CAMBRIDGE
International Education

Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT **8291/21**

Paper 2 Management in Context **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.

 [Turn over

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 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	<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.

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)	*any three from:* cost of carbon storage / (storing the carbon) may be expensive; not enough storage facilities; technology for storing carbon is new / developing; stored carbon might leak;	**3**
1(b)(i)	4 × 12 000 (48 000) **or** 5 × 12 000 (60 000); 240 000;	**2**
1(b)(ii)	*any four from:* reduces waste / reduces landfill usage; reduces need to quarry or mine; process is sustainable; reduces consumption of energy; permanently captures carbon dioxide; reduces (enhanced) greenhouse effect / greenhouse gas emission / global warming; (industrial) product has a low carbon footprint; reduces cost of raw materials in producing calcium / magnesium carbonate;	**4**

Question	Answer	Marks
1(b)(iii)	*any three from:* (shelled) organisms die / build-up on the sea bed; (shelled organisms) covered in sediment / forms layers (of dead organisms / sediment); compaction / pressurised / cementation; form fossil fuels;	**3**
1(c)	water / H_2O; (sun)light;	**2**

Question	Answer	Marks
2(a)(i)	axis labels: *y*-axis **and unit** carbon dioxide emissions / billion tonnes **and** *x*-axis sector; sensible linear scale with data that occupies at least half the grid; bars equal width **and** not touching; correct plots;	**4**

Question	Answer	Marks
2(a)(ii)	*any three from:* provides reliable data; provides a large quantity of data / big data; increases confidence in data; predicts emissions where data is not available; data can be used in climate models; shows which sectors are most polluting; targeted strategies for each sector; increase (public) awareness; idea that it is a global organisation so includes all countries / produces global averages for emissions;	**3**
2(b)(i)	*correct readings from graph:* 2015: 7.11 **and** 2020: 6.85; *correct manipulation of 2015 **and** 2020 data;* $[(7.11 - 6.85) \div 7.11] \times 100$ 3.6568; *answer to three significant figures* (–)3.66;	**3**

Question	Answer	Marks
2(b)(ii)	*any two from:* decreased use of vehicles; *increase use of:* public transport; electric cars; biofuel; low-carbon fuels;	**2**
2(c)	*any four from:* landfill sites; incineration / burning (of waste); storage; exporting to other countries; recycling;	**4**
2(d)(i)	*any two from:* chicken litter content are plant based; plants took in carbon dioxide (during photosynthesis); this carbon dioxide is returned to the atmosphere;	**2**
2(d)(ii)	biomass / biofuel;	**1**

Question	Answer	Marks
2(d)(iii)	*any two from:* could become invasive / could outcompete native plants; replace food crops / use land that could be used for agriculture or crops; could lead to food insecurity; (grown for biofuel so) short lived habitat; reduces biodiversity; require a lot of water;	**2**

Question	Answer	Marks
3(a)(i)	3 plants circled correctly at 32, 60, 53;	**1**
3(a)(ii)	avoids bias / equal chance of selection;	**1**
3(b)(i)	*method:* (on one plant) tap / hit / shake the plant (gently with a stick); collect falling insects on the beating tray; count (only) the insects; *processing:* repeat (the beating tray) method **and** take a mean; *idea of scaling up*; e.g. multiply the mean number of insects in the sampled area / plants sampled by the total number of plants	**5**

Question	Answer	Marks
3(b)(ii)	*any two from:* soybean plants are close to ground so difficult to get lower insects in tray; beating can damage the plant; beating cannot be used on wet plants; flying insects fly away / some insects might escape; some insects left on plant / not all insects will fall on the tray;	**2**
3(c)(i)	biological;	**1**
3(c)(ii)	control / to compare the result;	**1**
3(c)(iii)	*any one from:* to ensure that field 1 and field 2 had a comparable number of aphids (at the start); to see if the predator has an effect;	**1**
3(c)(iv)	predator reduces the aphid population; predator takes 8–12 days to make an impact / it took 10 days for the introduced predator to work; relevant comparable quoted data e.g. difference in aphid population with no predator is 215 (255-40) by day 65;	**3**
3(c)(v)	*any two from:* prevents predator flying away; prevents new pests / insects landing on the plants; prevents new predators landing on the plants; (so that the farmer knows) it is the harlequin beetle predator that has reduced the aphid population;	**2**

Question	Answer	Marks
3(d)	*any one from:* increased temperatures mean it will not become inactive; native species may die at hotter temperatures / in changed conditions; beetle competitors / predators might die; expand range of beetle;	**1**
3(e)(i)	plants grown at high density / high crop yield (per unit area); *any three from:* plants grown without soil / roots are in water that contains nutrients; plants less prone to soil pests; plants can be grown in areas with soil erosion / poor quality soil; plants can be grown inside; plants can be grown in controlled conditions; e.g. controlled lighting yields not dependent on weather conditions / rainfall; crops are not seasonal / can be grown all year;	**4**

Question	Answer	Marks
3(e)(ii)	*any three from:* leads to food shortages; more likely to benefit rich; food could rot if not stored properly; danger of losing (large) quantity of food at one time; fresh food loses nutritional value if stored for long period; idea that food should be distributed to people who are hungry now;	**3**
3(e)(iii)	*any four from:* food scarcity; nutritional deficiency / malnutrition; famine / starvation; poverty; forces migration; conflict;	**4**

Question	Answer	Marks
4(a)(i)	*any three from:* north and south of the Equator / between 15° and 35°; mostly north of Equator; west side or west coast of land masses; named desert / country / continent e.g. Africa / Australia / North America / Middle East / Asia;	**3**
4(a)(ii)	**X** drawn in Antarctica / Arctic / Greenland;	**1**
4(b)(i)	line drawn between points;	**1**
4(b)(ii)	49;	**1**
4(b)(iii)	3 : 20	**1**
4(b)(iv)	cactus **and** grass circled;	**1**
4(c)(i)	F frequent **and** O occasional **and** R rare;	**1**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(c)(ii)</td><td>5 correct [2]
3–4 correct [1];;

<table><tr><th>plant species</th><th>ACFOR scale</th></tr><tr><td>U</td><td>C</td></tr><tr><td>V</td><td>R</td></tr><tr><td>W</td><td>F</td></tr><tr><td>Y</td><td>C</td></tr><tr><td>Z</td><td>F</td></tr></table></td><td>2</td></tr>
<tr><td>4(c)(iii)</td><td>any two from:
estimate / qualitative;

biased / subjective;

tendency for overestimate for conspicuous or flowering plants / underestimate for inconspicuous plants;</td><td>2</td></tr>
<tr><td>4(d)(i)</td><td>25, 9 plotted;</td><td>1</td></tr>
<tr><td>4(d)(ii)</td><td>current number of bird species (at every location) is less than historic number;</td><td>1</td></tr>
<tr><td>4(d)(iii)</td><td>very low chance / probability (of a bird species colonising a new location within the desert biome);</td><td>1</td></tr>
</table>