AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.7.2.2

How materials are cycled

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**4**
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.

4.7.2.2 How materials are cycled

Answer 01 · Mark scheme June 2019 | 8464/B/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	methane	allow CH_4 **or** water (vapour) **or** H_2O allow correct example such as CFCs, nitrous oxide, ozone	1	AO1 4.7.3.5
07.2	any **two** from: • ice caps melting • rise in sea levels • desertification • extreme weather • change in species distribution • change in migration patterns • loss of biodiversity • coral bleaching • crop failure **or** food insecurity • loss of habitat qualified	ignore references to increased temperature and greenhouse gas / effect allow storms **or** droughts **or** flooding allow some species become extinct / endangered allow correct examples such as polar bears losing ice ignore forest fires	2	AO1 4.7.3.5

4.7.2.2 How materials are cycled

Answer 01 · Mark scheme

Question	Answers	Mark	AO/ Spec. Ref
07.3	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	4–6	AO1 4.7.2.2 4.4.1.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1-3	4.4.1.3 4.4.2.1
	No relevant content	0	
	Indicative content Photosynthesis • (carbon dioxide is) taken in through stomata / leaves • (carbon dioxide is) used in photosynthesis • to make glucose / carbohydrate • (glucose used) to make other carbon compounds or named example such as proteins, lipids • (glucose) stored as starch Feeding • plants are eaten / consumed by animals • which use the carbon compounds to make other carbon compounds Decay • when plants / animals die they are decomposed / decayed • by microorganisms • which use the carbon compounds to make other carbon compounds Respiration • plants / animals / microorganisms respire • (respiration) releases carbon dioxide back into the atmosphere Level 2 answers must consider photosynthesis and at least one other process in the carbon cycle. Level 2 answers must include some accurate detail.		
Total		**9**	

4.7.2.2 How materials are cycled

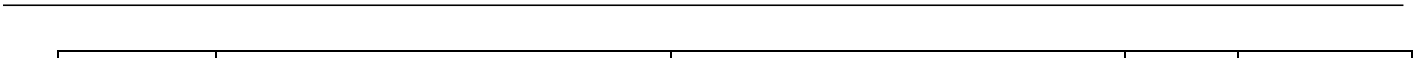
Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	root (hairs)		1	AO1 4.7.2.2 4.2.3.2
03.2	carbon water	in either order allow carbon dioxide if no other mark awarded allow oxygen for 1 mark	 1 1	AO1 4.7.2.2
03.3	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.		4–6	AO1 4.7.2.2 4.4.1.1 4.4.2.1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.		1–3	
	No relevant content		0	
	Indicative content • microorganisms decay (the dead plant) • microorganisms respire • using carbon compounds / glucose • releasing carbon dioxide • into the atmosphere • new plants take in carbon dioxide • (carbon dioxide) for photosynthesis • making glucose • converted into correctly named cell materials (when plants are decayed) Nitrate / mineral ions • are released into soil • to be taken up by new growing plants Water • plants dehydrate or water evaporates when they die • recycled as rain needed by growing plants			
Total			9	

4.7.2.2 How materials are cycled

Answer 02 · Mark scheme

November 2020 | 8464/B/2F | Original Q3



4.7.2.2 How materials are cycled

Answer 03 · Mark scheme

June 2022 | 8464/B/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	aerobic respiration		1	AO1 4.4.2.1 4.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	1. evaporation	allow evaporate(s) / evaporating	1	AO1 4.7.2.2
	2. condensation	allow condense(s) / condensing	1	
	3. precipitation	allow rain(ing) / rainfall allow named precipitation ignore precipitates	1	
	4. draining / drainage	allow run-off / percolation / infiltration allow groundwater / underground flow	1	
	5. transpiration		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	$6\,000\,000\,000 \times \frac{4.5}{100}$	allow $6\,000\,000\,000 \times 0.045$	1	AO2 4.7.2.2
	270 000 000		1	
	2.7×10^8	allow an incorrectly calculated number of people given in correct standard form	1	

4.7.2.2 How materials are cycled

Answer 03 · Mark scheme

June 2022 | 8464/B/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	climate change has increased the area of deserts more water is used to grow crops		1 1	AO3 4.7.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	decay / decomposition of leaves	allow leaves are broken down	1	AO2
	respiration (by microorganisms / decomposers)	ignore aerobic / anaerobic ignore respiration by worms / detritivores / insects / leaves	1	AO1
	respiration releases carbon dioxide **or** microorganisms release carbon dioxide		1	AO1
	carbon dioxide is used in photosynthesis (for new plant growth)	do **not** accept carbon dioxide absorbed in the roots	1	AO1 4.7.2.2 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	nitrates are released into the soil		1	AO2 4.7.2.2 4.4.1.3

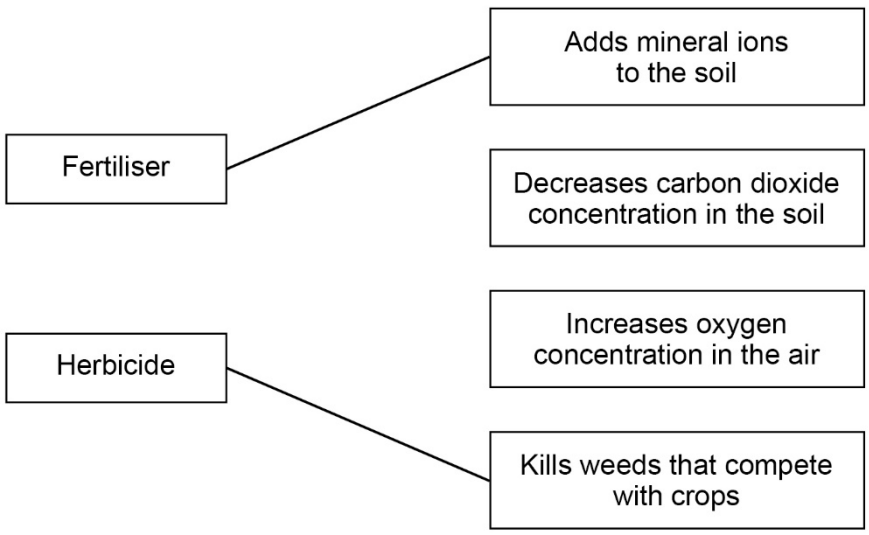
Total Question 5		**16**

4.7.2.2 How materials are cycled

Answer 04 · Mark scheme

June 2025 | 8464/B/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 4.7.1.1 4.7.1.2 4.7.3.2 4.6.2.4 4.7.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	owls		1	AO2 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	insects eat pests on the crop insects pollinate the crop		1 1	AO2 4.7.1.1 4.7.2.1

4.7.2.2 How materials are cycled

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	any **one** from: • as a habitat for (beneficial) insects / animals • to keep (larger) animals out **or** to keep people out • (to increase) biodiversity • to reduce wind speed • as a habitat for predators of crop damaging organisms • to prevent / reduce soil erosion	allow as a shelter / space for (beneficial) insects / animals allow to protect (the crop) from (larger) animals allow to protect (the crop) from people ignore keep insects / birds out ignore to protect the crop unqualified ignore to stop pests eating the crop allow to increase the number of insects / plants allow descriptions of increasing biodiversity allow act as wind break ignore to reduce pests unqualified ignore so more (crop) can be grown	1	AO2 4.7.3.6 4.7.3.1 4.7.1.1

4.7.2.2 How materials are cycled

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5		allow converse if clearly referring to soil		
	water takes more time to drain (through)	allow there will be more water (in the peat compost) allow water drains / moves slow**er** allow water drains / moves more slowly ignore water drains slow / slowly	1	AO3 4.7.3.3
	(so) water is more likely to be taken up by plants **or** (so) do not need to water plants (as) frequently **or** (which is an advantage because) young plants cannot reach water that is deep (in soil / compost)	allow (so) there is more time for plants to take up water allow (so) reduces water use ignore references to cost allow **2** marks for water more likely to be taken up by plants before it drains away	1	

4.7.2.2 How materials are cycled

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(A) respiration	answer line takes precedence	1	AO1 4.7.2.2
	(B) photosynthesis		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	(burning peat) releases / increases carbon dioxide	allow (burning peat) releases / increases CO_2 ignore burning releases carbon do **not** accept peat contains carbon dioxide	1	AO1 4.7.2.2 4.7.3.3 4.7.3.5
	(which) causes / increases global warming	allow (which) is a greenhouse gas allow (which) causes the greenhouse effect ignore (which) causes / increases climate change	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	bacteria		1	AO1 4.7.2.2 4.7.3.3
	fungi		1	

4.7.2.2 How materials are cycled

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	farming (cattle / biofuel / crops / animals)	allow examples of farming a crop / animal allow building allow named type of building eg houses / factories allow mining allow landfill allow reforestation / rewilding	1	AO1 4.7.3.4

Total Question 2	**15**

4.7.2.2 How materials are cycled

Answer 03 · Examiner comments

June 2022 | 8464/B/2F | Original Q5

Question 5 (standard demand)

05.1 40% of students knew that aerobic respiration produces water.

05.2 Many students could only name one or two parts of the water cycle shown on the figure. The most common marks awarded were for evaporation and precipitation. Very few students gave correct answers for processes 4 or 5. Some students gave descriptions rather than the name of each process, which did not gain the mark unless the process was named within the description.

05.3 Some students only got as far as the second marking point and stopped, or then made errors in writing the answer in standard form. Two marks were awarded in either instance.

The third marking point was not awarded for incorrect use of standard form, so 27×10^7 was frequently seen and was incorrect. Note the 'allow' statement in the extra information column for this marking point. Students gained one mark for only if they attempted an incorrect calculation using numbers from the question, and then gave that answer in standard form.

05.4 A third of students could identify two reasons why more people have severe water shortage now than in 2007.

4.7.2.2 How materials are cycled

Answer 03 · Examiner comments

June 2022 | 8464/B/2F | Original Q5

05.5 Students found this aspect of the carbon cycle challenging to explain. Many students repeated information given in the stem of the question, which is never creditworthy.

The most common mark awarded was for the idea of leaves decaying. Some students incorrectly suggested microorganisms eat the leaves. References to respiration were rare, and often incorrect, such as trees using carbon dioxide for respiration. The third and fourth marking points both required reference to carbon dioxide, not simply carbon, which was far more frequently seen. Although chemical formulae are generally acceptable as alternatives to the names of substances, they need to be correct, for example CO_2 is an acceptable alternative to carbon dioxide but CO2 and CO^2 are not.

05.6 38% of students could identify that nitrates released into the soil is a benefit of fallen leaves for living plants.

Answer 04 · Examiner comments

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

Question 2 (Low and Standard demand)

02.1 The correct role of fertiliser was seen more frequently than that of herbicide, but many students did not seem familiar with either term.

02.2 Fewer than half of students could identify the secondary consumer in the food chain. 'Mice' was the most commonly selected answer, presumably with students focussing on the 'secondary' rather than understanding the term 'secondary consumer'.

02.3 Most often, students could identify that insects pollinating the crop would increase yield, but fewer students realised that insects eating pests on the crop would also increase crop yield.

02.4 Many students gave a correct suggestion about why farmers increase the size of hedgerows. Most frequently this was the idea of keeping animals or people out or increasing the number of insects. Reponses suggesting that this gives more space for crops to grow was a frequent misconception, along with incorrect ideas of what hedges are and how much of a barrier they represent, for example, preventing insects passing through or preventing the spread of disease. Some students mistakenly thought hedgerows would keep birds out. Overall, there was a lack of appreciation for the role of hedgerows in increasing biodiversity.

02.5 Student can never be given credit to repeating information in the question, so statements such as 'the water drains slow' could not be awarded mark point 1. If students went a little further to state that 'the water drains more slowly', the response was then comparative and the mark could be awarded.

Peat comes from peat bogs.

0 2 . 5 Peat can be used to produce garden compost.

Table 1 compares peat compost with a sample of soil.

Table 1

	Mineral ion concentration	Speed at which water drains through
Peat compost	Low	Slow
Soil	High	Fast

Young plants have short roots.

Explain **one** advantage of growing young plants in peat compost instead of in soil.

[2 marks]

They have a low mineral ion concentration
A slow speed at which water drains
through.

This student has not added any information that is not taken directly from Table 1, therefore no marks could be awarded. If the student had stated 'A slower speed at which water drains through' then the mark would be awarded for that comparative response.

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4.7.2.2 How materials are cycled

Answer 04 · Examiner comments June 2025 | 8464/B/2F | Original Q2

02.6 'Transpiration' was frequently given as an incorrect answer. Presumably because students are more familiar with plants transpiring, than with plants respiring.

02.7 Students were provided with the information that peat contains carbon compounds and that burning peat contributes to climate change. Therefore, neither of those ideas could be awarded credit. The most common response that did not gain credit was that 'burning peat releases carbon and contributes to climate change'. Some students were incorrectly linking carbon dioxide with the ozone layer.

02.8 Nearly 50% of students could identify that both bacteria and fungi cause decay. The most common incorrect answer was 'algae'.

02.9 The wide mark scheme indicates the many and varied ways that students could answer this question. All the ideas on the mark scheme were seen. When the mark was not awarded, this was usually because students had not read or understood the question and they responded in terms of 'fewer trees giving out oxygen'.