Cambridge Assessment International Education

Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT **8291/13**

Paper 1 Principles of Environmental Management **October/November 2022**

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 October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **18** 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	<u>'List rule' guidance</u> 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)	*any two developed points:* *short-term:* noise; disturbs animal species / migrate to different environment / displaces animals; dust; affects plant species / photosynthesis / air quality; habitat destruction / trees or plants cut down to build dam; changes the area / disrupts food chains / loss of biodiversity; *long-term:* creation of new aquatic habitat; potential for different species to flourish; disruption of river flow; leads to silting downriver of the dam; interferes with traditional agricultural practices; e.g. reliance on annual flooding; deforestation; change in nature of habitat alters local environment / decrease in population of certain <u>species</u>; loss of biodiversity; local micro-climate alters; loss of trees / large body of water;	**4**

Question	Answer	Marks
1(b)	*local:* creates jobs; more money circulates in community; *national:* provides energy source / renewable energy source; relatively cheap energy; could have energy to export / improves economy;	**4**
1(c)	EDGE programme identifies endangered species; being on the list highlights the species; enables conservation interventions to be made; with legal backing;	**2**
1(d)	education / raise awareness about conservation; improved local agricultural practices; to reduce deforestation; ban logging / reduce illegal logging; to preserve the habitat; captive breeding and release of orangutans; to increase numbers; employ locals in protection / ecotourism schemes; to provide alternative income streams / improve local investment in protection; governments give them legal protection; prevent people harming / killing / interfering with orangutans;	**4**

Question	Answer	Marks
2(a)	burning fossil fuels / industrial processes / car exhausts;	**1**
2(b)	*any two steps in the process to total two marks:* released chemicals / named react with oxygen; in the air; to form acids / named acids; acids dissolve in precipitation; and fall as wet precipitation;	**2**
2(c)	leads to defoliation / loss of leaves; reduces crop yield / reduces or decreases plant growth;	**2**
2(d)	reduce fossil fuel use; reduce vehicle emissions; use of catalytic converters; fit factory scrubbers; encourage switch to electric vehicles;	**2**

Question	Answer	Marks
3(a)(i)	7 632.8 (total population); % = (821.6 / 7632.8) × 100 = 10.76% 10.8(%);	**2**
3(a)(ii)	when all people, at all times, have physical, social and economic access to sufficient; safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life;	**2**
3(a)(iii)	population growth results in more people to feed, supply may not keep up with demand; unsustainable production, demand greater than supply; increase in homogeneity in global food supply; price setting, may not be able to afford food; land degradation, reduces crop yield so less food available; agricultural disease, reduces crop yield so less food available; diverting crops for biofuels, reduces food available to meet demand; climate change, damage to crops / land, e.g. flooding reducing food available; transportation issues due to natural disasters / war or conflict; water shortages, crops may fail so less food available; poverty, unable to afford food;	**4**
3(b)	Africa Rising works on local and individual projects / helping them and people around them; to educate / introduce new skills; to both genders; targets appropriate areas of agriculture for each project / improve agriculture; meaning a more guaranteed crop; reducing food insecurity;	**3**

Question	Answer	Marks
4(a)	borehole; aquifer; artesian well;	**2**
4(b)	precipitation / rain / snow / hail / spring;	**1**
4(c)	chemical pollution; named pollutant; from agriculture / industry; leaches into the ground; percolates; infiltrates; enters the groundwater stores;	**2**
4(d)	pollution of the stores affects water quality; could be toxic / lead to illness; reduces the availability of water / less water to use; could be long term damage to supply;	**3**

Question	Answer	Marks
4(e)	*any developed strategy explained for two marks:* sustainable water extraction and improved supply; e.g. piped supply / aquifers and artesian wells / boreholes / gravity-fed schemes / reservoirs and dams; reduction in water usage; e.g. improved irrigation techniques / growing crops less dependent on high water supply / recycling and rain water catchment; water meters / charging for water use; slows / reduces consumption of water / reduces waste of water; education on sustainable water use; example; poverty reduction; international agreement and water-related aid; rationing; e.g. hosepipe bans / car washing;	**2**

Question	Answer	Marks
5(a)(i)	transfer of energy;	**1**
5(a)(ii)	trophic level 3 / 3;	**1**
5(a)(iii)	trophic level 5 / 5;	**1**
5(a)(iv)	as heat; from respiration; as waste; e.g. faeces;	**2**
5(a)(v)	*any valid effects explained:* increase in phytoplankton; due to reduction in feeding by squid; increased predation by Orca on other species; because there is less squid to feed on; reduction in named species; due to increased predation / decreased food supply / migration; increase in named species; due to less predation;	**4**
5(b)(i)	oxygen; carbon dioxide; water;	**2**

Question	Answer	Marks
5(b)(ii)	*clockwise from top left-hand corner:* photosynthesis; respiration; combustion; decomposition; feeding; decomposition;	**3**
5(b)(iii)	increased release of carbon dioxide; extra carbon dioxide is trapped in the atmosphere; allows radiation from the sun to enter the atmosphere; changes to longer wave radiation; reflected back by carbon dioxide; increases the temperature / global warming; leading to increase in severe weather / climate events / named climate event;	**4**

Question	Answer	Marks
6	**'International agreements are the main reason why the populations of humpback, grey and blue whale species have increased over the past 50 years.'** **To what extent do you agree with this statement?** **Give reasons and include relevant information to support your answer.** The question requirements are to: • demonstrate understanding of the strategies which protect whale species • explain why agreements are difficult to introduce and enforce • discuss the success of the strategies. This question assesses AO2 and AO3 skills. **Indicative content** Answers should show understanding of the roles of the named organisations/protocols: CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora), an agreement between international governments to protect species of wild animals and plants from over-exploitation through international trade. It regulates this international trade by use of permits for both imports and exports. CITES is a conservation agreement with 183 parties. IWC (International Whaling Commission) is responsible for the management of whaling and conservation of whales which was set up in 1946. It has 88 member governments from countries around the world. The IWC regulates whaling and is also involved in other conservation issues such as bycatch and entanglement, ocean noise, pollution and debris, collision between whales and ships, and sustainable whale watching. Candidates may also refer to activist groups such as Greenpeace and Friends of the Earth and the disruption of whaling fleets and protests at traditional whaling festivals such as that in Iceland. Agreements were difficult especially with those countries with a tradition of whaling and using whale products. Quotas and bans were introduced and some level of monitoring took place. Some countries refused to accept quotas.	**20**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6</td><td>
Finding alternatives to whale-based products was also part of the strategy. The increase in numbers suggests some measure of success as the species have shown significant rises in populations.

Candidates could argue that the change has been brought about as a result in changing attitudes, less interest in whale-based products and as a consequence less of a market so it became unprofitable.

Generic levels of response
<table>
<tr><th>Level</th><th>AO2: Information handling and analysis</th><th>Marks</th></tr>
<tr><td>3</td><td>• Responses contain reasoned explanations with knowledge that indicates a strong conceptual understanding of the topic.
• Incorporates frequent use of directly relevant examples.</td><td>7–8</td></tr>
<tr><td>2</td><td>• Responses contain explanations with some gaps or errors in the reasoning.
• Explanations may lack detail or accurate knowledge.
• Examples are included but some opportunities to include relevant examples are missed.</td><td>4–6</td></tr>
<tr><td>1</td><td>• Responses contain a few general points, which are mainly descriptive, comprising a few simple points.
• Knowledge is basic and understanding may be poor and lack relevance to the question set.
• Irrelevant or no examples are given.</td><td>1–3</td></tr>
<tr><td>0</td><td>• No creditable response.</td><td>0</td></tr>
</table>
</td><td></td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6</td><td>
<table>
<tr><th>Level</th><th>AO3: Investigation skills and making judgements</th><th>Marks</th></tr>
<tr><td>4</td><td>• Clearly presents and develops both sides of the argument.
• Judgements are fully supported with relevant qualitative and/or quantitative information.
• Clear, balanced conclusion which is consistent with the question and candidate response.</td><td>10–12</td></tr>
<tr><td>3</td><td>• One side of the argument is better developed than the other.
• Judgements are partially supported with qualitative and/or quantitative information.
• Conclusion is consistent with the question and candidate response.</td><td>7–9</td></tr>
<tr><td>2</td><td>• Describes only one side of the argument.
• Judgements have minimal support; qualitative or quantitative information lacks relevance.
• Conclusion may be inconsistent with the question and candidate response.</td><td>4–6</td></tr>
<tr><td>1</td><td>• Response is descriptive
• Minimal judgement is made, unsupported by qualitative or quantitative information.
• Conclusion is inconsistent with the question and candidate response, or no conclusion made.</td><td>1–3</td></tr>
<tr><td>0</td><td>• No creditable response.</td><td>0</td></tr>
</table>
</td><td></td></tr>
</table>

Question	Answer	Marks
7	**Evaluate the success of strategies to manage energy security in a location of your choice.** **Give reasons and include relevant information to support your answer.** The question requirements are to: • show understanding of energy security • demonstrate knowledge of strategies to manage energy security • evaluate the success of the strategies described. This question assesses AO2 and AO3 skills. **Indicative content** Candidates should define energy security as the reliable availability of energy sources at an affordable price with a consideration of the environmental impacts. With reference to an appropriate location, candidates should discuss a range of strategies and evaluate their success. Candidates may refer to increasing energy efficiency in terms of production methods and strategies to reduce consumption and waste, which could include insulation systems, switching off lights, smart meters etc., increasing energy production through increasing development of generating systems, reducing reliance on fossil fuels, investing in renewable resources (with examples such as solar panel farms, HEP, tidal barrages and wind power, both domestic small scale and industrial size generation) and carbon neutral fuels, development of alternative energy technologies such as hybrid cars, fuel cells, investment in local energy projects and rationing.	**20**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7</td><td>Candidates should describe the strategy, explain why it is a valid response to energy insecurity and evaluate the relative success or otherwise.

Candidates may choose to compare different countries in their response.

<table>
<tr><th>Level</th><th>AO2: Information handling and analysis</th><th>Marks</th></tr>
<tr><td>3</td><td>• Responses contain reasoned explanations with knowledge that indicates a strong conceptual understanding of the topic.
• Incorporates frequent use of directly relevant examples.</td><td>7–8</td></tr>
<tr><td>2</td><td>• Responses contain explanations with some gaps or errors in the reasoning.
• Explanations may lack detail or accurate knowledge.
• Examples are included but some opportunities to include relevant examples are missed.</td><td>4–6</td></tr>
<tr><td>1</td><td>• Responses contain a few general points, which are mainly descriptive, comprising a few simple points.
• Knowledge is basic and understanding may be poor and lack relevance to the question set.
• Irrelevant or no examples are given.</td><td>1–3</td></tr>
<tr><td>0</td><td>• No creditable response.</td><td>0</td></tr>
</table>
</td><td></td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7</td><td>
<table>
<tr><th>Level</th><th>AO3: Investigation skills and making judgements</th><th>Marks</th></tr>
<tr><td>4</td><td>• Clearly presents and develops both sides of the argument.
• Judgements are fully supported with relevant qualitative and/or quantitative information.
• Clear, balanced conclusion which is consistent with the question and candidate response.</td><td>10–12</td></tr>
<tr><td>3</td><td>• One side of the argument is better developed than the other.
• Judgements are partially supported with qualitative and/or quantitative information.
• Conclusion is consistent with the question and candidate response.</td><td>7–9</td></tr>
<tr><td>2</td><td>• Describes only one side of the argument.
• Judgements have minimal support; qualitative or quantitative information lacks relevance.
• Conclusion may be inconsistent with the question and candidate response.</td><td>4–6</td></tr>
<tr><td>1</td><td>• Response is descriptive.
• Minimal judgement is made, unsupported by qualitative or quantitative information.
• Conclusion is inconsistent with the question and candidate response, or no conclusion made.</td><td>1–3</td></tr>
<tr><td>0</td><td>• No creditable response.</td><td>0</td></tr>
</table>
</td><td></td></tr>
</table>