AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.10.2.2

Ways of reducing the use of resources

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**4**
Available paper years	**2021–2025**

Using this booklet

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

Name: _____ **Date:** _____

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

5.10.2.2 Ways of reducing the use of resources

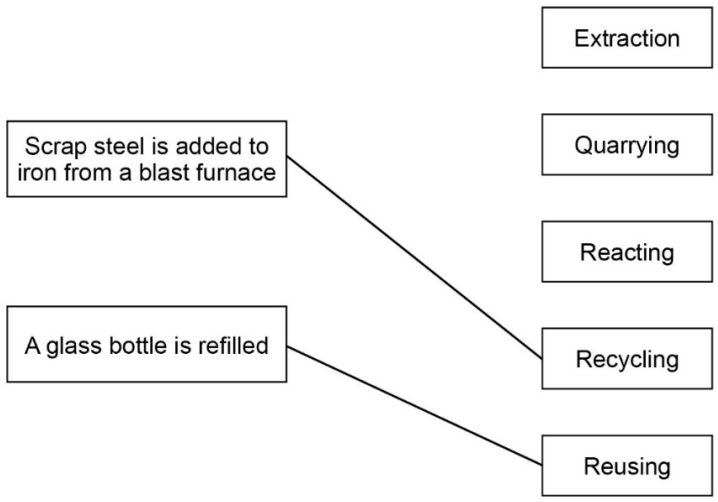
Answer 01 · Mark scheme

November 2021 | 8464/C/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	as population increased, copper production increased		1	AO3 5.10.1.1
05.2	(copper ore) (70 × 100 =) 7000 (recycled copper) (27×100 =) 2700 (7000 – 2700 =) 4300 (MJ)	 allow correct use of incorrectly determined values for MP1 (copper ore) and/or MP2 (recycled copper)	1 1 1	AO2 5.10.2.2
05.3	any **one** from: • reduces acid rain • reduces respiratory problems (in humans)	 allow sulfur dioxide causes acid rain allow sulfur dioxide causes respiratory problems (in humans)	1	AO1 5.9.3.2
05.4	$\frac{75}{100}$ × 8 = 6 (g)		1 1	AO2 5.10.1.1

5.10.2.2 Ways of reducing the use of resources

Answer 01 · Mark scheme

05.5	 do **not** accept more than one line from a box on the left	1 1	AO2 5.10.2.2
05.6	**B**, **C**, **D**, **A**	1	AO1 5.10.2.2
Total		**10**	

5.10.2.2 Ways of reducing the use of resources

Answer 01 · Mark scheme

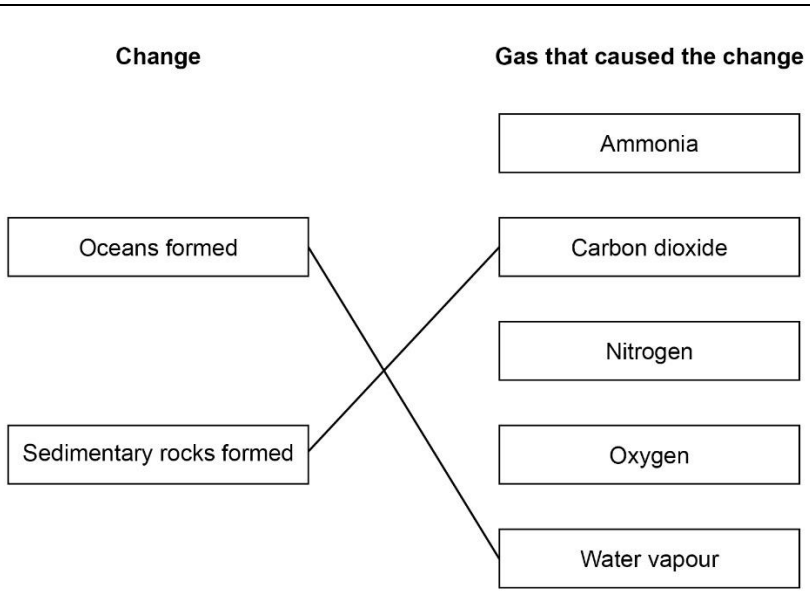
November 2021 | 8464/C/2F | Original Q5

5.10.2.2 Ways of reducing the use of resources

Answer 02 · Mark scheme

June 2023 | 8464/C/2F | Original Q2

Question 2

Question	Answers	Mark	AO / Spec. Ref.
02.1	 do **not** accept more than one line from a box on the left	1 1	AO1 5.9.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	nitrogen		1	AO2 5.9.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	(number of times more =) $\frac{95}{0.04}$ = 2375 = 2.375×10^3	 allow a correctly calculated answer in standard form from an incorrect calculation which uses values given in **Table 1**	1 1 1	AO2 5.9.1.1

5.10.2.2 Ways of reducing the use of resources

Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	increased		1	AO2 5.9.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	(mass CO_2 =) $\frac{17.2}{4}$ = 4.3 (kg)		1 1	AO2 5.9.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	photosynthesis		1	AO1 5.9.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	any **two** from: (forest area) • increases in Africa • increases in Europe • decreases in South America • decreases in Asia		2	AO2 5.9.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	6 (%)		1	AO2 5.9.2.1 5.9.2.2

5.10.2.2 Ways of reducing the use of resources

Answer 02 · Mark scheme

June 2023 | 8464/C/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	(**A**) reuse (**B**) recycle		1 1	AO2 5.10.2.2

Total Question 2	**15**

5.10.2.2 Ways of reducing the use of resources

Answer 03 · Mark scheme

June 2024 | 8464/C/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(mass of aluminium recycled =) $\frac{212 \times 68.0}{100}$		1	AO2 5.10.2.1 5.10.2.2
	= 144 (million kg)	allow 144.16 (million kg) allow for **1** mark only an answer of 144 000 000 (million kg) **or** 144 160 000 (million kg)	1	

5.10.2.2 Ways of reducing the use of resources

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	(unit conversion 4 kg =) 4000 g		1	AO2 5.10.2.2
	(number of cans =) $\frac{4000}{15.8}$	allow correct use of an incorrect / no conversion	1	
	= 253.16		1	
	= 253	allow correct whole number from an incorrectly determined number of cans using the values from the question	1	
	alternative approach 1			
	(unit conversion 15.8 g =) 0.0158 kg (1)			
	(number of cans =) $\frac{4}{0.0158}$ (1)	allow correct use of an incorrect / no conversion		
	= 253.16 (1)			
	= 253 (1)	allow correct whole number from an incorrectly determined number of cans using the values from the question		
	alternative approach 2			
	(number of cans from 1000 g =) $\frac{1000}{15.8}$ (1)			
	= 63.29 (1)			
	(number of cans from 4000 g) = 63.29 × 4 (1)	allow correct use of an incorrectly determined number of cans from 1000 g		
	(= 253.16) = 253 (1)	allow correct whole number from an incorrectly determined number of cans using the values from the question		

5.10.2.2 Ways of reducing the use of resources

Question	Answers	Mark	AO / Spec. Ref.
05.3	**Level 2:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	3–4	AO3 5.10.2.1 5.10.2.2
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content • less steel (than wood) goes to waste • (so) less space taken up in landfill • more steel (than wood) is recycled • (so) less non-renewable resources are needed • no steel is burnt • (so) no carbon dioxide produced • (so) no contribution to climate change • most wood is disposed of as waste • (so) more space taken up in landfill • least wood is disposed of by burning • (but) still produces carbon dioxide • (which) contributes to climate change • most steel is disposed of by recycling • (so) less non-renewable resources are needed • judgement		

Total Question 5	10

5.10.2.2 Ways of reducing the use of resources

Answer 04 · Mark scheme

June 2025 | 8464/C/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	water that is safe to drink		1	AO1 5.10.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	to remove large solid objects		1	AO1 5.10.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	(conversion 4.5 kg =) 4500 (g) (number of hats =) $\frac{4500}{50}$ = 90 **alternative approach** (conversion 50 g =) 0.05 (kg) (1) (number of hats =) $\frac{4.5}{0.05}$ (1) = 90 (1)	 allow correct use of incorrect / no conversion allow correct use of incorrect / no conversion	1 1 1	AO2 5.10.1.1

5.10.2.2 Ways of reducing the use of resources

Question	Answers	Mark	AO / Spec. Ref.
04.4	**Level 2:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account	3–4	AO3 5.10.1.1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	

	Indicative content
	
	(poly(propene) has)
	• higher level of insulation
	  ○ (so) keeps the wearer warmer
	
	• lower cost
	  ○ (so) the clothes are cheaper
	
	• higher durability
	  ○ (so) the clothes last longer
	
	(wool is)
	• sheep are a renewable resource
	  ○ so are sustainable
	
	for **Level 2** there must be an advantage for both poly(propene) and wool plus a linked explanation		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	reused	must be in this order	1	AO2 5.10.2.2
	recycled		1	

5.10.2.2 Ways of reducing the use of resources

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	a catalyst steam		1 1	AO1 5.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	bromine water		1	AO1 5.7.1.4

Total Question 4	14

5.10.2.2 Ways of reducing the use of resources

Answer 01 · Examiner comments November 2021 | 8464/C/2F | Original Q5

Question 5 (low and standard demand)

The interpretation of data and the associated calculations were generally well done, and many students scored highly on this question. The exception was question 05.3, where no credit was given for sulfur dioxide being toxic or harmful, as these are not the most significant reasons for reducing the global emissions of the gas.

Answer 02 · Examiner comments June 2023 | 8464/C/2F | Original Q2

Question 2

02.1 Around a quarter of students gained both marks on this question. Half of all students gained one mark, most frequently for the idea that the oceans were formed from water. Far fewer were able to make the link between rock formation and carbon dioxide.

02.2 Nine in ten students were able to identify nitrogen as having the highest percentage.

02.3 One in five students gained all three marks here. A quarter completed the calculation correctly without then expressing it in standard form. Of the remaining students, very few were able to make progress, with one in twenty achieving one mark, usually for expressing an incorrect calculation in standard form. There were all combinations of calculations seen by examiners using the numbers 95 and 0.04.

02.4 This question proved to be the easiest on this year's examination, with over 97% achieving the correct answer.

02.5 Three quarters of students correctly calculated the mass of carbon dioxide. The most common incorrect response saw students multiply rather than divide the two numbers.

02.6 Around half of students correctly identified photosynthesis as the correct answer. The most common incorrect responses were respiration, distillation and deforestation.

02.7 Approximately one third of students gained two marks for this question, with one in ten gaining one mark. Many students did not identify the direction of change, suggesting Africa or South America changed the most, which was not creditworthy. Also, students often responded with ideas about developing areas and industrialised areas, without talking about the continents on the bar chart.

02.8 Students were able to calculate the percentage of landfill methane emissions from the pie chart with over 85% of students completing the question correctly.

02.9 Around half of students achieved both marks for interpreting the graphic. Only one in ten gained one mark. The most common response that gained no credit was for reuse and recycle the wrong way round. However, all of the other responses were commonly seen.

Answer 03 · Examiner comments

Question 5 (low & standard demand)

05.1 This calculation proved accessible to many students, with over half gaining at least 1 mark.

A common error included unnecessary unit conversions, particularly multiplying by 1 000 000, but such students could still get the compensation mark. Failure to divide by 100 for the percentage often appeared, meaning no credit could be given. Many students divided 212 by 68% rather than multiplying them together.

A few students coincidentally arrived at the correct numerical value by incorrectly subtracting, 212 – 68 = 144, but this gained no credit.

05.2 Although unfamiliar, this AO2 calculation was well attempted by many students, with just over 50% gaining full marks.

For marking point 1 incorrect conversions, such as 15.8 × 1000, or 4 ÷ 1000, were commonplace although marks could still be awarded consequentially. Some students inappropriately rounded 15.8 to 16 and used this in their calculations, which meant marking points 2 and 3 could not be awarded. Marking point 4 was often missed by students rounding up instead of down, or not reading the question properly and leaving a decimal point in their final answer.

All the alternative mathematical methods on the mark scheme were used in arriving at the right answer. Some students arrived at the correct answer by simply scaling up 15.8 many times until they got to (eg) 253 cans = 3997.4 g and 254 cans = 4013.2 g, then correctly choosing the lower value. Simple incorrect use of the values (eg 15.8 × 4) was seen, giving an answer of 63.2 which could not gain credit, but the consequential whole number of 63 cans could be awarded marking point 4 because the values in the question had been used.

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5.10.2.2 Ways of reducing the use of resources

Answer 03 · Examiner comments June 2024 | 8464/C/2F | Original Q5

05.3 Fewer than 10% of students were able to achieve marks in Level 2 on this AO3 extended response evaluation question. To access marks in Level 2 students needed to provide a judgement supported by appropriate comparisons and links.

Simply repeating data from the table without interpretation or using it was common and was not credited.

Most comparisons were made between steel and wood, but also comparisons made horizontally across the table (eg most wood is wasted) were quite common. Some solid answers with more than one link were lacking in a judgement, which did not address the command word and so were restricted to Level 1.

Judgements were often muddled by describing both wood and steel as sustainable 'because they're both recycled', failing to see the advantage of steel. Wasting wood was often considered to be a good thing as it could be used for animal habitats, or because it rots back into the ground and burning wood was seen as a good thing since it is a good fuel. Imprecise language such as 'steel can be re-used' (rather than 're-cycled') was often used.

Of the links, carbon dioxide and climate change was most used; landfill descriptions were a rarity and no mention was seen of conserving non-renewable resources.

0 5 . 3 **Table 5** shows three methods used to dispose of wood and steel after use.

Table 5

	Percentage (%) of material disposed of by each method		
	As waste	Recycled	Burnt
Wood	58	36	6
Steel	15	85	0

Evaluate the sustainability of the disposal of wood and steel.

[4 marks]

Steel is more sustainable than wood as the table shows it is recycled more and less put into waste

Despite making a judgement in their opening sentence and then going on to make two valid comparisons ('it [steel] is recycled more' and 'less put into waste'), this student has not made any links so is limited to the top of Level 1 and gains 2 marks.

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5.10.2.2 Ways of reducing the use of resources

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Steel	15	85	0

Evaluate the sustainability of the disposal of wood and steel.

[4 marks]

~~out of 100 only 58%~~
~~of w~~ 58% of wood wasted.
36% Recycled and put to use
6% burned which Releases
CO_2 which is a greenhouse
gas, contributes to global
warming

only 15% steel waste as its
hard to Dispose off

In this response, the student is quoting numbers from the table without adding anything, which is not creditworthy; however, they have made a link to burning wood releases carbon dioxide which is a greenhouse gas. There is no judgement given and no comparisons, which are required to access Level 2, so this response is at the top of Level 1 and gains 2 marks.

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5.10.2.2 Ways of reducing the use of resources

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Evaluate the sustainability of the disposal of wood and steel.

[4 marks]

The sustainability of wood and steel is wood as 58% of waste, 36% recycled and 6% burnt. Steel has 15% waste, 85% recycled, 0% burnt so steel would be more sustainably as there less of it.

This student has only quoted numbers from the table, again not doing anything with them, which is not creditworthy. The final sentence is a judgement; however, it is not logically supported so is also not creditworthy. This response gained no marks.

5.10.2.2 Ways of reducing the use of resources

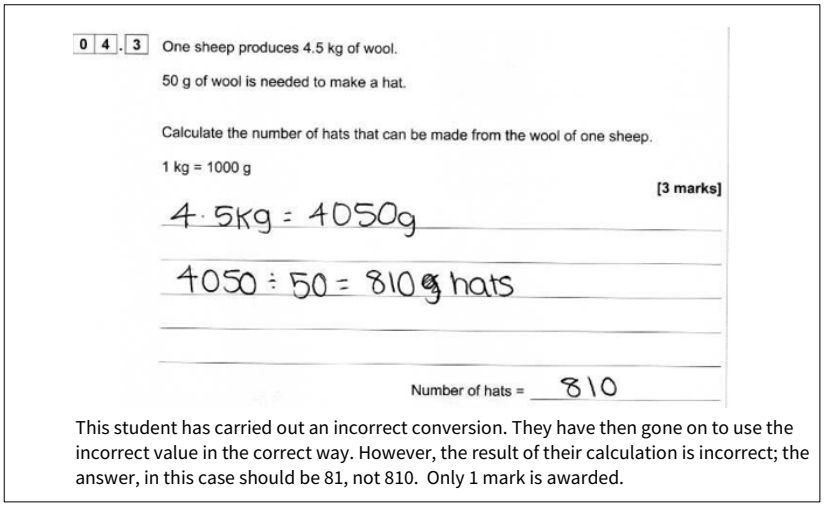
Answer 04 · Examiner comments June 2025 | 8464/C/2F | Original Q4

Question 4 (Low and Standard demand)

04.1 Almost 70% of students correctly selected 'water that is safe to drink'.

04.2 Nearly three quarters of students knew that the metal grids in water treatment were to 'remove large solid objects'.

04.3 This question was answered well. Most students used the first approach where they converted 45 kg to 4500 g and then divided that number by 50 to arrive at 90 hats.
Some students who did the conversion incorrectly, usually by multiplying by 100 instead of 1000, could still access 2 marks providing the calculation was carried out correctly.



0 4 . 3 One sheep produces 4.5 kg of wool.

50 g of wool is needed to make a hat.

Calculate the number of hats that can be made from the wool of one sheep.

1 kg = 1000 g

[3 marks]

4·5kg = 4050g

4050 ÷ 50 = 810 hats

Number of hats = 810

This student has carried out an incorrect conversion. They have then gone on to use the incorrect value in the correct way. However, the result of their calculation is incorrect; the answer, in this case should be 81, not 810. Only 1 mark is awarded.

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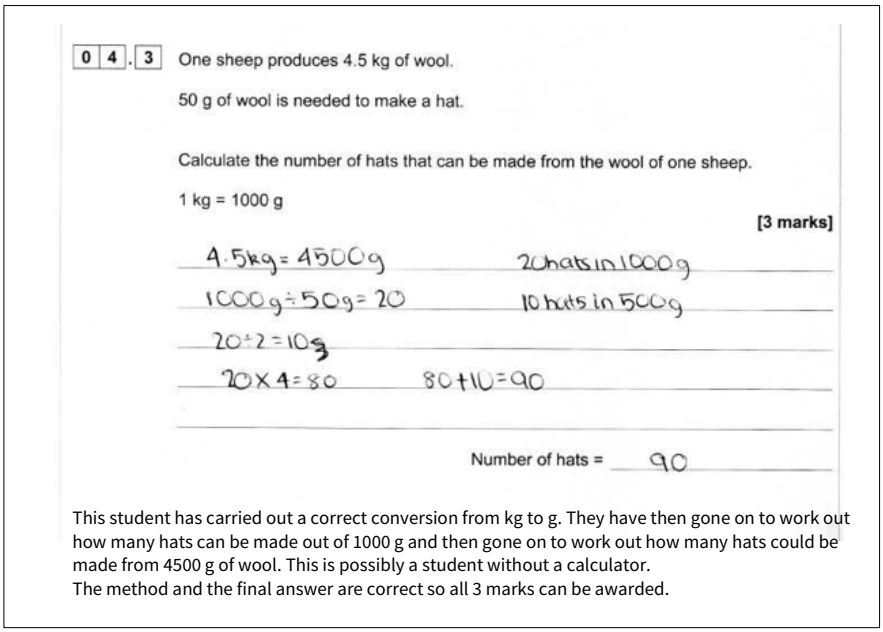
5.10.2.2 Ways of reducing the use of resources

Answer 04 · Examiner comments June 2025 | 8464/C/2F | Original Q4



0 4 . 3 One sheep produces 4.5 kg of wool.

50 g of wool is needed to make a hat.

Calculate the number of hats that can be made from the wool of one sheep.

1 kg = 1000 g

[3 marks]

4.5kg = 4500g
1000g ÷ 50g = 20
20 ÷ 2 = 10g
20 × 4 = 80
20 hats in 1000g
10 hats in 500g
80 + 10 = 90

Number of hats = 90

This student has carried out a correct conversion from kg to g. They have then gone on to work out how many hats can be made out of 1000 g and then gone on to work out how many hats could be made from 4500 g of wool. This is possibly a student without a calculator.
The method and the final answer are correct so all 3 marks can be awarded.

04.4 This was an 'extended response' style of question. Such questions are marked holistically. There are overall generic descriptions for the two levels of response at the top of the mark scheme, giving a hierarchy of response. Within each level there are 2 marks.

Level 1 could be accessed simply by offering any relevant comparison of either poly(propene) or wool, and over half of all students were able to do this. A large number of responses however merely offered a repetition of the information given and consequently could not gain credit.

For Level 2 there needed to be an advantage of both poly(propene) and wool, with a linked explanation. The table offered more information on poly(propene) than wool and consequently very few students were able to access Level 2, as they focussed purely on poly(propene) and did not mention any advantages of using wool.

Many students abbreviated poly(propene) to either poly or propene. Poly was credited, however propene was not, which resulted in some responses which were otherwise good not accessing either Level.

There appeared to be a common misconception that we would 'run out of sheep' therefore making wool a non-renewable source. This limited students to Level 1.

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5.10.2.2 Ways of reducing the use of resources

Answer 04 · Examiner comments

June 2025 | 8464/C/2F | Original Q4

Explain the advantages of using poly(propene) and of using wool for clothing.

[4 marks]

The advatages for using poly(propene) is that the leveal of isalution is high the cost is low and the Durablity is high and ~~sto~~ works for long. Also the advatage of wool is that its easy to get acesses to it as thier are many steep.

This student has not used any comparative terminology and has only copied information from the table. The question is looking for durability being 'higher' and therefore lasting 'longer' for example. No marks can be awarded.

04.5 This was well answered. All options were used by students, and over three quarters of all students gained both marks.

04.6 Less than a quarter of all students gained both marks in this question. A catalyst was the most common response, but it was often paired with sulfuric acid rather than with steam.

04.7 Half of all students were able to recall bromine water as the test for alkenes with all other answers being equally spread between the other 3 options.