AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.7.3.2

Waste management

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**4**
Available paper years	**2020–2024**

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.

4.7.3.2 Waste management

Answer 01 · Mark scheme

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

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	the variety of all the different <u>species</u> (of organisms) on Earth **or** the variety of all the different <u>species</u> (of organisms) in a habitat / area / ecosystem		1	AO1 4.7.3.1
03.2	any **one** from: • compost • burning **or** as a fuel	allow to improve soil (texture / drainage / quality) allow to grow food / crops / plants ignore farming unqualified ignore as fertiliser	1	AO1 4.7.3.3
03.3	decay / burning of peat releases carbon dioxide (into the atmosphere) which is increasing global warming	do **not** accept peat bogs release carbon dioxide into the atmosphere allow a description of global warming or consequences if no other mark awarded allow removal of a carbon sink / store for 1 mark	1 1	AO1 4.7.3.3 4.7.3.5

4.7.3.2 Waste management

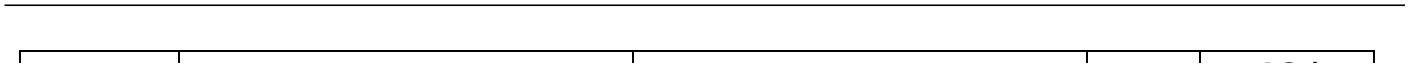
Answer 01 · Mark scheme

03.4	any **two** from: • takes minerals from the soil as crops are harvested / removed • leads to soil erosion • farmers have to use fertilisers which pollute water / streams / lakes • burning crop waste produces carbon dioxide • using large farm machinery causes soil compaction	ignore nutrients allow burning crop waste causes global warming allow using large farm machinery releases carbon dioxide	2	AO3 4.7.3.2 4.7.3.3 4.7.3.5 4.7.3.6
03.5	antibiotic passed into the environment in animal faeces / urine / sewage **or** antibiotic in animal faeces / urine / sewage flows into rivers		1	AO2
	bacteria in water / land become antibiotic resistant	allow named water or land pathogen such as typhoid / cholera / E coli	1	AO2
	some of these bacteria are human pathogens		1	AO3
	(so) cause (human) diseases which now cannot be cured because they are antibiotic resistant	If no other marks awarded allow 1 mark for mention of antibiotics in milk / meat being consumed by humans.	1	AO3 4.6.3.4 4.7.3.2
Total			**10**	

4.7.3.2 Waste management

Answer 01 · Mark scheme

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



4.7.3.2 Waste management

Answer 02 · Mark scheme

June 2022 | 8464/B/2H | Original Q2

Question 2

Question	Answers	Mark	AO / Spec. Ref.
02	**Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3
	Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO3 AO1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	

2 cont.	**Indicative content**
	Increase in world population
	• sewage (released into rivers / lakes / seas)
	  ○ causes algae to grow
	  ○ algae block light
	  ○ causing plants to die and decompose
	  ○ leading to lack of oxygen in the water
	  ○ (sewage) could contain pathogens
	
	Need to produce more food for world's population
	• fertilisers (used on farms to increase crop yield, leach into rivers / lakes / seas)
	  ○ causes algae to grow
	  ○ leading to lack of oxygen in the water
	• herbicides / pesticides (used on farms to increase crop yield, run into rivers / lakes / seas)
	  ○ build-up in food chains
	
	Increasing demand for products / energy
	• toxic chemicals **or** named toxic chemicals (run into rivers / lakes / seas)
	  ○ from factories / industry **or** power stations
	  ○ build-up in food chains
	  ○ chemicals may cause mutations **or** chemicals may act as hormones
	  ○ radiation leaks from nuclear (power stations)
	  ○ (oil) spills from extraction / rigs / tankers in oceans
	  ○ acid rain formation
	  ○ acidification of lakes
	  ○ increased carbon dioxide emissions causes acidification of oceans
	
	Buildup of waste products
	• litter / plastics (thrown in rivers / lakes / seas)
	  ○ example of effect on living organisms, such as plastics consumed or plastics build up in stomach or plastics get stuck around beaks
	  ○ (most) plastics are not biodegradable
	  ○ build-up of microplastics in water animals
	
	Consequence of the above is that organisms living in rivers / lakes / seas are harmed / die
	
	For **Level 3** students need to consider different types of pollution
			4.7.3.2
			4.7.2.1

Total Question 2		**6**

4.7.3.2 Waste management

Answer 03 · Mark scheme

June 2024 | 8464/B/2H | Original Q1

Question 1

Question	Answers	Mark	AO / Spec. Ref.
01.1	alga(e) → limpet(s) → crab(s) direction of arrows must be correct	1	AO2 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	(50 (cm) × 50 (cm) =) 2500 (cm^2)	allow conversion cm to m (50 ÷ 100 =) 0.5 (m)	1	AO2 4.7.2.1 RPA7
	$(\frac{2500}{100 \times 100}$ =) 0.25 (m^2)	allow ¼ (m^2) allow (0.5 × 0.5 =) 0.25 (m^2) for **2** marks allow (½ × ½ =) ¼ (m^2) for **2** marks	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	(1800 × $\frac{2}{100}$ =) 36 (m^2)	allow (1800 × 0.02 =) 36 (m^2)	1	AO2 4.7.2.1 RPA7
	$(\frac{36}{0.25}$ =) 144 (quadrats)	allow (36 × 4 =) 144 (quadrats) allow a correct calculation of number of quadrats with an incorrect calculation of 2% of 1800 allow ecf from question **01.2**	1	

4.7.3.2 Waste management

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	(location of sample will be) biased / chosen **or** (location of sample will be) limited by how far students can throw	allow students may aim for limpets allow students may aim to avoid limpets allow students may stand / start near groups of limpets	1	AO1 4.7.2.1 RPA7
	(therefore) results will not be representative (of (actual) abundance)	allow population size will be too high / low	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	tape measure along two (perpendicular) sides (of sea shore) **or** allocate co-ordinates (to sea shore) **or** divide area into a grid		1	AO1 4.7.2.1 RPA7
	use random number generator	allow description of generating random number(s) for example pulling numbers from container do **not** accept throwing quadrats	1	

4.7.3.2 Waste management

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	any **one** from: • water • tide • rocks • quicksand • named hazardous material on the sea shore eg needles, glass • sewage • animals	allow named example of a hazard allow sea allow waves allow slippery / uneven surfaces allow appropriate named animal for example crab / jellyfish	1	AO3 4.7.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	any **one** from: • fertiliser • sewage • toxic chemicals	allow named toxic chemical eg herbicide / pesticide / insecticide / DDT / (crude) oil allow (micro)plastics allow (dissolved) carbon dioxide allow heavy metals allow thermal pollution	1	AO2 4.7.3.2

Total Question 1	11

4.7.3.2 Waste management

Answer 04 · Mark scheme

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	the interaction of (a community of living) organisms and (the non-living parts of) their environment / habitat	allow the interaction of (a community of) biotic parts and the abiotic parts of their environment / habitat allow the interaction of a community and (the non-living parts of) their environment / habitat	1	AO1 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	any **two** from: • may be a predator therefore control prey population • may be prey so provide energy to predator • may be a primary consumer therefore control plant / algae population • may alter habitat for other species (to survive) • may provide shelter for other species (to survive) • may maintain biodiversity • may disperse seed / pollen	allow named examples throughout allow may be predator so keep prey population (fairly) constant ignore may be prey so provide food to predator	2	AO2 4.7.1.1 4.7.2.1 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	$(\frac{216}{4} =) 54$	allow $(\frac{216\ 000}{4000} =) 54$	1	AO2 4.7.3.2

4.7.3.2 Waste management

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4		ignore references to inversely proportional		
	as number of bacteria increases, the concentration of dissolved oxygen decreases	allow as bacteria increases, oxygen decreases allow there is a negative correlation allow converse	1	AO3 4.7.3.2
	(the relationship is) **not** number of bacteria increases and the concentration of oxygen increases (in the same ratio)	allow (the relationship is) **not** as bacteria increases, oxygen increases allow whereas proportional (relationship) would mean as one increases the other increases (in the same ratio) allow converse	1	

4.7.3.2 Waste management

Answer 04 · Mark scheme

June 2024 | 8464/B/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	(decrease in oxygen concentration causes a) decrease in the number of fish	allow (decrease in oxygen concentration means) more fish die	1	AO3
	(because) fish need oxygen to respire (aerobically)	allow invertebrates need oxygen to respire **and** fish eat invertebrates do **not** accept implications that otters require oxygen from water do **not** accept energy produced / made / created by respiration	1	AO2
	(therefore) otter population decreases due to less food	allow rate of reproduction (in otter population) is lower due to less food allow otters migrate to another river / area / habitat ignore decrease in oxygen causes decrease in otter population unqualified **alternative answer** (decrease in oxygen concentration means) more bacteria are present (1) (so) more fish die (from bacterial infection) (1) (therefore) otter population decreases due to less food **or** rate of reproduction (in otter population) is lower due to less food **or** otters migrate to another river / area / habitat (1)	1	AO2 4.7.2.1 4.7.3.2 4.4.2.1

Total Question 5	9

4.7.3.2 Waste management

Answer 02 · Examiner comments

June 2022 | 8464/B/2H | Original Q2

Question 2 (standard demand)

In this question, students had to explain how human activities are polluting rivers, lakes and seas.

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

Many students correctly referred to a type of water pollution and explained the source of the pollution or detailed consequence of the pollution. References to plastic/litter were common. Many students knew that sewage is an issue for pollution of rivers, lakes and seas and could give more information as to why this is a problem.

Within Level 1 (1–2 marks) responses students gave types of water pollution or consequences but made no links.

To access Level 2 (3–4 marks), students needed to link a type of pollution with a cause or detailed explanation. The indicative content on the mark scheme gives an indication of the types of detailed explanation required. However, with such a broad subject matter, not all possible examples could be given on the mark scheme. Other examples that were seen and gained credit as linked relevant content were ‘noise pollution from boats disrupts the communication of whales’ and references to thermal pollution (of water) from factories or power stations would be a type of pollution linked to a source.

For Level 3 (5–6 marks), students needed to give logically linked explanations relating to different types of pollution.

References to carbon dioxide emissions and climate change were frequent, but often did not answer the question to relate them to water pollution.

4.7.3.2 Waste management

Answer 03 · Examiner comments

Question 1 (standard demand)

01.1 Many students could give the food chain in the correct order with appropriate arrows showing the flow of energy. Responses that used commas or hyphens, rather than arrows, did not gain the mark. Some students tried to give extra information, such as identifying the producer and primary consumer, but this was not required.

01.2 Some students demonstrated problems converting from centimetres to metres. Responses occasionally stated that 50 cm = 5 m.

Calculation of area was sometimes a challenge, with frequently seen responses such a 50 + 50 + 50 + 50 = 200 indicating confusion between area and perimeter.

Many students gave the incorrect response of 0.5 × 0.5 = 2.5, perhaps suggesting that they are not using their calculator.

01.3 Marks were often awarded for allowing error carried forward from the previous question.

Many students only calculated 2% of the area of the shore and then stopped. Therefore only the first mark was awarded.

Some students who did not gain marks had attempted to calculate 2% of their answer to the previous question, indicating they had not understood the context.

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4.7.3.2 Waste management

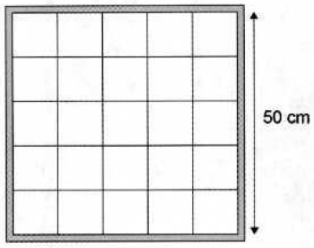
Answer 03 · Examiner comments June 2024 | 8464/B/2H | Original Q1

Students estimated the population of limpets on a sea shore.

The students were given a square quadrat.

Figure 2 shows the quadrat.

Figure 2



0 1 . 2 Calculate the area of the quadrat in m^2. **[2 marks]**

$50 \times 50 = 2500\ cm^2$

$2500\ cm^2 = 25\ m^2$

$\div 100$

Area of quadrat = 25 m^2

0 1 . 3 The total area of the sea shore was 1800 m^2.

The students sampled 2% of the total area of the sea shore.

Calculate the number of times the students needed to use the quadrat for the 2% sample.

Use your answer from Question **01.2** **[2 marks]**

$10\% = 180\ m^2$

$1\% = 18\ m^2$

$2\% = 36\ m^2$

to capture $36\ m^2$

quadrat used 2 times.

25

50

Number of times = 2

For question 01.2, the student gained marking point 1 only.

For question 01.3, the student has calculated 2% of 1800 m^2 then noted that the quadrat would need to be used twice (using their error carried forward) therefore 2 marks were awarded for question 01.3.

01.4 Most students could give a reason for not throwing the quadrat and gain the first mark. Usually, students stated throwing could be biased. Very few could explain why this was a problem. References to the effect it would have on the population estimate were rare.

Some students demonstrated the misconception that throwing quadrats is an appropriate sampling method. Others stated that the issue is that the quadrat could sample the same area twice, which was not correct, because that could also occur with a random method.

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4.7.3.2 Waste management

Answer 03 · Examiner comments June 2024 | 8464/B/2H | Original Q1

01.5 Some students had knowledge of using a random number generator on their calculator or phone and could describe the use of coordinates on the shore.

Many students incorrectly referred to throwing in random directions or being blindfolded. These are never appropriate methods for sampling. Others demonstrated the misconception that choosing locations with the most limpets would be appropriate. Some confusion between quadrats and transects was seen.

01.6 On the Foundation tier, many students gave a risk, such as drowning, rather than a hazard. This was rare on the Higher tier paper. Common incorrect answers referred to the quadrat being washed away, or gave descriptions of ways to reduce risk, such as 'wear sensible shoes'.

01.7 Most students could name one type of pollution that may affect the population of limpets. The most frequently seen answers were plastic and sewage.

Common responses that were not awarded the mark were chemicals, crabs and waste.

Answer 04 · Examiner comments

Question 5 (standard, standard/high & high demand)

05.1 Students found this a very challenging question with very few giving creditworthy responses. It was evident that students did not understand the breadth of the term ecosystem, with few students gaining the mark. The definition is given within the specification, so this was an AO1 question.

Some students correctly recognised that both living organisms and the environment were part of an ecosystem but expression was weak and did not meet the requirements of the definition, often referring to just plants and animals, instead of organisms, or to area rather than to environment or habitat.

Many students omitted the idea of interaction between organisms or organisms and their environment. A large proportion of responses used vague language, particularly of biological terms that students are expected to know, such as habitat, population or community.

05.2 The most common correct answer related to bullet point 1 and the control of prey populations. Students could answer in terms of animal species in general, or otters, or any other named animal.

Many attempts at other points were too vague. Statements such as ‘they are prey’ or ‘they are part of a food chain’ did not go far enough to gain credit for the idea that the species may be prey and therefore provide energy for a predator.

Many students gave examples that lacked enough detail to gain the mark such as ‘beavers build dams’, ‘birds build nests’ or 'prey feed the predators'. These did not go far enough to describe how that effects another species. Some students stated that otters defended smaller animals against larger predators, and this did not gain credit.

Marking point 4 was often awarded for faeces providing minerals for plants. Note that named examples such as this were acceptable, as shown in the extra information column of the mark scheme. Some students misunderstood the idea of stability and suggested that a species increases biodiversity.

05.3 Most students could select the correct figures and calculate the correct answer. The most common error was attempting to subtract one figure from the other.

05.4 Students more often gave marking point 1 than marking point 2. There were some references to inversely proportional, which were ignored, as shown on the mark scheme.

Simply quoting figures from the table was not enough to gain either mark. Likewise, just identifying that the symbol in the question means proportional was not sufficient for the mark.

05.5 Many students gave detailed explanations that matched all three marking points on the left-hand side of the mark scheme. The alternative approach (given on the right-hand side of the mark scheme) was seen occasionally and when it was seen often gained all 3 marks.

Some students referred to marking point 2 incorrectly, either in terms of fish breathing underwater, or otters needing oxygen from the water. References to ‘affecting the otter population’ were not given credit for the idea of ‘decreasing the otter population’.

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