AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.10.2.2

Ways of reducing the use of resources

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**41**
Available paper years	**2007–2022**

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.

4.10.2.2 Ways of reducing the use of resources

Answer 01 · Mark scheme

January 2007 | CHY1F | Original Q4 | Legacy

Question 4

	answers	extra information	mark
(a)	**1** / one **3** / three		1 1
(b)(i)	(wear safety) glasses / masks / gloves	accept do not handle hot objects / use tongs **or** accept other safety points such as, 'tie hair back'	1
(ii)	calcium oxide	accept quicklime	1
(iii)	carbon dioxide / CO_2 is given off	accept a gas is given off	1
(c)	any **two** from: • conserves (saves) resources • avoids dumping / landfill • lowers energy requirements / save energy • stops quarries opening • less carbon dioxide / carbon emissions / greenhouse gases • lowers the price of glass • glass is non-biodegradable	 accept reduces waste do **not** accept speeds up the process do **not** accept cheaper process	2
(d)(i)	any **two** from: • dust / atmospheric pollution • noise • eyesore • destroys habitats • (extra) traffic • any other named pollution or description of pollution		2

Continued on next page

4.10.2.2 Ways of reducing the use of resources

Answer 01 · Mark scheme

	answers	extra information	mark
(ii)	any **one** from: • employment • increases local trade / makes money • future development of quarry – recreation / park / lake / reservoir	do **not** accept cheaper houses / land / new roads	1
total			10

4.10.2.2 Ways of reducing the use of resources

Answer 02 · Mark scheme

March 2007 | CHY1A | Original Q9 | Legacy

Nine	**2**	**3**	**4**	**2**

4.10.2.2 Ways of reducing the use of resources

Answer 02 · Mark scheme March 2007 | CHY1A | Original Q9 | Legacy

CHY1A (Products from Rocks) Higher Tier

Question	*Key*		
One	**A**	calcium carbonate only	**1**
	B	calcium oxide only	**3**
	C	calcium carbonate and calcium oxide	**2**
	D	carbon dioxide only	**4**
Two	**A**	**2**	
	B	**1**	
	C	**4**	
	D	**3**	

	A	**B**	**C**	**D**
Three	**3**	**2**	**3**	**3**
Four	**2**	**3**	**4**	**2**
Five	**3**	**4**	**3**	**3**
Six	**2**	**3**	**3**	**2**
Seven	**3**	**2**	**3**	**3**
Eight	**3**	**1**	**1**	**3**
Nine	**1**	**4**	**2**	**1**

4.10.2.2 Ways of reducing the use of resources

Answer 03 · Mark scheme

June 2007 | CHY1F | Original Q7 | Legacy

The full source mark scheme begins on page 54. Follow original question 7 in that document.

Answer 04 · Mark scheme

November 2007 | CHY1B | Original Q2 | Legacy

Two	**A**	screwdriver	**3**
	B	disposable coffee cup	**4**
	C	bottle for soft drinks	**2**
	D	frying pan	**1**

Answer 05 · Mark scheme

November 2007 | CHY1B | Original Q8 | Legacy

Eight	**4**	**4**	**3**	**4**

4.10.2.2 Ways of reducing the use of resources

Answer 06 · Mark scheme January 2008 | CHY1F | Original Q8 | Legacy

Question 8

question	answers	extra information	mark
(a)(i)	oxygen / O / O_2	do **not** accept oxide	1
(a)(ii)	sodium **and** carbon **and** oxygen	do **not** allow symbols alone do **not** allow oxide	1
	all correct numbers linked to correct elements ie 2 (sodium), a / 1 (carbon), 3 (oxygen)	accept statement 'the number **and** type of atoms' for **1** mark only ignore types of particles	1
(b)(i)	calcium carbonate →	allow $CaCO_3$	1
	calcium oxide + carbon dioxide	either way round allow CaO + CO_2 do **not** allow quick lime maximum **1** mark for unbalanced symbol equation	1
(b)(ii)	thermal decomposition	accept endothermic do **not** accept reversible / equilibrium	1
(c)	any **one** from: • lowers energy / temperature needed **or** conserves energy • decreases the amount of fuel needed • no / less glass going to landfill	do **not** accept no energy ignore cheaper / easier ignore conserves raw materials **or** more quarries needed	1
total			7

4.10.2.2 Ways of reducing the use of resources

Answer 07 · Mark scheme

March 2008 | CHY1BP | Original Q3 | Legacy

Three	**A**	10%	**1**
	B	15%	**2**
	C	20%	**3**
	D	55%	**4**

Answer 08 · Mark scheme

June 2008 | CHY1AP | Original Q8 | Legacy

Eight	**1**	**4**	**3**	**1**

Answer 09 · Mark scheme

June 2008 | CHY1BP | Original Q8 | Legacy

Eight	**1**	**1**	**4**	**1**

4.10.2.2 Ways of reducing the use of resources

Answer 10 · Mark scheme June 2008 | CHY1F | Original Q5 | Legacy

question	answers	extra information	mark
5(a)(i)	hydrogen	must be name	1
5(a)(ii)	a line of four or more ethene molecules joined to the original two with single bonds	at least two other ethene molecules joined to the original two in a chain gains **1** mark	2
5(b)(i)	any **two** from: • non-biodegradable • landfill sites are filling up / limited • waste of a resource / could be recycled / reused	accept remains a long time accept land / space used up ignore references to tablets / animals	2
5(b)(ii)	any **one** from: • (two) different polymers / plastics / materials • need to be separated • limited collection points / many need to be collected • tablets may still be present		1
Total			**6**

4.10.2.2 Ways of reducing the use of resources

Answer 10 · Mark scheme

June 2008 | CHY1F | Original Q5 | Legacy

COMPONENT NUMBER: CHY1F

COMPONENT NAME: Science B / Chemistry

STATUS: Final

DATE: June 2008

4.10.2.2 Ways of reducing the use of resources

Answer 11 · Mark scheme June 2008 | CHY1F | Original Q7 | Legacy

question	answers	extra information	mark
7(a)(i)	calcium oxide / CaO carbon dioxide / CO_2	products can be in either order ignore chemical names other than calcium oxide **or** carbon dioxide	1 1
7(a)(ii)	(thermal) decomposition	accept endothermic	1
7(b)(i)	(chemical) reaction / react energy / heat released / exothermic	accept calcium hydroxide / slaked lime produced ignore incorrect products ignore gets hot / heats up if neither mark awarded then allow 'mixing the chemicals heats up the coffee' for **1** mark	1 1
7(b)(ii)	any **two** from: • foil has been broken • ring pull used • quicklime and / or water mixed / reacted	if neither mark awarded accept 'cannot / difficult to repair' for **1** mark ignore button pushed accept reaction not reversible accept cannot / difficult to replace quicklime / water / chemicals	2
Total			**7**

4.10.2.2 Ways of reducing the use of resources

Answer 11 · Mark scheme June 2008 | CHY1F | Original Q7 | Legacy

COMPONENT NUMBER: CHY1F

COMPONENT NAME: Science B / Chemistry

STATUS: Final

DATE: June 2008

Answer 12 · Mark scheme November 2008 | CHY1AP | Original Q4 | Legacy

Four	**A**	a mixture	**2**
	B	expensive to extract from its ore	**1**
	C	a good conductor	**4**
	D	hard-wearing	**3**

Answer 13 · Mark scheme November 2008 | CHY1AP | Original Q6 | Legacy

Six	**2**	**3**	**2**	**1**

Answer 14 · Mark scheme November 2008 | CHY1AP | Original Q9 | Legacy

Nine	**2**	**3**	**3**	**3**

* This question was removed from the mark scheme and this test was marked out of 35.

Answer 15 · Mark scheme June 2009 | CHY1AP | Original Q9 | Legacy

Nine	**3**	**3**	**4**	**1**

Answer 16 · Mark scheme June 2009 | CHY1BP | Original Q2 | Legacy

Two	**A**	PTFE	**2**
	B	Nylon	**3**
	C	Polystyrene	**1**
	D	PET	**4**

4.10.2.2 Ways of reducing the use of resources

Answer 17 · Mark scheme June 2009 | CHY1F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	C_2H_4		1
5(a)(ii)	poly(ethene)		1
5(b)(i)	is not biodegradable		1
5(b)(ii)	not enough landfill sites / space	accept landfill sites are filling up **or** plastics remain for <u>years</u> **or** plastics not broken down ignore cost / waste of resources / not biodegradable / wildlife	1
5(b)(iii)	less (crude) oil / fuels / energy used	accept (crude) <u>oil</u> is a non-renewable resource	1
Total			**5**

4.10.2.2 Ways of reducing the use of resources

Answer 17 · Mark scheme

June 2009 | CHY1F | Original Q5 | Legacy

CHY1F

4.10.2.2 Ways of reducing the use of resources

Answer 18 · Mark scheme January 2010 | CHY1F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)(i)	any **one** from: • contain metals / filaments / wires • contain other / toxic chemicals / materials • different type of glass	ignore contamination without explanation accept named metal(s) accept named chemical(s) / material(s) accept glass would not melt ignore thicker / thinner glass	1
7(a)(ii)	any **one** from: • (glass bottles are) recycled • need to be more expensive glass **or** strong / thicker / different glass (to be reused) • damaged / weaker (with reuse) • need to be cleaned / transported • different sizes / shapes / colours • no refunds paid	 accept made to be used only once accept glass bottles are made of readily available materials **or** thin / cheap glass accept need to be sorted	1
7(a)(iii)	any **two** from: • low / less energy / heat or lower temperature needed • low / less fuel burned • no (carbon dioxide) from carbonate(s)	allow converse arguments ignore no energy without explanation ignore no fuel without explanation accept less fuel for extraction / transportation of raw materials accept name(s) of this carbonate(s)	2
7(b)(i)	46		1

Question 7 continues on the next page…

4.10.2.2 Ways of reducing the use of resources

CHY1F

Question 7 continued

question	answers	extra information	mark
7(b)(ii)	any **one** from: • (more) imported (as wine bottles) • not much green glass made in the UK • not a high demand (for green glass)	 accept come from / made in other countries **or** made elsewhere	1
7(b)(iii)	any **two** from: • more (clear) glass is produced (64%) than recycled (40%) • (clear) glass going to landfill • (more) raw materials needed / extracted / quarried • (more) heat / energy / fuel would be needed • (more) carbon dioxide produced	 accept not enough (clear) glass is recycled allow 'thrown away' ignore they will run out accept high carbon footprint / carbon emissions **or** global warming	2
Total			**8**

4.10.2.2 Ways of reducing the use of resources

Answer 19 · Mark scheme

March 2010 | CHY1AP | Original Q4 | Legacy

Four	**A**	aluminium	**2**
	B	glass	**3**
	C	iron	**4**
	D	lead	**1**

4.10.2.2 Ways of reducing the use of resources

Answer 20 · 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

4.10.2.2 Ways of reducing the use of resources

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**

4.10.2.2 Ways of reducing the use of resources

Answer 20 · Mark scheme

June 2010 | CHY2F | Original Q6 | Legacy

CHY2F

Answer 21 · Mark scheme

November 2010 | CHY1AP | Original Q9 | Legacy

Nine	**3**	**2**	**1**	**2**

4.10.2.2 Ways of reducing the use of resources

Answer 22 · Mark scheme

Question 6

question	answers	extra information	mark
6(a)(i)	low percentage / very little of metal (in the ore)	accept only 0.5% metal in the ore **or** over 99% waste in the ore **or** nearly 100% waste in the ore ignore reference to percentage of metal in the Earth's crust **or** energy used or pollution	1
6(a)(ii)	any **one** from • iron uses less energy / fuel for extraction • iron has more uses • more demand for iron • iron is stronger • cheaper / costs less • easier to extract	(it = iron) ignore electrolysis / uses electricity / reactivity ignore high abundance in the Earth's crust / high percentage of metal in ore ignore harder	1
6(b)(i)	has melting point lower than 950°C	(it = aluminium) allow has a low melting point ignore boiling point	1
6(b)(ii)	electrode(s) made of carbon oxygen reacts with electrode(s) / carbon	 accept $C + O_2$ ($\rightarrow$ CO_2) NB oxygen reacts with the carbon electrode(s) = **2** marks	1 1

Question 6 continues on the next page

4.10.2.2 Ways of reducing the use of resources

CHY1F

Question 6 contd

question	answers	extra information	mark
6(b)(iii)	any **two** from: • saves resources / non renewable • landfill problem • saves energy / fuel / electricity • less carbon dioxide / carbon emissions or reduces carbon footprint • less quarrying / mining	accept aluminium / ore will run out or conserves aluminium accept aluminium does not corrode ignore global warming ignore consequences of quarrying / mining ignore pollution / harms environment / costs / easy to recycle	2
Total			**7**

4.10.2.2 Ways of reducing the use of resources

Answer 22 · Mark scheme January 2011 | CHY1F | Original Q6 | Legacy

CHY1F

Answer 23 · Mark scheme March 2011 | CHY1AP | Original Q9 | Legacy

Nine	**4**	**3**	**2**	**2**

Answer 24 · Mark scheme November 2011 | CHY1AP | Original Q9 | Legacy

Nine	**3**	**2**	**1**	**2**

Answer 25 · Mark scheme November 2011 | CHY1BP | Original Q4 | Legacy

Four	**A**	5 %	**2**
	B	10 %	**1**
	C	40 %	**3**
	D	55 %	**4**

Answer 26 · Mark scheme November 2011 | CHY1BP | Original Q7 | Legacy

Seven	**4**	**3**	**1**	**1**

4.10.2.2 Ways of reducing the use of resources

Answer 27 · Mark scheme

January 2012 | CH1FP | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	reduction		1
2(b)	carbon is less reactive than aluminium		1
2(c)	aluminium (ions) / they are positively charged so they are attracted **or** they move towards the negative electrode **OR** aluminium (ions) / they need to gain electrons (1) which come from the negative electrode (1)	they = aluminium ions ignore particle names accept aluminium (ions) / they are cations allow aluminium (ions) / they have an opposite charge if no other marks awarded allow 'opposites attract' for **1** mark	1 1
2(d)	aluminium has a low density aluminium is resistant to corrosion		1 1
2(e)	**advantage** less carbon dioxide is produced **disadvantage** used aluminium cans have to be collected and transported		1 1
Total			**8**

4.10.2.2 Ways of reducing the use of resources

Answer 27 · Mark scheme January 2012 | CH1FP | Original Q2 | Legacy

CH1FP

4.10.2.2 Ways of reducing the use of resources

Answer 28 · Mark scheme

June 2012 | CH1FP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	any **one** from: • there are many stages needed (to extract titanium) • more energy / materials are needed (to extract titanium) • titanium cannot be extracted by using carbon	ignore references to cost / mining / availability allow longer / slower / more complicated process / batch process ignore higher temperature ignore reference to electrolysis do **not** accept titanium extracted by electrolysis	1
7(b)	carbon dioxide	allow CO_2	1
7(c)	magnesium chloride is electrolysed / used / decomposed magnesium and / or chlorine are recycled / reused	 allow the products of electrolysis are recycled word / symbol equation = **1** mark	1 1
7(d)	 because oxygen / nitrogen (in air) would react with the magnesium **or** would produce magnesium oxide / nitride whereas argon is inert / unreactive **or** argon does not react with magnesium	accept titanium for magnesium ignore argon is in Group 0 / noble gas	 1 1
7(e)	240		1
7(f)	250	allow range 245 to 250	1
Total			**8**

4.10.2.2 Ways of reducing the use of resources

Answer 28 · Mark scheme June 2012 | CH1FP | Original Q7 | Legacy

CH1FP

4.10.2.2 Ways of reducing the use of resources

Answer 29 · Mark scheme

January 2013 | CH1FP | Original Q4 | Legacy

question	answers	extra information	mark
4(a)(i)	Positive impact any **one** from: • provides employment **or** • improves local economy • improved transport - new roads are built, new rail links • after use the quarry could provide recreation facilities Negative impact any **one** from: • destruction of animal habitats • fewer plants and trees to absorb carbon dioxide • visual pollution **or** noise pollution **or** atmospheric / air pollution • more traffic • uses non-renewable resources	 allow dust pollution allow pollutants from burning diesel	1 1
4(a)(ii)	economical		1
4(b)	carbon / coke burns (in oxygen / air)	accept carbon / coke reacts with oxygen / air	1
4(c)(i)	iron oxide (reactant) carbon dioxide (product)	must be words	1 1
4(c)(ii)	reduction		1

4.10.2.2 Ways of reducing the use of resources

Answer 29 · Mark scheme

CH1FP

question	answers	extra information	mark
4(d)(i)	oxygen reacts with carbon **or** oxygen and carbon produce carbon dioxide / carbon monoxide carbon dioxide / carbon monoxide is a gas **or** the carbon is removed as a gas		1 1
4(d)(ii)	much harder		1
4(e)	Advantage: less carbon dioxide is produced Disadvantage: there are different types of steel which must be sorted		 1 1
Total			**12**

4.10.2.2 Ways of reducing the use of resources

Answer 29 · Mark scheme

January 2013 | CH1FP | Original Q4 | Legacy

CH1FP

4.10.2.2 Ways of reducing the use of resources

Answer 30 · Mark scheme

January 2013 | CH2FP | Original Q8 | Legacy

question	answers	extra information	mark
8(a)(i)	because they are positively charged	accept they are positive / H^+ accept oppositely charged **or** opposites attract ignore they are attracted	1
8(a)(ii)	gains one / an electron	accept $H^+ + e^- \rightarrow H$ or multiples allow gains electrons	1
8(b)	3 bonding pairs 1 lone pair	 accept 2 non-bonding electrons on outer shell of nitrogen	1 1
8(c)(i)	hydroxide / OH^-	do **not** accept sodium hydroxide	1
8(c)(ii)	$H^+ + OH^- \rightarrow H_2O$	ignore state symbols ignore word equation	1

January 2013

CH2FP

question	answers	extra information	mark
8(d)	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.		6

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	There are basic descriptions of advantages or disadvantages of the electrolysis cells.	There are clear descriptions of environmental or economic advantages or disadvantages of the electrolysis cells. Comparisons may be implied.	There are detailed descriptions of environmental and economic advantages and disadvantages, comparing the electrolysis cells.

examples of chemistry points made in the response:

Accept converse where appropriate.

- mercury cell is more expensive to construct
- mercury is recycled but membranes must be replaced
- mercury is toxic but membrane / polymer is not
- removing traces of mercury from waste is expensive
- mercury cell uses more electricity
- mercury cell produces chlorine that is purer
- mercury cell produces higher concentration / better quality of sodium hydroxide (solution)

Total			12

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

4.10.2.2 Ways of reducing the use of resources

Answer 31 · Mark scheme June 2015 | CH1FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	gold		1	1 / 1.3.1c
1(b)	atom (s)		1	1 / 1.1.1a
1(c)(i)	protons neutrons	any order allow proton allow neutron	1 1	1 / 1.1.1c/h
1(c)(ii)	3 / three		1	2 / 1.1.1e/g / 1.1.2a
1(d)(i)	Al	ignore any numbers / charges	1	2 / 1.1.1b
1(d)(ii)	any **two** from: • limited resource • expensive in terms of energy / mining • effects on the environment, such as, landfill, atmospheric pollution, quarrying	allow uses a lot of energy to extract	2	1 / 1.3.1e/i/j
1(e)	resistant to corrosion does not react (with water or food)	allow **one** mark for low density with a suitable reason given	1 1	2+3 / 1.3.3c
Total			**10**	

4.10.2.2 Ways of reducing the use of resources

Answer 31 · Mark scheme

June 2015 | CH1FP | Original Q1 | Legacy



4.10.2.2 Ways of reducing the use of resources

Answer 32 · Mark scheme

June 2016 | CH1FP | Original Q3 | Legacy

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	because it is a good conductor of electricity.		1	AO1 1.3.3b
3(b)(i)	2.1 (%)		1	AO2 1.3.1c
3(b)(ii)	correct bar for calcium at 3.6 % correct bar for iron at 5.0 %	allow error of +/- 0.05% allow error of +/- 0.05%	1 1	AO2 1.3.1c
3(c)(i)	decomposition		1	AO1 1.1.3b; 1.2.1b/c
3(c)(ii)	carbon dioxide		1	AO1 1.2.1c
3(c)(iii)	carbon = 1 oxygen = 3	allow one allow three	1 1	AO2 1.1.3 a
3(c)(iv)	44 (g)	allow forty four	1	AO2 1.1.3 c
3(d)(i)	to make alloys for specific uses.		1	AO1 1.3.2a/b/c
3(d)(ii)	any **three** from: • to conserve resources of iron or iron ore • to avoid the need for quarrying/mining • to conserve energy resources or fossil fuels • to limit the amount of carbon dioxide produced or to reduce global warming • to reduce the amount of landfill	"it" = steel ignore cost and reuse and time and waste allow steel instead of iron or iron ore allow limited resource or non-renewable	3	AO1 1.3.1j
Total			**13**	

4.10.2.2 Ways of reducing the use of resources

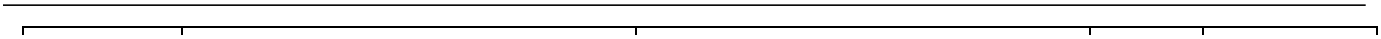
Answer 33 · Mark scheme June 2017 | CH1FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	magnesium oxide	allow MgO but must be correct formula do **not** allow extra products	1	AO2 1.1.3b
3(b)(i)	carbon	ignore C ignore any numbers eg 3 carbon	1	AO1 1.1.1b
3(b)(ii)	loss of oxygen	allow iron gains electrons do **not** allow loss of oxide do **not** allow iron oxide gains electrons	1	AO2 1.3.1d
3(b)(iii)	brittle soft alloys **or** steels		1 1 1	AO1 1.3.2a;b;c
Total			**6**	

4.10.2.2 Ways of reducing the use of resources

Answer 33 · Mark scheme

June 2017 | CH1FP | Original Q3 | Legacy



4.10.2.2 Ways of reducing the use of resources

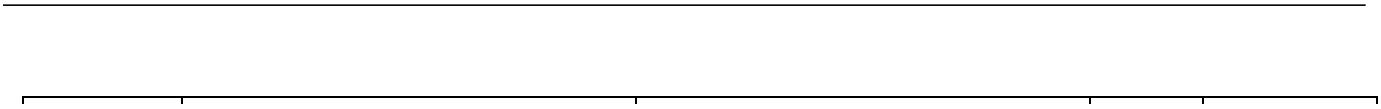
Answer 34 · Mark scheme June 2017 | CH1FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)(i)	2900	allow with **or** without working If answer is not correct allow one mark for 7000/2 **or** for 3500 (km)	2	**AO2** 1.7.1a
5(a)(ii)	plates speeds currents processes	Must be in this order	1 1 1 1	**AO1** 1.7.1c
5(b)(i)	bar correct (47%)	allow ± ½ a square	1	**AO2** 1.7.1b
5(b)(ii)	9 %		1	**AO2** 1.7.1b
5(b)(iii)	limited / finite resource	allow running out **or** non-renewable ignore cost **or** short supply **or** there is not a lot of it left	1	**AO3** 1.3.1j 1.3.3b
5(b)(iv)	electrolysis		1	**AO1** 1.3.1h
5(b)(v)	copper ions are <u>attracted</u> because they are positive	allow opposite (charges) <u>attract</u> allow because they need to gain electrons (to form copper)	1 1	**AO1** 1.3.1g;h
Total			**12**	

4.10.2.2 Ways of reducing the use of resources

Answer 34 · Mark scheme

June 2017 | CH1FP | Original Q5 | Legacy



4.10.2.2 Ways of reducing the use of resources

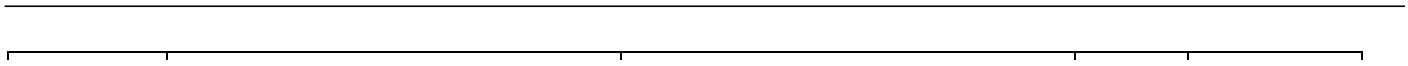
Answer 35 · Mark scheme June 2018 | 8462/2F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	bar to 0.3 g bar labelled copper	 allow Cu	1 1	AO2 4.10.3.2
04.2	(£) 57	allow (£) 57.00	1	AO2 4.10.3.2
04.3	$\frac{22}{9} \times 1.9$ = 4.6 (g)	an answer of 4.6(4444) (g) scores **2** marks allow an answer of 4.6(4444) (g)	1 1	AO2 4.10.3.2
04.4	(9 carat gold is) any **two** from: • harder • less expensive • aesthetic reasons	allow converse arguments about 24 carat or pure gold allow stronger or more durable or less malleable allow cheaper allow references to colour ignore references to finite resources	2	AO1 AO3 4.2.2.7 4.10.3.2
04.5	any **three** from: • copper ores will run out • landfill sites running out • less energy used • mining causes pollution • copper from copper ore more expensive	 allow copper ores scarce allow reduces waste allow produces less carbon dioxide or an implication e.g. global warming allow a specific pollution resulting from mining, eg noise, eyesore, damage to environment allow recycled copper is cheaper	3	AO1 AO3 4.10.1.4 4.10.2.2
Total			**10**	

4.10.2.2 Ways of reducing the use of resources

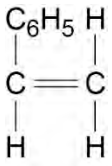
Answer 35 · Mark scheme

June 2018 | 8462/2F | Original Q4



4.10.2.2 Ways of reducing the use of resources

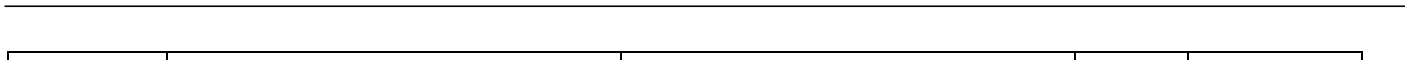
Answer 36 · Mark scheme June 2018 | 8462/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1			1	AO2 4.7.3.1
06.2	polymerisation		1	AO2 4.7.3.1
06.3	monomers many polymers	must be in this order	1 1 1	AO1 4.7.3.1
06.4	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.		3–4	AO3
	Level 1: Relevant features are identified and differences noted.		1–2	AO2
	No relevant content		0	
	Indicative content for coated paper cups – accept converse for poly(styrene) **advantages** • produced from a renewable resource • biodegradable so breaks down **disadvantages** • higher energy costs • greater use of fossil fuels and consequent pollution • not recyclable so uses landfill			4.10.1.1 4.10.2.1
Total			**9**	

4.10.2.2 Ways of reducing the use of resources

Answer 36 · Mark scheme

June 2018 | 8462/2F | Original Q6

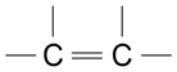


4.10.2.2 Ways of reducing the use of resources

Answer 37 · Mark scheme

June 2019 | 8462/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	covalent		1	AO1 4.2.1.4
05.2			1	AO1 4.7.2.1 4.7.2.2
05.3	composite		1	AO2 4.10.3.3
05.4	limestone sand	either order	1 1	AO1 4.10.3.3
05.5	any **two** from: (makes the board) • strong • hard • tough • waterproof • durable • aesthetic reasons • rigid • less friction • protection	ignore corrosion / erosion / rotting / rusting allow long lasting allow streamlined / smooth allow prevents damage	2	AO3 4.10.3.3
05.6	(advantages of addition polymers) low(er) cost low(er) density (disadvantages of addition polymers) weak(er) hard(er) to dispose of	 allow cheap(er) allow light(er) allow (more) likely to break ignore references to recycling or use as a fuel	 1 1 1 1	AO3 4.10.1.1 4.10.2.1

4.10.2.2 Ways of reducing the use of resources

Answer 37 · Mark scheme

June 2019 | 8462/2F | Original Q5

05.7	150 = $\frac{5.25}{\text{volume}}$ (volume =) $\frac{5.25}{150}$ (volume =) 0.035 (m^3)	an answer of 0.035 (m^3) scores **3** marks. allow **2** marks for an answer of 0.105 (m^3) (addition polymer)	1 1 1	AO2 4.10.1.1
Total			**14**	

4.10.2.2 Ways of reducing the use of resources

Answer 38 · Mark scheme

November 2020 | 8462/2F | Original Q6

Question 6

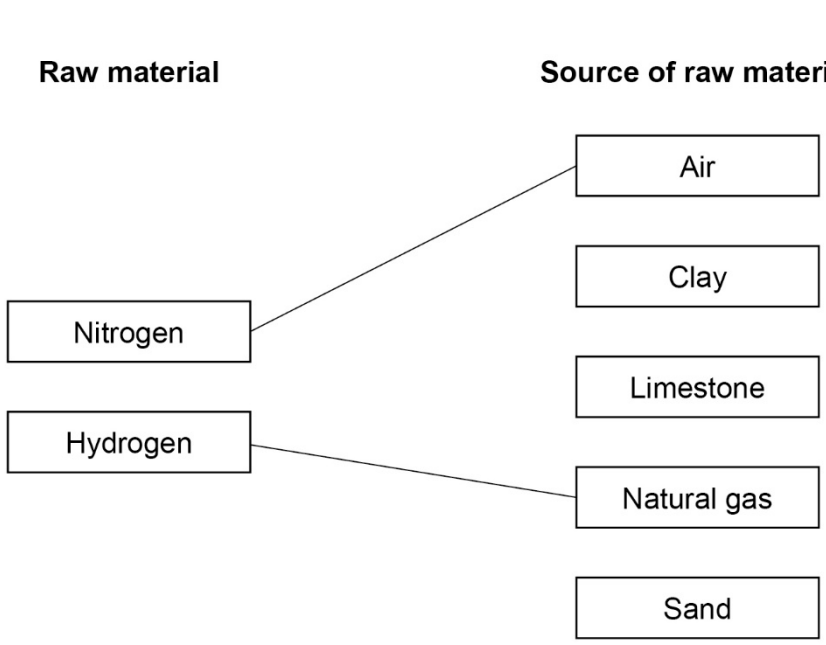
Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	disposal at the end of useful life		1	AO3 4.10.2.1
06.2	heating in a furnace shaping wet clay		1 1	AO1 4.10.3.3
06.3	polymers propene	allow (a) monomer	1 1	AO1 AO2 4.7.3.1
06.4	cracking fractional distillation		1 1	AO2 4.7.1.2 4.7.1.4
06.5	covalent		1	AO1 4.2.2.5 4.7.3.1
06.6	thermosetting		1	AO3 4.10.3.3
06.7	polymer **A** has crosslinks (between polymer molecules) **or** polymer **B** has no crosslinks (between polymer molecules)		1	AO3 4.10.3.3
Total			**10**	

4.10.2.2 Ways of reducing the use of resources

Answer 39 · Mark scheme

June 2022 | 8462/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	 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.
05.2	gas gas		1	AO1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	there is one product		1	AO2 4.3.3.2 4.10.4.1

4.10.2.2 Ways of reducing the use of resources

Answer 39 · Mark scheme

June 2022 | 8462/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	liquefied recycled	must be in this order	1 1	AO1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	all six points plotted correctly line of best fit	allow a tolerance of ± ½ a small square allow **1** mark for four / five points plotted correctly	2 1	AO2 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	(percentage yield) increases		1	AO2 4.10.4.1

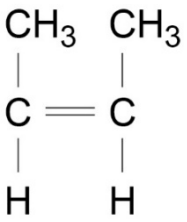
Total Question 5		10

4.10.2.2 Ways of reducing the use of resources

Answer 40 · Mark scheme

June 2022 | 8462/2F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	C=C bond		1	AO2 4.7.3.1
	2x C-H bonds **and** 2x C-CH_3 bonds	do **not** accept extra bonds	1	
		an answer of  scores **2** marks		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	any **one** from: • (otherwise) the copper (produced) would be impure • (otherwise) the copper (produced) would be a mixture • (otherwise) the insulation would burn / melt (during recycling) • copper and poly(butene) are recycled by different methods	allow (otherwise) the copper (produced) would be contaminated allow (otherwise) poly(butene) could produce toxic fumes	1	AO3 4.10.2.2

4.10.2.2 Ways of reducing the use of resources

Answer 40 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	(wire heated until) copper melts (re)cast / reformed (into pipes)	 allow (re)shaped / extruded / (re)moulded	1 1	AO1 4.10.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	 any **two** from: (recycling scrap copper) • uses less energy • conserves copper (ore) • (produces) less waste • specified environmental impact	allow converse statements for extracting copper from ores ignore references to cost allow less landfill required	 2	AO1 4.10.1.1 4.10.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	 sodium hydroxide (solution) blue precipitate	MP2 dependent on MP1 allow NaOH for sodium hydroxide allow blue solid	 1 1	AO1 4.8.3.2 RPA7

4.10.2.2 Ways of reducing the use of resources

Answer 40 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6	(add acidified) barium chloride (solution)	MP2 dependent on MP1 allow $BaCl_2$ for barium chloride allow (add acidified) barium nitrate (solution) do **not** accept add sulfuric acid	1	AO1 4.8.3.5 RPA7
	white precipitate	allow white solid	1	

Total Question 8		11

4.10.2.2 Ways of reducing the use of resources

Answer 41 · Mark scheme

June 2022 | 8462/2F | Original Q10

Question 10

Question	Answers	Mark	AO / Spec. Ref
10.1	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.10.1.1 4.10.2.1
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content **raw materials** • crude oil is finite • quarrying / mining pollute the environment • glass uses more energy to process raw materials **manufacturing** • glass uses more energy to make bottles • glass is heavier so takes more energy to transport **use and operation** • glass bottles are reusable • reuse of glass conserves (natural) resources • reuse of glass consumes energy during washing • reuse of glass consumes water during washing **disposal** • both glass and polymer bottles can be recycled • recycling polymer conserves finite resources • recycling glass and polymer uses less energy than making new glass and polymer • both methods reduce use of landfill **other points** • energy needed may be derived from fossil fuels • use of fossil fuels causes (specified) pollution • total energy for glass (bottle) (7500 kJ) is greater than total energy for polymer (bottle) (1800 kJ) **reasoned judgement**		

4.10.2.2 Ways of reducing the use of resources

Answer 41 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2	mass = density × volume mass = 0.40 × 40 = 16 (g)		1 1 1	AO2 4.10.1.1 4.10.2.1

Total Question 10		**9**

4.10.2.2 Ways of reducing the use of resources

Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1F Unit Chemistry 1

Mark Scheme

2007 examination - June series

4.10.2.2 Ways of reducing the use of resources

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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Dr Michael Cresswell, Director General.

4.10.2.2 Ways of reducing the use of resources

MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

4.10.2.2 Ways of reducing the use of resources

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

4.10.2.2 Ways of reducing the use of resources

CHY1F Question 1

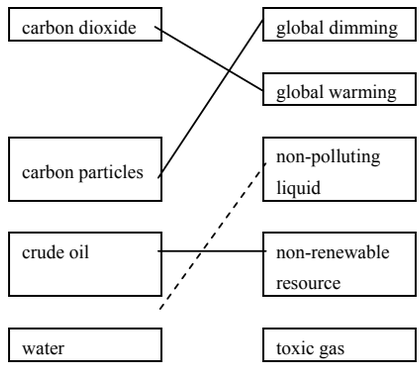
	answers	extra information	mark
(a)	low density unreactive		1 1
(b)	a polymer		1
(c)	any **one** from: • not broken down by (microorganisms) • does not decay (naturally)	ignore cannot recycle / degrade / disintegrate	1
total			4

CHY1F Question 2

	answers	extra information	mark
(a)(i)	additive		1
(b)	any **three** from: • colour 1 is made up of only one colour / dye • colour 2 is made up of only one colour / dye • colour 3 is made up of two colours / dyes **or** more colours (than colours 1 and 2) • colours 1, 2 and 3 are all different • colour 1 is less dark than colour 2	accept colour 3 is a mixture of colours 1 and 2 for **3** marks accept E-number or additive instead of colour ignore comments about height / level	3
total			4

4.10.2.2 Ways of reducing the use of resources

CHY1F Question 3

	answers	extra information	mark
(a)	hydrogen	ignore formulae	1
(b)	any **two** from: • different sized molecules / more or less (carbon) atoms (in molecules) • fuels have <u>different</u> boiling points • fuels condense at <u>different</u> temperatures	ignore different densities	2
(c)		all three correct = **3** marks two correct = **2** marks one correct = **1** mark	3
total			6

4.10.2.2 Ways of reducing the use of resources

CHY1F Question 4

	answers	extra information	mark
(a)(i)	any **one** from: • iron ore is a limited resource / non-renewable • iron is in high demand • provide jobs • economic advantage		1
(ii)	any **two** from: • would damage (wildlife) habitats / countryside / greenfield sites • extra traffic • visual (pollution) / eyesore • noise (pollution) / sound (pollution) • dust (pollution) • river (pollution) • carbon dioxide (from traffic) / adds to greenhouse effect / global warming • damage roads / buildings by <u>vibrations</u> / <u>shockwaves</u>		2
(b)(i)	carbon monoxide / carbon	accept formulae CO / C	1
(ii)	atoms are all the same (size) / type	accept (particles) are all the same (size) / type for one mark	1 1

Continued on next page

4.10.2.2 Ways of reducing the use of resources

Question 4 continued

	answers	extra information	mark
(iii)	any **two** from: • impurities / carbon / different (sized) atoms **or** elements **or** metals • changes the structure / disrupts the pattern or layers • prevents layers sliding over each other • it is an alloy		2
total			8

4.10.2.2 Ways of reducing the use of resources

CHY1F Question 5

	answers	extra information	mark
(a)	core	ignore outer or inner	1
	mantle		1
(b)(i)	carbon dioxide	accept formula CO_2	1
	oxygen	accept formulae O_2 / O	1
(ii)	4%		1
(iii)	carbon dioxide has <u>decreased</u> / from 95% to 0%		1
	oxygen has <u>increased</u> / from 0% to 21%		1
	any **one** from: (carbon dioxide decrease) • carbon dioxide used during photosynthesis / by plants • carbon dioxide dissolves in oceans • carbon dioxide is locked up in rocks / carbonates / fossil fuels (oxygen increase) • oxygen released during photosynthesis / by plants		1
total			8

4.10.2.2 Ways of reducing the use of resources

CHY1F Question 6

	answers	extra information	mark
(a)	any **two** from: • nitrogen • carbon dioxide • water (vapour) / steam	 accept formulae N / N_2 accept formula CO_2 ignore CO accept formula H_2O	2
(b)	any **three** from: <u>limestone</u> • abundant / local • natural material **or** no 'processing' needed • relatively easy to cut • appearance better <u>concrete</u> • <u>raw materials</u> are abundant • can be reinforced (by steel rods) / strong(er) / supported (by steel rods) • concrete mixture can be poured / moulded / constructed on site • less reactive with acid rain / weathering / erosion	no mark for 'limestone' or 'concrete' on first line – mark advantages only ignore ideas of speed of production or easier to use accept 'can build higher' ignore density / extraction / quarrying / pollution / cost	3
total			5

4.10.2.2 Ways of reducing the use of resources

CHY1F Question 7

	answers	extra information	mark
(a)(i)	$Cu_2S + 2O_2 \rightarrow 2CuO + SO_2$	accept fractions and multiples	1
(ii)	any **two** from: • sulfur dioxide • causes acid rain • consequence of acid rain eg kills fish / plants	 accept sulphur dioxide / sulphur oxide / SO_2 ignore other comments eg global warming / ozone / global dimming / greenhouse effect	2
(b)	any **two** from: • heat (copper oxide with carbon) • oxygen is removed by carbon **or** carbon monoxide / carbon dioxide is produced **or** carbon displaces copper • because carbon is more reactive than copper	 accept copper (oxide) loses oxygen **or** carbon gains oxygen accept carbon oxide accept a correct word or balanced symbol equation allow a correct comparison of reactivity	2
(c)(i)	electrolysis	accept electroplating	1
(ii)	(electrical) wiring / appliances / coins / pipes / cladding for buildings / jewellery / making alloys **or** named alloys		1

Continued on next page

4.10.2.2 Ways of reducing the use of resources

Question 7 continued

	answers	extra information	mark
(d)	any **three** explanations from: <u>for recycling</u> • less acid rain (pollution) • copper reserves last longer / conserved **or** do not run out • energy for extraction (saved) **or** less energy required • less mining / quarrying • less waste (copper) / electrical appliances dumped **or** less landfill <u>against recycling</u> • collection problems • transport problems • difficult to separate copper from appliances • energy used to melt the collected copper	ignore electrolysis / pollution ignore ideas about less machinery / plant ignore idea of cost	3
total			10

4.10.2.2 Ways of reducing the use of resources

Answer 35 · Examiner comments

June 2018 | 8462/2F | Original Q4

Question 4 (low demand)

04.1 This question was well answered with 79% of students achieving both marks and most of the rest missing the second mark by not labelling the bar ‘copper’.

04.2 60% of students calculated the cost of the gold correctly.

04.3 Students found this calculation much more daunting and there were many obscure methods employed resulting in incorrect answers (often greater than 5.0g!). It appeared that the problem often related to the students lack of understanding of the concept of ratios and hence the need to include the term 22/9 in their calculation.

04.4 26% of students achieved both marks usually giving the first two answers on the mark scheme. Responses failing to gain credit referred to gold’s sustainability / weight / density / rusting / reactivity / availability.

Answer 35 · Examiner comments

June 2018 | 8462/2F | Original Q4

04.5 Students found this question difficult and too often simply repeated the information given in the stem. For example, many achieved a mark for saying ‘copper ores are finite’, but a similar number just copied ‘Copper ores are non-renewable’ from the stem or incorrectly stated that ‘recycled copper is renewable’.

References to landfill were often too vague to gain a mark where we were looking for the idea of the decreasing number of landfill sites or to reducing the amount of copper that is wasted. Few realised the implications of producing less carbon dioxide, the greenhouse effect or global warming, as a result of using less energy. Many answers referred to pollution but they often did not link it to mining. Few mentioned that recycling was cheaper than extracting new copper.

4.10.2.2 Ways of reducing the use of resources

Answer 36 · Examiner comments

June 2018 | 8462/2F | Original Q6

Question 6 (low demand)

06.1 65% of students correctly identified the correct monomer.

06.2 79% of students correctly identified the correct process.

06.3 This question differentiated well, with a good spread of marks. 36% of students achieved full marks.

Answer 36 · Examiner comments

June 2018 | 8462/2F | Original Q6

06.4 This question required an ‘extended response’ and was marked holistically using a ‘levels’ mark scheme. The command word was ‘compare’. Lower-attaining students simply repeated the information in the question and gained no credit.

As a guideline, those who only identified the various properties as advantages and disadvantages were probably in level 1. 53% of responses moved beyond this into level 2, by explaining why. For example, that being made out of wood was an advantage because wood is renewable or that being non-recyclable was a disadvantage because it fills up landfill sites.

4.10.2.2 Ways of reducing the use of resources

Answer 39 · Examiner comments

June 2022 | 8462/2F | Original Q5

Question 5 (Low and standard demand)

05.1 Nearly 40% of the students gained two marks, with many of the remainder reversing the correct responses.

05.2 Over 40% of the students knew that nitrogen and hydrogen are both gases. Roughly the same number incorrectly selected an option that stated one of these elements is a gas and the other a liquid.

05.3 Fewer than 20% of the students gained a mark. A large majority thought that the reversibility of the reaction was linked to 100% atom economy.

05.4 Both evaporated and filtered were often seen. There was no obvious pattern in the responses and over 30% of the students gained both of the marks.

05.5 Around one-third of students obtained all three marks.
Over 50% of students plotted the points correctly but did not obtain the line of best fit mark. Common mistakes when drawing the line of best fit were to draw a straight line, a series of dot-to-dot straight lines, a very thick line or multiple lines.

05.6 About two-thirds of students realised that the percentage yield of ammonia would also increase.

4.10.2.2 Ways of reducing the use of resources

Answer 40 · Examiner comments

June 2022 | 8462/2F | Original Q8

Question 8 (Standard demand)

08.1 This was well answered by a small minority of students with around 10% of students scoring both marks. The most common errors were to omit the double bond, to add additional bonds or atoms to the carbon atoms. Brackets and/or the inclusion of the letter n were ignored.

08.2 The better responses correctly referred to the insulation being burned or melted or the lack of purity or 'contamination' of the copper produced. Uncreditworthy responses often made comments such as 'so you only get copper'. Around 40% of the students scored this mark.

08.3 This was reasonably well answered as responses such as the copper melting and being reformed/moulded into new pipes were seen. Responses referring to 'heating the wire' were insufficient to gain credit. Around 40% of the students scored both marks.

08.4 The most common correct responses referred to the conservation of copper and the use of less energy in this process. Relatively few answers identified specified environmental impacts.

Weaker responses referred to 'pollution' alone which was too vague to gain credit. Some referred to cost without making a link to the amount of energy needed. Less than 10% of students were able to identify two advantages of recycling, though just over 40% could identify one.

08.5 The test for copper(II) ions was not well known.

A variety of tests were chosen, with the most common incorrect response being the use of flame tests. The addition of acids, especially hydrochloric acid, was also often suggested.

Acceptable results included shades of blue precipitate, e.g. pale/light blue, but answers giving two colours such as green/blue were not credited. Around 1% of students scored both the marks.

08.6 The use of barium chloride or barium nitrate as the reagent for the test was generally followed by the correct result.

The test was often incorrect, with the result, therefore, not able to be awarded a mark. The most common incorrect reponses were the use of a flame test or an incorrect reagent(s). Again, around 1% of students scored both the marks.

4.10.2.2 Ways of reducing the use of resources

Answer 41 · Examiner comments

June 2022 | 8462/2F | Original Q10

Question 10 (Standard demand)

10.1 In this extended response question, the command word was 'evaluate'. This command word demands a reasoned judgement to be given for a fully complete answer and therefore for access to a Level 3 mark. Isolated comments such as 'I think polymer is a better material than glass' are not reasoned judgments. The vast majority of students did not go further than this and were therefore capped at four marks. Very few students gained 5 or 6 marks.

Most students scored a Level 1 mark (merely by comparing the values given in the table) or a Level 2 mark (by introducing one or two pieces of 'added value' information about the impacts of the data provided). Nearly 30% of students gained a Level 2 mark, whilst a further 15% or so did not attempt the question.

10.2 This straightforward calculation presented no difficulties for the majority of students. Well over 70% of the students gained all three marks.

4.10.2.2 Ways of reducing the use of resources

Answer 41 · Examiner comments

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account of how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.