



Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT

8291/23

Paper 2

May/June 2021

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **15** printed pages.

PUBLISHED**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1 Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.

2 The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.

3 Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).

4 The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.

5 'List rule' guidance

For questions that require *n* responses (e.g. State **two** reasons ...):

- The response should be read as continuous prose, even when numbered answer spaces are provided.
- Any response marked *ignore* in the mark scheme should not count towards *n*.
- Incorrect responses should not be awarded credit but will still count towards *n*.
- Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response.
- Non-contradictory responses after the first *n* responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Question	Answer	Marks
1(a)(i)	<p>Haiti trees are missing / no trees / only small trees; (mountain) soil exposed / bare earth / appears to lack plants; small scrub bushes / grassland; lacks shelter;</p> <p>max 2</p>	2
1(a)(ii)	<p><u>humans</u> remove trees; for fuel; for agriculture / grazing land; lack of control / law enforcement; poverty;</p> <p>max 2</p>	2
1(a)(iii)	<p>soil dries out; exposed to forces of erosion; example e.g. wind; no roots to bind the soil / hold it in place; reduction in litter layer; loss of fertility;</p> <p>max 3</p>	3
1(a)(iv)	<p>loss of shelter; loss of food; disruption of food web; reduction in water availability; reduction in species variety / gene pool;</p> <p>max 2</p>	2
1(b)(i)	<p>3-4 points correctly plotted; 5 points correctly plotted; line of best fit accurately drawn;</p>	3

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Question	Answer	Marks
1(b)(ii)	there has been a steep decline in the amount remaining; the line of best fit is a straight line; the rate of loss is consistent; use of figures; max 1	1
1(c)(i)	five;	1
1(c)(ii)	plants / producers / first / 1;	1
1(c)(iii)	(they feed in) two; trophic levels; they eat plants; and insects; max 2	2
1(d)	increasing light intensity; increases rate of photosynthesis; more glucose produced; increasing growth; until another factor becomes limiting; named factor; max 3	3

Question	Answer	Marks
2(a)(i)	eutrophication;	1

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Question	Answer	Marks
2(a)(ii)	fertiliser stimulates plant growth; algae grow rapidly; algae die due to lack of sunlight / light energy / due to competition for resources; (decomposing) bacteria / decomposers; use dead algae for nutrients; respiration; consumes oxygen; fish suffocate / die due to lack of oxygen; max 4	4
2(a)(iii)	legislation; enforcement / fines; educate; follow instructions; crop rotation; mixed cropping; leguminous plants; fallow land; grow GM crops; which are adapted to poor soils; persuade farmers to use organic rather than inorganic fertilisers; because they are slower release; subsidies for organic farming; use of reed beds to filter water; max 4	4
2(b)(i)	A – <u>unconfined</u> (aquifer); B – <u>confined</u> (aquifer);	2

Question	Answer	Marks
2(b)(ii)	pesticides; oil and petroleum products; chemical industrial wastes; detergents; paint; acid; sewage; heavy metals; max 3	3
2(b)(iii)	groundwater moves slowly; recharge takes a long time / is slow; little force behind the movement; chemicals take a long time to be washed away; max 2	2
2(b)(iv)	encourage clean-up of e.g. oil spills; restrict pesticide / fertiliser use; encourage safe disposal of products; legislate / enforcement; educate; re-use / recycle water to reduce waste water; reduce drainage of wetlands; max 4	4

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Question	Answer	Marks
3(a)	<p>Advantages Water supply is improved, potential for recreation, landscaping, power generation, improved economy and lifestyles, new habitat created, jobs</p> <p>Disadvantages Cost, potential for downriver problems, conflict with other countries, silting, affect seasonal agricultural floods, affect fish migration routes, destruction of habitats, displacement of people, noise and dust from construction, loss of agricultural land</p> <div data-bbox="338 496 842 580" style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p>please use level descriptors 1</p> </div>	10
3(b)	<p>The requirements for this question are:</p> <ul style="list-style-type: none"> • to discuss the concept of shared resources • to demonstrate understanding that shared resources can lead to conflict • to evaluate the statement. <p>Candidates should be aware of the difficulty of obtaining international agreements and be able to relate this to the shared resources concept such as the water in rivers that flow through more than one country. Other examples could include marine waters and fishing rights, and international protocols on pollution (shared air). Candidates should provide a balanced argument about the statement and suggest an opinion.</p> <div data-bbox="338 991 842 1075" style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p>please use level descriptors 2</p> </div>	30

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Question	Answer	Marks
4(a)	<p>Advantages The habitat is preserved whilst allowing access to public and scientific research. Possibly vulnerable and endangered species are protected and may thrive. Where appropriate, rare species are re-introduced and protected. Invasive and non-native species are excluded to preserve the habitat. Barriers prevent immigration and emigration where appropriate</p> <p>Disadvantages Costly to establish and maintain with protective measures and patrols. Could result in disruption of people’s lives and even displacement. Non-native species may have to be killed, establishing the area also draws attention to the presence of rare species (poachers and hunters). Barriers are artificial and alter the environment. Needs political will. Potential conflict with NGOs and activists.</p> <div data-bbox="338 584 842 668" style="border: 1px solid black; padding: 5px; text-align: center;"> <p>please use level descriptors 1</p> </div>	10
4(b)	<p>The requirements for this question are:</p> <ul style="list-style-type: none"> • to demonstrate knowledge of the methods of conservation • to show understanding of different methods • to assess the relative success of chosen examples. <p>Candidates should use a range of examples which could include National Parks, conservation areas, game reserves, parks and zoos and ecotourism. A description of how each chosen example works with a critical assessment of the relative success of each. Candidates should make a conclusion about which methods work and to be able to justify the decision.</p> <div data-bbox="338 1067 842 1152" style="border: 1px solid black; padding: 5px; text-align: center;"> <p>please use level descriptors 2</p> </div>	30

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Question	Answer	Marks
5(a)	<p>The source material suggests that as population grows the numbers of people living with severe water stress will increase from 38% to 47%. Causes are expanding population requiring more resources, provided by increased industrialisation and increased agricultural production. As a result, more water is used. Increasing aridity and consequent desertification are factors as is the potential of climate change. Countries with low economic development have few resources to build appropriate infrastructure or provide water catchment and storage systems.</p> <div data-bbox="338 400 842 488" style="border: 1px solid black; padding: 5px; text-align: center;"> <p>please use level descriptors 1</p> </div>	10
5(b)	<p>The requirements for this question are:</p> <ul style="list-style-type: none"> • to demonstrate a knowledge of issues relating to water supply • to discuss the problems of countries with lower income countries • to describe the different systems needed to supply potable water • to make comparisons between different levels of economic development. <p>The cost, lack of resources and lack of political will to solve issues. Lower income countries often rely on NGO for support and input. Infrastructure to build storage systems and the transport from source to use are all expensive. Borrowing leads to debt and more problems. Lack of water can be offset with desalination plants but again there are cost issues. A well-developed economy has the ability and usually the will to provide these essentials</p> <div data-bbox="338 970 842 1058" style="border: 1px solid black; padding: 5px; text-align: center;"> <p>please use level descriptors 2</p> </div>	10

Question	Answer	Marks
Section B Descriptor Levels:		
Descriptor	Award Mark	
Consistently meets the level criteria	Mark at top of level	
Meets the criteria, but with some inconsistency	Middle, mark to just below top mark	
Meets most of level criteria, but not all convincingly	Just below middle, mark to just above bottom mark	
On the borderline of this level and the one below	Mark at bottom of level	

Question	Answer	Marks
<p>Section B Part (a)</p> <div data-bbox="181 284 495 347" style="border: 1px solid black; padding: 5px;">Level Descriptors 1</div> <p>8–10 marks The response:</p> <ul data-bbox="181 459 1178 592" style="list-style-type: none">• contains few errors• shows a very good understanding of the question• shows a good use of data or the information provided, where appropriate• provides a balanced answer <p>5–7 marks The response:</p> <ul data-bbox="181 703 1160 836" style="list-style-type: none">• may contain some errors• shows an adequate understanding of the question• shows some use of data or the information provided, where appropriate• may lack balance <p>1–4 marks The response:</p> <ul data-bbox="181 948 1095 1080" style="list-style-type: none">• may contain errors• shows limited understanding of the question• shows little or no use of data or the information, where appropriate• lacks balance		

Question	Answer	Marks
Section B Part (b):	<div data-bbox="181 284 495 347" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">Level Descriptors 2</div> <p data-bbox="168 384 324 416">Responses:</p> <p data-bbox="168 453 517 485">Level One, 25–30 marks</p> <ul data-bbox="168 488 987 663" style="list-style-type: none">• fulfil all the requirements of the question• contain a very good understanding of the content required• contain a very good balance of content• contain substantial critical and supportive evaluations• make accurate use of relevant vocabulary <p data-bbox="168 700 517 732">Level Two, 19–24 marks</p> <ul data-bbox="168 735 927 911" style="list-style-type: none">• fulfil most of the requirements of the question• contain a good understanding of the content required• contain a good balance of content• contain some critical and supportive evaluations• make good use of relevant vocabulary <p data-bbox="168 948 528 979">Level three, 13–18 marks</p> <ul data-bbox="168 983 909 1158" style="list-style-type: none">• fulfil some requirements of the question• contain some understanding of the content required• may contain some limited balance of content• may contain brief evaluations• make some use of relevant vocabulary <p data-bbox="168 1195 499 1227">Level four, 6–12 marks</p> <ul data-bbox="168 1230 920 1406" style="list-style-type: none">• fulfil limited requirements of the question• contain limited understanding of the content required• may contain poorly balanced of content• may not contain evaluations• make limited use of relevant vocabulary	

Question	Answer	Marks
<p>Level five, 1–5 marks</p> <ul style="list-style-type: none">• fulfil a few of the requirements of the question• contain a very limited understanding of the content required• are likely to be unbalanced and undeveloped• evaluative statements are likely to be missing• make no use of relevant vocabulary		