Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT	8291/21
Paper 2 Management in Context	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.

This document consists of **17** printed pages.

[Turn over

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
BP	blank page
A1	Assessment Objective (AO), number corresponds to AO**1**, AO**2** etc.
L1	Level of Response. Number indicates the level awarded to the response (mark scheme details mark ranges for each level)
✔ **1**	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.
NAQ	response has not answered question
CON	contradiction in response, mark not awarded

Question	Answer	Marks
1(a)(i)	(gas that) absorbs infrared radiation;	1
1(a)(ii)	explosion;	1
1(b)(i)	**M1** bar plotted at 205; **M2** same width **and** same gap between bars;	2
1(b)(ii)	110;	1
1(b)(iii)	*any two from:* **M1** permafrost (melting); **M2** oceans (outgassing); **M3** decaying vegetation; **M4** animals (waste or respiration); **M5** volcanoes (outgassing or erupting);	2
1(b)(iv)	*any three from:* **M1** different variables (fed into different models); **M2** uncertainty over data (input or output); **M3** feedback mechanisms not fully understood; **M4** not all sources or sinks are known; **M5** differences in technologies or advancements;	3

Question	Answer	Marks
2(a)(i)	*any one from:* **M1** may stress or frighten the animals; **M2** increased risk of predation; **M3** reduces chance of breeding success; **M4** time consuming;	**1**
2(a)(ii)	n_1 (total) number of individuals captured in first sample; n_2 number of individuals captured in second sample both marked and unmarked; m_2 number of **marked individuals** recaptured in second sample;	**3**
2(b)	*any three from:* **M1** (only) continent of Africa; **M2** highest in south(east) of Africa / mostly southern tip of continent; **M3** (highest in) region of Tropic of Capricorn (in Africa) / mostly south of Equator / mostly southern hemisphere; **M4** relevant quoted data; e.g. 1001–2500 in South of Africa	**3**
2(c)(i)	**1970–1975** circled;	**1**

Question	Answer	Marks
2(c)(ii)	*any three from:* **M1** national park created; **M2** hunting or poaching ban; **M3** patrols / surveillance; **M4** international protection e.g. IUCN red list; **M5** increased awareness / education (on conservation); **M6** captive breeding programme;	3
2(d)(i)	March / Mar;	1
2(d)(ii)	10;	1
2(d)(iii)	*any three from:* **M1** high rainfall; **M2** high temperatures bake soil; **M3** ground cannot absorb water; **M4** leads to flooding; **M5** climate change leads to extreme weather;	3
2(d)(iv)	provides place to avoid (flood)water / mounds provide high ground;	1

Question	Answer	Marks
2(d)(v)	*any two from:* **M1** predation; **M2** hunting / poaching; **M3** competition for **named resource**, e.g., food / water / shelter / space; **M4** disease / pests;	**2**

Question	Answer	Marks
3(a)(i)	producer;	**1**
3(a)(ii)	(Arctic) walrus	**1**
3(a)(iii)	*any five from:* **M1** energy **decreases** (between trophic or feeding levels or from phytoplankton to polar bear); **M2** amount transferred is approximately 10% (between trophic or feeding levels or from phytoplankton to polar bear); **M3** between **EACH** trophic or feeding levels or from phytoplankton to polar bear, **energy is lost** from the food chain; *reasons for decrease in energy:* **M4** not every part of organisms is eaten; **M5** some parts of organisms are not digested; **M6** some energy lost as, waste (products) / urine / faeces / excretion; **M7** energy released as heat or thermal energy; **M8** due to, digestion / respiration / metabolic processes / movement / reproduction / growth;	**5**

Question	Answer	Marks
3(b)(i)	*any one from:* **M1** reduction in sea ice / (sea) ice has melted; **M2** travelling further to find food / reduction in food supply;	1
3(b)(ii)	*any two from:* **M1** uses up energy reserves; **M2** risk of disease in large groups; **M3** increased risk of predation; **M4** increased risk of coming into contact with humans;	2
3(c)(i)	*any three from:* **M1** difficult to see or count walruses from space; **M2** idea of walruses huddled together so difficult to see or count individuals; **M3** walruses move around / walruses may be below water or hidden; **M4** satellite imagery can't be used when cloudy; **M5** expense of satellite; **M6** using, non-scientists / non-experts / amateurs; **M7** requires people to make judgement / confused with other animals; **M8** idea of big data with lots of satellite images to sort through / time consuming (to analyse data);	3

Question	Answer	Marks
3(c)(ii)	*any two from:* **M1** volunteers do not need to be paid; **M2** partly automated / less time-consuming (than going to walruses); **M3** do not need to go to where walruses are / doesn't disturb walruses or environment; **M4** can cover a large area / large amount of data; **M5** raises awareness;	2
3(c)(iii)	crowd sourcing;	1

Question	Answer	Marks
4(a)(i)	*any two from:* **M1** consider safe access; **M2** know the depth; **M3** (know the) structure of river bed; **M4** (know the) flow or velocity of water; **M5** (know the) direction of water flow; **M6** (know the) weather forecast / risk of flash flooding; **M7** wear appropriate or protective clothing; e.g., closed shoes or boots / gloves	2

Question	Answer	Marks
4(a)(ii)	*any five from:* *method of disturbance:* **M1** disturb or kick, riverbed; **M2** disturb or kick for stated period; *method of sampling:* **M3** use systematic or random sampling of site / or method described; *location:* **M4** sample collected downstream of disturbance; **M5** (opening of) net facing upstream; *method of counting and processing:* **M6** idea of decanting sample into bucket; **M7** identify mayfly nymph **and** count sample; **M8** repeat **and** average (at same location); **M9** repeat **and** average at different, times / location;	5
4(b)	*any two from:* **M1** yes **and** highest abundance in <u>May</u> and pH 7; **M2** no **and** <u>September</u> low abundance and pH 7; **M3** no **and** other factors also influence abundance;	2

Question	Answer	Marks
4(c)(i)	*any four from:* **M1** deposition can be wet or dry; **M2** fossil fuels contain sulfur (compounds); **M3** (combustion of fossil fuels) releases sulfur dioxide or SO_2 gas; **M4** (sulfur dioxide or SO_2) reacts with water **and** oxygen; **M5** forms, sulfuric acid / H_2SO_4;	4
4(c)(ii)	*any two from:* **M1** defoliation / loss of leaves (of plants or crops); **M2** reduced crop yield; **M3** (enhanced) chemical weathering; **M4** damage to, **limestone** buildings / marble statues / metal structures; **M5** (dry acid deposition) causes **named** health issue e.g., respiratory lung disease, asthma, bronchitis;	2

Question	Answer	Marks
5(a)(i)	*any three from:* *treated toilet waste:* **M1** better sanitation / reduces risk of diseases / reduces risk of contamination of water sources; **M2 named** disease or illness e.g. diarrhoea / cholera / dysentery; *clean water produced:* **M3** clean water can be used for **named purpose**; e.g., irrigation / household use *closed system:* **M4** reduces risk of leakage into water sources; **M5** reduces open defecation (prevents water contamination); **M6** water (for flushing), is produced from toilet waste / is recycled; **M7** less water is used;	3
5(a)(ii)	*any two from:* **M1** provides source of electricity or energy; **M2** no chemicals added to toilet (which could contaminate water sources); **M3** no pit needs to be dug to store waste; **M4** ash can be used as a **fertiliser**;	2

Question	Answer	Marks
5(b)	*any two from:* **M1** water demand in increasing; **M2** water availability is decreasing; **M3** rate of increase and decrease the same; **M4** demand exceeds availability in or after 2040;	**2**
5(c)(i)	**M1** axes labels and units: volume of water / billion m^3 **and** all years indicated / year; **M2** suitable linear scale whereby plotted data occupies at least half the grid; **M3** 5 correct plots;	**3**
5(c)(ii)	*any two from:* **M1** data is for, USA / one country; **M2** not all countries are HICs; **M3** differing, amounts of industrialisation or needs between rural and urban areas; **M4** no data after 2010; **M5** unpredictable events (may change industry usage by 2030);	**2**

Question	Answer	Marks
5(d)	*any three from:* **M1** **improved** irrigation / named improvement e.g. trickle drip; **M2** growing crops less dependent on high water supply / GM modified drought resistant crops; **M3** recycling water; **M4** rainwater catchment; **M5** mulching / covering soil (to reduce evaporation); **M6** wind breaks (to reduce evaporation); **M7** limits on water volume (legally) allowed to be used / legislation;	3
5(e)	ground water and permafrost 2nd and 3rd box ticked;	1
5(f)	*any four from:* **M1** water source or intake uphill from village; **M2** idea of small dam that raises water level locally; **M3** idea of source protected from contamination e.g. limited agriculture / no housing; **M4** settlement tank / sediments or solids fall to bottom of a tank; **M5** pressure break tank; **M6** pipes to village; **M7** idea of water treatment; e.g. add iodine tablets / chlorination / storage tank / water stand posts / taps **M8** not all water taken from source (to maintain the system);	4