AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.10.2.2

Ways of reducing the use of resources

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**46**
Available paper years	**2007–2024**

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 | CHY1H | Original Q3 | Legacy

Question 3

	answers	extra information	mark
(a)(i)	contain enough metal to make it economical / worth while to extract		1
(ii)	reduction	accept displacement accept redox	1
(iii)	Fe + CO_2	do **not** accept Fe_2 / Fe_4	1
	correct balancing	accept multiples and halves	1
	2Fe_2O_3 + **3**C → **4**Fe + **3**CO_2	allow Fe_2 / Fe_4 as ecf	
(b)	**Pure Iron** (in pure metal all the atoms are the same size and) able to slip / slide over each other – (property soft)	OWTTE ignore references to molecules / particles. if they say 'move' both times, allow **one** mark but 'crack' or 'split' is wrong.	1
	Cast iron (in cast iron) different sized atoms / larger atoms **or** structure is distorted / disrupted	OWTTE	1
	so it is difficult for layers of atoms to slip / slide over each other	OWTTE	1
(c)	any **three** from: • conserves / saves resources / metal ores • saves energy resources (used for extraction / processing) • decreases waste materials • decreases a named pollution	accept cheaper / saves money do **not** accept acid rain	3
total			10

4.10.2.2 Ways of reducing the use of resources

Answer 02 · Mark scheme March 2007 | CHY1A | Original Q4 | Legacy

Four	**A**	compounds	**1**
	B	elements	**2**
	C	groups	**4**
	D	properties	**3**

Answer 03 · Mark scheme June 2007 | CHY1A | Original Q7 | Legacy

Seven	**3**	**2**	**3**	**3**

Answer 04 · Mark scheme June 2007 | CHY1H | Original Q2 | Legacy

The full source mark scheme begins on page 57. Follow original question 2 in that document.

Answer 05 · Mark scheme November 2007 | CHY1A | Original Q7 | Legacy

Seven	**4**	**4**	**2**	**2**

Answer 06 · Mark scheme November 2007 | CHY1A | Original Q9 | Legacy

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

4.10.2.2 Ways of reducing the use of resources

Answer 07 · Mark scheme November 2007 | CHY1B | Original Q3 | Legacy

Three	**4**	**4**	**3**	**4**

Answer 08 · Mark scheme January 2008 | CHY1H | Original Q2 | Legacy

No matching mark scheme was available in the supplied archive for this question.

Answer 09 · Mark scheme January 2008 | CHY1H | Original Q4 | Legacy

No matching mark scheme was available in the supplied archive for this question.

Answer 10 · Mark scheme January 2008 | CHY1H | Original Q6 | Legacy

No matching mark scheme was available in the supplied archive for this question.

Answer 11 · Mark scheme June 2008 | CHY1AP | Original Q3 | Legacy

Three	**1**	**4**	**3**	**1**

Answer 12 · Mark scheme June 2008 | CHY1AP | Original Q7 | Legacy

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

Answer 13 · Mark scheme June 2008 | CHY1BP | Original Q3 | Legacy

Three	**1**	**1**	**4**	**1**

4.10.2.2 Ways of reducing the use of resources

Answer 14 · Mark scheme June 2008 | CHY1H | Original Q1 | Legacy

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

4.10.2.2 Ways of reducing the use of resources

Answer 14 · Mark scheme June 2008 | CHY1H | Original Q1 | Legacy

COMPONENT NUMBER: CHY1H

COMPONENT NAME: Science B / Chemistry

STATUS: Final

DATE: June 2008

Answer 15 · Mark scheme November 2008 | CHY1AP | Original Q4 | Legacy

Four	**2**	**3**	**3**	**3**

Answer 16 · Mark scheme November 2008 | CHY1AP | Original Q8 | Legacy

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

Answer 17 · Mark scheme June 2009 | CHY1AP | Original Q4 | Legacy

Four	**3**	**3**	**4**	**1**

4.10.2.2 Ways of reducing the use of resources

Answer 18 · Mark scheme

June 2009 | CHY1H | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	reacts with carbon / C carbon dioxide / CO_2 / gas is formed / given off	accept burns / oxidises carbon accept carbon monoxide / CO accept correctly balanced equation for **2** marks ignore state symbols	1 1
4(a)(ii)	change / improve properties	accept any specific property accept to make alloys / special steels ignore brittle	1
4(b)	any **two** from: • to conserve ores / iron • to prevent the use of landfills • to conserve energy / fuel • to reduce carbon / carbon dioxide emissions • to meet EU / International targets	 accept ores / iron are non-renewable / non-sustainable allow less quarrying / mining allow reduce waste accept fossil fuels are non-renewable ignore costs / demand	2
Total			**5**

4.10.2.2 Ways of reducing the use of resources

Answer 18 · Mark scheme

June 2009 | CHY1H | Original Q4 | Legacy

CHY1H

4.10.2.2 Ways of reducing the use of resources

Answer 19 · Mark scheme January 2019 | CHY1H | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(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
2(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
2(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
2(b)(i)	46		1

Question 2 continues on the next page…

CHY1H

Question 2 continued

question	answers	extra information	mark
2(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
2(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 January 2010 | CHY1H | Original Q2 | Legacy

CHY1H

Answer 20 · Mark scheme March 2010 | CHY1BP | Original Q6 | Legacy

Six	**2**	**1**	**4**	**3**

4.10.2.2 Ways of reducing the use of resources

Answer 21 · Mark scheme

June 2010 | CHY1H | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	C	must be correct symbol do **not** accept carbon any balancing must be correct	1
3(a)(ii)	Fe + CO_2 2…. + 3….	correct formulae correct balancing allow Fe_2 + $3CO_2$ for this mark	1 1
3(a)(iii)	layers / atoms in pure iron are able to slide over each other **or** layers / atoms in cast iron are unable to slide over each other (easily)	it = pure iron accept ions for atoms ignore molecules / particles	1

Question 3 continues on the next page

CHY1H

Question 3 continued

question	answers	extra information	mark
3(b)	any **three** from: • less iron ore used • less other metals extracted / used to make different steels • less fuel used • less specified pollution • less / no landfill space needed • less / no mining needed **or** fewer specified effects of mining	mention of ozone = max **2** accept the idea that ores would be conserved but not unspecified conservation accept the idea that ores would be conserved but not unspecified conservation accept the idea that fuels would be conserved ignore reduces energy requirements accept global warming / greenhouse effect / CO_2 / CO / carbon emissions / acid rain / SO_2 / global dimming / do **not** accept ozone layer ignore reduces waste accept effect such as eyesore / loss of habitat eg 'less mining iron ore' = **2** marks	3
Total			**7**

4.10.2.2 Ways of reducing the use of resources

Answer 21 · Mark scheme June 2010 | CHY1H | Original Q3 | Legacy

CHY1H

4.10.2.2 Ways of reducing the use of resources

Answer 22 · Mark scheme

June 2010 | CHY2H | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	(nitrogen) + hydrogen → ammonia	accept H_2 and NH_3 ignore incorrect symbols ignore balancing	1
1(a)(ii)	any **one** from: • catalyst • to speed up the reaction • lower activation energy	 ignore causes reaction ignore heat / reference to particles 	1
1(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 1 continues on the next page

4.10.2.2 Ways of reducing the use of resources

CHY 2H

Question 1 continued

question	answers	extra information	mark
1(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
1(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 22 · Mark scheme

June 2010 | CHY2H | Original Q1 | Legacy

CHY 2H

Answer 23 · Mark scheme

November 2010 | CHY1AP | Original Q4 | Legacy

Four	**3**	**2**	**1**	**2**

Answer 24 · Mark scheme

November 2010 | CHY1BP | Original Q2 | Legacy

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

Answer 25 · Mark scheme

November 2010 | CHY1BP | Original Q5 | Legacy

Five	**1**	**3**	**2**	**4**

4.10.2.2 Ways of reducing the use of resources

Answer 26 · Mark scheme

Question 1

question	answers	extra information	mark
1(a)(i)	very little / low percentage 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
1(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
1(b)(i)	has melting point lower than 950°C	(it = aluminium) allow has a low melting point ignore boiling point	1
1(b)(ii)	electrode(s) made of carbon oxygen reacts with electrode(s) / carbon	 accept C + O_2 (→ CO_2) NB oxygen reacts with the carbon electrode(s) = **2** marks	1 1

Question 1 continues on the next page

4.10.2.2 Ways of reducing the use of resources

CHY1H

Question 1 contd

question	answers	extra information	mark
1(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 26 · Mark scheme

January 2011 | CHY1H | Original Q1 | Legacy

CHY1H

4.10.2.2 Ways of reducing the use of resources

Answer 27 · Mark scheme

January 2011 | CHY1H | Original Q5 | Legacy

Question 5

Question	Advantages	Disadvantages	
Reused	• saves raw materials / crude oil • saves energy / fuel / transport • fewer bags needed / made • reduces carbon / CO_2 emissions • reduces use of landfill • saves cost of a new bag • no waste	• unable to reuse many times • bags easily split	1
Recycled	• saves raw materials / crude oil • saves energy / use of fuel • reduces carbon / CO_2 emissions • reduces use of landfill • can be used for new products	• has to be collected / transported / washed / separated / melted ignore uses energy	1
Burned	• heat / energy released can be used (for heating / generating electricity) • reduces use of landfill	• has to be collected / transported • wastes the resource / plastic • releases harmful gases / toxic gases / CO_2	1
Dumped	• collected / transported with household waste • (slowly) biodegrades **or** produces methane which can be used as a fuel • (not biodegradable so) does not release CO_2 / green house gas into the air	• wastes the resource • plastic uses landfill • produces methane which is a greenhouse gas / could cause explosions • not biodegradable / take years to decompose	1
ignore cost / litter / waste / global warming / habitats unless mentioned above			

Total			**4**

4.10.2.2 Ways of reducing the use of resources

Answer 27 · Mark scheme January 2011 | CHY1H | Original Q5 | Legacy

CHY1H

Answer 28 · Mark scheme March 2011 | CHY1AP | Original Q4 | Legacy

Four	4	3	2	2

Answer 29 · Mark scheme March 2011 | CHY1BP | Original Q7 | Legacy

Seven	4	4	1	2

Answer 30 · Mark scheme June 2011 | CHY1AP | Original Q5 | Legacy

Five	2	2	1	3

Answer 31 · Mark scheme November 2011 | CHY1AP | Original Q4 | Legacy

Four	3	2	1	2

4.10.2.2 Ways of reducing the use of resources

Answer 32 · Mark scheme

January 2012 | CH1HP | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	reduction	accept redox / smelting	1
4(a)(ii)	3 4 3		1
4(b)(i)	55	ignore other units	1
4(b)(ii)	water	accept sodium hydroxide accept correct formulae H_2O or NaOH	1
4(b)(iii)	any **one** from: • save energy / fuel for transporting the ore • (old) quarries nearby for waste/red mud	accept less (cost of) transport allow transported quickly	1

Question 4 continues on the next page …….

CH1HP

Question 4 cont'd…

question	answers	extra information	mark
4(c)	**Environmental** any **one** from: • less mining / quarrying (of bauxite) • less landfill space needed / used • less use of fossil fuels / energy • less carbon dioxide produced **Ethical or social** any **one** from: • saves resources • creates (local) employment • more people aware of the need for recycling	 allow loss of habitat / less qualified noise pollution allow less red mud / waste allow using resources more than once if answers reversed and both correct award **1** mark allow less qualified noise pollution if not given in environmental	1 1
Total			**7**

4.10.2.2 Ways of reducing the use of resources

Answer 32 · Mark scheme

January 2012 | CH1HP | Original Q4 | Legacy

CH1HP

4.10.2.2 Ways of reducing the use of resources

Answer 33 · Mark scheme

June 2012 | CH1HP | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(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
2(b)	carbon dioxide	allow CO_2	1
2(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
2(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
2(e)	240		1
2(f)	250	allow range 245 to 250	1
Total			**8**

4.10.2.2 Ways of reducing the use of resources

Answer 33 · Mark scheme

June 2012 | CH1HP | Original Q2 | Legacy

CH1HP

4.10.2.2 Ways of reducing the use of resources

Answer 34 · Mark scheme

January 2013 | CH1HP | Original Q7 | Legacy

question	answers	extra information	mark
7(a)	(because to produce low-carbon steel) oxygen is needed to react with / oxidise carbon	accept (to produce low-carbon steel) oxygen removes carbon as carbon dioxide	1
	(to produce titanium) an atmosphere of argon is used because it is unreactive		1
	any oxygen / air would react with / oxidise magnesium or titanium	ignore magnesium chloride / titanium chloride reacts with oxygen	1
7(b)		it = titanium ignore references to abundance / usefulness / temperature / amounts / relative reactivity / equipment	
	for titanium:	allow converse arguments for iron	
	• there are more stages in its manufacture	accept slower rate of production **or** is more labour intensive **or** a batch process is used or the process used is not continuous	1
	• larger amounts of energy are needed	accept the titanium chloride is cooled and reheated which is not energy efficient	1
	• magnesium / chlorine / argon have to be produced **or** are expensive **or** are used		1

4.10.2.2 Ways of reducing the use of resources

CH1HP

question	answers	extra information	mark
7(c)	titanium is below magnesium and above iron (in the reactivity series of metals)	allow similar position to aluminium **or** carbon **or** zinc	1
	because magnesium removes chlorine from titanium chloride **and** titanium removes oxygen from iron oxide **OR** magnesium more reactive than titanium because it removes chlorine from titanium chloride (1) titanium more reactive than iron because it removes oxygen from iron oxide (1)	allow magnesium displaces titanium **and** titanium displaces iron accept magnesium more reactive than titanium because it displaces titanium accept titanium more reactive than iron because it displaces iron	1
Total			**8**

4.10.2.2 Ways of reducing the use of resources

Answer 34 · Mark scheme

January 2013 | CH1HP | Original Q7 | Legacy

CH1HP

4.10.2.2 Ways of reducing the use of resources

Answer 35 · Mark scheme

January 2013 | CH2HP | Original Q2 | Legacy

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

4.10.2.2 Ways of reducing the use of resources

January 2013

CH2HP

question	answers	extra information	mark
2(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

4.10.2.2 Ways of reducing the use of resources

Answer 35 · Mark scheme

January 2013

CH2HP

4.10.2.2 Ways of reducing the use of resources

Answer 36 · Mark scheme

January 2013 | CH2HP | Original Q6 | Legacy

question	answers	extra information	mark
6		reference to incorrect bonding **or** incorrect particles **or** incorrect structure = max **3**	
	high melting point	accept will not melt (at high temperatures) ignore withstand high temperatures	1
	because a lot of energy needed to break bonds		1
	because it is covalent **or** has strong bonds	accept bonds are hard to break	1
	and because it is a giant structure **or** a macromolecule **or** a lattice	ignore many bonds	1
Total			**4**

4.10.2.2 Ways of reducing the use of resources

Answer 36 · Mark scheme

January 2013

CH2HP

4.10.2.2 Ways of reducing the use of resources

Answer 37 · Mark scheme

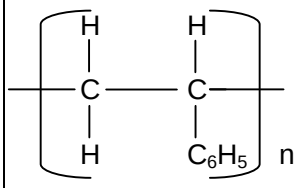
June 2013 | CH1HP | Original Q4 | Legacy

Question 4

question	Answers	extra information	Mark
4(a)	any **one** advantage from: • conserves resources (of crude oil / metal ores) • reduces use of landfill • less use of fuels/energy • less carbon dioxide produced any **one** disadvantage from: • made of different polymers / alloys / materials • difficulty / cost of separating the different materials	ignore can be made into other items allow the materials (in the pen) are non-renewable allow less expensive than producing from the raw material ignore less waste ignore global warming unqualified allow not all the materials can be recycled	1 1
4(b)	hard / strong / durable resistant to corrosion **or** unreactive	allow do not rust do **not** allow corrosive	1 1
4(c)(i)	vapours (of decane) passed over a catalyst **or** porous pot **or** aluminium oxide **or** mixed with steam (1) at a (very) high temperature (1)	ignore pressure / hot / heat allow high temperature (≥150 °C) allow catalyst even if incorrectly named if temperature quoted, must be ≥500 °C	1 1

Question 4 continues on the next page

Question 4 continued

question	Answers	extra information	Mark
4(c)(ii)	many monomers **or** many ethene molecules join / bond **OR** monomers / ethene molecules (1) form chains **or** very large molecules (1)	 allow addition polymerisation for second mark if no other mark awarded allow double bond breaks / opens up **or** double bond forms a single bond for **1** mark	1 1
4(d)		allow bonds that do not extend through brackets 7 single bonds are used and are in the correct places with no additional atoms (1) the brackets and the n are in the correct place (1)	2
Total			**10**

4.10.2.2 Ways of reducing the use of resources

Answer 38 · Mark scheme

June 2016 | CH1HP | Original Q3 | Legacy

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	(thermal) decomposition	allow decomposes or endothermic	1	AO1 1.2.1b/c
3(a)(ii)	copper oxide		1	AO2 1.2.1b/c
3(b)(i)	the (potassium) carbonate did not decompose/change/react (when heated) the mass did not change or the limewater did not go cloudy because no carbon dioxide produced	allow temperature not high enough do **not** allow potassium did not decompose ignore references to reactivity	1 1 1	AO1+AO2 +AO3 1.2.1c/e; 4.5.4a
3(b)(ii)	the less reactive the metal the more (easily) its carbonate will decompose/react or vice versa	needs to be a relative comparison allow max **1** mark where the distinction between a metal and its carbonate is not clear allow **1** mark for carbonates of reactive metals do not decompose or vice versa	2	AO3 1.2.1 c; 1.3
3(c)(i)	make it economical (to extract the metal/iron)	allow make it worth extracting allow so they can make money/profit	1	AO1 1.3.1a
3(c)(ii)	Fe balanced correctly (2,3,4,3)	 not ecf allow correct balanced equation but with $2Fe_2$ on right for one mark	1 1	AO2 1.1.3b; 1.3.2c

4.10.2.2 Ways of reducing the use of resources

Answer 38 · Mark scheme

June 2016 | CH1HP | Original Q3 | Legacy

3(c)(iii)	**iron** from the blast furnace is brittle **steel** produced is strong / flexible	"it" = iron allow steel has more/specific uses allow steel is rust-resistant	1 1	AO1 1.3.2a/b/c
3(c)(iv)	(recycling) is used to conserve iron (ore) **or** energy **or** resources **or** minimise pollution **or** reduce the need to quarry (not reuse) because of damage, paint removal, rusting/corrosion, metal fatigue/weaker (not landfill) because sites have limited space **or** loss of habitats	allow reverse arguments. allow to reduce the use of landfill	1 1 1	AO1+AO2 1.3.1j
Total			**15**	

4.10.2.2 Ways of reducing the use of resources

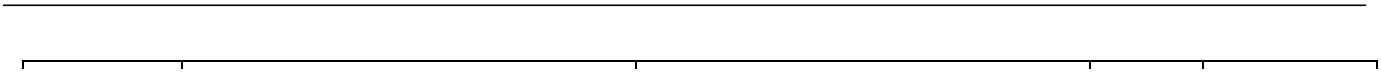
Answer 39 · Mark scheme June 2017 | CH1HP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)(i)	many (small / ethene) molecules / monomers join together **or** (small / ethene) molecules / monomers form chains / large molecules		1	**AO1** 1.5.2a
4(a)(ii)	(from 2006) until 2009 the number of bags used decreased from 2009 / 2010 (to 2014) the number of bags used increased	 if no other mark awarded allow one mark for the number of bags decreased and then increased	1 1	**AO2** 1.5.2
4(a)(iii)	any **two** from: • bags are thinner • bags are smaller • bags use less material • bags are lighter **or** less dense		2	**AO3** 1.5.2
4(b)(i)	landfill space is limited (many polymers) are not biodegradable	ignore takes up space in landfill allow landfill is running out allow a long time to degrade **or** long time to break down	1 1	**AO1** 1.5 1.5.2c
4(b)(ii)	(polymers are made from) crude oil which is a limited / non-renewable resource less energy is needed to recycle polymers	ignore costs allow less carbon dioxide produced **or** less global warming	1 1	**AO1** 1.5
Total			**9**	

4.10.2.2 Ways of reducing the use of resources

Answer 39 · Mark scheme

June 2017 | CH1HP | Original Q4 | Legacy



4.10.2.2 Ways of reducing the use of resources

Answer 40 · Mark scheme

June 2018 | 8462/2H | Original Q10

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
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	AO3
	Level 1: Relevant points are made. They are not logically linked.	1–2	AO2
	No relevant content	0	
	Indicative content **raw materials** • crude oil finite **or** will run out (so will be unavailable for other uses) • wood is a renewable resource • wood involves land use for forestry (so less available for agriculture / food) • wood may involve deforestation (so reduces biodiversity) **manufacturing** • both require energy which may be derived from finite fuels (so they run out more quickly) • paper more energy intensive (so more pollution is possible) • the need for more energy for paper potentially releases more carbon dioxide to the atmosphere (so increases global warming) • paper involves higher water usage (so increases the potential for water pollution) • paper cups are heavier to transport (so have higher energy requirement) • packaging requirements similar (so neither has an advantage) **usage** • both single-use (so neither has an advantage) **disposal** • paper releases more energy if incinerated (so more energy can be used for other purposes) • paper will decompose (so will not remain in landfill) • poly(styrene) could release toxins on incineration • poly(styrene) will not decompose (so will remain in landfill) • poly(styrene) can be used to manufacture other products (so conserves energy **or** finite resources) • both can cause litter **or** visual pollution		4.10.1.1 4.10.2.1

4.10.2.2 Ways of reducing the use of resources

Answer 40 · Mark scheme June 2018 | 8462/2H | Original Q10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2	$\frac{1000}{8.3} \times 550$ (kJ) = 6.63×10^4 (kJ)	an answer of 6.63×10^4 (kJ) scores **2** marks allow $6.6265060240963 \times 10^4$ (kJ) correctly rounded allow 66265.060240963 (kJ) correctly rounded for **1** mark	1 1	AO2 4.10.2.1
10.3	(melamine is a) thermosetting (polymer) (which) contains crosslinks / bonds (between polymer chains)	 do **not** accept reference to intermolecular forces allow (so) it decomposes	1 1	AO3 4.10.3.3 AO2 4.10.3.3
Total			**10**	

4.10.2.2 Ways of reducing the use of resources

Answer 41 · Mark scheme

November 2020 | 8462/2H | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	any **two** from: energy used in: • extraction of raw materials • processing raw materials • manufacturing • transportation • cleaning non-disposable plates • disposal • recycling	allow energy used to make food plate materials	2	AO3 4.10.2.1

Question 5 (continued)

Question	Answers	Mark	AO/ Spec. Ref
05.2	**Level 2:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	3–4	AO3 4.10.1.1 4.10.2.1 4.10.2.2
	Level 1: Some logically linked reasons are given. There may also be a simple judgement.	1–2	
	No relevant content	0	
	Indicative content **Raw materials** • Trees are renewable • Crude oil and clay are finite **Manufacturing and packaging** • Paper plates use the least packaging so conserve raw materials • Paper plates need less transportation overall as more plates in a 10 dm^3 cardboard box **Use and operation** • Paper plates are single use so must be replaced most often • Ceramic plates last longer than polymer plates so must be replaced less often **Disposal** • Polymer / ceramic plates take up landfill which is running out • Paper / polymer plates can be used to make new products • Recycling conserves raw materials **Reasoned judgement**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	(wet) clay is shaped		1	AO1 4.10.3.3
	(and) heated in a furnace	allow (and) heated in a kiln / oven allow (and) fired	1	

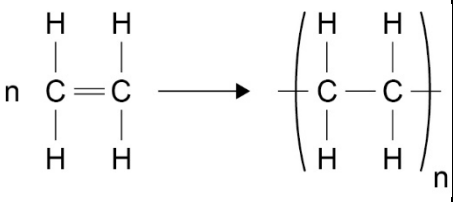
Total			8

4.10.2.2 Ways of reducing the use of resources

Answer 42 · Mark scheme

November 2021 | 8462/2H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1		if equation incorrect allow **1** mark for 5 single bonds **or** allow **1** mark for n	2	AO1 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2		allow converse statements about thermosetting polymers		
	(poly(ethene)) melts	allow thermosoftening polymers melt	1	AO1
	(so) can be reshaped (into new products)		1	AO3 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	use different (reaction) conditions	allow use different temperatures / pressures	1	AO1 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4		allow converse statements about LDPE		AO3 4.10.3.3
	(in HDPE) polymer chains / molecules are closer together	allow (HDPE has) unbranched polymer chains / molecules	1	
	(so) more atoms per unit volume	allow (so) more molecules per unit volume	1	

Question 4 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	circle around HO– **or** –OH on monomer **A**		1	AO2 4.7.2.3 4.7.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	H_2O **and** HCl	must be in this order	1	AO3 4.7.3.2

Total			9

4.10.2.2 Ways of reducing the use of resources

Answer 43 · Mark scheme

November 2021 | 8462/2H | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	(lead is) toxic / poisonous	allow (lead is) harmful ignore (lead is) dangerous / deadly / lethal	1	AO3 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	the proportions (of metals) are different		1	AO3 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	any **three** from: • recycling conserves copper ores • recycling uses less energy • recycling reduces waste • mining / quarrying cause environmental impacts	ignore references to cost allow copper ores are finite allow recycling reduces use of landfill allow description of environmental impact caused by mining / quarrying	3	AO1 AO2 AO3 4.10.1.1 4.10.1.4 4.10.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	grow plants (on land containing copper ores) plants are burnt (to produce ash) ash dissolved in acid (to produce a solution of a copper compound) electrolysis of solution (containing a copper compound) **or** displacement (of copper) from solution (containing a copper compound)	allow named plant allow addition of scrap iron to the solution (of a copper compound)	1 1 1 1	AO1 4.10.1.4

4.10.2.2 Ways of reducing the use of resources

Question 8 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	any **two** from: • high grade ores still available • land not available • phytomining takes a long time • new technology	allow demand not high enough	2	AO3 4.10.1.4

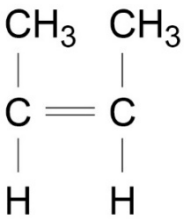
Total			**11**

4.10.2.2 Ways of reducing the use of resources

Answer 44 · Mark scheme

June 2022 | 8462/2H | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	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.
01.2	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 44 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	(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.
01.4	 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.
01.5	 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 44 · Mark scheme

June 2022 | 8462/2H | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	(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 1		11

4.10.2.2 Ways of reducing the use of resources

Answer 45 · Mark scheme

June 2022 | 8462/2H | Original Q3

Question 3

Question	Answers	Mark	AO / Spec. Ref
03.1	**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 45 · Mark scheme

June 2022 | 8462/2H | Original Q3

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

Total Question 3		9

4.10.2.2 Ways of reducing the use of resources

Answer 46 · Mark scheme

June 2024 | 8462/2H | Original Q6

Question 6

Question	Answers	Mark	AO / Spec. Ref.
06.1	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.10.2.1 4.10.3.2
	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 • bamboo is renewable • aluminium is a finite resource • growing bamboo uses up agricultural land • mining aluminium ore is a polluting activity • cost of aluminium alloy is lower • (so) can be replaced more frequently • aluminium alloy is stronger • (so) can withstand larger forces • aluminium alloy has lower mass • (so) bicycle is faster • (so) is easier to carry / transport • the aluminium alloy frame lasts less long • (so) bicycle must be replaced more frequently • aluminium alloy is recyclable (so) aluminium ores are conserved • bamboo can provide renewable heat energy • (so) less overall contribution to global warming • (and) is carbon neutral • neither material may reach landfill • both materials have a sustainable disposal method **Reasoned judgment**		

4.10.2.2 Ways of reducing the use of resources

Answer 46 · Mark scheme

June 2024 | 8462/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	aluminium (alloy) has an oxide coating (so) contact between aluminium (alloy) and water / air / oxygen is prevented	 do **not** accept sacrificial protection	1 1	AO1 4.10.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	(coating with) grease	allow (coating with) oil allow galvanise allow use stainless steel as the alloy	1	AO2 4.10.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	(carbon fibre) reinforcement (polymer resin) matrix / binder	allow reinforces the polymer / resin ignore (carbon) fibres allow binds the fibres / fragments ignore (polymer) resin	1 1	AO2 4.10.3.3

Total Question 6	11

Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1H 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

CHY1H Question 1

	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

CHY1H Question 2

	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 2 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

CHY1H Question 3

	answers	extra information	mark
(a)(i)	core		1
(ii)	plate (boundaries)	accept parts of the crust ignore crust alone	1
	sudden movement / colliding **or** normally move a few centimetres per year	accept movement but ignore movement apart accept continental drift	1
	convection currents / driven by heat from radioactive processes / decay	idea of source of energy for the movement	1
	the idea of uncertainty with an explanation eg scientists do not know (with any certainty) • what happens under the crust • where the forces / pressure are building up • we cannot measure the forces • when the forces reach their limit	ignore references to volcanoes	1
(b)(i)	78		1

Continued on next page

4.10.2.2 Ways of reducing the use of resources

Question 3 continued

	answers	extra information	mark
(ii)	marks awarded for any 2 gases from the following 3 gases	max **3** marks from CO_2	
	any **four** from: carbon dioxide has decreased: • used by plants / bacteria (stromatolites) • during photosynthesis (must be linked to CO_2 decrease) • 'locked up' in (sedimentary) rocks / carbonates / fossil fuels • dissolved in oceans **and / or** oxygen has increased because: • released by plants / bacteria (stromatolites) • during photosynthesis (must be linked to O_2 increase) **and / or** nitrogen has increased because • ammonia reacted with oxygen (to release nitrogen) • nitrogen is released by bacteria	ignore references to respiration	4
total			10

4.10.2.2 Ways of reducing the use of resources

CHY1H Question 4

	answers	extra information	mark
(a)	permitted additive / (added) chemicals **or** names / types of additives	accept the chemical name ignore food additive alone	1
(b)(i)	water and oil do not mix / are immiscible **or** don't dissolve each other	ignore density ignore emulsifier alone	1
(ii)	any **two** from: • emulsifier • forms an emulsion • holds the two components together • by lowering the surface tension	 accept description of an emulsion accept stops them separating / they mix allow bonds / binds for holds accept a description of how an emulsifier works for **two** marks eg 'tadpole' diagram or dispersal of oil drops	2
(c)(i)	(because they contain) a double (carbon carbon) bond	accept unsaturated ignore poly or mono	1
(ii)	results suggest sunflower oil is best **or** 'the one that took the least time' because (sunflower oil) has the highest amount of unsaturation / most double bonds / least saturated	 ignore uses up I_2 most quickly second mark is dependent on first	1 1

Continued on next page

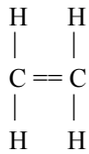
4.10.2.2 Ways of reducing the use of resources

Question 4 continued

	answers	extra information	mark
(d)(i)	any **one** from: • have a higher melting point than (vegetable) oil • are solid at (room temperature) / hardened / harder	 accept useful as spreads **or** doesn't soak into bread ignore hard / soft(er)	1
(ii)	any **two** from: • hydrogen added • to carbon carbon double bond / to saturate • (nickel) catalyst / temperature 60 - 150°C	 do **not** accept 'water' wrong catalyst doesn't get this mark ignore high / warm temperature	2
total			10

4.10.2.2 Ways of reducing the use of resources

CHY1H Question 5

	answers	extra information	mark
(a)(i)	by (fractional) distillation **or** fractionation	accept a description of the distillation process (heat and how separation works) eg heat **and** condense accept boil / vapourise etc for heat	1
(ii)	CO_2 H_2O	note the order of these products must be correct wrong way round = **1** mark	1 1
(b)(i)	(hexane) has been broken down (into smaller hydrocarbons / molecules)	accept (thermal) decomposition / cracked / split / broken up owtte	1
(ii)		accept $CH_2=CH_2$	1
(iii)	water / hydrogen oxide / steam	accept H_2O	1

Continued on next page

4.10.2.2 Ways of reducing the use of resources

Question 5 continued

	answers	extra information	mark
(c)	candidates must include both sugar cane and crude oil in their evaluation **and** both an advantage and a disadvantage to gain full marks. if they do not then the maximum mark is three any **four** from: <u>advantages of using sugar</u> • country has no wealth to buy (large quantities of) crude oil • country has limited technological development **or** underdeveloped / third world country • able / suitable climate to grow sugar cane • enough land to grow sugar cane / land cannot be used to grow food / deforestation • sugar is a renewable source **or** crude oil is a non-renewable resource / finite resource / limited resources • CO_2 / carbon neutral <u>advantages of using alkanes:</u> • economic costs are low • continuous process • country has large oil resources • country has oil refineries / cracking plants • very pure product • faster process	not 'expensive' alone	4
total			10

Answer 40 · Examiner comments

June 2018 | 8462/2H | Original Q10

Question 10 (standard / high & high demand)

10.1 This was an 'extended response', 'level marked' question. There were three levels and the command word was 'evaluate'. The question was marked holistically. Most answers considered all three relevant stages of a Life Cycle Assessment for both types of cup.

However, many answers failed to consider the environmental impact of the factors discussed. For example, students might say that paper cups are heavier to transport, but did not go on to say what environmental impact that might have in terms of more pollution from lorries, or a greater energy requirement burning more fossil fuels and adding to climate change. This limited their mark to level 2, as did failure to give a strongly linked judgement.

Some students misinterpreted 'recyclable' as 'reusable': the terms are not synonymous. The question stated that both types of cup are disposable, ie single use.

Some answers focussed on the economics or ease of use of the cup, rather than environmental impact. Most students were able to acquire at least one mark with 50% of students achieving four marks. 22% of students made it into level 3.

10.2 A mark was often missed through inappropriate rounding to a whole number of cups at an intermediate stage in the working. Others rounded 1000 ÷ 83 to 120.5, then multiplied this figure by 550 and quoted an answer to five significant figures. This gave an answer which did not fit the correct value. Had they rounded to two, three or four significant figures they would have achieved the mark. It is never appropriate to quote an answer to more significant figures than an earlier intermediate step. 50% of students achieved both marks.

10.3 Many students tainted an otherwise good answer by referring to intermolecular forces, often alongside a reference to cross-links. They seem not to realise that the cross-links are covalent bonds.

Others were confused and referred to strong bonds or cross-links between monomers. Some referred to layers rather than chains. 21% of students achieved both marks here, although many more gained a mark for 'thermosetting'.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on 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.

4.10.2.2 Ways of reducing the use of resources

Answer 41 · Examiner comments November 2020 | 8462/2H | Original Q5

Question 5 (standard and standard / high demand)

05.1 A significant number of students did not realise they were being asked to name the processes for which the energy requirement needed to be known, but instead tried to guess which material would use more energy.

05.2 Very few students gave a reasoned judgement and so were unable to access level 2. Some did not even have comparisons, but simply described the characteristics of each material in isolation. Some referred to deforestation, missing the point that more trees can be grown. Many made valid comparisons of the number of plates that could be packaged in a box and of the number of times each plate could be used, but did not go on to look at the consequences, such as the relative energy cost of transporting the plates or the need for replacement of the plates. Few referred to the conservation of raw materials, either in the context of the number of uses or the lack of recyclability. There was confusion between the terms reusable and recyclable. Some were highly focused on energy usage, even though no energy data was provided.

05.3 Some students knew that moulding and heating were involved, but often did not mention a furnace, kiln or oven. There were some references to heating clay **before** it is shaped.

Answer 42 · Examiner comments November 2021 | 8462/2H | Original Q4

Question 4 (standard, standard / high and high demand)

04.1 Around half of the students either drew five single bonds or wrote ‘n’. Around one third provided a completely correct response.

04.2 Many of the students scored one mark, usually for stating that poly(ethene) melts. The consequence in terms of recycling was less well known.

04.3 How poly(ethene) is produced from ethene was not well known.

04.4 Approaching half of the students scored one mark but only a tiny number scored both. The fact that the chains are closer together or unbranched was well known but not how that linked to density.

04.5 Some students seem to think that any -OH is an alcohol group even if it is part of a carboxylic acid group. Other students circled whole molecules rather than functional groups.

04.6 Very few students were able to use the diagrams to work out that hydrogen chloride was the small molecule formed when a polyester was produced from monomers **A** and **B**.

4.10.2.2 Ways of reducing the use of resources

Answer 43 · Examiner comments November 2021 | 8462/2H | Original Q8

Question 8 (standard, standard / high and high demand)

08.1 The likely toxicity of lead was identified by approximately half of the students.

08.2 Nearly half of the students gained this mark.

08.3 A good spread of marks were seen here, with around 70% giving at least one creditworthy response, usually linked to energy or waste. However very few were able to gain all 3 marks.

08.4 Approximately one-third of students were able to gain the first two marking points. However, very few scored beyond marking point 2 as the need to add the resulting ash to acid was almost never given.

08.5 Under half of students gave one reason, usually that phytomining is slow. Very few were able to give a second reason.

Answer 44 · Examiner comments June 2022 | 8462/2H | Original Q1

Question 1 (Standard demand)

01.1 This was well answered by many students. The most common errors were to omit the double bond, or to add additional bonds to the carbon atoms. Brackets and/or the inclusion of the letter n were ignored. Around two-thirds of the students scored both marks.

01.2 The majority of responses correctly referred to the insulation being burned or melted or the lack of purity or 'contamination' of the copper produced. Around 60% of students scored this mark.

01.3 This was generally well answered as the copper melting and being reformed/moulded into new pipes were commonly seen. Responses referring to 'heating the wire' were insufficient to gain credit. Around 70% of the students scored both marks.

01.4 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 insufficient to gain credit. Only around 30% of the students were able to identify two advantages of recycling.

4.10.2.2 Ways of reducing the use of resources

Answer 44 · Examiner comments — June 2022 | 8462/2H | Original Q1

01.5 The specific correct reagent used and correct result, were not well known.

A variety of tests were chosen, with the most common incorrect response being the use of flame tests.

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 a third of students scored both the marks.

01.6 The use of barium chloride or barium nitrate as the reagent for the test was generally followed by the correct result. Again, around a third of the students scored both the marks.

The most common incorrect responses were the use of a flame test or the use of an incorrect reagent.

The mark for the result of the test was dependent upon a mark being being awarded for a correct test.

Answer 45 · Examiner comments — June 2022 | 8462/2H | Original Q3

Question 3 (Standard demand)

03.1 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. The vast majority of students did not include a judgement and were therefore unable to access Level 3. Only about 10% of students gained 5 or 6 marks.

Even some students who did give a judgement gained a mark in Level 1 (1-2) often by only comparing the values given in the table or a mark in Level 2 (3-4), by introducing only one or two pieces of 'added value' information about the impacts of the data provided. Roughly 30% of students gained a Level 1 mark and nearly 60% were awarded a Level 2 mark

03.2 Well over 90% of the students gained all three marks on this calculation.

4.10.2.2 Ways of reducing the use of resources

Answer 46 · Examiner comments June 2024 | 8462/2H | Original Q6

Question 6 (standard and standard / high demand)

06.1 Most students were able to compare the given data with mathematical processing commonly seen and where the majority of the credit for linked reasons was awarded. Most of the explicitly linked reasons in the indicative content were rarely seen.

Many students thought that burning bamboo to produce heat energy as a method of disposal was a negative point, commonly referring to the release of carbon dioxide as problematic. This was invalid given that bamboo can be seen as a carbon neutral material.

A significant number of students gave comprehensive responses in terms of logically linked reasons but were unable to reach Level 3 because they did not give a reasoned judgement as to which material is better. It is essential that students understand what is required when a particular command word is used, in this case 'evaluate'.

Around one-fifth of students gained a Level 3 mark, with roughly a further 55% achieving Level 2.

06.2 The idea of a protective oxide coating was scored much more often than the idea of contact between aluminium and water or air or oxygen being prevented.

Common misconceptions were that aluminium has too low a reactivity to react with water or oxygen, that the presence of other metals means that aluminium cannot react with water or oxygen - quite often the idea of sacrificial protection was included – or that iron is the only metal that can corrode. Less than 5% of students gained both marks.

06.3 Greasing, oiling and the use of a sacrificial metal, eg galvanising, were commonly seen. Around three-quarters of students gained this mark.

06.4 A significant number of students gave properties of the components, eg strong, flexible, light. The term 'matrix' was seen much more often than 'binder'. The components of a composite were often reversed. Around 15% of students were awarded both marks.