

# Cambridge International AS Level

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**ENVIRONMENTAL MANAGEMENT****8291/12**

Paper 1 Principles of Environmental Management

**October/November 2024**

MARK SCHEME

Maximum Mark: 80

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**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 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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This document consists of **14** 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 descriptions 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.

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(a)(i)	<p><i>any three from:</i>  highest concentrations in Asia and Africa;  highest concentrations tend to be in northern hemisphere;  medium concentrations found in North America, Europe, Africa, Middle East and South Asia;  lowest concentrations at high latitudes / lowest concentrations in, Oceania / S America / Greenland;  between tropics mostly countries with a low concentration / mix of concentrations / countries with high concentration are between tropics;</p>	<b>3</b>
1(a)(ii)	<p>in the presence of sunlight;</p> <p><i>any two from reaction of ozone with:</i>  oxides of nitrogen;  particulates;  VOCs;</p>	<b>3</b>
1(a)(iii)	<p><i>any two from:</i>  (in plants it) decreases crop yields;  (in materials it) deteriorates, plastics / rubber;  smog reduces visibility when driving and may cause road accidents;</p>	<b>2</b>
1(b)	<p><i>any three from:</i>  reduce area of rice fields / aerate rice fields;  reduce landfill / burn landfill gases ;  reduce cattle farming;  reduce emissions from oil extraction;  legislation to limit emissions;  idea of protecting permafrost from melting / protect peat bogs;  reduce emissions from water treatment / reduce anaerobic digestion;</p>	<b>3</b>
1(c)(i)	<p>6.4 and 3.2 seen;  range given as 1 d.p.</p>	<b>2</b>

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Question	Answer	Marks
1(c)(ii)	<p><i>any three from:</i>            limited historical data;            named data sources e.g. tree rings, ice cores;            models use different variables;            climate feedback mechanisms not fully understood;            time delay between cause and effect;            uncertainty over the use of some data / not knowing how the data is used;            so many sources of carbon dioxide so hard to track;</p>	<b>3</b>

Question	Answer	Marks
2(a)(i)	<p><i>any five from:</i></p> <p><i>method:</i>            use sweep net to catch the dragonflies;            mark dragonflies caught;            in a period of time e.g. 60 minutes;            in the measured sample area;</p> <p><i>control of variables:</i>            idea of control of variables;            same time of day;            same amount of time (60 mins);            same sweep net method;            same areas;</p> <p><i>repeating:</i>            repeat whole investigation and calculate mean;            repeat whole investigation at different times of year;</p> <p><i>estimating population:</i>            scaling up described;            use Lincoln index to estimate the population;</p>	<b>5</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(a)(ii)	<p><i>any three from:</i>            dragonflies, fly quickly / hard to catch;            dragonflies will be scared out of the area / migrate;            (sweep nets) may damage the dragonflies;            paint may damage wings ;            paint may make dragonflies more susceptible to predators;            idea of hard to control variables e.g. weather dependent;</p>	<b>3</b>
2(b)(i)	963;	<b>1</b>
2(b)(ii)	<p><i>any three from:</i>            habitat loss / draining wetlands / deforestation / urbanisation / fragmentation;            (impact of) agricultural practices;            lack of prey;            increase of dragonfly predators;            use of insecticides / pesticides;            invasive species;            disease;            climate change;</p>	<b>3</b>
2(c)(i)	<p>food chain with 4 trophic levels;            arrows in correct direction;</p>	<b>2</b>
2(c)(ii)	frog / thrush;	<b>1</b>
2(c)(iii)	<p><b>A</b> circled;  <i>any two from:</i>            energy cannot be created;            energy lost at each trophic level / energy decreases up the food chain;            named example of energy loss e.g. respiration / movement / death etc;</p>	<b>3</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
3(a)(i)	<p><i>any two from:</i>            uses renewable energy / or named example e.g. wind;            no fossil fuels used;            removes carbon dioxide from the atmosphere;            carbon dioxide out equals carbon dioxide in / no carbon dioxide produced;</p>	<b>2</b>
3(a)(ii)	<p><i>any three from:</i>            lack of technology / infrastructure;            lack of skilled labour;            less renewable energy sources;            more reliant on fossil fuels / infrastructure set up for fossil fuels;            lack of funding;</p>	<b>3</b>
3(b)(i)	<p><i>any three from:</i>  <u>reliable</u> energy supply;            at an affordable price;            with a consideration for the environment;            available in the short and long term / at all times;</p>	<b>3</b>
3(b)(ii)	<p><i>any four from:</i>  <i>positive (max 3):</i>            allows all people to have some access to energy;            encourages people to conserve energy;            encourages development of energy conservation strategies;</p> <p><i>negative (max 3):</i>            limits industrial production;            limits economic development;            can cause unemployment;            can be a cause of conflict;</p>	<b>4</b>



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Question	Answer	Marks
3(b)(iii)	<i>any two from:</i> increasing energy efficiency; increasing energy production; reducing reliance on fossil fuels; investing in renewable resources; development of alternative energy technologies; investment in local energy projects;	<b>2</b>

Question	Answer	Marks
4(a)	<i>any three from:</i> mass in recycled / composted increases; mass incinerated increases; mass in landfill decreases; comparative data quote;	<b>3</b>
4(b)(i)	<i>any two from:</i> can be used to produce energy; source of jobs; growth of local economy / more money for locals; reduces landfill / large area not required for landfill; reduces waste dumped into ocean;	<b>2</b>
4(b)(ii)	<i>any two from:</i> produces ash / particulates / carbon dioxide / heavy metals / named pollutant; large number of trucks / ships; unpleasant odour; visual pollution; noise pollution	<b>2</b>
4(b)(iii)	<i>any two from:</i> reduce / reuse / recycle; use biodegradable plastic;	<b>2</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(c)	<i>any three from:</i> toxins leach (from landfill); (toxins) in soil and ground water; organisms / producers, take in toxins; higher trophic levels consume lower trophic levels; concentration of toxins increases up the food chain;	<b>3</b>

Question	Answer	Marks
5	<p>Reducing food waste is the most effective strategy for managing food security. To what extent do you agree with this statement? Give reasons and include information from relevant examples to support your answer.</p> <p>The question requirements are to:</p> <ul style="list-style-type: none"> <li>• show an understanding of food security</li> <li>• describe causes of food insecurity and threats to food security, including: <ul style="list-style-type: none"> <li>• population growth</li> <li>• unsustainable production, increase in</li> <li>• homogeneity in global food supply</li> <li>• price setting</li> <li>• land degradation</li> <li>• agricultural disease</li> <li>• diverting crops for biofuels</li> <li>• climate change</li> <li>• water shortages</li> <li>• poverty</li> </ul> </li> <li>• describe strategies for reducing food wastage</li> <li>• describe other strategies for managing food security, including: <ul style="list-style-type: none"> <li>• subsistence agriculture</li> <li>• increase food production by intensification and extensification</li> <li>• improved agricultural techniques and efficiency <ul style="list-style-type: none"> <li>- aquaculture and hydroponics</li> <li>- use of selective breeding and genetically modified (GM) crops to developing pest-resistant crops and crops with a higher yield</li> <li>- controlling limiting factors, e.g. use of fertilisers in areas short of nutrients</li> <li>- increasing productivity by removing competition from weeds by the use of herbicides, reducing fungal disease by use of fungicides, reducing pest species by use of biological control</li> </ul> </li> </ul> </li> <li>• reduction in livestock and increase in growing crops</li> <li>• large-scale food stockpiling</li> <li>• improve transportation of food</li> <li>• protecting pollinating insects</li> </ul>	20

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5	<ul style="list-style-type: none"> <li>• the World Food Programme and food aid</li> <li>• rationing</li> <li>• evaluate the statement with particular consideration for ‘most effective’</li> </ul> <p>Candidates may use specific examples of individual, local and national schemes to reduce food waste, including case studies.</p> <p>The wide range of schemes will all have limitations that may be outlined by candidates.</p> <p>Candidates need to focus on ‘most effective’ when evaluating the statement.</p> <p>Candidates are likely to disagree that reducing food wastage is the most effective strategy but their answer should be balanced. Answers should be supported by case studies / relevant examples where this provides balanced evidence.</p>	

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Question	Answer	Marks
6	<p>Evaluate geo-engineering as a strategy for counteracting climate change. Give reasons and include information from relevant examples to support your answer.</p> <p>The question requirements are to:</p> <ul style="list-style-type: none"> <li>• show an understanding of climate change, including:</li> <li>• the natural and enhanced greenhouse effects</li> <li>• show an understanding of the impacts of climate change, including:</li> <li>• temperature and precipitation</li> <li>• sea level</li> <li>• ocean and wind circulation</li> <li>• melting of sea ice, ice sheets, glaciers and permafrost</li> <li>• species distribution and biodiversity</li> <li>• describe geo-engineering strategies, including:</li> <li>• albedo management</li> <li>• space reflectors</li> <li>• stratospheric aerosols</li> <li>• evaluate geo-engineering strategies now and in the future</li> <li>• evaluate geo-engineering strategies on a local, country and global level</li> </ul> <p>Candidates may use specific examples of individual, local, national and international strategies including case studies. The examples should be balanced and show successful and less successful strategies.</p> <p>Candidates should describe the limitations of the strategies.</p> <p>Candidates are likely to be split over their conclusion but their answer should be balanced. Answers should be supported by case studies / relevant examples where this provides balanced evidence.</p>	20

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<b>Level</b>	<b>AO2: Information handling and analysis</b>	<b>Marks</b>
3	<ul style="list-style-type: none"> <li>• Responses contain reasoned explanations with knowledge that indicates a strong conceptual understanding of the topic.</li> <li>• Incorporates frequent use of directly relevant examples.</li> </ul>	7–8
2	<ul style="list-style-type: none"> <li>• Responses contain explanations with some gaps or errors in the reasoning.</li> <li>• Explanations may lack detail or accurate knowledge.</li> <li>• Examples are included but some opportunities to include relevant examples are missed.</li> </ul>	4–6
1	<ul style="list-style-type: none"> <li>• Responses contain a few general points, which are mainly descriptive, comprising a few simple points.</li> <li>• Knowledge is basic and understanding may be poor and lack relevance to the question set.</li> <li>• Irrelevant or no examples are given.</li> </ul>	1–3
0	<ul style="list-style-type: none"> <li>• No creditable response.</li> </ul>	0

<b>Level</b>	<b>AO3: Investigation skills and making judgements</b>	<b>Marks</b>
4	<ul style="list-style-type: none"> <li>• Clearly presents and develops both sides of the argument.</li> <li>• Judgements are fully supported with relevant qualitative and / or quantitative information.</li> <li>• Clear, balanced conclusion which is consistent with the question and candidate response.</li> </ul>	10–12
3	<ul style="list-style-type: none"> <li>• One side of the argument is better developed than the other.</li> <li>• Judgements are partially supported with qualitative and / or quantitative information.</li> <li>• Conclusion is consistent with the question and candidate response.</li> </ul>	7–9
2	<ul style="list-style-type: none"> <li>• Describes only one side of the argument.</li> <li>• Judgements have minimal support, qualitative or quantitative information lacks relevance.</li> <li>• Conclusion may be inconsistent with the question and candidate response.</li> </ul>	4–6
1	<ul style="list-style-type: none"> <li>• Response is descriptive.</li> <li>• Minimal judgement is made, unsupported by qualitative or quantitative information.</li> <li>• Conclusion is inconsistent with the question and candidate response, or no conclusion made.</li> </ul>	1–3
0	<ul style="list-style-type: none"> <li>• No creditable response.</li> </ul>	0