



## Cambridge International AS Level

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**ENVIRONMENTAL MANAGEMENT**

**8291/23**

Paper 2 Management in Context

**May/June 2022**

MARK SCHEME

Maximum Mark: 80

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**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 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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This document consists of **13** printed pages.

**PUBLISHED****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 descriptors 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	<p><u>'List rule' guidance</u></p> <p>For questions that require <i>n</i> responses (e.g. State <b>two</b> reasons ...):</p> <ul style="list-style-type: none"> <li>• The response should be read as continuous prose, even when numbered answer spaces are provided.</li> <li>• Any response marked <i>ignore</i> in the mark scheme should not count towards <i>n</i>.</li> <li>• Incorrect responses should not be awarded credit but will still count towards <i>n</i>.</li> <li>• Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should <b>not</b> 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.</li> <li>• Non-contradictory responses after the first <i>n</i> responses may be ignored even if they include incorrect science.</li> </ul>

**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.

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Question	Answer	Marks
	<p><i>In general ignore the follow if unqualified:</i></p> <p><i>pollution</i>  <i>land pollution</i>  <i>death</i>  <i>harms health</i>  <i>harms the environment</i>  <i>not environmentally friendly</i>  <i>affects environment / people</i>  <i>standard of living</i>  <i>resources</i></p> <p><b>accept</b> alternate wording</p> <p><i>allow development where stated</i></p> <p><i>underlined terms are specially required for the marking point, although accept phonetic spellings</i>  <i>guidance allow are extra marking points unless referenced to numbered marking point e.g. M1 or qualified e.g. <b>accept</b> CH<sub>4</sub> for methane</i></p> <p><b>allow</b> CO<sub>2</sub> / CO<sup>2</sup> / Co2 / co2</p>	
1(a)(i)	<p><i>any three from:</i></p> <p>coal is a fossil fuel;  coal is, finite / non-renewable;  burning coal produces carbon dioxide / sulfur dioxide / nitrous oxides / carbon monoxide;  burning coal contributes to particulates / smoke / soot;  burning coal contributes to climate change / global warming / enhanced greenhouse effect;  non-carbon dioxide emitting gases needed to meet carbon targets / investment in carbon neutral fuels;  burning coal contributes to acid rain;  (using alternative energy sources) increases energy security;</p>	<b>3</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(a)(ii)	<p><i>any two from:</i></p> <p>not enough wind turbines;            new technology needed / new equipment needed / lack of suitable infrastructure;            weather conditions not favourable / not enough wind;            expensive;            (excess) energy available from other sources;</p>	<b>2</b>
1(a)(iii)	<p><i>any two or developed from:</i></p> <p>energy insecurity;            disrupted electricity supply;            job losses;            increased poverty;            civil disruption / conflict;            (import country) not self-reliant;            economic reason;            transport implication e.g. spillage / using fossil fuels</p>	<b>2</b>
1(a)(iv)	<p>plants capture carbon dioxide;            (by the process of) photosynthesis;</p>	<b>2</b>
1(b)	<p><i>any three from:</i></p> <p>(particulates) cause (photochemical) smog;            eye irritation;            respiratory irritation / named condition / breathing problem / lung problem;            heart ailment;            cancer;            decreased crop yields;            leads to food shortages;</p>	<b>3</b>
1(c)(i)	<p>oil;</p>	<b>1</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(c)(ii)	<i>any four from:</i>  coal share greater than nuclear; both overall (slight) decrease; nuclear decrease greater than coal / coal more stable; comparative year trend or data quote;	<b>4</b>
1(c)(iii)	<i>any two from:</i>  new reserves found; improved technology; extraction from previously banned areas permitted e.g. Alaska increased demand;	<b>2</b>

Question	Answer	Marks
2(a)(i)	4;	<b>1</b>
2(a)(ii)	18(.421)); % given to whole number;	<b>2</b>
2(a)(iii)	<i>any one from:</i>  doesn't take into account the number of people in each country; only includes landfill and recycling / there are other methods of waste disposal; different countries have different ways of describing recycling;	<b>1</b>
2(a)(iv)	<i>any five or developed from:</i>  contamination of soil / soil pollution; leading to leaching; contamination of (ground water) / water pollution; build-up and/or release of the greenhouse gas/methane; leading to danger of explosions; visual pollution / noise pollution / odour; risk of spread of disease; release of, toxic substances / toxins / heavy metals / mercury; bioaccumulation; biomagnification; animals harmed if waste, ingested / trapped; take up space;	<b>5</b>
2(a)(v)	<i>any one from:</i>  education / advertising / raise awareness; economic incentive / economic penalty; legislation / laws / regulations; increase, availability of recycling points / accessibility; idea of simple / easy recycling, system;	<b>1</b>



<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(b)(i)	sectors in rank order largest first beginning at noon and proceeding clockwise; correct plotting $\pm 1\%$ ; sectors match key;	<b>3</b>
2(b)(ii)	(only) 9% is from domestic / 91% from other sources / small amount from domestic;	<b>1</b>
2(c)	<i>any two from:</i>  can be used for, heating / electricity or provides a form of energy; idea of gets rid of large quantities of waste / doesn't take up (land) space / land can be used for other purpose; avoids landfill / landfills full; idea of reduces named pollution e.g. water pollution / leaching / plastics in ocean / soil pollution / smell / visual pollution; reduces methane production (compared to landfills);	<b>2</b>

Question	Answer	Marks
3(a)(i)	A4: 4; D3: 5;	2
3(a)(ii)	<p><i>max [4]</i></p> <p><i>benefits max 3:</i>            can be counted remotely;            data can be checked / hard copy of data;            avoids bias;            large areas can be covered;            automated;            doesn't harm the birds / birds not disturbed;</p> <p><i>limitations max 3:</i>            relies on photographing all the birds / birds move;            need aeroplane or satellite or drone to take the images / costly;            difficult to count if birds on a grid line;            reliant on suitable weather conditions;            reliant on lack of dense groundcover;            potential distortion (due to oblique angle);            difficult to identify species of bird;</p>	4
3(b)(i)	0.44; (1 – M1 =) 0.56;	2
3(b)(ii)	<b>Z</b> is more diverse (than <b>Y</b> );	1
3(c)(i)	<p><i>any three from:</i></p> <p>tag / named example e.g. leg rings / tags / chip;            recapture  <i>idea of capture:</i> marked AND unmarked / random capture;            named method of estimating population: Lincoln index;</p>	3

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
3(c)(ii)	<p><i>any two from:</i></p> <p>no death / no change in survival rate;  no births;  no migration;  sampling methods are identical to first capture;  random mixing of population;</p>	<b>2</b>
3(d)(i)	5;	<b>1</b>
3(d)(ii)	<p>algae → zooplankton → (sandhill) crane;  <b>OR</b>  plants/seeds → (sandhill) crane → eagle</p>	<b>1</b>
3(e)	<p><i>any three from:</i></p> <p>restrict number of birds hunted / number of birds killed;  restricted times/season for hunting;  enables birds to reproduce;  birds given time to fatten (ready for migration);  (<i>sign</i>) education / awareness;</p>	<b>3</b>
3(f)	<p>loss of habitat / wetlands dry up;  alter migration;  loss of other species / loss of food source / disrupt food chain;  introduces, invasive species/predators;</p>	<b>4</b>

Question	Answer	Marks
4(a)(i)	15114 –12296 or 2818; $(M1 \div 15114) \times 100 = (-) 18.6 / 19;$	<b>2</b>
4(a)(ii)	<i>any three or developed from:</i>  increased population; more homes needed; more land needed for farming / to provide food; increased urbanisation; any one other use of land e.g. logging / timber / mining / change of land use; economic reason; forest / wild, fires;	<b>3</b>
4(b)(i)	87;	<b>1</b>
4(b)(ii)	in favour (of planting more trees on their land);	<b>1</b>
4(b)(iii)	random (sampling);  <i>method described:</i> each farmer (in the area) given a number or letter or label; idea farmers picked from a hat / number generator;	<b>3</b>
4(b)(iv)	<i>any two from:</i>  area <b>E</b> has only 5 respondents / not representative; no information on how the farmers were selected; no information on demographic of farmer / age / gender; different number of farmers; small number of total farmers; no indication of how strongly they felt; size of farm / type of farm not given;	<b>2</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5(a)	<p><i>any four from:</i></p> <p>loss of income;  time lost (in travelling to work);  respiratory illness;  eye irritation;  from vehicle emissions or named emission e.g. SO<sub>2</sub>, NO<sub>x</sub>, VOCs, particulates / unburnt hydrocarbons;  formation of emission described;  impact of emission described e.g. acid rain / photochemical smog;  carbon dioxide emissions;  impact of CO<sub>2</sub> emissions global warming;</p>	<b>4</b>
5(b)	<p><i>any six from but at least one benefit and one limitation:</i></p> <p><i>benefit:</i>  does not use, fossil fuels / petrol;  (solar) is renewable / non-finite;  does not emit, CO<sub>2</sub> / air pollution (at point of use);  will improve quality of life for drivers;  do not need to wait for battery to charge / can swop battery rather than charging it / battery charges as you go;</p> <p><i>limitation:</i>  expensive / drivers unlikely to be able to afford them / drivers low wage;  extra equipment likely to be heavy;  range is short / only lasts for 6 hours;  solar panel needs Sun / won't operate at night or when cloudy;</p>	<b>6</b>