CAMBRIDGE
International Education

Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT **8291/13**

Paper 1 Principles of Environmental Management **October/November 2025**

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 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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	<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.

Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	correct point or mark awarded
	incorrect point or mark not awarded
BOD	benefit of the doubt given
TV	response is too vague or there is insufficient detail in response
ECF	error carried forward applied
^	information missing or insufficient for credit
I	incorrect or insufficient point ignored while marking the rest of the response
R	incorrect point or mark not awarded
LNK	two statements are linked
SEEN	point has been noted, but no credit has been given or blank page seen

Annotation	Meaning
	key point attempted / working towards marking point / incomplete answer / response seen but not credited / blank page seen
	blank page
	Assessment Objective (AO), number corresponds to AO**1**, AO**2** etc.
	Level of Response. Number indicates the level awarded to the response (mark scheme details mark ranges for each level)
	correct awarding one mark from marking point or marking group 1. similar numbered ticks are used for marking point or marking groups 2, 3, 4 etc.
	response has not answered question
	contradiction in response, mark not awarded

Question	Answer	Marks
1(a)(i)	*one mark per high, medium, low description:* *high population density:* **M1** high density mainly in southern Asia / India; **M2** some high density in Europe / Africa / Caribbean; *medium population density:* **M3** medium density mainly in the Americas / South America; **M4** some medium density in Africa / Europe / Asia; **M5** majority of world / countries has medium density; *low population density:* **M6** low density mainly in Oceania / northern Asia / northern North America / Canada; **M7** some low density in Africa / South America; **M8** low density tends to be at high latitudes;	**3**
1(a)(ii)	*support:* **M1** both countries are shaded the same / both countries are medium density; *does not support:* **M2** density ranges from 10 to 199 people per km^2 / medium covers a range of densities;	**2**
1(a)(iii)	**M1** 4(.1); **M2** low;	**2**

Question	Answer	Marks
1(b)	*any one from each of:* *environmental:* **M1** soil fertility / topography / climate / availability of resources e.g. food or water / ref. to natural disasters; *economic:* **M2** wages / job opportunities; *social:* **M3** healthcare / infrastructure / schools / politics / culture / religion;	**3**
1(c)(i)	MIC circled;	**1**
1(c)(ii)	*any two from:* **M1** wide base / mostly young people / large number of young children; **M2** idea of gradual taper / getting narrower / decreasing number of older people; **M3** some in highest age categories;	**2**
1(d)	*any three from:* **M1** less people in work force / employment; **M2** lower tax revenue; **M3** economy decreases / economic recession; **M4** higher pension spending; **M5** pressure on health care; **M6** pressure to raise retirement age; **M7** ageing population can share experience with younger population;	**3**

Question	Answer	Marks
2(a)(i)	*any three from:* **M1** reliable availability of energy; **M2** at an affordable price; **M3** consideration for environmental impacts; **M4** allows economic developments;	**3**
2(a)(ii)	*any two from:* **M1** decreases energy security / increases energy insecurity; **M2** pirates take control of tankers / pipelines; **M3** disrupts supply; **M4** increases prices;	**2**

Question	Answer	Marks
2(a)(iii)	*any four from: (max 3 from benefits or limitations)* *benefits:* **M1** fossil fuels are cheaper; **M2** fossil fuels are widely available / abundant; **M3** fossil fuels are energy dense; **M4** simple / known technology available; *limitations:* **M5** fossil fuels are finite / will run out / non-renewable; **M6** increased emissions of carbon dioxide / greenhouse gases / ref. to increased enhanced greenhouse effect; **M7** leads to climate change / description of climate change / global warming; **M8** greater concentrations of smog / particulates; **M9** not all countries have alternative technology / not all countries have access to renewables e.g. no suitable coast for tidal / no suitable rivers for hydroelectric / not all countries have nuclear technology;	**4**
2(b)(i)	**M1** line graph **and** both axes labelled as year and percentage of the population; **M2** linear scale so that plotted points occupy at least half of the grid; **M3** points plotted correctly ± ½ small square;;	**4**
2(b)(ii)	45 (%);	**1**

Question	Answer	Marks
2(b)(iii)	*any two from:* **M1** increase jobs / increased working hours; **M2** increase industry; **M3** improved health care; **M4** improved education; **M5** improved / allows access to internet; **M6** decrease poverty; **M7** decrease civil unrest / conflict;	**2**

Question	Answer	Marks
3(a)(i)	*any four from any two methods:* **M1** water; **M2** freely available through pipes / enough water supply / getting the same amount of water; **M3** nutrients / mineral ions; **M4** dissolved in water / supplied at optimum concentration; **M5** space; **M6** optimum spacing between plants / plants have enough space to thrive; **M7** light; **M8** plants on a slope prevents shading / maximises light; **M9** weeds / other competing plants; **M10** weeds can be removed / no weeds present;	**4**

Question	Answer	Marks
3(a)(ii)	*any four from: (max 3 from benefits or limitations)* *benefits:* **M1** increased yield; **M2** increased crop quality; **M3** all year production / no seasonality; **M4** high crop value; **M5** reduced use of pesticides / pests can be controlled; **M6** reduced use of fertilisers; *limitations:* **M7** expensive infrastructure / not everyone can afford it; **M8** requires expertise; **M9** requires large workforce / labour intensive; **M10** only useful for certain crops; **M11** high energy cost / requires artificial light / requires heat;	**4**
3(b)(i)	*any two from:* **M1** all people at all times have access; **M2** sufficient safe and nutritious food; **M3** to meet dietary needs / for active / for healthy life;	**2**

Question	Answer	Marks
3(b)(ii)	*any three from:* **M1** subsistence agriculture; **M2** intensification; **M3** extensification / expanding agriculture; **M4** aquaculture; **M5** selective breeding; **M6** GM crops; **M7** use of fertilisers; **M8** use of pesticides / insecticides / fungicides; **M9** reduction in livestock; **M10** reducing food waste; **M11** large-scale stockpiling; **M12** improved transport / storage of food; **M13** protecting pollinating insects; **M14** food aid; **M15** rationing / food equally distributed;	**3**

Question	Answer	Marks
4(a)(i)	8 (km);	**1**
4(a)(ii)	A;	**1**
4(b)(i)	*any three from:* **M1** ground level ozone; **M2** forms photochemical smog; **M3** eye irritation; **M4** respiratory irritation / any named respiratory issue e.g. asthma, lung cancer; **M5** damages crops and causes malnutrition;	**3**
4(b)(ii)	*any three from:* **M1** absorbs UV / shortwave radiation; **M2** prevents UV reaching Earth surface; **M3** prevents cataracts; **M4** prevents cancer;	**3**
4(c)(i)	**M1** increases (1980 to 2022); **M2** levels off / fluctuates (1998 to 2022);	**2**
4(c)(ii)	**M1** 2 and 25 seen; **M2** 1150 / correct value from their values;	**2**

Question	Answer	Marks
4(d)	*any three from:* **M1** CFCs; **M2** from aerosols / refrigerants; **M3** CFCs are unreactive / don't react in lower atmosphere / accumulate in stratosphere or upper atmosphere; **M4** (CFCs) broken down by UV; **M5** releases chlorine (atom); **M6** chlorine (atom) reacts with ozone / breaks down ozone; **M7** chlorine (atom) remains;	**3**

Question	Answer	Marks
5	**'Local human activities have a greater impact on tropical rainforests than global climate change.'** The question requirements are to: • describe the impacts of human activities on tropical rainforests • describe impacts of climate change on tropical rainforests • evaluate the statement with particular emphasis on 'greater impact than'. Candidates may describe the impacts of human activities including: • deforestation • fragmentation • timber / fuel collection • mineral extraction • hydroelectric and reservoir projects • exploitation of species • agricultural development • urbanisation Candidates may describe the impacts of climate change on tropical rainforests including: • change in biodiversity / forest composition • spread of fungal diseases • species change • stated effect on photosynthesis • spread of pests Candidates are likely to be split about which will have the greatest impact but their reasoning should be balanced. Candidates may argue that climate change is a human activity so impacts are the same. Answers should be supported by case studies / relevant examples where this provides balanced evidence.	**20**

Question	Answer	Marks
6	**Evaluate the success of legislation and protocols as methods of conserving biodiversity.** Give reasons and include information from relevant examples to support your answer. The question requirements are to: • show an understanding of the importance of biodiversity • describe unsustainable and sustainable harvesting • describe legislations and protocols • evaluate the success of legislation and protocols. Candidates may describe the importance of biodiversity including: • genetic variation • preventing extinction • effects on food chains / food production • potential sources of medicines • resources of food and materials. Candidates may describe examples of sustainable and unsustainable harvesting in a local, national or global context. Candidates may describe legislations and protocols including CITES, IWC, EUCFP, ITTO, IUCN (detailed knowledge of policy details is not required). Candidates may describe other ways of maintaining biodiversity e.g. EDGE awareness programme, national parks etc. Candidates should evaluate the success of the legislations and protocols including relevant examples. Candidates are likely to be divided over the success of the strategies but their reasoning should be balanced. Answers should be supported by case studies / relevant examples where this provides balanced evidence.	**20**

Question	Answer	Marks
	Mark levels for Question 5 and Question 6 This question assesses AO2 and AO3 skills. Award a mark for each AO separately. The mark awarded will be the total of the marks awarded for AO2 and AO3. Marks should be awarded based on a judgement of the overall quality of the response for that AO, rather than awarding marks for specific points. Indicative content is provided as a guide. Inevitably, the mark scheme cannot cover all responses that candidates may make for all of the questions. In some cases, candidates may make some responses which the mark scheme has not predicted. These answers should nevertheless be credited according to their quality. **Instructions for using the levels** Start from the top level for each AO and read down until you meet the level that 'best fits' the response. An answer needs to show evidence of most, but not necessarily all, of the qualities described in a level. Use the following guide to decide which mark to give within the level: • Consistently meets the level criteria mark at top of level. • Meets most of criteria but with some inconsistency mark at middle of level. • On the borderline of this level and the one below, mark at bottom of level. Award a mark for each AO separately. Then add the two marks together to arrive at the total mark for the response.	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td></td><td>
<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>

Question	Answer	Marks

Level	AO3: Investigation skills and making judgements	Marks
4	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.	**10–12**
3	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.	**7–9**
2	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.	**4–6**
1	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.	**1–3**
0	No creditable response.	**0**