Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT **8291/12**

Paper 1 Principles of Environmental Management **May/June 2024**

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.

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This document consists of **15** printed pages.

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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.

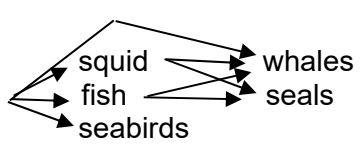|	
6	<u>Calculation specific guidance</u> Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'. For questions in which the number of significant figures required is not stated, credit should be 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.

Question	Answer	Marks
1(a)	*any two from:* people do not have access to / lack of access to; sufficient / safe / nutritious food; that meets their dietary needs for an active / healthy life;	**2**
1(b)(i)	*any three from:* fluctuates (2005–2020); from 2005–2007 stable / AW; 2007–2008 (rapid or constant) increase / increases after 2007; after 2011–2014 starts to decrease; data quote (year and/or percentage);	**3**
1(b)(ii)	*any four from:* improved crop production or yield / intensification / increased farming land area (in the USA) / increased mechanisation; GM / selectively bred / higher yielding, crops introduced; improved or more fertilisers / soil improvement / crop rotation; improved pests, weeds and disease control / improved or more pesticides / improved crop protection; reduction in livestock farming to grow crops; reduction in food waste / improvement in food storage; improved transportation (of foods) / improved infrastructure; protection of pollinating insects / biological control; food aid / importing food; food rationing / conservation of food; subsistence agriculture; development of hydroponics and aquaculture;	**4**
1(c)(i)	A and B are yes or no / C is open-ended / A and B easier to quantify / C hard to quantify / gives varied responses;	**1**
1(c)(ii)	Any appropriate question, such as: Do your children get the food they require?;	**1**

Question	Answer	Marks
1(d)	*any four from:* *in the context of decreasing food security (max 3):* increase in homogeneity or monoculture / unsustainable production; increased risk of disease; increased susceptibility to pests; increased susceptibility to climate change; increased reliance on fertilisers; soil degradation; nutrient loss from soil / compaction or loss of soil structure (e.g. soil erosion); *in the context of increasing food security (max 3):* extensive agriculture or farming / mechanisation; (leads to) increased yield or large yield / increased food production; production meets demand / crops can be stored / less food wastage;	**4**

Question	Answer	Marks
2(a)(i)	complete: phytoplankton → zooplankton squid → whales fish → seals seabirds phytoplankton to zooplankton; zooplankton to squid **and** fish **and** seabirds **and** whales; squid to whales **and** seals **AND** fish to whales **and** seals;	**3**
2(a)(ii)	*any three from:* shorter food chain / less trophic levels (to pass through), when eating zooplankton; (90%) energy lost at each trophic level / (only) 10% of energy transferred; as heat / waste / movement / respiration / metabolism, etc.; less energy lost / transfer of energy is higher (from zooplankton to whales);	**3**

Question	Answer	Marks
2(b)(i)	$CO_2 + H_2O \rightarrow C_6H_{12}O_6 + O_2$; correct balancing: $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$;	**2**
2(b)(ii)	*any two from:* (availability of) sunlight or light / light intensity; (concentration of) carbon dioxide; temperature (of water);	**2**
2(c)(i)	find migration routes / find breeding grounds / find feeding depths;	**1**
2(c)(ii)	*any two from:* limited battery life of sensor; only transmits when on the surface / loses connection at depth; difficult to fit; fitting the device may stress the whale; (wearing the) devices may harm or stress the whale; device is lost / not returned;	**2**
2(c)(iii)	*any four from:* produce international agreements; member countries follow the convention; set catch limits / legislation on overfishing; monitor commercial whaling / monitor poaching or illegal hunting; promote whale conservation / raise awareness; fund conservation projects / design management plans; designate protected areas; protect whales e.g. females with calves; work to prevent ship strikes; entanglement response capacity; strategy for whale watching; monitor chemical or noise pollution in the ocean;	**4**

Question	Answer	Marks
3(a)	*any three from:* northern hemisphere / mainly north of Tropic of Cancer; (high in) North America / USA / Canada; (high in) Europe; none in Oceania / Australia; very little in, Africa / Asia / South America;	**3**
3(b)(i)	*any four from:* mix of **air** pollutants / or named air pollutants; (both involve air pollutants) of an acidic nature / pH below 5.6; *wet deposition:* snow / hail / rain / fog / precipitation; *dry deposition:* dust / gases;	**3**
3(b)(ii)	*any two from:* fossil fuels contain sulfur compounds; (combustion of) fossil **fuels** releases sulfur dioxide gas; nitrogen (from the atmosphere) reacts with oxygen (in the high temperatures) of vehicle engines to form nitrogen monoxide gas; nitrogen monoxide gas is released into the atmosphere in vehicle emissions; *any two from:* sulfur dioxide gas reacts with water **and** oxygen (in the atmosphere) **OR** nitrogen monoxide gas reacts with water **and** oxygen (in the atmosphere); to form sulfuric acid **OR** to form nitric acid;	**4**

Question	Answer	Marks
3(c)(i)	*any two from:* defoliation / loss of leaves / damages leaves; reduced growth / death of trees; loss of habitat / reduced biodiversity;	**2**
3(c)(ii)	*any two from:* reduced <u>crop</u> yield / <u>crop</u> damage; damages fish gills / stunts reproductive system; impacts food chain / reduces marine **populations** / reduces biodiversity; enhanced chemical weathering / damages **buildings** made of concrete or limestone;	**2**

Question	Answer	Marks
4(a)(i)	*any three from:* solar, panel / collector / heater; wind turbine; (wind and solar are) renewable; (wind and solar are) carbon neutral / do not emit CO_2; windows are shaded / blinds on windows (for temperature control); double-glazing on windows (reduces heat transfer / insulates);	**3**

Question	Answer	Marks
4(a)(ii)	*any four from:* *max 3 from benefits:* reduces demand for, fossil fuels / imported energy; reduces production of, carbon dioxide / greenhouse gases / <u>air</u> pollution; mitigates, climate change / global warming; saves money / cheaper electricity bills; *max 3 from limitations:* not all people have access to the technology; homes difficult to adapt; expensive **to buy / set-up / maintain**; weather dependent / not always reliable production of energy;	**4**
4(b)(i)	120 **and** 15 / (120–15)/15 × 100; 700 / range 650–757;	**2**
4(b)(ii)	*any two from:* disrupted supply; increasing costs (of energy) **for industry**; job losses / economic recession; increased poverty / **lower** standard of living; reliance on imported energy; civil disruption / conflict;	**2**

Question	Answer	Marks
4(b)(iii)	*max two from:* drought limits (supply of) hydroelectric electricity; increased temperatures increases demand (for energy); increased use of air-conditioning (in homes and offices); severe weather damages power lines or infrastructure; fossil fuel mines flooded; migration increases demand (in some countries); *max two from:* (leads to) disrupted supply; (leads to) limited energy sources / poor energy mix; (leads to) increased costs to industry or consumers;	**3**

Question	Answer	Marks
5	The question requirements are to: • show an understanding of the role of protected areas • describe other strategies for managing the impacts • explain how the strategies conserve tropical rainforests • evaluate the statement Candidates may describe protected areas using specific examples and case studies. Candidates may describe other strategies including: • legislation and international agreement • sustainable harvesting • debt for nature swaps Candidates may use specific examples of individual, local, national and international schemes, including case studies. The wide range of strategies will all have limitations that may be outlined by candidates. Candidates are likely to have mixed opinions about the effectiveness but their answer should be balanced. Answers should be supported by case studies / relevant examples where this provides balanced evidence.	**20**

Question	Answer	Marks
6	The question requirements are to: • describe the impacts of waste disposal • describe strategies for reducing waste disposal • describe successful and less successful examples • evaluate the statement on an individual, local, national and global level. Candidates may describe the impacts of waste disposal, including: • contamination of soil leading to leaching and contamination of ground water • build-up and release of the greenhouse gas methane (CH_4) with a danger of explosions • visual and noise pollution and unpleasant odour • risk of spread of disease • release of toxic substances • bioaccumulation and biomagnification • plastics and microplastics in oceans. Candidates may describe the strategies for waste disposal including: • reduce, reuse and recycle • biodegradable plastics • food waste for animal feed • composting • fermentation • use of waste to generate energy • education • financial incentives and legislation. 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. Candidates may describe the limitations of the strategies. 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.	**20**

Generic levels of response

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