AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.8.2.3

Test for carbon dioxide

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**7**
Available paper years	**2019–2025**

Using this booklet

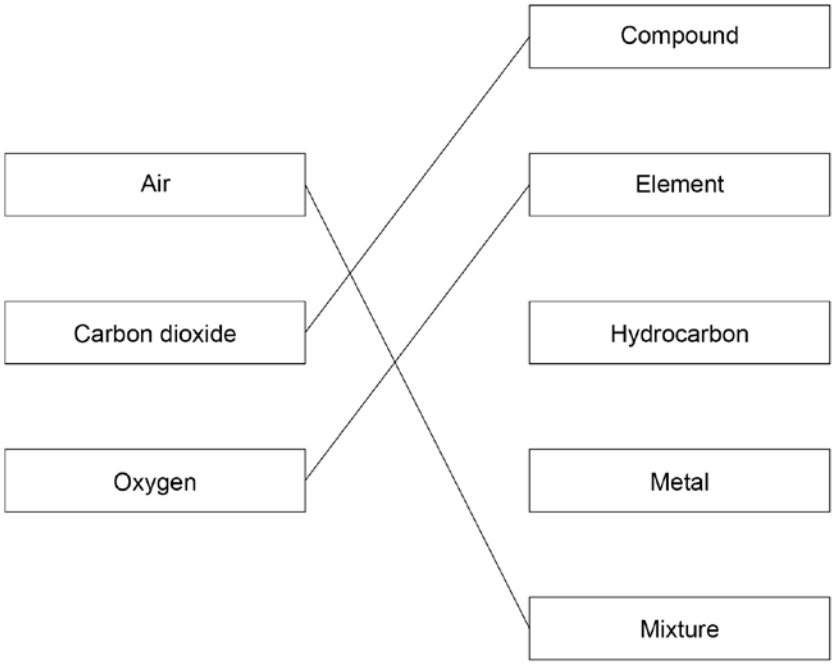
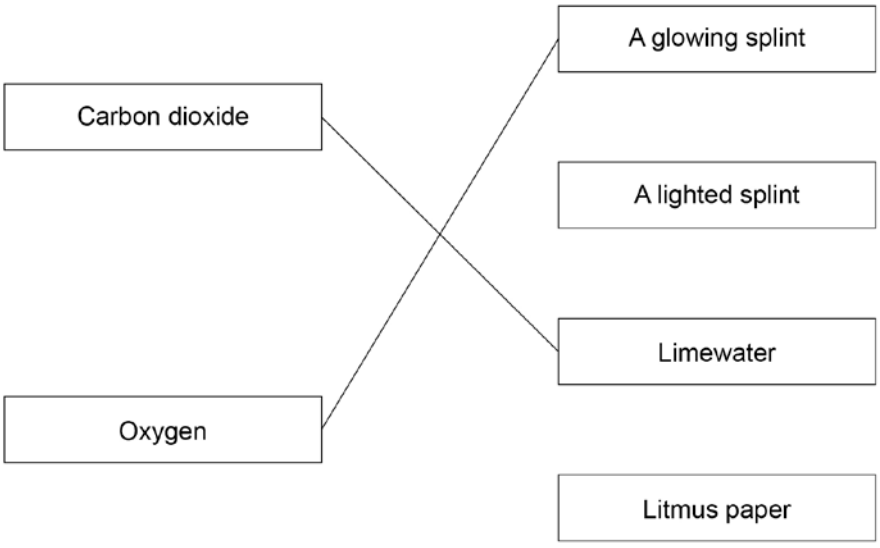
1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

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.

5.8.2.3 Test for carbon dioxide

Answer 01 · Mark scheme June 2019 | 8464/C/2F | Original Q1

01.1	 If more than one line is drawn from any one substance and not crossed out, no mark is given for that substance. The other marks can be awarded.	1 1 1	AO2.1 5.1.1.2 5.8.1.1 5.1.1.1
01.2	 If more than one line is drawn from any one gas and not crossed out, no mark is awarded for that gas. The other mark can be awarded.	1 1	AO1.1 5.8.2.2 5.8.2.3

01.3	dissolved in oceans photosynthesis		1 1	AO1 5.9.1.2 5.9.1.4

5.8.2.3 Test for carbon dioxide

Answer 01 · Mark scheme

June 2019 | 8464/C/2F | Original Q1

01.4	⇌	ignore any other words, formulae or symbols	1	AO1.1 5.6.2.1
01.5	endothermic (reaction)	spelling must be correct do **not** accept exothermic	1	AO1.1 5.6.2.2
01.6	rate (of reaction)	allow speed or velocity do **not** accept any other response	1	AO1 5.6.2.3
Total			**10**	

5.8.2.3 Test for carbon dioxide

Answer 01 · Mark scheme

June 2019 | 8464/C/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.

5.8.2.3 Test for carbon dioxide

Answer 02 · Mark scheme November 2020 | 8464/C/1F | Original Q8

08	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	5.3.1.3 5.4.2.2
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content: • weigh test tube • add metal carbonate • weigh test tube and metal carbonate • heat • allow to cool • weigh test tube and metal oxide • repeat (heat, cool and weigh) until no change in mass • determine mass of metal carbonate used • determine mass of carbon dioxide produced • repeat with different metal carbonate(s) an alternative method can be based on any mass of metal carbonates and at end divide by this mass to find mass carbon dioxide per gram metal carbonate level 3 change in mass is determined for at least one other carbonate		

Total			**6**

5.8.2.3 Test for carbon dioxide

Answer 03 · Mark scheme November 2020 | 8464/C/2F | Original Q6

06.1	$C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$	allow multiples	1	AO2 5.1.1.1 5.7.1.3
06.2	(bubble gas through) lime water	MP2 is dependent upon correct response in MP1 allow (bubble gas through) calcium hydroxide (solution)	1	AO1.2 5.8.2.3
	turns milky / cloudy / white **or** white precipitate forms		1	
06.3	C_3H_6		1	AO2 5.1.1.1 5.7.1.4
06.4	burning / lit splint	MP2 is dependent upon correct response in MP1 allow flame do **not** accept glowing splint	1	AO1 5.8.2.1
	burns with a (squeaky) pop sound	allow pops	1	
06.5	bromine (water)	do **not** accept bromide	1	AO1 5.7.1.4
	(colour change) orange	allow 1 mark for colourless (to) orange	1	
	(to) colourless		1	
		ignore clear		
Total			**9**	

5.8.2.3 Test for carbon dioxide

Answer 03 · Mark scheme

November 2020 | 8464/C/2F | Original Q6

5.8.2.3 Test for carbon dioxide

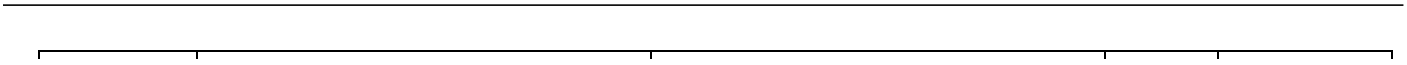
Answer 04 · Mark scheme November 2021 | 8464/C/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	bar drawn to 54 (%)	allow a tolerance of ± ½ a small square	1	AO2 5.9.3.1
02.2	city centre		1	AO3 5.3.1.4 5.9.3.1
02.3	less traffic (because) fewer people working	allow fewer lorries / cars allow (because) no school allow (because) businesses / factories closed	1 1	AO3 5.9.3.1
02.4	(mean =) $\frac{35 + 37 + 37 + 34 + 37}{5}$ = 36 (arbitrary units)		1 1	AO2 5.9.3.1
02.5	catalysts are **not** used up in a reaction catalysts lower the activation energy of a reaction		1 1	AO1 5.6.1.4
02.6	finite resource		1	AO2 5.8.1.2 5.10.1.1
02.7	limewater		1	AO1 5.8.2.3
Total			**10**	

5.8.2.3 Test for carbon dioxide

Answer 04 · Mark scheme

November 2021 | 8464/C/2F | Original Q2



5.8.2.3 Test for carbon dioxide

Answer 05 · Mark scheme

June 2023 | 8464/C/1F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	hydrogen / H^+		1	AO1 5.4.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2		MP2 is dependent upon MP1 being awarded		AO1 5.4.2.4
	(indicator) universal	ignore pH meter	1	
	(result) (green to) red / orange / yellow		1	
	OR			
	(indicator) (blue) litmus (1)			
	(result) (turns) red (1)			
	OR			
	(indicator) methyl orange (1)			
	(result) (turns) red (1)			

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	the solubility decreases		1	AO3 5.3.2.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	pH of the solution increases		1	AO3 5.3.2.5 5.4.2.4

5.8.2.3 Test for carbon dioxide

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	(I)		1	AO2 5.2.2.2 AO2.2

Question	Answers	Mark	AO / Spec. Ref.
06.6	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO3 5.3.1.3 5.4.2.2
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative Content: • measure a (stated) mass of calcium carbonate • use a balance • add calcium carbonate into a conical flask • measure a (stated) volume of hydrochloric acid • use a measuring cylinder • add hydrochloric acid to the conical flask • immediately place the stopper (and delivery tube) in the conical flask • record the total volume of carbon dioxide gas **or** record volume of carbon dioxide collected in set time **or** time taken to collect fixed volume of gas • collected in the gas syringe • repeat • repeat method with different masses of calcium carbonate		

Total Question 6	12

5.8.2.3 Test for carbon dioxide

Answer 06 · Mark scheme

June 2025 | 8464/C/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	balance	allow (weighing) scales	1	AO1 5.6.1.2 RPA11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	42 (cm^3)		1	AO2 5.6.1.2 RPA11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	concentration of hydrochloric acid		1	AO1 5.6.1.2 RPA11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	to reduce loss of gas	allow carbon dioxide for gas do **not** accept to stop loss of gas	1	AO3 5.6.1.2 RPA11

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	calcium hydroxide solution		1	AO1 5.8.2.3

5.8.2.3 Test for carbon dioxide

Answer 06 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	time in s(econds)	if neither mark awarded allow **1** mark for headings of time **and** volume	1	AO2 5.6.1.1 5.6.1.2 RPA11
	volume (of gas collected) in cm^3		1	
	time values in correct order		1	
	volume values in correct order		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	$(\text{mean rate of reaction} =) \frac{18}{30}$		1	AO2 5.6.1.1 RPA11
	= 0.6		1	
	cm^3/s		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	the particles are closer together		1	AO1 5.6.1.2 5.6.1.3
	the particles collide more frequently		1	

Total Question 2	14

5.8.2.3 Test for carbon dioxide

Answer 07 · Mark scheme

June 2025 | 8464/C/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	formulation		1	AO1 5.8.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	14		1	AO2 5.1.1.1 5.8.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	carbon monoxide is a toxic gas		1	AO1 5.9.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	$2\,CH_4O + 3\,O_2 \rightarrow 2CO_2 + 4\,H_2O$	allow multiples	1	AO2 5.1.1.1 5.3.1.1 5.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	(test) add a burning splint (result) (hydrogen burns with) a pop sound	do **not** accept glowing splint MP2 is dependent on MP1 being awarded	1 1	AO1 5.8.2.1

5.8.2.3 Test for carbon dioxide

Answer 07 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	any **two** from: • melting ice caps • rising sea levels • more flooding • extremes of weather • increase in droughts • increase in wildfires • loss of habitats • reduction in biodiversity • change in migration patterns	allow increase in frequency of storms allow desertification ignore global warming do **not** accept acid rain do **not** accept global dimming do **not** accept deforestation do **not** accept natural disasters do **not** accept references to ozone	2	AO1 5.9.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	colour change (from blue to pink)		1	AO2 5.6.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.8	endothermic	allow (thermal) decomposition	1	AO2 5.6.2.2

Total Question 3	10

5.8.2.3 Test for carbon dioxide

Answer 04 · Examiner comments November 2021 | 8464/C/2F | Original Q2

Question 2 (low and standard demand)

This was a skills-based question and most students were able to draw a bar chart and calculate a mean. Only around half of the students gained full marks in the mean calculation as they determined the mean for the full week rather than Monday to Friday as required.

Many students appreciated that pollution levels were lower at the weekend but did not give a reason, or link this to reduced traffic levels for the second mark.

Answer 05 · Examiner comments June 2023 | 8464/C/1F | Original Q6

Question 6 (standard demand)

06.1 Students found identifying the ion which makes a solution acidic very difficult. Carbon was a very common incorrect response.

06.2 Just over 25% of the students named an indicator (usually universal indicator) that could be used to test if a solution is acidic. About half of these then gave the correct colour in the acid solution. Common incorrect responses were pH paper, strips, solution or meter.

Answer 05 · Examiner comments June 2023 | 8464/C/1F | Original Q6

06.3 More than three-quarters of students deduced that the solubility of carbon dioxide decreases as the temperature of water increases. The solubility increases proved to be the most popular distractor.

06.4 Just over a third of students deduced that the pH of the solution increases as the temperature of water increases. The pH of the solution decreases was selected by nearly as many students.

06.5 More than 40% of students knew that the state symbol of water is (l). The other three distractors were selected in similar numbers.

06.6 The majority of students made an attempt at this question which discriminated well with nearly a third of students achieving level two, though few were able to access level 3. Students appreciated the need to mix together quantities of hydrochloric acid and calcium carbonate, then collect the gas evolved. Better answers gave an indication of how this was done. The sticking point was the method of collection of the gas which prevented students from achieving level 3. Many did not specify that the gas syringe needed to be connected to the conical flask. Many students used a beaker for the reaction which prevented successful gas collection. A tiny minority chose to filter and heat the solution with a Bunsen burner.

5.8.2.3 Test for carbon dioxide

Answer 06 · Examiner comments

June 2025 | 8464/C/2F | Original Q2

Question 2 (Low and Standard demand)

02.1 Just under one third of responses were correct. Correct responses were roughly equally divided between 'balance' and 'scales'. A large number of students stated 'scale' (singular) which is not equivalent to 'scales' and this terminology error resulted in no mark being awarded. The most common incorrect equipment given was 'measuring cylinder'.

02.2 The vast majority of students were able to read the scale correctly as 42.

02.3 Half of all students chose the correct response of concentration of hydrochloric acid.

02.4 The majority of students failed to recognise that the reaction would start immediately and that some gas would inevitably escape from the conical flask. They therefore answered in terms of an absolute such as 'to stop gas escaping' or 'prevent the gas escaping' rather than expressing the fact that the insertion of the bung would 'minimise' or 'reduce' the volume of gas lost. Consequently, less than 10% of students gained this mark.

02.5 Only a third of students knew the chemical name for limewater is calcium hydroxide solution. The most common incorrect response was sodium chloride solution.

02.6 Many students found completing the table difficult. Units were often listed against each number in the table rather than in the headings, although this was given credit if the headings were correct and all the values added to the table had the unit alongside them. Several responses mixed up minutes and seconds and often omitted at least one time or volume. Overall, however

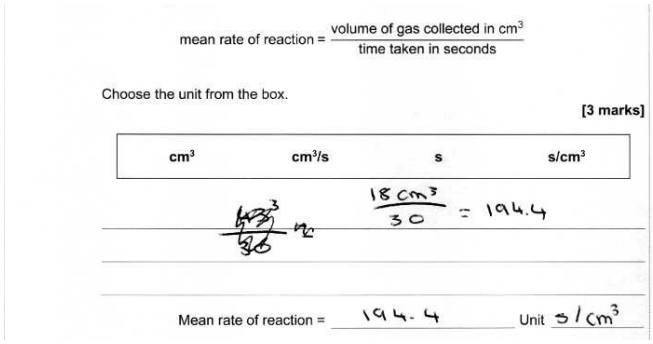
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5.8.2.3 Test for carbon dioxide

Answer 06 · Examiner comments June 2025 | 8464/C/2F | Original Q2

over three quarters of students still gained at least one mark and very few did not attempt the question.

02.7 This was well answered overall. Many students substituted the numbers into the given equation correctly although they sometimes struggled with the units.
A significant number unfortunately used 18^3 rather than 18 cm^3.



This student has substituted the numbers correctly into the given equation but has then carried out an incorrect calculation to arrive at their answer. They have used 18^3. Incorrect units have been chosen. Only the mark for substituting values into the equation can be credited.

02.8 Only about 20% of students could identify both reasons why increasing the concentration increases the rate of reaction. A large number of students included ' the particles move faster' in their response.

5.8.2.3 Test for carbon dioxide

Answer 07 · Examiner comments June 2025 | 8464/C/2F | Original Q3

Question 3 (Low and Standard demand)

03.1 Well over half of all students recognised screenwash as a formulation.

03.2 Nearly three quarters of students were able to work out the number of atoms in one molecule of glycerol correctly as 14.

03.3 Most students could state that carbon monoxide is a toxic gas. The most common incorrect response was that carbon monoxide is a greenhouse gas.

03.4 Many students were able to correctly balance the equation. A significant number however incorrectly added an H or CH in front of the CO_2
There was clear evidence of many pupils working out the numbers of individual atoms to correctly balance the equation.

03.5 Many students remembered that hydrogen burns with a pop or squeaky pop however far fewer identified that a burning/lit splint was needed in order for that to happen, therefore neither mark could be awarded.

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Answer 07 · Examiner comments June 2025 | 8464/C/2F | Original Q3

The most common incorrect response referred to using a glowing splint, confusing the test for oxygen and hydrogen.
When students correctly identified a burning/lit splint as the correct test, most also then went on to state the correct result and gained both marks.

03.6 Many students were able to correctly give one effect of global climate change, but fewer were able to correctly give two. The most common creditworthy responses were for identifying 'melting ice caps' and 'rising sea levels'.
Many responses referring to floods, storms and wildfires but could not gain credit as they were not comparative. The question was looking for the idea that there would be '*more* floods' for example, as floods happen without climate change.
Very few students answered in terms of a reduction in biodiversity or changes to migration patterns.

03.7 Many students correctly recognised that the anhydrous cobalt chloride would change colour or described the correct colour change. Incorrect responses often referred to the water or solution changing colour, or included additional observations, such as 'fizzing' or 'bubbles'.

03.8 Many students correctly identified the type of reaction as being endothermic.