CAMBRIDGE
International Education

Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT **8291/22**

Paper 2 Management in Context **May/June 2026**

MARK SCHEME

Maximum Mark: 80

Published

This mark scheme contains the instructions and marking guidance that our examiners used to mark candidate responses for this component.

Before they start marking, examiners complete a standardisation process. They review a range of candidate responses and discuss the mark scheme in detail to agree which answers can and cannot be accepted. Examiners award marks where it is clear that candidate responses have met the requirements of the mark scheme. These requirements may vary between different components or different versions of the same component, depending on the exact requirements of the question and the candidate responses seen during the standardisation process.

Sometimes, our mark schemes may allow marks to be awarded to responses which contain elements that are factually incorrect or for content not covered by the syllabus. We do this in response to the demands of a specific question to support candidates and make sure that our assessments are fair. However, these allowances should not be used as a guide for teaching and learning.

We cannot discuss the mark scheme with schools, and we recommend that schools read the mark scheme together with the assessment material and the Principal Examiner Report for Teachers.

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General marking principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: • the specific **content** defined in the mark scheme • the specific **skills** defined in the mark scheme or in the level descriptions • the **standard of response** required as exemplified by the standardisation scripts.
2	Examiners must award **whole marks** (not half marks, or other fractions).
3	Examiners must award marks **positively**. This means that: • marks are not deducted for errors or omissions • marks are awarded for correct/valid answers as defined in the mark scheme and also for **other valid answers** which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate • the quality of spelling, punctuation and grammar are judged **only** when the mark scheme indicates that these features are **specifically assessed** in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must **consistently** apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the **full range of marks** defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and **must not** award marks with grade thresholds or grade descriptions in mind.

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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.

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6	<u>Calculation specific guidance</u> 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	<u>Guidance for chemical equations</u> 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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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

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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
REP	Repetition in response

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Mark Scheme Abbreviations

Abbreviation	**Meaning**
;	separates marking points
/	alternative responses for the same marking point
R	reject the response
A	accept the response
I	ignore the response
ecf	error carried forward
AVP	any valid point
ora	or reverse argument
AW	alternative wording
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
( )	the word / phrase in brackets is not required but sets the context
max	indicates the maximum number of marks that can be given
M1, **M2**….	marking point reference

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general guidance: in general ignore the following if unqualified:

pollution
land pollution
death
harms or damages or impacts health
harms or damages or impacts the environment
not environmentally friendly
affects or impacts environment / people
standard of living
resources unqualified

accept alternate wording throughout

allow development where stated

<u>underlined</u> terms are specially required for the marking point, although accept phonetic spellings throughout

guidance allow are extra marking points unless referenced to numbered marking point e.g. M1 or qualified e.g. **accept** CH_4 for methane

allow CO2 CO^2 Co2 co2

allow the names or formula unless stated otherwise in additional guidance – however, incorrect formula will CON a correct name – however, this will be referenced in the additional guidance

allow GHG / GG for greenhouse gases

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Question	Answer	Marks	Guidance
1(a)(i)	*any two from:* M1 disrupt breeding; M2 scare off prey / disrupt feeding; M3 damage to habitat qualified e.g. litter ingested; M4 introduce disease e.g. bacteria; M5 invasive species introduction; M6 hunting / poaching; AVP;	**2**	M1 M2 max [1] for general idea of changing behaviour of seal in some way **allow** stress if qualified
1(a)(ii)	*any three from:* M1 demilitarise Antarctica / used for peaceful purposes only / no nuclear testing; M2 promote scientific cooperation / information exchange; M3 set aside dispute over territorial sovereignty; M4 conservation of plants and animals; M5 preservation of historic sites; M6 designation and management of protected areas; M7 collection of meteorological data; M8 hydrographic charting; M9 logistic cooperation; M10 communications and safety; M11 no mining / mineral extraction; M12 no (large scale) infrastructure e.g. power plants; M13 all waste needs to be removed;	**3**	**ignore** management of tourism protection of environment too vague
1(b)(i)	300;	**1**	
1(b)(ii)	1050;	**1**	
1(b)(iii)	increases **and** increases / decreases **and** decreases;	**1**	

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Question	Answer	Marks	Guidance
1(b)(iv)	M1 (device) attached to seal; *any one from:* M2 transmit or send (radio waves or radio) signals/information; M3 (signals) **received** by antenna / receiver / datalogger / satellite receiver;	**2**	**allow** high level response surrounding the physics of receiving signals **allow** reference to GPS signals for M2
1(c)	*any two impacts developed:* *for each impact max two:* M1 change in food / change in distance from land seals need to swim to find food; M2 prey migrates; M3 increased competition for resources as other species feed in warmer water; M4 invasive species; M5 can dive deeper (if temperatures warmer); M6 ocean currents change; M7 change in state of behaviour; M8 changing timing of breeding cycles; M9 change in habitats M10 sea ice melts; M11 disease; M12 from migration into seal waters from other species;	**4**	**allow** impact and reason in either order **allow** same impact for both answers if different developed reasons given **ignore** temperature of oceans

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Question	Answer	Marks	Guidance
1(d)	*any four advantages of method 2 / ora:* M1 do not have to physically go to the island; M2 easier to access hard to reach beaches; M3 less likely to miscount / less likely to count same seal more than once; M4 can check results as physical record / seals are not moving in photo; M5 less time consuming; M6 less chance of disturbing seals; M7 analysis can be automated / use of AI to analyse results; M8 safer for scientists to count seals; AVP;	**4**	**allow** number of seals can be checked on photos by other scientists M4 **ignore** accuracy unqualified
1(e)(i)	straight line of best fit drawn;	**1**	**not** point-to-point **not** extrapolated back to zero or beyond last point **allow** line to go within 3 small squares of the origin **and** no more than 2250 on x-axis
1(e)(ii)	*any one from:* M1 positive correlation; M2 stated data e.g. aerial count of 1000 has ground count of 1000;	**1**	**ignore** directly proportional **ignore** if line of best fit would go through zero then **allow** directly proportional **allow** straight line **with gradient of 1** **allow** the same number of seals are recorded for each method; **allow** data points close to best fit line
1(f)	east coast circled;	**1**	**not** additional locations

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Question	Answer	Marks	Guidance
2(a)(i)	M1 bar plotted at + 3.7; M2 same width as other bars **and** same spacing between bars;	**2**	Straight lines needed for **M2** **ignore** shading M1 **allow** ± half small square
2(a)(ii)	M1 population decrease; M2 percentage change in population was –0.5%;	**2**	M1 **allow** people moving out of the country / emigration / migration out of country; M1 **allow** the rate of deaths exceeds the rate of births M1 **ignore** migration on its own
2(a)(iii)	M1 LICs have largest percentage change in population / HICs have lowest percentage change; M2 comparative data between LIC and / or HIC and / or MIC;	**2**	
2(b)	M1 2–1.5 or 0.5; M2 33 or M1 ÷ 1.5 ×100;	**2**	correct answer 33 (.3) % [2] **allow** ECF for **M2**
2(c)(i)	*any one from:* M1 fuel or petrol produces CO_2 (when combusted); M2 can only transport two people so need a lot of air cars / or number of journeys increase; M3 more vehicles manufactured / carbon emissions increased due to more AirCars required;	**1**	**ignore** powered by carbon-based fuel M1 **allow** carbon emissions for carbon dioxide and other greenhouse gases

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Question	Answer	Marks	Guidance
2(c)(ii)	*any two from:* M1 reduce number of cars on the road / less congestion / less traffic jams **and** as number (of cars) expected to increase; M2 reduce journey time **and** as quicker to fly by air / economic or environmental benefit of reduced journey time; AVP e.g. could reach remote areas **and** not all regions have roads;	**2**	**ignore** climate change reduction **allow** reduced traffic on road **and** educed emissions in urban areas **allow** reduced emissions DUE to less time spent in car **allow** improved work / life balance DUE to less time spent travelling / commuting AVP **allow** less travel time / less congestion **and** reduces mental health issues / more time for other activities
2(d)(i)	< 5.6;	**1**	
2(d)(ii)	dust / gas;	**1**	**allow** (atmospheric) aerosols **allow** particles / particulates **allow** ash
2(d)(iii)	M1 nitrogen from atmosphere; M2 reacts with oxygen (in atmosphere); M3 in high temperatures of vehicle engines;	**3**	**allow** M3 high temperatures lightning strikes
2(d)(iv)	sulfur dioxide / SO_2;	**1**	
2(d)(v)	nitric (acid) / HNO_3;	**1**	**allow** aqua fortis / spirit of nitre / hydrogen nitrate / saltpetre acid / nitrous acid / HNO_2

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Question	Answer	Marks	Guidance
2(d)(vi)	damages fish gills or decrease fish populations;	1	**ignore** acidifies water or decreases pH **ignore** coral bleaching **ignore** reference to plants **ignore** death / damage unqualified **allow** pH affects fish egg development **allow** it reduces shell growth (calcium carbonate) shell / exoskeleton
2(e)(i)	volatile organic compounds / VOCs;	1	
2(e)(ii)	sunlight is needed (for the reaction);	1	**allow** UV is needed
2(e)(iii)	*any two from:* M1 eye irritation; M2 lung irritation; M3 decreased crop yields; M4 deterioration of building materials or plastics or rubber; M5 reduced visibility;	2	**allow** M2 lachrymator **allow** M3 cannot photosynthesize efficiently

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Question	Answer	Marks	Guidance
3(a)(i)	*any two from:* *China / ora:* M1 greater population size; M2 less investment in renewables; M3 greater level of industrialisation; M4 less legislation about emissions; M5 greater use of fossil fuels or stated use e.g. more vehicles; M6 greater difference in economic income;	**2**	**allow M3** more urbanisation
3(a)(ii)	*any three from:* M1 China and India increasing; M2 USA and UK decreasing; M3 USA fluctuates more than others; M4 comparative data quote that includes at least 2 countries e.g. China has overtaken USA;	**3**	note: question is asking for overall trends answers must be comparative **allow** M4 data comparison India and China emissions have approximately trebled **allow** two countries compared e.g. China increases UK decreases 1 mark if **M1** and **M2** not awarded
3(b)	*any three from:* M1 use public transport; M2 switch to a plant-based diet; M3 do not wash their clothes every day; M4 dry clothes naturally; M5 reduce the time they shower; M6 energy efficient devices e.g. lighting; M7 switch off devices; AVP;	**3**	max [1] for list of three ‘reducing use’ with no explanation e.g. reduce use of: car, washing machine, tumble drier = [1] max **allow** car sharing **allow** work from home

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Question	Answer	Marks	Guidance
3(c)	*any two from:* M1 the extraction of resources to produce devices e.g. extraction of metals or minerals to make devices / batteries; M2 transport of resources to produce devices; M3 the manufacturing process of devices; M4 the use of electricity to run devices; M5 disposal / recycling of electronic devices (e-waste); M6 named example of usage: using the internet / sending emails / storing data / servers / cloud storage;	**2**	
3(d)	*any three from:* M1 (reflective) particles / stated aerosols e.g. sulfates (injected into stratosphere); M2 which reflect (incoming) solar radiation; M3 increased albedo effect; M4 creates cooling effect / counteracts global warming; M5 mimics emissions / impacts of volcanic eruptions;	**3**	M1 **allow** reflective droplets **ignore** method putting it into stratosphere M2 **allow** reflect sunlight / visible radiation / UV / IR M2 **allow** scatter light M4 **allow** reducing temperature
3(e)(i)	*any three from:* M1 all the strategies are better than no strategy; M2 all strategies have a lag phase; M3 geo-engineering appears most effective strategy / causes quickest change; M4 geo-engineering and carbon dioxide removal cause a reduction in the impact; M5 reducing carbon dioxide emissions is the least effective strategy; AVP;	**3**	**M1 allow** no strategies has largest negative effect on climate change **allow** reducing carbon dioxide emissions is not as effective as removing carbon dioxide / geo-engineering **allow** removing carbon dioxide from atmosphere becomes more effective over time
3(e)(ii)	different variables used / variables given different importance (in model);	**1**	**ignore** errors in entering data

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Question	Answer	Marks	Guidance
3(e)(iii)	*any two from:* M1 limited historical data; M2 climate feedback mechanisms not fully understood; M3 future emissions not known; M4 future strategies not known; M5 time delay between cause and effect; M6 conflict between scientific fact and political opinion; M7 volcanic eruptions not taken into account; M8 computer models constantly updated and refined;	**2**	M1 **allow** historical data based on proxy data M3 **allow** idea of future human behaviour affecting climate change **allow M4** methods of limiting climate change not taken into account

Question	Answer	Marks	Guidance
4(a)	M1 when all people, at all times have access to sufficient food / have physical, social and economic, access to sufficient food; M2 food is safe to eat; M3 food is nutritious / meets their dietary needs and (food preferences) for an active / or healthy life;	**3**	not M1 for food insecurity M1 idea of access to enough food ALL of the time M2 idea of food is safe M3 idea of food is nutritious / meets their dietary needs / enables a healthy life
4(b)(i)	source of food waste: percentage: rank order preparation of food: 15: 2 over ordering of ingredients: 12: 4 food spoilage: 13: 3 food portion size: 4: 5 customer plates: 56: 1	**1**	

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Question	Answer	Marks	Guidance
4(b)(ii)	*any two from:* M1 number sampled; M2 which meal occasion is sampled; M3 size of restaurant / number of people who eat at the restaurant; M4 location of restaurant / name of restaurant; M5 season the investigation takes place;	**2**	**allow** size of portion / mass of food **allow** number of covers **allow** perceived quality of food
4(c)	*any two from:* M1 biggest sector start at noon; M2 sectors decrease in size clockwise from noon; M3 include a key; M4 do not have two sectors the same shading;	**2**	**ignore** putting angle of segment **allow** label the segment of pie chart
4(d)	**M1** axis labels: *y*-axis growth rate / arbitrary units **and** *x*-axis temperature / °C; **M2** suitable linear scale that enables the points to occupy half the grid; **M3** 5 correct plots;	**3**	**ignore** curve or lines **M1 ignore** absence of arbitrary units for growth rate **M2** and **M3** can be awarded if **M1** is incorrect e.g. temperature on Y axis **M3 allow** ± ½ small square tolerance M3 not bar chart Not M3 if non-linear scale
4(e)(i)	*any one from:* M1 heavy to transport; M2 not suitable for large items / small quantities in cans; M3 uses metals which are a finite resource; M4 requires energy for the strategy;	**1**	**allow** difficult to open **allow** loss of nutritional value **allow** loss of taste **allow** health implications due to contamination from metal of can **allow** takes largest amount of space to store **allow** materials (metal) or canning factories not available **ignore** cost

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Question	Answer	Marks	Guidance
4(e)(ii)	*any one from:* M1 electricity not available; M2 lack of technology; M3 cost of equipment; M4 availability of fresh food;	**1**	**allow** no refrigeration appliances
4(e)(iii)	*any one from:* M1 alters the taste of the food; M2 health concerns; M3 shorter shelf life / expiry date (than canned strategy);	**1**	**allow** stated cost e.g. cost of fuel for smoking / cost of salt
4(f)	M1 increasing the yield (per unit area of farmland); *any one example of how this is done:* M2 using nutrients / pesticides / insecticides / fertilisers; M3 increasing labour; M4 increasing time worked on land; M5 increase growing more crops on same area of land; M6 increased number of harvests in a year;	**2**	M1 **allow** increase food productivity M2 **allow** increased inputs compared with extensive farming
4(g)	food crops replaced by biofuels;	**1**	**accept** biofuels decrease food crops area

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