AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.10.4.2

Production and uses of NPK fertilisers

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**21**
Available paper years	**2008–2025**

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.

4.10.4.2 Production and uses of NPK fertilisers

Answer 01 · Mark scheme January 2008 | CHY2F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
(a)(i)	nitrogen + hydrogen → ammonia	accept full correct balanced equation	1
(a)(ii)	reversible (reaction) (owtte)	do **not** allow just 'backwards' (unqualified)	1
(a)(iii)	catalyst / speed up reaction	accept to lower activation energy	1
(a)(iv)	boiling point		1
(a)(v)	recycled (owtte)		1
(b)(i)	used to make explosives (owtte) used to make medicines (owtte)		1
(b)(ii)	used to make fertilisers (owtte)		1
(c)(i)	sensible answers such as provides workers (owtte) good transport links	ignore reference to raw materials	1

continued…

4.10.4.2 Production and uses of NPK fertilisers

Answer 01 · Mark scheme

January 2008 | CHY2F | Original Q5 | Legacy

CHY2F

Question 5 continued…

question	answers	extra information	mark
(c)(ii)	sensible idea		1
	linked reason		1
	idea	linked reason	
	eg escape of chemicals /fumes /waste gases / pollution	harmful to health / environmental damage owtte do **not** allow harmful / damage / smell (unqualified)	
	risk of explosion	because of high pressures / may endanger local people / dangerous	
	risk of fire	because of high temperatures / may endanger local people	
	noise	any detrimental effect on quality of life **or** night and day	
	lorries / traffic	danger / noise / pollution etc	
	unsightly	detrimental effect on quality of life / house prices / reduced tourism	
	uses a lot of land	loss of habitats	
total			10

4.10.4.2 Production and uses of NPK fertilisers

Answer 01 · Mark scheme

January 2008 | CHY2F | Original Q5 | Legacy

CHY2F

4.10.4.2 Production and uses of NPK fertilisers

Answer 02 · Mark scheme

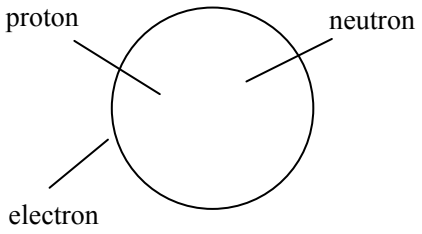
Question 8

question	answers	extra information	mark
(a)	N_2O		1
(b)	13.8 to 14	gains full marks without working if answer incorrect 13 gains **1** mark **or** 14/101 × 100 gains **1** mark	2
total			3

4.10.4.2 Production and uses of NPK fertilisers

Answer 03 · Mark scheme

June 2008 | CHY2F | Original Q5 | Legacy

question	answers	extra information	mark
5(a)(i)		all three correct **2** marks one correct **1** mark	2
5(a)(ii)	14		1
5(b)	A		1
5(c)(i)	ammonia can break up to form nitrogen and hydrogen ammonia is made from nitrogen and hydrogen	list principle applies	2
5(c)(ii)	air		1
5(d)	ammonium nitrate		1
Total			**8**

4.10.4.2 Production and uses of NPK fertilisers

Answer 03 · Mark scheme June 2008 | CHY2F | Original Q5 | Legacy

COMPONENT NUMBER: CHY2F

COMPONENT NAME: Additional Science / Chemistry

STATUS: Final

DATE: June 2008

Answer 04 · Mark scheme January 2010 | CHY2F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	fertilisers		1
2(b)	air		1
2(c)(i)	water **and** carbon monoxide on correct side of equation	accept H_2O for water and CO for carbon monoxide	1
2(c)(ii)	speeds up the reaction (owtte)	accept lowers the activation energy	1
2(d)	reversible reaction		1
2(e)(i)	10		1
2(e)(ii)	sulfuric water	accept H_2SO_4 accept H_2O / hydrogen oxide	1 1
Total			**8**

4.10.4.2 Production and uses of NPK fertilisers

Answer 04 · Mark scheme

January 2010 | CHY2F | Original Q2 | Legacy

CHY2F

4.10.4.2 Production and uses of NPK fertilisers

Answer 05 · Mark scheme

June 2010 | CHY2F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	(nitrogen) + hydrogen → ammonia	accept H_2 and NH_3 ignore incorrect symbols ignore balancing	1
6(a)(ii)	any **one** from: • catalyst • to speed up the reaction • lower activation energy	 ignore causes reaction ignore heat / reference to particles 	1
6(a)(iii)	any **two** from: • cooled • ammonia condenses / turns into liquid • nitrogen and hydrogen do not condense / turn into liquid **or** nitrogen and hydrogen stay as gases	it = ammonia ignore references to boiling point if no marks awarded accept pass through / separated in condenser **or** unreacted nitrogen and hydrogen / gases recycled for **1** mark	2

Question 6 continues on the next page

4.10.4.2 Production and uses of NPK fertilisers

CHY2F

Question 6 continued

question	answers	extra information	mark
6(b)	80	correct answer with or without working gains **2** marks ignore units if answer incorrect, evidence of correct *working* gains **1** mark eg 14 + (4 x 1) + 14 + (3 x 16) (= 70) **or** 2N + 4H +30	2
6(c)	fertiliser is **C** evidence of correct working	 examples of minimum correct working: 39/101 **or** 14/101 **or** 38.61/100 **or** 13.86/100	1 1
Total			**8**

4.10.4.2 Production and uses of NPK fertilisers

Answer 05 · Mark scheme June 2010 | CHY2F | Original Q6 | Legacy

CHY2F

Answer 06 · Mark scheme November 2010 | CHY1AP | Original Q3 | Legacy

Three	**A**	Biodiesel	**3**
	B	Methane	**2**
	C	Animal waste	**1**
	D	Dried sludge	**4**

4.10.4.2 Production and uses of NPK fertilisers

Answer 07 · Mark scheme

June 2011 | CHY2F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	NH_3		1
1(a)(ii)	electrons		1
1(a)(iii)	covalent		1
1(b)(i)	air natural gas		1 1
1(b)(ii)	reversible		1
1(b)(iii)	iron		1
1(c)	nitric acid		1
1(d)(i)	any **one** from: • lost jobs / unemployment • meant that they had to move away from Humberstone **or** no one lives there • loss of income (owtte)	 allow closed down the town ignore it closed the mine unless it is further qualified by some effect of this on the local community	1

Question 1 continues on the next page

4.10.4.2 Production and uses of NPK fertilisers

Question 1 continued

question	answers	extra information	mark
1(d)(ii)	any **two** from: • less transport (costs) • less pollution / greenhouse gases / global warming <u>from transport</u> • cheaper to make in country than to import • not dependent on Chile for nitrate supplies **or** reliable source • provides employment to workers in Britain • good for British economy • raw materials readily available • continuous process	ignore reference to environment / ecofriendly allow smaller carbon footprint ignore reference to quicker	2
Total			**11**

4.10.4.2 Production and uses of NPK fertilisers

Answer 07 · Mark scheme June 2011 | CHY2F | Original Q1 | Legacy

CHY2F

Answer 08 · Mark scheme June 2011 | CHY2F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2	use a more concentrated solution of sulfuric acid		1
	grind the phosphate rock into a powder before adding the acid		1
	increase the temperature of the sulfuric acid		1
Total			**3**

CHY2F

4.10.4.2 Production and uses of NPK fertilisers

Answer 09 · Mark scheme

June 2011 | CHY3F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	sodium hydroxide solution blue		1 1
3(a)(ii)	barium chloride white		1 1
3(b)	fully ionised in water		1
3(c)(i)	H^+ ions		1
3(c)(ii)	lower than		1
3(d)(i)	(indicator) changed colour / goes colourless	ignore clear / discoloured	1
3(d)(ii)	13.9 **or** (titration) 2		1
3(d)(iii)	13.2	ecf from 3(d)(ii)	1
Total			**10**

4.10.4.2 Production and uses of NPK fertilisers

Answer 09 · Mark scheme

June 2011 | CHY3F | Original Q3 | Legacy

CHY3F

4.10.4.2 Production and uses of NPK fertilisers

Answer 10 · Mark scheme

Question 2

question	answers	extra information	Mark
2(a)	11		1
2(b)(i)	nitric		1
2(b)(ii)	neutralisation		1
2(c)	fertiliser	accept helps plants grow accept provide nitrogen	1
2(d)(i)	nitrate iodide	must be in this order	1 1
2(d)(ii)	precipitate		1
2(d)(iii)	filtration/filtering		1
2(d)(iv)	crystallisation	allow evaporation / heat / cooling do **not** accept freezing ignore “leave it” if unqualified	1
Total			**9**

4.10.4.2 Production and uses of NPK fertilisers

Answer 11 · Mark scheme June 2014 | CH2FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
4(a)(i)	14		1	2 / 2.3.1c	G
4(a)(ii)	isotope		1	1 / 2.3.1d	G
4(a)(iii)	(very) small	*accept smaller / tiny / (very) little*	1	1 / 2.3.1b	G
4(b)(i)	C		1	1 / 2.1	A
4(b)(ii)	NH_3		1	1 / 2.1.1g	A
4(c)(i)	nitric (acid)		1	1 / 2.6.2b	G
4(c)(ii)	indicator		1	1 / 2.6.1b	E
4(c)(iii)	crystallisation **or** evaporation	allow by heating **or** cooling **or** leave (on windowsill) *do not accept freezing*	1	1 / 2.6.1c	E
4(c)(iv)	any **one** from: • grass grows faster • grass grows taller **or** thicker	*allow grass grows better / greener*	1	3 / 2.6.2c	E
4(d)	potassium (atom) loses (an electron) chlorine (atom) gains (an electron) 1 (electron) electron	reference to incorrect bonding or particle = max **3** ignore references to full outer shells	1 1 1 1	1 + 2 / 2.1.1c/d/e	E
Total			**13**		

4.10.4.2 Production and uses of NPK fertilisers

Answer 11 · Mark scheme

June 2014 | CH2FP | Original Q4 | Legacy



4.10.4.2 Production and uses of NPK fertilisers

Answer 12 · Mark scheme June 2014 | CH3FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
4(a)	⇌ ammonia	 allow NH_3	1 1	2 / 3.5.1b	E
4(b)	increases quickly at first *then slows* *at any number in range from 160 – 220 (atmospheres)*	 *ignore* levels off allow *rate of increase slows for first two marking points* *allow any number in range 60 – 66 (%)*	1 1 1	2 / 3.5	E
4(c)	(nitrogen and hydrogen) recycled	*allow (nitrogen and hydrogen) reused*	1	1 / 3.5.1b	E
4(d)(i)	*jobs lost*	accept mines closed **or** local economy damaged	1	3 / 3.5	E
4(d)(ii)	any **one** from: • *nitrates* / fertilisers cost less • more crops / food can be grown • food costs less • *nitrates / fertilisers more widely available*		1	3 / 3.5	E
Total			**8**		

4.10.4.2 Production and uses of NPK fertilisers

Answer 12 · Mark scheme

June 2014 | CH3FP | Original Q4 | Legacy



4.10.4.2 Production and uses of NPK fertilisers

Answer 13 · Mark scheme June 2016 | CH2FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
6(a)	endothermic		1	AO1 2.5.1d
6(b)	82 (%)	correct answer with working gains **3** marks if 17 or 34 not shown in working **max 2** marks accept 82.4 accept 82.35 to full calculator display (82.35294...) correctly rounded to at least 2 sf if no answer or incorrect answer, then (M_r =) 17 gains **1** mark **or** 14/17 gains **2** marks **OR** ($2M_r$ =) 34 gains **1** mark **or** 28/34 gains **2** marks **OR** 14/their M_r shown gains **1** mark **or** correct calculation of 14/their M_r gains **2** marks	3	AO2 2.3.3a, 2.3.1f
6(c)(i)	7 / seven		1	AO1 2.6.2d
6(c)(ii)	$H^+ + OH^- \rightarrow H_2O$		1	AO1 2.6.2e
6(c)(iii)	ammonium chloride	allow NH_4Cl ignore an incorrect formula	1	AO1 2.6.2b

Question 6 continues on the next page

Question 6 continued

Question	Answers	Extra information	Mark	AO / SpecRef
6(d)			6	2AO2 / 4AO3 2.6.2c

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.	Suggestion with a reference to a graph.	Suggestion with reasons referring to more than one graph.	Suggestion with reasons from all three graphs, and linking of ideas which may explain a compromise.

Examples of chemistry points made in response:

A reasonable suggested amount of fertiliser would be in the region of 200 kg (per ha). Accept any suggestion from about 180 kg (per ha) to 500 kg (per ha).

Yield:

- Using fertiliser improves yield.
- Yield improved most up to about 200 kg (per ha) of fertiliser.
- Yield only increased slightly above about 200 kg (per ha).

Profit:

- About 200 kg of fertiliser gives the most profit.
- Above about 200 kg (per ha) of fertiliser profit declines.

Run off:

- Run off is at low levels until about 300 kg (per ha) of fertiliser.
- Above about 300 kg (per ha) of fertiliser, run off increases.

Examples of linking of ideas:

- Overall 200 kg gives high crop yield and most profit.
- In conclusion 200 kg gives high crop yield and low run off.
- 200 kg gives most profit and low run off.

Examples of compromise:

- Profits go down after about 200 kg (per ha) of fertiliser because cost of fertiliser is not covered by increased yield.
- 200 kg gives the highest profit although it is not the highest yield.
- 500 kg gives the best yield but has the most runoff.

Total			13

4.10.4.2 Production and uses of NPK fertilisers

Answer 14 · Mark scheme

June 2019 | 8462/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	(equation contains a) ⇌ (symbol)	allow description of arrow / symbol	1	AO1 4.6.2.1
03.2	exothermic		1	AO1 4.6.2.2
03.3	to reduce costs to use less energy		1 1	AO3 4.6.1.4
03.4	(the world production of ammonia) increased (the increase was) not steady / linear	 do **not** accept decreases ignore levels off	1 1	AO2 4.10.4.1
03.5	the demand for food changed the world population changed		1 1	AO2 AO3 4.10.4.2
03.6	**C** and **D**		1	AO3 4.10.4.2
03.7	**D**		1	AO3 4.10.4.2
Total			**10**	

4.10.4.2 Production and uses of NPK fertilisers

Answer 15 · Mark scheme

November 2020 | 8462/2F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	(the reaction is) reversible	allow description of a reversible reaction	1	AO1 4.6.2.1 4.10.4.1
01.2	iron		1	AO1 4.10.4.1
01.3	activation energy with a catalyst		1	AO1 4.6.1.4 4.10.4.1
01.4	bar to 22 (%) labelled phosphorus / P bar to 25 (%) labelled potassium / K	allow a tolerance of ± ½ a small square if no other mark is awarded, allow **1** mark for two bars drawn to 22% and 25%	1 1	AO2 4.10.4.2
01.5	there are other elements in the fertiliser (besides phosphorus and potassium) **or** there is nitrogen in the fertiliser	allow there are other substances in the fertiliser (besides phosphorus and potassium)	1	AO3 4.10.4.2

4.10.4.2 Production and uses of NPK fertilisers

Question 1 (continued)

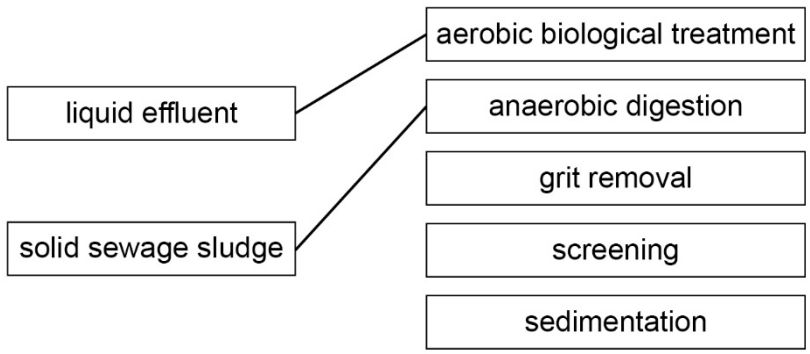
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	B		1	AO3 4.10.4.2
01.7	B		1	AO2 4.10.4.2
Total			8	

Answer 16 · Mark scheme

November 2020 | 8462/2F | Original Q9

Question 9

Question	Answers	Mark	AO/ Spec. Ref
09.1	**Level 2**: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	3–4	AO1 4.10.1.2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content • choose an appropriate source of fresh water • such as rivers, streams, lakes, boreholes • pass through filter beds • (which) removes undissolved solids • sterilise • using chlorine / ozone / UV light • (which) destroys harmful microbes		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	any **one** from: • distillation • reverse osmosis	allow use of membranes allow desalination	1	AO3 4.10.1.2
09.3	 additional line from a box on the left negates the mark for that box		1 1	AO1 4.10.1.3

Question 9 (continued)

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	$\frac{260}{1413} \times 100$		1	AO2 4.10.1.3
	= 18.40056617 (%)		1	
	= 18.4 (%)	allow an answer correctly calculated to 3 significant figures from an incorrect percentage calculation which uses values in the question	1	
09.5	any **one** from: • the population increased • more waste water produced • less untreated sewage discharged		1	AO3 4.10.1.3
09.6	any **two** from: • increased demand for food (due to increasing population) • conserves energy / resources • landfill space is running out • increased demand for organic fertiliser	ignore references to cost allow more farming allow more sustainable allow more awareness of the negative environmental impacts of landfill ignore less sent to landfill allow lifestyle choice for organic food	2	AO3 4.10.1.3
Total			**13**	

4.10.4.2 Production and uses of NPK fertilisers

Answer 17 · Mark scheme

November 2021 | 8462/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	fuel		1	AO1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	propene		1	AO2 4.7.2.1 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	(percentage yield =) $\frac{380}{400} \times 100$ = 95 (%)		1 1	AO2 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	some ethanol changes back into ethene and steam some ethanol escapes from the apparatus		1 1	AO2 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	C_2H_5OH + **3** O_2 → 3 H_2O + 2 CO_2	allow multiples	1	AO2 4.1.1.1 4.3.1.1 4.7.2.3

4.10.4.2 Production and uses of NPK fertilisers

Question 7 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	(advantages) (fermentation) low energy usage (fermentation) uses renewable raw materials (disadvantages) (fermentation) produces impure ethanol (fermentation) slow rate of reaction		 1 1 1 1	AO3 4.7.2.2 4.7.2.3 4.10.1.1

Total			**11**

4.10.4.2 Production and uses of NPK fertilisers

Answer 18 · Mark scheme

June 2022 | 8462/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	nitric acid		1	AO2 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	(mass =) $\frac{40 \times 600}{800\ 000}$ $= 0.03\ (kg/m^2)$		1 1	AO2 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	(the scientist might be) biased **or** (there was) no peer review	allow the investigation was not repeated (by others)	1	AO3 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	one / 1		1	AO2 4.10.4.2

4.10.4.2 Production and uses of NPK fertilisers

Answer 18 · Mark scheme

June 2022 | 8462/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	phosphorus		1	AO2 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	formulation		1	AO1 4.8.1.2 4.10.4.2

Total Question 7		**7**

4.10.4.2 Production and uses of NPK fertilisers

Answer 19 · Mark scheme

June 2024 | 8462/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	to recycle (remaining) nitrogen and hydrogen	allow to recycle unreacted gases allow to return nitrogen and hydrogen to the reactor	1	AO1 4.10.4.1

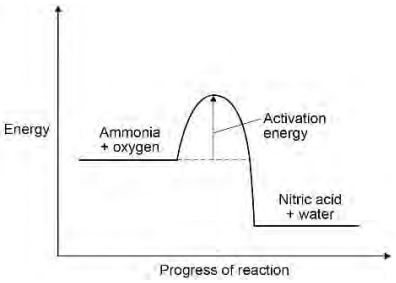
Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	iron	allow Fe	1	AO1 4.6.1.4 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	(test) glowing splint (result) (splint) relights	 MP2 is dependent upon MP1 being awarded	 1 1	AO1 4.8.2.2

4.10.4.2 Production and uses of NPK fertilisers

Answer 19 · Mark scheme

June 2024 | 8462/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	labelled vertical arrow from dotted line to peak ammonia **and** oxygen on left **and** nitric acid **and** water on right	ignore arrow heads allow NH_3 for ammonia allow O_2 for oxygen allow HNO_3 for nitric acid allow H_2O for water an answer of  scores **2** marks	1 1	AO2 4.6.1.4 4.10.4.1 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	the line would reach a higher peak		1	AO1 4.6.1.4 4.10.4.1 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	fertilisers	allow explosives allow sports injury packs	1	AO3 4.10.4.1 4.10.4.2

Total Question 9	**8**

4.10.4.2 Production and uses of NPK fertilisers

Answer 20 · 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	

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

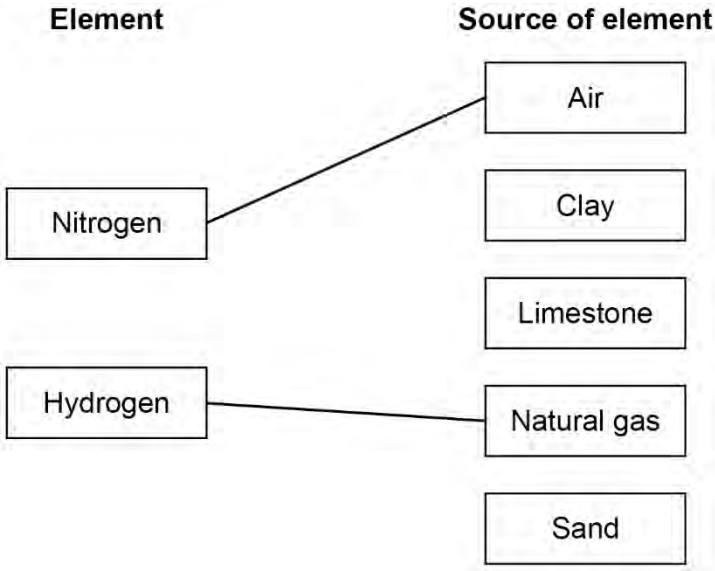
Total Question 2	12

4.10.4.2 Production and uses of NPK fertilisers

Answer 21 · Mark scheme

June 2025 | 8462/2F | Original Q4

Question 4

Question	Answers	Mark	AO / Spec. Ref.
04.1	 do **not** accept more than one line from a box on the left	1 1	AO1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	cooling		1	AO3 4.2.2.1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	catalyst		1	AO1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	(world production of ammonia) increased		1	AO3 4.10.4.1

4.10.4.2 Production and uses of NPK fertilisers

Answer 21 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	(change in mass = 165 – 130 =) 35 (arbitrary units)		1	AO2 4.10.4.1
	(number of years = 2020 – 2000 =) 20		1	
	(mean change =) $\frac{35}{20}$	allow correct use of incorrectly determined change in mass and / or number of years	1	
	= 1.75 (arbitrary units per year)	allow 1.75 (arbitrary units per year) correctly rounded to at least 2 significant figures	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	change in world population		1	AO3 4.10.4.1 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	$Ca(NO_3)_2$		1	AO2 4.1.1.1 4.10.4.2
	$(NH_4)_2SO_4$		1	

Total Question 4	12

4.10.4.2 Production and uses of NPK fertilisers

Answer 18 · Examiner comments

June 2022 | 8462/2F | Original Q7

Question 7 (Low and standard demand)

07.1 Over 80% of the students were able to identify nitric acid.

07.2 Around 25% of the students gained both marks, but a significant number inverted the equation when carrying out the calculation. .

07.3 The idea of bias was well known to some students, but many responses blamed inadequate testing in one form or another. Around 25% of the students gained the mark.

07.4 Over half of the students were able to deduce that there was one nitrogen atom in the formula. Two and four were sometimes seen.

07.5 Over 40% of the students gained the mark, but almost as many incorrectly identified oxygen.

07.6 The term “formulation” was not well known with fewer than 5% of the students giving a correct response.

Answer 19 · Examiner comments

June 2024 | 8462/2F | Original Q9

Question 9 (standard demand)

09.1 The role of the condenser and the importance of recycling unreacted gases in the Haber process is poorly understood with just over 5% of students gaining credit in this question. A large number of students stated that the ammonia or excess gases or gases alone were returned to the reactor. In addition, a number of students focused their answer on the condenser part of the flow chart and responded with the idea that uncondensed gases needed to be recycled.

09.2 Less than 25% of students correctly identified the catalyst used in the Haber process as iron, with copper, ammonia and hydrogen being frequently seen incorrect responses.

09.3 The test for oxygen gas is poorly understood with less than 25% of students being able to recall the correct test and its result. Many students referred to the splint being lit and then blown out or

© 2024 AQA and its licensors. All rights reserved.

Answer 19 · Examiner comments June 2024 | 8462/2F | Original Q9

attempted to describe a glowing splint as a small or dying flame. A correct test was needed to allow award of a mark for the test result. The correct test and result for hydrogen gas was frequently seen.

09.4 Over 25% of students either correctly labelled the products and reactants or correctly drew an arrow, labelled the activation energy, and gained one mark. A further 10% of students gained two marks by doing both correctly.

There were many variations of drawing and labelling the arrow for the activation energy. Some students mistakenly labelled the peak as being the activation energy or despite the dotted line drew the arrow too short or at an angle.

Many students incorrectly identified the reactants and products from the equation or used nitrogen, hydrogen, and ammonia from the previous question. Other students were unsure where the reactants and products would be located on a reaction profile diagram.

09.5 One in five students correctly identified that if there was no catalyst used in the reaction the peak would be higher. Many students misread the question and incorrectly answered that the peak would be lower.

09.6 One in six students were able to identify the use of ammonium nitrate in a fertiliser or NPK fertiliser. A small minority stated that it was used in farming or agriculture unqualified. Only a handful of students identified its use in explosives or sports injury packs. Many students misread the question and took salt from the stem of the question and answered in terms or flavouring or preserving food or using salt to de-ice roads.

4.10.4.2 Production and uses of NPK fertilisers

Answer 20 · 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 20 · 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.

4.10.4.2 Production and uses of NPK fertilisers

Answer 21 · Examiner comments June 2025 | 8462/2F | Original Q4

Question 4

04.1 Around 40% of students correctly identified both sources of the gases. There is a strongly held misconception that hydrogen comes from the air.

04.2 Nearly half of students understood that cooling occurs at point X in the diagram. The two distractors were both equally commonly seen.

04.3 Around half of students knew that iron was used as a catalyst in the Haber process.

04.4 Over 90% of students correctly identified the trend from the given data.

04.5 Nearly three fifths of students achieved all four marks on this scaffolded calculation. Taking the correct numbers from the table was the most common step where students did not gain credit.

04.6 About half of students scored the mark for this item. Change in amount of acid rain was the more common distractor seen.

04.7 Nearly 4 in 5 students correctly identified both compounds that contain nitrogen. Most of the remainder gained one of the two marks.