CAMBRIDGE
International Education

Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT **8291/13**

Paper 1 Principles of Environmental Management **May/June 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 May/June 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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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.

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)	*any three from:* **M1** house present; **M2** other crops seen / bananas also growing; **M3** small fields / small plots of land / small scale; **M4** no mechanisation / buffalo used for ploughing; **M5** farmer has **hand** tools / farmer doing manual labour; **M6** buffalo used for, meat / milk; **M7** farmer working alone;	**3**
1(a)(ii)	*any two from:* **M1** grow a larger variety of crops / keep farm animals; **M2** use fertilisers; **M3** use pest-resistant crops / high-yielding seeds or crops; **M4** use pesticides / biological control / insecticides / herbicides; **M5** grow cash crops; **M6** become a commercial farmer / intensification / extensification / mechanisation / agroforestry / keep more buffalo / **improve** food storage;	**2**

Question	Answer	Marks
1(b)(i)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ one mark for all formulae correct; one mark for balancing equation;	**2**
1(b)(ii)	*any three from:* **M1** methane is a greenhouse gas; **M2** absorbs / traps (more) infrared / IR / longwave (radiation); **M3** energy prevented from escaping the atmosphere / reflected back to Earth's surface; **M4** (absorbed infrared radiation) warms the atmosphere / leads to temperature increase;	**3**
1(b)(iii)	*any two from:* **M1** they photosynthesise; **M2** they are consumed / eaten (by herbivores / consumers); **M3** they can be combusted; **M4** they form organic waste / are excreted by animals; **M5** they form a carbon store;	**2**

Question	Answer	Marks
1(c)	*any two ways explained:* **M1** can be used to plough / transport goods / replace tractors / buffalo easy to maintain; **AND** **M2** limits, use of fossil fuels / energy consumption / buffalo eats leftover crops; **M3** provides, manure / nutrients for soil; **AND** **M4** reduces need for fertiliser / used as a natural fertiliser / improve soil structure; **M5** can reproduce; **AND** **M6** no need to keep replacing expensive machinery / offspring can be sold for profit / increases farmers income; **M7** provides, milk / meat; **AND** **M8** food for, family / income;	**4**

Question	Answer	Marks
2(a)(i)	510;	**1**
2(a)(ii)	*any one from:* **M1** not all individuals are counted / can't capture all / only capture some of the population; **M2** not all of area covered; **M3** based on one instant in time / time taken between samples is small compared to lifespan;	**1**
2(a)(iii)	**M1** only shrews are sampled / Lincoln Index (only) estimates populations; **M2** biodiversity includes all, species / organisms / Simpson's Index (of Diversity) used for (bio)diversity;	**2**
2(b)	**Due to an issue with question 2(a)(b), the question has been removed from the question paper.**	**4**
2(c)(i)	*any three from:* **M1** all regions show an overall decrease in LPI; **M2** North America has smallest decrease in LPI / North America (small) increase 2010 to 2018; **M3** South America and Caribbean has the greatest decrease in LPI; **M4** greatest rate of decrease in LPI is, between 1970 and 1990 / at the start; **M5** manipulated / comparative, data quote e.g. world index decreases by 69%;	**3**

Question	Answer	Marks
2(c)(ii)	*any three from:* **M1** resources of potential medicines; **M2** food / wood / fibres / oils / fuels; **M3** (maintains) diversity in genes; **M4** ecological services / ecological value e.g. pollination, air purification, prevents soil erosion, food security; **M5** cultural value;	**3**

Question	Answer	Marks
3(a)	*any three from:* **M1** (use of) a waste product; **M2** limits need for waste disposal; **M3** free / cheap, source of energy; **M4** renewable source of energy / sustainable; **M5** idea of carbon neutral;	**3**
3(b)	*any five from:* **M1** (combustion) releases carbon dioxide; **M2** enhanced greenhouse effect / increased global temperatures / climate change; **M3** (combustion) releases particulates; **M4** forms smog; **M5** eye irritation / respiratory irritation / described impact on human health; **M6** decreased crop yield; **M7** deterioration of plastics and rubber; **M8** (clay mining) uses large areas of land; **M9** habitat destruction / fragmentation; **M10** animals forced to migrate; **M11** described impact on food chain;	**5**

Question	Answer	Marks
3(c)(i)	oil;	**1**
3(c)(ii)	idea that less energy was produced (than in the previous year);	**1**
3(c)(iii)	all non-renewables increased;	**1**
3(c)(iv)	*any three from:* **M1** reliable availability of energy / availability to all people at all times; **M2** at an affordable price; **M3** consideration for environmental impacts; **M4** short-term security described; **M5** long-term security described;	**3**
3(c)(v)	*any three from:* **M1** increase energy, efficiency / conservation; **M2** increase energy production; **M3** increase diversity of (energy) resources; **M4** reduce reliance on fossil fuels / non-renewable energy sources; **M5** invest in, renewables / carbon neutral fuels; **M6** develop alternative technologies; **M7** invest in local energy projects; **M8** rationing / legislation e.g. tariffs on fossil fuels;	**3**

Question	Answer	Marks
4(a)(i)	*any one from:* **M1** sodium / potassium / magnesium / calcium / soluble salts / salt ions; **M2** accumulate in the topsoil; **M3** salt-rich water added through irrigation; **M4** inappropriate use of fertilisers adds salts; **M5** (submergence with) sea water; *any two from:* **M6** water evaporates leaving salts behind / too much water removed from it; **M7** (capillary movement of water) draws salts to the soil surface; **M8** poor drainage / waterlogging, prevents salts leaching away; **M9** removal of plants stops salts being taken up;	**3**

Question	Answer	Marks
4(a)(ii)	*any four from:* *benefits max 3:* **M1** prevents, wilting / reduction in crop yield; **M2** good coverage of crop / large areas covered; **M3** large volume of water can be supplied; **M4** doesn't require much labour / automated / time efficient; **M5** agrochemicals e.g. fertilisers, pesticides, can be added; *limitations max 3:* **M6** requires energy; **M7** cost of equipment / expensive to, install / build / maintain; **M8** requires flat land; **M9** (wheels) compact soil / damage soil; **M10** requires a large water source; **M11** can cause water insecurity / wastes water;	**4**
4(b)(i)	**M1** *x*-axis labelled **volume** with unit **and** *y*-axis labelled **yield** with unit; **M2** linear scale on both axis with data occupying at least half of the grid; **M3** 5–6 correct points plotted to within ±half of a small square; **M4** line graph with a smooth curve or points joined point to point;	**4**

Question	Answer	Marks
4(b)(ii)	*any two from:* **M1** (water needed for) photosynthesis; **M2** water is a limiting factor (in photosynthesis); **M3** (photosynthesis) produces glucose / sugars / energy, for growth; **M4** idea that crop / fruit / seed, needs water (for development); **M5** water prevents wilting; **M6** (water needed for) nutrient uptake;	**2**

Question	Answer	Marks
5	**'Agricultural diseases are the main threat to global food security.'** **To what extent do you agree with this statement?** The question requirements are to: • show an understanding of the threats to global food security • describe the effect of disease on crops and animals and how they can be managed • describe the impacts of food insecurity • describe strategies for improving food security • evaluate the statement with particular emphasis on 'the main threat'. This question assesses AO2 and AO3 skills. **Indicative content** Candidates may describe threats to food security, including population growth, unsustainable production, homogeneity of crops, price setting, land degradation, diverting crops for biofuels, climate change, water shortage, poverty etc. Candidates may describe local, national and global impacts of food insecurity including poverty, nutritional deficiency and malnutrition, famine, death, forced migration, conflict etc. Candidates may suggest and evaluate strategies that can be used to manage agricultural diseases such as subsistence agriculture, intensification, reduction in livestock, reducing food waste, protecting pollinating insects, international programmes, rationing and improved agricultural techniques such as aquaculture, hydroponics, GM, selective breeding, fertilisers, pesticides. Candidates are likely to be split about the effectiveness of the strategy but their reasoning should be balanced. Answers should be supported by case studies / relevant examples where this provides balanced evidence.	**20**

Question	Answer	Marks
6	**Evaluate the success of sustainable water extraction and improved supply as strategies for managing water security.** **Give reasons and include information from relevant examples to support your answer.** The question requirements are to: • show an understanding of water security • explain the causes of water insecurity • explain the impacts of water insecurity • evaluate the success of the strategy. This question assesses AO2 and AO3 skills. **Indicative content** Candidates may describe local, regional, national and global threats to water security including climate change, natural disasters, pollution events, inadequate sanitation, population growth, competing demands, mismanagement of irrigation, international competition and inequality of availability. Candidates may describe individual, local, national and global impacts including reduced crop yield, crop failure, livestock death, food shortage, malnutrition, famine, illness. Candidates should describe sustainable extraction and improved supply including piped supply, aquifers, artesian wells, boreholes, gravity-fed schemes, reservoirs and dams. Candidates are likely to conclude that the strategies are ineffective, but their reasoning should be balanced. Answers should be supported by case studies / relevant examples where this provides balanced evidence.	**20**

Levels of response Question 5 and Question 6

Level	AO2: Information handling and analysis	Marks
3	• Responses contain reasoned explanations with knowledge that indicates a strong conceptual understanding of the topic. • Incorporates frequent use of directly relevant examples.	**7–8**
2	• 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.	**4–6**
1	• 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.	**1–3**
0	No creditable response.	**0**

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**