alkanes	**1**

4.7.1.4 Cracking and alkenes

Answer 15 · Mark scheme

June 2011 | CHY1F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)(i)	heat / high temperature / hot / vaporise	if (fractional) distillation / hydrogenation mentioned as the method = max 1 allow thermal decomposition ignore evaporation do **not** accept 'burns' do **not** accept temperature < 100	1
	catalyst **or** silica / alumina / porous pot **or** steam	ignore other named catalyst allow heat (the vapour) to a very high temperature / >800°C for **2** marks	1
7(a)(ii)	C_2H_3Cl	ignore attempts to balance equation	1
7(a)(iii)	single bonds between C – H, C – Cl **and** C – C	do **not** accept symbols outside the bracket	1
7(b)(i)	so that the amount of plasticiser / (sample of) PVC is the independent / only variable that affects the bending / flexibility of the samples	allow because different sizes would give different results accept because size is a control variable ignore references to reliability / precision etc	1
7(b)(ii)	to improve the reliability (of the investigation)	accept to calculate a mean accept to check for anomalous results **or** to check the range of results ignore accuracy / precision etc	1

Question 7 continues on the next page

Question 7 continued

question	answers	extra information	mark
7(b)(iii)	23	correct answer with or without working = **2** marks if answer is incorrect allow $\frac{22+23+24}{3}$ **or** 21 for **1** mark	2
7(b)(iv)	(PVC) sample had been stretched / used / tested in first three tests	accept higher temperature allow worn **or** become weaker ignore (human) error ignore more flexible / softer ignore intermolecular forces	1
7(c)	does not bend (easily / much) **or** it is not flexible **or** it is rigid	ignore non-biodegradable / low maintenance ignore sturdy / stronger / harder	1
Total			**10**

The AQA UMS Conversion Calculator is available on the Results statistics page of the AQA Website

4.7.1.4 Cracking and alkenes

Answer 16 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)(i)	hydrocarbons		1
3(a)(ii)	ethane has the smallest molecules heptadecane has the highest boiling point		1 1
3(a)(iii)	evaporating condense		1 1
3(b)(i)	**W** **Y**		1 1
3(b)(ii)	floats	if no answer written on line, allow correct answer indicated in the box	1
3(b)(iii)	open the tap stop the flow of liquid when the water has run out	allow let the water out ignore remove water allow until oil is left behind ignore filter	1 1
Total			**10**

4.7.1.4 Cracking and alkenes

Answer 16 · Mark scheme

January 2012 | CH1FP | Original Q3 | Legacy

CH1FP

4.7.1.4 Cracking and alkenes

Answer 17 · Mark scheme

June 2012 | CH1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	6 oxygen		1 1
6(b)(i)	heating the hydrocarbon to a high temperature the presence of a catalyst		1 1
6(b)(ii)	all bonds correct four C—H bonds **and** one C=C bond		1
6(b)(iii)	water	accept hydrogen oxide/steam allow H_2O	1
6(c)(i)	carbon dioxide	allow CO_2	1
6(c)(ii)	by filtering/decanting/centrifuging (to remove yeast) (fractional) distillation (to separate ethanol from water)	ignore sieving accept a description of (fractional) distillation	1 1
Total			**9**

4.7.1.4 Cracking and alkenes

Answer 17 · Mark scheme

June 2012 | CH1FP | Original Q6 | Legacy

CH1FP

4.7.1.4 Cracking and alkenes

Answer 18 · Mark scheme

June 2012 | CH1FP | Original Q8 | Legacy

Question 8

question	answers	extra information	mark
8(a)(i)	(1) 5 3 (6) 4 2	all numbers in the correct order gains both marks any two numbers in the correct position gains **1** mark	2
8(a)(ii)	water	ignore formula if correct name given accept hydrogen oxide allow H_2O	1
	carbon dioxide	allow CO_2 accept carbon monoxide / CO **or** carbon / C	1

Question 8 continues on the next page . . .

CH1FP

Question 8 cont'd

question	answers	extra information	mark
8(b)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. **Examiners should also refer to the information on page 2**, and apply a 'best-fit' approach to the marking.		6

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	There is a **basic** description of at least one advantage **or** one disadvantage caused by using plastic shopping bags made from poly(ethene).	There is a **clear** description of both an advantage **and** a disadvantage caused by using plastic shopping bags made from poly(ethene).	There is a **detailed** description of both advantages **and** disadvantages caused by using plastic shopping bags made from poly(ethene).

examples of the chemistry/social points made in the response:
ignore cost unqualified

Advantages:

- Simple properties eg strong / low density / water resistant
- Bags can be reused (for shopping) **or** another specified use eg bin liners
- Money charged for bags can go to good causes **or** encourage reuse
- Poly(ethene) bags can be recycled eg made into milk bottle crates
- Poly(ethene) bags can be burned to provide heat for buildings/generation of electricity
- New bags are now made that can biodegrade

Disadvantages:

- (Older) bags can take many years to biodegrade
- There is a shortage of landfill space
- Bags are made from (crude) oil which is a non-renewable resource/running out
- Large amounts of energy/fuel are used for the production of poly(ethene)
- Production of poly(ethene) releases carbon dioxide/causes global warming
- Specified issue caused by litter eg visual pollution or effect on wildlife
- Burning bags release carbon dioxide / causes global warming

Total			10

UMS Conversion Calculator www.aqa.org.uk/umsconversion

4.7.1.4 Cracking and alkenes

Answer 19 · Mark scheme

question	answers	extra information	mark
7(a)	heat to vaporise (the crude oil)	do **not** accept cracking / burning	1
	vapours condense		1
	at different temperatures	allow they have different boiling points	1
7(b)	(alkanes) are hydrocarbons **or** are compounds of hydrogen and carbon only		1
	alkanes are saturated **or** have only (carbon-carbon) single bonds	accept have no (carbon-carbon) double bonds accept general formula is C_nH_{2n+2} for **2** marks	1

CH1FP

question	answers	extra information	mark

7(c)

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. — 6

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	There is a basic description of at least one advantage or one disadvantage of extracting petroleum products from oil sands.	There is a clear description of an advantage and a disadvantage of extracting petroleum products from oil sands.	There is a detailed description of both advantages and disadvantages of extracting petroleum products from oil sands.

examples of the chemistry/environmental/economic/social points made in the response

Advantages:

- the oil sands are needed because crude oil is running out
- this crude oil is needed because demand is increasing
- the oil sands contain a large amount of crude oil
- the oil sands could improve Canada's economy
- the oil sands provide employment for a lot of people
- the trees / forest are used for wood products / fuel

Disadvantages:

- destruction of environment / habitats
- fewer trees / forests to absorb carbon dioxide
- specified pollution, for example, visual, noise, atmospheric (including dust), water (including river or drinking) with cause, e.g. gases/particulates from burning diesel
- large amounts of methane(natural gas) are used to provide energy
- energy / fuel needed for cracking and fractional distillation
- burning fuel releases carbon dioxide
- crude oil / natural gas contains locked up carbon
- crude oil is non-renewable

Total		11

UMS conversion calculator www.aqa.org.uk/umsconversion

4.7.1.4 Cracking and alkenes

Answer 20 · Mark scheme

June 2013 | CH1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	Mark
6(a)	any **two** from: • similar fossils in Africa and South America • similar rocks in Africa and South America • 'jigsaw fit'	ignore same plants / animals allow rocks / fossils match in Africa and South America	2
6(b)	crust mantle heat / energy earthquake		1 1 1 1
Total			**6**

4.7.1.4 Cracking and alkenes

Answer 21 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	mixture (of different substances)		1	1 / 1.4.1a
3(a)(ii)	boiling (points)		1	1 / 1.4.2c
3(a)(iii)	distillation		1	1 / 1.4.1b
3(b)(i)	combustion		1	1 / 1.4.3b
3(b)(ii)	(reactant) oxygen (products) carbon dioxide **and** water	allow correct formulae products in any order allow carbon or carbon monoxide allow water vapour or steam or hydrogen oxide	 1 1	2 / 1.4.3b
3(b)(iii)	(burning sulfur) produces sulfur dioxide / SO_2 causes acid rain	allow it/sulfur reacts with oxygen ignore sulfur oxide	1 1	1+2 / 1.4.3c/d
3(c)(i)	propane is a fuel		1	2 / 1.5.1e
3(c)(ii)	double bond drawn between carbon atoms	do not allow any other bonds or symbols	1	1 / 1.5.1c
3(c)(iii)	orange to colourless		1	1 / 1.5.1d
3(c)(iv)	poly(pentene)	allow polymer(s)	1	1 / 1.5.1d
Total			**12**	

4.7.1.4 Cracking and alkenes

Answer 21 · Mark scheme

June 2015 | CH1FP | Original Q3 | Legacy

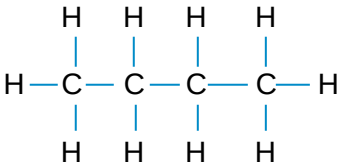


4.7.1.4 Cracking and alkenes

Answer 22 · Mark scheme

June 2016 | CH1FP | Original Q5 | Legacy

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)(i)	high temperature catalyst or steam	allow heating / hot / 250-900 °C allow named catalyst eg zeolite, Al_2O_3, silica, ceramic allow in the absence of air / oxygen ignore any references to pressure	1 1	AO1 1.5.1a
5(a)(ii)	colourless	allow decolourised ignore clear / discoloured	1	AO1 1.5.1d
5(a)(iii)			1	AO2 1.4.2a
5(b)(i)	20.3(0) (kJ)	if answer incorrect allow **1** mark for 24.36/1.2	2	AO2 1.4.3b
5(b)(ii)	use a lid reduce energy / heat loss	allow insulate beaker or use draught shield ignore references to thermometer or repeats or distance of flame or loss of water vapour allow stir (1) to distribute energy / heat (1) allow use a metal can (1) as it's a better conductor (1)	1 1	AO3 4.3.2b/c/d
5(b)(iii)	carbon/soot (produced by) incomplete combustion	ignore tar, smoke allow from a limited supply of oxygen/air	1 1	AO1+AO2 1.4.3a/b
5(b)(iv)	hexane gives out the greatest energy (per 1.0 g) hexane produces the least smoke / carbon / soot	ignore more energy allow has the cleanest flame ignore less smoke / carbon / soot	1 1	AO3 1.4.2c; 1.4.3a/b

QWC Mark Scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(c)			6	AO1+AO2+ AO3 1.1.3b; 1.4.1b/c; 1.4.3a/b/c/d ;1.7.2h/i

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content	Statements made from the information that indicate whether at least one statement is an advantage **or** a disadvantage **or** a linked advantage or disadvantage	Descriptions of an advantage **and** a disadvantage with some use of their knowledge to add value.	Descriptions of advantages **and** disadvantages that are linked to their own knowledge.

Examples of the added value statements and links made in the response could include:
Note that link words are in bold; links can be either way round.
Accept reverse arguments and ignore cost throughout.

Advantages of using hydrogen:

- Combustion only produces water **so** causes no pollution
- Combustion does not produce carbon dioxide **so** this does not contribute to global warming or climate change
- Combustion does not produce sulfur dioxide **so** this does not contribute to acid rain
- Incomplete combustion of petrol produces carbon monoxide **that is** toxic
- Incomplete combustion of petrol produces particulates **that** contribute to global dimming
- Petrol comes from a non-renewable resource **but** there are renewable/other methods of producing hydrogen
- Hydrogen releases more energy **so** less fuel needed or more efficient

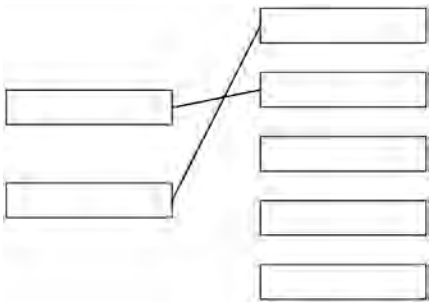
Disadvantages of using hydrogen:

- Hydrogen is a gas **so** is difficult to store or transfer to vehicles
- Hydrogen gas is very flammable **so** leaks cause a greater risk of explosion
- Most hydrogen is produced from fossil fuels **which** are running out
- Cannot be used in existing car engines **so** modification / development or replacement is needed
- Lack of filling stations **so** difficult to refuel your vehicle

Total			18

4.7.1.4 Cracking and alkenes

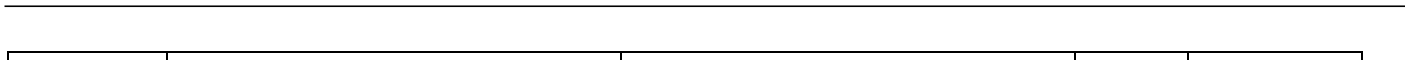
Answer 23 · Mark scheme June 2018 | 8462/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	$C_{12}H_{26}$		1	AO2 4.7.1.4
02.2	alkane		1	AO2 4.7.1.1
02.3	air	allow atmosphere	1	AO2 4.9.3.1
02.4		particulates – global dimming sulfur dioxide – acid rain	1 1	AO1 4.9.3.2
02.5	carbon dioxide carbon monoxide		1 1	AO1 4.7.1.3 4.9.3.1
02.6	develop fuel efficient engines use electric cars		1 1	AO3 4.9.3.1
Total			**9**	

4.7.1.4 Cracking and alkenes

Answer 23 · Mark scheme

June 2018 | 8462/2F | Original Q2



4.7.1.4 Cracking and alkenes

Answer 24 · Mark scheme

June 2019 | 8462/2F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	a temperature between 400 (°C) and 500 (°C) inclusive	allow a temperature range entirely within 400 (°C) and 500 (°C) inclusive	1	AO3 4.7.1.2
08.2	(diesel oil has a) lower boiling point / range than heavy fuel oil (but diesel oil has a) higher boiling point / range than kerosene	ignore quoted values for boiling points ignore references to melting points ignore references to intermolecular forces or chain length allow temperature of vaporisation / condensation for boiling points throughout allow the boiling range (of diesel oil) is between those of heavy fuel oil and kerosene for **2** marks.	1 1	AO2 4.7.1.2
08.3	any **two** from: • (too) viscous • not (very) flammable • boiling point (too) high	ignore references to cost allow references to difficulty of flow allow references to difficulty of ignition / burning do **not** accept bitumen takes more energy to burn allow not (very) volatile	2	AO2 4.7.1.3
08.4	C_6H_{14}		1	AO2 4.7.1.1

4.7.1.4 Cracking and alkenes

Answer 24 · Mark scheme

08.5	high temperature any **one** from: • steam • catalyst	ignore references to pressure allow a quoted temperature above 320 °C ignore hot / heat ignore name of catalyst allow alumina allow aluminium oxide allow porous pot allow zeolite	1 1	AO1 4.7.1.4
08.6	greater demand (for smaller molecules) any **one** from: (because smaller molecules are) • more useful • better fuels • used to make alkenes • used to make polymers	allow converse argument for larger molecules allow a named polymer ignore plastics	1 1	AO1 4.7.1.4
08.7	C_3H_6		1	AO2 4.1.1.1 4.7.1.4
Total			**11**	

4.7.1.4 Cracking and alkenes

Answer 25 · Mark scheme

June 2022 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	**C** **B** **A**	must be in this order	1	AO3 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	higher lower	must be in this order	1 1	AO2 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	scale labelled at 20, 30, 40, (50) % at 2 cm intervals (**K**) bar drawn to 44%	 allow a tolerance of ± ½ a small square	1 1	AO2 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	contains more kerosene	allow **K** contains less kerosene	1	AO3 4.7.1.3 4.7.1.4

4.7.1.4 Cracking and alkenes

Answer 25 · Mark scheme

June 2022 | 8462/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	a catalyst steam		1 1	AO1 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	$C_{11}H_{24}$		1	AO2 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	a single bond between two carbon atoms		1	AO1 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	carbon dioxide water		1 1	AO1 4.7.1.3

Total Question 2		12

Answer 26 · Mark scheme

June 2023 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(the poly(propene) beaker will begin to) melt (the poly(propene) beaker will) burn / ignite	allow poly(propene) has a low melting point allow poly(propene) is flammable	1 1	AO3 4.7.3.1

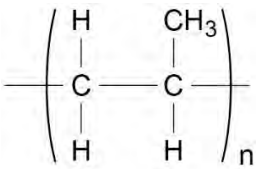
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(poly(propene) beakers are) less easily broken	allow (poly(propene) beakers are) less likely to shatter allow (poly(propene) beakers are) tougher allow (poly(propene) beakers have a) higher resistance to impact	1	AO3 4.7.3.1 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	boron trioxide		1	AO1 4.10.3.3

Question	Answers	Mark	AO / Spec. Ref.
02.4	<table><tr><th>Symbol for element</th><th>Name of element</th><th>Number of atoms of element in one molecule of propene</th></tr><tr><td>C</td><td>carbon</td><td>3</td></tr><tr><td>H</td><td>hydrogen</td><td>6</td></tr></table> if no other mark awarded allow **1** mark for a correct column	1 1	AO1 AO2 4.1.1.1 4.7.2.1

4.7.1.4 Cracking and alkenes

Answer 26 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5			1	AO2 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(**Stage 1** is) fractional distillation		1	AO1
	(**Stage 2** is) cracking		1	AO2
	(**Stage 3** is) polymerisation		1	AO2 4.7.1.2 4.7.1.4 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	alkene		1	AO2 4.7.2.1
	monomer		1	4.7.3.1

Total Question 2	12

4.7.1.4 Cracking and alkenes

Answer 27 · Mark scheme

June 2025 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	propene		1	AO1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	9		1	AO2 4.1.1.1 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	making a polymer		1	AO1 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	(*y*-axis 0, 20), 40, 60, 80, (100)	ignore intermediate values	1	AO2 4.7.2.1
	carbon bar drawn to 86%	allow a tolerance of ± ½ a small square	1	
	carbon bar labelled		1	

Answer 27 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	(test) add bromine (water) (result) (bromine water) turns (from orange to) colourless	 allow (bromine water) decolorises ignore clear MP2 is dependent upon MP1 being awarded	1 1	AO1 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	$C_{10}H_{22} \longrightarrow C_3H_6 + C_7H_{16}$		1	AO2 4.1.1.1 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	fuels		1	AO1 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	the molecules collide more frequently at 750 °C		1	AO2 4.6.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	(at 750 °C the rate of reaction is) higher	allow (at 450 °C the rate of reaction is) lower	1	AO2 4.6.1.2

Total Question 2	**12**

Answer 23 · Examiner comments

June 2018 | 8462/2F | Original Q2

Question 2 (low demand)

02.1 54% of students identified the correct formula with all the other distractors proving equally popular as each other.

02.2 71% of students recognised that octane was an alkane.

02.3 This question was not well answered with 87% of responses failing to score. Of these responses, about half gave 'plants / trees / photosynthesis' as the source of oxygen with the remaining suggesting 'hydrogen / carbon / oxide' or a named oxide such as 'carbon dioxide' was the source.

02.4 Most students knew that sulfur dioxide caused acid rain, although the environmental effect of particulates was less well known.

02.5 Most students realised that carbon dioxide was produced in car engines but far fewer identified carbon monoxide as the other possible product. Nitrogen was often given instead.

02.6 89% of students could identify both ways of reducing atmospheric pollution in cities.

Answer 25 · Examiner comments

June 2022 | 8462/2F | Original Q2

Question 2 (Low demand)

02.1 A large majority of the students put the fractions in the correct order.

02.2 Nearly 50% of the students gained two marks for correctly identifying the trend in both viscosity and flammability in the three crude oil fractions.

02.3 The bar chart was largely very well drawn with correct scales. More than 80% of students gained both marks.

02.4 Around a third of students answered correctly in terms of the proportion of kerosene in the fractions. Other students did not appear to understand the requirements of the question.

02.5 Nearly 40% of the students gained two marks for identifying the use of a catalyst or steam in cracking. Ozone was the most common incorrect response.

02.6 Most students could work out the number of hydrogen atoms but some did not write 24 as a subscript and therefore did not gain the mark.

02.7 More than 40% of the students gained the mark, but nearly half incorrectly suggested a double bond between two carbon atoms.

02.8 Only 20% of the students gained two marks, although carbon dioxide was often seen alongside an incorrect response, usually hydrogen.

4.7.1.4 Cracking and alkenes

Answer 26 · Examiner comments

June 2023 | 8462/2F | Original Q2

Question 2 (Low demand)

02.1 More than two thirds of students were able to use the information provided in the table to provide two correct reasons as to why poly(propene) beakers should not be used to heat liquids. More students suggested that poly(propene) would burn rather than melt. Common incorrect responses did not refer to the effect of heat on poly(propene) instead referring to the effect of the liquid being heated on the polymer.

02.2 More than half of students used the information in the table to suggest a reason why using poly(propene) beakers could save money. The most common incorrect responses did not include a comparison to the glass beakers so that the unqualified 'because they are tough' added no value to the data in the table. Some students used the wrong column and said the poly(propene) does shatter (on impact) even though this then made no sense in the context of saving money.

02.3 More than half of students successfully identified boron trioxide as a raw material for making borosilicate glass.

02.4 More that 90% of students obtained at least one mark on this question (usually for completing the 'name' column correctly) with just over 50% achieving both marks. The most common incorrect response was to incorrectly identify the number of carbon atoms. A minority of students failed to identify the number of atoms but instead calculated the mass of each element.

02.5 This question was very well answered with over 80% of students correctly identifying the repeating unit of poly(propene). The distractors attracted roughly equal support.

02.6 Students struggled to recognise and correctly identify the stages needed to produce poly(propene) from the descriptions provided in the question. Quite often, correct processes were identified but sequenced incorrectly. Less than one-third of students obtained all three marks and less than half achieved 2 marks.

02.7 Just over one third of students achieved 2 marks to identify both of the words that described a hexene molecule during a polymerisation reaction. About half of students achieved 1 mark by identifying hexene as an alkene or by identifying it as a monomer.

4.7.1.4 Cracking and alkenes

Answer 27 · Examiner comments June 2025 | 8462/2F | Original Q2

Question 2

02.1 Half of the students correctly identified the alkene as propene. Both butene and ethene were commonly seen.

02.2 Over 80% of students were able to give the number of atoms in the molecule as 9.

02.3 Over two thirds of students correctly identified the use of alkenes.

02.4 Nearly 80% of students scored all three marks for plotting the bar chart. Of the remaining students, most scored two marks, the most common error was to plot the bar at 92, rather than 86.

02.5 The test for alkenes is not well known. Slightly more than 1 in 10 students scored either mark on this question. A full range of tests was seen, with nearly 30% of students did not attempt this item.

Answer 27 · Examiner comments June 2025 | 8462/2F | Original Q2

02.6 Nearly two thirds of students correctly completed the formula in the equation. Many students recognised that the number should be 7, but did not follow the conventions of writing formulas, so did not gain the mark because the 7 was too large. When writing formulas, it is expected that the tops of numbers are discernibly below the tops of upper-case letters.

02.7 Over half of students correctly identified the use of alkanes as fuels. Both distractors were frequently seen.

02.8 Nearly 90 % of students correctly answered this item.

02.9 Three quarters of students correctly compared the rates, with many explaining why the rate changes using the ideas from the previous item.