Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT **8291/11**

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

Cambridge International is publishing the mark schemes for the October/November 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

This document consists of **14** 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	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.

Question	Answer	Marks
1(a)(i)	line from biogas **and** geothermal to renewable; line from nuclear **and** natural gas to non-renewable;	**2**
1(a)(ii)	renewable if it is not used up / replaced (naturally) / constantly replenished; not sustainable if it is used at a faster rate than can be replaced / not available for future needs or generations; not sustainable in the long term if the materials needed to harness the energy are in limited supply e.g. silicon for solar panel manufacture;	**2**
1(b)(i)	*any three from:* China uses a greater percentage from coal than the USA; China uses a greater percentage from hydroelectric; China uses a greater percentage from non-renewables; USA uses a greater percentage from oil than China; USA uses a greater percentage from natural gas than China; USA uses a greater percentage from nuclear; both use similar percentage of other resources; comparative data quote;	**3**
1(b)(ii)	*any three from:* has large reliance on one energy resource; doesn't use all available resources / doesn't use hydroelectric; reliance on coal / oil / gas / fossil fuels; which are non-renewable; finite supply / will run out; increases environmental impacts;	**3**

Question	Answer	Marks
1(b)(iii)	*any three from:* disrupted electricity supply to homes / industry; increasing prices for energy resources; increasing costs for industry / lower productivity; job losses / unemployment / economic recession; (increased levels of) poverty / low standards of living; reliance on imported sources of energy; civil disruption / conflict; disrupted information technology / lines of communication;	**3**

Question	Answer	Marks
2(a)(i)	(linked to a) geographical location or area / map; *any one from:* data gathered / data collection; computer generated / using technology;	**2**
2(a)(ii)	*benefit:* large amount of data / fast data capture / fast processing / computerised processing / global access to data; *limitation:* questions over trustworthiness of data / ways data can be used / bias used / difficulty identifying correlation / would need to be stored securely / questions over accuracy or reliability of data;	**2**
2(a)(iii)	**X** on map anywhere except forest **and** no trees (to capture water) / bare ground does not hold water;	**1**

Question	Answer	Marks
2(a)(iv)	*any four from:* map with grid of known area; *a random method described* e.g. randomly choose coordinates / random number generator / use device to generate coordinates; *a systematic method described* e.g. transect line with regular intervals / at every n^{th} distance; count trees **and** calculate mean number (in total grid area); *idea of* scaling up;	**4**
2(b)	*any six from:* *photosynthesis* converts (atmospheric) carbon dioxide to glucose / sugar / organic molecules; using light energy / sunlight / energy from the sun; traps carbon / trees act as carbon sinks / stores / carbon is taken out of atmosphere; trees are producers so they add carbon to food chains / act as carbon sources; *respiration* converts glucose / sugar / organic molecules to carbon dioxide; using oxygen / intake oxygen; adds carbon dioxide / releases carbon dioxide to the atmosphere;	**6**

Question	Answer	Marks
3(a)(i)	interaction between living organisms / biotic components; and their environment / non-biotic / abiotic components;	2
3(a)(ii)	*any five from:* inter-specific; between plants of different species; intra-specific; between individuals of the same species; tends to be the most severe; because competing for the <u>same</u> resources; for light / carbon dioxide; for photosynthesis; space / nutrients / oxygen / pollinators;	5
3(b)(i)	*any four from:* methane is a greenhouse gas; enhanced greenhouse effect; absorbs infrared radiation / longwave radiation; traps heat / energy in the atmosphere; increased global temperatures / global warming;	4
3(b)(ii)	*any two from:* landfill; extraction of fossil fuels; rice fields; <u>melting</u> of permafrost; cattle / livestock; termites / named insect; microorganisms;	2
3(c)(i)	1825 **and** 1705 seen / (1825-1705) $\div$ 1705 $\times$ 100; 7.038; answer rounded to 3 sig figs;	3

Question	Answer	Marks
3(c)(ii)	*any two from:* values are averages; concentration not constant / fluctuates / changes by location; measurements represent a small sample of the atmosphere which are then scaled up to represent the whole atmosphere;	**2**

Question	Answer	Marks
4(a)	the ability to access enough / sufficient quantities of clean water; to maintain adequate standards of food and manufacturing of goods, adequate sanitation and sustainable healthcare;	**2**
4(b)	*strategy 1* reservoir / dam; *strategy 2* rain water catchment / water butt;	**2**
4(c)	*any two from:* cover barrels; overflow pipe from barrel 1 to barrel 2; more / larger, barrels; put gutter round whole roof; ensure roof feeds into the gutter;	**2**
4(d)	*any three from:* reduced crop yield / crop failure; water needed for photosynthesis / prevents wilting; livestock cannot reproduce / poor growth rates / death; food shortages / food insecurity; malnutrition / famine / starvation; illness caused by contaminated drinking water; named illness e.g. diarrhoea / cholera; reliance on aid; human migration;	**3**

Question	Answer	Marks
4(e)	*any five from:* *benefit (max 4):* large volume of water; low running cost; habitat creation / increase in biodiversity; recreational opportunities; potential source of food (fish); creates jobs / benefits local economy; water supply is managed to deal with periods of high and low rainfall; *limitation (max 4):* people forced to move; historic sites lost / family homes lost; high set-up cost; habitat destruction / decrease in biodiversity; if not well built, dams can fail causing catastrophic flooding / dams can reactivate faults leading to earthquakes;	**5**

Question	Answer	Marks
5	Plastics have a greater impact on ecosystems than other pollutants. To what extent do you agree with this statement? Give reasons and include information from relevant examples to support your answer. The question requirements are to: • show an understanding of plastic and microplastic pollution • describe other pollutants including greenhouse gases, sulfur dioxide and oxides of nitrogen, toxic substances e.g. heavy metals or radioactive isotopes, fertilisers and pesticides, human and animal waste • explain how these pollutants impact ecosystems including climate change / global warming / enhanced greenhouse effect, acid deposition, bioaccumulation and biomagnification, eutrophication, diseases such as cholera • evaluate the statement Candidates may describe pollutants and impacts using specific examples and case studies. Impacts may be individual, local, national and international. Candidates are likely to have mixed opinions about the statement 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	**Evaluate the success of national and international agreements for managing climate change.** **Give reasons and include information from relevant examples to support your answer.** The question requirements are to: • show an understanding of climate change including global warming / enhanced greenhouse effect • show an understanding of the impacts of climate change on the environment including temperature and precipitation, sea level, ocean and wind circulation, melting of sea ice, ice sheets, glaciers and permafrost, species distribution and biodiversity • show an understanding of the impacts of climate change on the human population including increased frequency and severity of extreme, weather events leading to flooding and loss of land, drought and wild fires, damage to property and loss of life during extreme weather events, forced migration, impacts on crop yields and increased pest outbreaks, impacts on food, energy and water security Describe successful and less successful examples for managing climate change including: • reduction of global and individual carbon footprint (fewer children per woman, eating a plant-based diet, adopt an energy-efficient lifestyle) • switching to low-carbon fuels • reducing the use of fossil fuels • using alternative forms of energy • transport policies • use of carbon capture and storage • reducing deforestation, increasing reforestation and afforestation • energy efficient buildings and infrastructure • adaptation to climate change • national and international agreements • evaluate the statement on a local, country and global level Candidates may provide a definition of climate change along with an understanding of its importance. Candidates may use specific examples of individual, local and national strategies and impacts, including case studies. The examples should be balanced and show successful and less successful 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.	

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