



# Cambridge International AS Level

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**ENVIRONMENTAL MANAGEMENT**

**8291/02**

Paper 2 Management in Context

**For examination from 2022**

MARK SCHEME

Maximum Mark: 80

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**Specimen**

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This document has **14** pages. Blank pages are indicated.

**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> (see examples below)</p> <p>For questions that require <b>n</b> 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 <b>n</b></li> <li>• Incorrect responses should not be awarded credit but will still count towards <b>n</b></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 <b>n</b> responses may be ignored even if they include incorrect science.</li> </ul>

6	<p><u>Calculation specific guidance</u></p> <p>Correct answers to calculations should be given full credit even if there is no working or incorrect working, <b>unless</b> the question states 'show your working'.</p> <p>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.</p> <p>For answers given in standard form, (e.g. <math>a \times 10^n</math>) in which the convention of restricting the value of the coefficient (<math>a</math>) 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.</p> <p>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.</p>
7	<p><u>Guidance for chemical equations</u></p> <p>Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.</p> <p>State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.</p>

**Mark scheme abbreviations**

;	separates marking points
/	alternative answers for the same marking point
max	indicates the maximum number of marks that can be given
ORA	or reverse argument
ECF	error carried forward
I	ignore

**Examples of how to apply the list rule**

State three reasons ... [3]

**A**

1. Correct	✓	<b>2</b>
2. Correct	✓	
3. Wrong	✗	

**B (4 responses)**

1. Correct, Correct	✓, ✓	<b>3</b>
2. Correct	✓	
3. Wrong	ignore	

**C (4 responses)**

1. Correct	✓	<b>2</b>
2. Correct, Wrong	✓, ✗	
3. Correct	ignore	

**D (4 responses)**

1. Correct	✓	<b>2</b>
2. Correct, CON (of 2.)	✗, (discount 2)	
3. Correct	✓	

**E (4 responses)**

1. Correct	✓	<b>3</b>
2. Correct	✓	
3. Correct, Wrong	✓	

**F (4 responses)**

1. Correct	✓	<b>2</b>
2. Correct	✓	
3. Correct CON (of 3.)	✗ (discount 3)	

**G (5 responses)**

1. Correct	✓	<b>3</b>
2. Correct	✓	
3. Correct Correct CON (of 4.)	✓ ignore ignore	

**H (4 responses)**

1. Correct	✓	<b>2</b>
2. Correct	✗	
3. CON (of 2.) Correct	(discount 2) ✓	

**I (4 responses)**

1. Correct	✓	<b>2</b>
2. Correct	✗	
3. Correct CON (of 2.)	✓ (discount 2)	

Question	Answer	Marks	Guidance
1(a)	<i>any one from:</i> increase in population; increase in personal wealth;	1	<b>allow:</b> more electronic devices used
1(b)	<i>any one from:</i> leads to contamination of (ground) water; affects biodiversity; bioaccumulation / biomagnification;	1	<b>allow:</b> affects soil fertility <b>ignore:</b> health impact unless qualified <b>ignore:</b> causes pollution unless qualified <b>ignore:</b> they are toxic
1(c)(i)	reduces cost (of analysing) / idea that there is only one sample to analyse;	1	<b>allow:</b> quicker method
1(c)(ii)	<i>any one from:</i> only gives an average; individual sample information is lost; contamination might vary within the overall site; information on variability or patterns or trends is not obtained; high concentration of contaminant may be masked / dilution might occur;	1	
1(c)(iii)	<i>any one from:</i> the scientist is investigating soil samples not plant samples; plants may absorb toxic substances; if the investigation is repeated the results will not be comparable if plant material is present;	1	<b>ignore:</b> plants may affect the results
1(d)	the soil is contaminated / contains lead / has a higher concentration than the safe threshold / 400 ppm; <i>any one from:</i> reduce exposure to the soil; wash hands immediately after gardening; do not grow food crops in the soil; do not allow children access to the soil; keep the soil covered;	2	

Question	Answer	Marks	Guidance
1(e)	<p><i>any six from:</i></p> <p>HICs are passing the problem or pollution on to LICs;  idea of (environmental) inequality / idea of 'not in my back yard' (NIMBY) in HICs / idea of not an ethical practice;  idea that waste or pollution should be regarded as a world problem and dealt with globally;  income / financial advantage to LICs for taking the e-waste;  repaired e-waste item can then be sold (by the LICs);  difficult to monitor e-waste coming into a LIC / some e-waste might not be repairable;  LICs may have more space to store the e-waste;  delayed cost (of environmental impact);  LICs may not have the technology, money or infrastructure to deal with the e-waste;  named impact of landfill, e.g. visual or noise pollution / odour / bioaccumulation / biomagnification;  make reasoned judgement regarding the overall advantages or disadvantages for HICs and / or LICs;</p>	<b>6</b>	response can argue from point of view of a HIC or LIC, in terms of advantages or disadvantages for both or either
1(f)	<p><i>any two from:</i></p> <p>reduce / reuse / recycle;  education;  financial incentives;  legislation;</p>	<b>2</b>	
Question	Answer	Marks	Guidance
2(a)	<p><i>any three from:</i></p> <p>1993 to 2005 steady increase;  faster rate after 2007;  manipulated quoted data, e.g. increased by (approx.) 7.6 mm since 1992 / since 2012 sea level has risen by (approx.) 0.6 mm / calculation of or reference to gradient;</p>	<b>3</b>	<p><b>ignore:</b> sea level increases  <b>note:</b> max. two marks from data</p>

Question	Answer	Marks	Guidance
2(b)	<p>any two from:  climate change;  increased global temperatures;  ice sheets melt;  rate of ice loss has exceeded rate of ice gain / glacier retreat;</p>	2	
2(c)(i)	<p>an evaluation that refers to aims of treaty;  <i>max. four from any one figure:</i>  (Fig. 2.2)  tourism is not being controlled in Fig. 2.2 / idea that tourists are too close to the colony;  permits needed for tourist travel so this tourist trip will have been approved;  increased number of visitors / tourists increases waste management issues;  the penguin colony might not be in a protected area;  (Figs. 2.3 and 2.4)  scientific study is allowed as part of the treaty;  benefits (global) scientific community;  research is used to influence treaties or legislation (on pollution);  (Fig. 2.3)  vehicle contributes to atmospheric pollution;  pollutants from vehicle could affect other scientific readings taken in the Antarctic;  (Fig. 2.4)  waste management is a consideration as the balloon is released into atmosphere / balloon and monitoring device are not collected back;  meteorological data from Antarctica are used globally;</p>	6	<p><b>note:</b> answers that refer to only one figure are limited to four marks</p>
2(c)(ii)	<p>any two from:  ice cover makes the land inaccessible;  extreme cold / weather makes mining impractical;  lack of transport to and from Antarctica;  long way from world markets;  Southern Ocean has extreme weather;</p>	2	<p><b>ignore:</b> prohibited by the Antarctic Treaty</p>



Question	Answer	Marks	Guidance
3(a)(i)	<p><i>any six from:</i>            select one branch;            tap / hit / shake the branch (gently with a stick);            collect falling insects on the beating tray;            use a hand lens to view small insects;            count the insects;            count or estimate the number of branches on the tree;            multiply the number of insects by the number of branches;            repeat on another branch on the tree and take an average;            record results in a suitable table;</p>	6	
3(a)(ii)	<p><i>any one from:</i>            looking at individual leaves takes a long time;            enables you to sample an entire branch in a short amount of time;            difficult to see small insects just by looking at leaves;</p>	1	
3(b)(i)	<p><i>any four from:</i>            What was the address? / What were the GPS coordinates?;            What was the date of observation?;            What is the variety of apple tree?;            What was the damage?;            What stage of development was the moth? / Did you see an adult moth or larvae?;</p>	4	
3(b)(ii)	<p><i>any two from:</i>            members of the public could be unreliable;            incorrect species could be identified;            no way to verify the data;            could end up with 'big data' / a lot of data to analyse;</p>	2	
3(c)(i)	<p><i>any two from:</i>            introduced / non-native species;            which becomes established / becomes a naturalised species;            spreads quickly / outcompetes native or other species;</p>	2	
3(c)(ii)	<p><i>any one from:</i>            eliminates native or other species;            changes species diversity or biodiversity;</p>	1	

Question	Answer	Marks	Guidance
4(a)(i)	labelled axes; suitable y-axis linear scale and negative values on y-axis shown; correct plots $\pm$ half a small square tolerance;	3	
4(a)(ii)	58;	1	<b>note:</b> 30 to –28 <b>ignore:</b> non-calculated range
4(a)(iii)	variable data / overestimates and underestimates in projected warming rate; reliability has improved;	2	
4(a)(iv)	<i>any four from:</i> limited historical data used to reconstruct past climate conditions (ice cores, tree rings, historical accounts); future climate predictions are made using climate change models which use different variables; climate feedback mechanisms are not fully understood; time delay between cause and effect; uncertainty over the use of some data in drawing conclusions has resulted in differences in scientific and political opinion;	4	
4(b)	<i>any four from:</i> reduction of global and individual carbon footprint (e.g. having fewer children per woman, eating a plant-based diet, adopting an energy-efficient lifestyle); switching to low-carbon fuels / reducing the use of fossil fuels / using alternative forms of energy; relevant transport policies; use of carbon capture and storage; national and international agreements such as Kyoto Protocol 1992, Paris Agreement 2016;	4	

Question	Answer	Marks	Guidance
4(c)(i)	<p><i>any three from:</i>  limiting the amount of solar radiation that reaches the Earth (to bring the Earth's temperature down);  reflecting (small amounts) of sunlight back into space / albedo enhancement;  (albedo effect examples / explained)  marine cloud brightening;  where clouds are sprayed with tiny droplets of sea water;  increasing number of white rooftops / light pavements;  cover large area of desert in reflective sheets;  plant crops that are light in colour;  space reflectors;  stratospheric aerosols;  (stratospheric aerosols explained)  injecting sulfur dioxide particles into stratosphere;  this causes global dimming;</p>	3	
4(c)(ii)	<p><i>any one from:</i>  extreme regional cooling;  interferes with local weather;  unknown consequences;  changes precipitation patterns;</p>	1	

Question	Answer	Marks	Guidance
4(d)	<p><i>max. four from environment:</i>            increased frequency and severity of, extreme weather / flooding / drought / wild fires / change in hydrological cycle;            increase in atmospheric temperature;            increase in river flow (into delta);            thermal expansion of sea water;            rise in sea level;            increase in inundation of delta / increase in tidal surge;            salt water intrusion;            reduced fresh water stores in river, lake, wetland;            salinisation of soil;            increased length of dry / wet season;            change in biodiversity;</p> <p><i>max. four from population:</i>            damage to property during extreme weather events;            loss of life during extreme weather events;            forced migration;            impact on crop yields / increase in pest outbreaks;            impact on food / energy / water security;            effect on (rain-fed) irrigation;            effect on the suitability of land for growing crops;            loss of income;            during extreme weather events;</p>	6	<p><b>allow:</b> supported comments that refer to the stimulus material  <b>ignore:</b> direct copying of question paper text that is unqualified (e.g. the area is low lying)</p>

Question	Answer	Marks	Guidance
5(a)(i)	350 (%); final percentage increase quoted to 3 significant figures;	2	
5(a)(ii)	<i>any two from:</i> larger increase for LICs than HICs / ORA; greater population for HICs than LICs / ORA; quoted data to show manipulation or comparison;	2	

Question	Answer	Marks	Guidance
5(b)	<p><i>any eight from:</i></p> <p>(fossil fuels)  HICs and LICs decreasing use of fossil fuels;  HICs use more fossil fuels for energy consumption / ORA;  HICs have more industries that use fossil fuels;  fossil fuels reserves are declining;  fossil fuels are expensive / LICs are less able to afford fossil fuels / ORA;</p> <p>(renewable energy resources)  HICs and LICs increasing use of renewables for energy;  HICs have only a small increase in use of renewables / LICs use more renewables;  fossil fuels are expensive;  renewables are more suitable for smaller or local projects / non-urban environments;</p> <p>(population data)  reference to population data, e.g. population of LICs increasing at fast rate,  this may affect future consumption of fossil fuels;</p> <p>manipulation of quoted data, e.g. rate of use of fossil fuels decreased more sharply in LICs since 2010;</p>	8	

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