

Cambridge O Level

ENVIRONMENTAL MANAGEMENT

5014/01

Paper 1 Principles of Environmental Management

For examination from 2027

MARK SCHEME

Maximum Mark: 80

Specimen

This document has **12** pages.

Generic Marking Principles

All examiners must apply these general marking principles when marking candidate responses. Examiners must apply them alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme must 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 descriptions for the question
- the specific skills defined in the mark scheme or in the generic level descriptions 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 descriptions.

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 descriptions 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.

mark scheme abbreviations

;	separates alternative responses to the question
/	separates alternative wording within the same response
accept	a less than ideal answer which should be marked correct
allow	identifies an answer that will be allowed if no other marking point is awarded
and	indicates that two or more parts of a response are required for the mark
AVP	any valid point
AW	alternative wording (where responses vary more than usual)
ignore	indicates an incorrect response which is irrelevant and does not cause a contradiction
reject	reject
not	indicates an incorrect response that would contradict another otherwise correct alternative
or	separates possible variants in a response which are mutually exclusive (award marks for one OR the other, not parts of each)
owtte	or words to that effect
<u>underlined</u>	underlined words must be included to gain credit for a response
ecf	credit a correct statement that follows a previous wrong answer
M	marking point (with relevant number)
ora	or reverse argument
()	the word/phrase in brackets is not required but sets the context

Question	Answer	Marks	Guidance														
1(a)(i)	A ;	1															
1(a)(ii)	heat and pressure ;	1															
1(b)	<p><i>one line from each of:</i></p> <table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; width: 30%;">term</th> <th style="text-align: center; width: 30%;">description</th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black; padding: 5px;">crystallisation</td> <td style="border: 1px solid black; padding: 5px;">molten rock cools and solidifies</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">cementation</td> <td style="border: 1px solid black; padding: 5px;">rock particles are transported by gravity, water, wind and ice</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">erosion</td> <td style="border: 1px solid black; padding: 5px;">rock particles are pressed together and water is removed</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">weathering</td> <td style="border: 1px solid black; padding: 5px;">break down of rocks into smaller pieces on the surface of the Earth</td> </tr> <tr> <td></td> <td style="border: 1px solid black; padding: 5px;">sediments are joined together by minerals</td> </tr> <tr> <td></td> <td style="border: 1px solid black; padding: 5px;">rock particles are deposited in layers</td> </tr> </tbody> </table> <p>1 line correct ; 2 lines correct ; 3 lines correct ;</p>	term	description	crystallisation	molten rock cools and solidifies	cementation	rock particles are transported by gravity, water, wind and ice	erosion	rock particles are pressed together and water is removed	weathering	break down of rocks into smaller pieces on the surface of the Earth		sediments are joined together by minerals		rock particles are deposited in layers	3	reject each additional line
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1(c)(i)	M1 ability of water to pass through rocks or soil ; M2 via the pore spaces of rocks and soil ;	2															

Question	Answer	Marks	Guidance
1(c)(ii)	M1 permeable: limestone / sandstone ; M2 impermeable: shale ;	2	M1 accept any named permeable sedimentary rock M2 accept any named impermeable sedimentary rock
1(d)(i)	<i>any three from:</i> M1 phytomining ; M2 plants grown in soils with minerals / plants absorb minerals ; M3 plants harvested and combusted ; M4 minerals extracted from ash ;	3	
1(d)(ii)	<i>any two from:</i> M1 it does not meet demand / low metal yields ; M2 takes time for plants to grow ; M3 requires technology for separation of minerals from ash ; M4 dependent on growing conditions / climate may not be suitable for plant growth / plants will not grow in that soil type or pH ; M5 plants do not extract all minerals ;	2	

Question	Answer	Marks	Guidance
2(a)(i)	M1 transfer Y: (surface) run-off ; M2 transfer Z: evaporation ;	2	
2(a)(ii)	M1 increases interception ; M2 more, leaves / foliage to catch, rain / precipitation ;	2	
2(b)(i)	water that is safe to drink ;	1	
2(b)(ii)	M1 water heated until it boils ; <i>any two from:</i> M2 salt remains in the liquid ; M3 steam is pure water ; M4 steam is cooled and condensed ;	3	
2(b)(iii)	reverse osmosis ;	1	

Question	Answer	Marks	Guidance
2(b)(iv)	<p><i>any six from:</i> benefits: (max 5) M1 increases availability of water ; M2 uses a source of water that is not, potable / drinkable ; M3 conserves water for, irrigation / crops ; M4 produces very pure water ; M5 removes bacteria ; M6 reduces risk of water conflict ; M7 AVP ;</p> <p>limitations: (max 5) M8 expensive infrastructure / expensive per litre produced / other sources may be cheaper ; M9 produces, waste / brine ; M10 stated impact of waste on ecosystem ; M11 uses a large amount of energy ; M12 idea of consumer reluctance / perceived 'taste' to water ; M13 stated impact of energy use ; e.g. further contributes to resource depletion / global warming / climate change M14 cannot be used by landlocked countries ; M15 idea of different grades of fresh water available ; M16 AVP ;</p>	6	<p>M3 allow named water source</p> <p>M5 allow named pathogen</p> <p>M8 cost / expense must be qualified with reason</p> <p>M13 climate change and global warming must be linked to energy use</p>

Question	Answer	Marks	Guidance
3(a)(i)	3.7(%) ;	1	
3(a)(ii)	values are rounded ;	1	reject error in adding up
3(a)(iii)	<p>M1 overall similar shape of pyramid / overall similar percentages, for male and female / overall there are less females than males ;</p> <p><i>any two from:</i> M2 more males 0–49 than females ; M3 same population of males and females 50–54 ; M4 fewer males over 55 than females ; M5 more males born than females ;</p>	3	<p>ora throughout answers must be comparative ignore unqualified data quotes</p>

Question	Answer	Marks	Guidance												
3(b)	<table border="1"> <thead> <tr> <th>description</th> <th>tick (✓) if true</th> <th>tick (✓) if false</th> </tr> </thead> <tbody> <tr> <td>LICs have a wider base than HICs.</td> <td>✓</td> <td></td> </tr> <tr> <td>HICs have a smaller percentage of people in the working population than LICs.</td> <td></td> <td>✓</td> </tr> <tr> <td>LICs have a smaller percentage of elderly dependants than HICs.</td> <td>✓</td> <td></td> </tr> </tbody> </table>	description	tick (✓) if true	tick (✓) if false	LICs have a wider base than HICs.	✓		HICs have a smaller percentage of people in the working population than LICs.		✓	LICs have a smaller percentage of elderly dependants than HICs.	✓		2	3 correct = 2 marks 2 correct = 1 mark 0–1 correct = 0 marks
description	tick (✓) if true	tick (✓) if false													
LICs have a wider base than HICs.	✓														
HICs have a smaller percentage of people in the working population than LICs.		✓													
LICs have a smaller percentage of elderly dependants than HICs.	✓														
3(c)	<p><i>any three from:</i></p> <p>M1 access to contraception ; M2 improved healthcare ; M3 pro-natalist / anti-natalist / national, policies ; M4 control of migration ; M5 improved education ;</p>	3													

Question	Answer	Marks	Guidance
4(a)	<p>biogas geothermal power solar power wood ;;</p>	2	4 correct = 2 marks 2–3 correct = 1 mark 0–1 correct = 0 marks reject an additional circle
4(b)(i)	<p><i>any three from:</i></p> <p>M1 bioethanol is combusted ; M2 heat, boils water / forms steam ; M3 steam turns blades of turbine ; M4 turbine turns a generator ;</p>	3	

Question	Answer	Marks	Guidance
4(b)(ii)	<p><i>any three from:</i></p> <p>M1 requires large areas of land to grow fuel crops / electricity production is dependent on crop yield ;</p> <p>M2 less land available for food crops ;</p> <p>M3 deforestation to grow bioethanol ;</p> <p>M4 low energy content ;</p> <p>M5 releases, carbon dioxide / greenhouse gases ;</p> <p>M6 it requires specialised infrastructure ;</p> <p>M7 bioethanol is, highly volatile / difficult to store / harmful / bioethanol is corrosive ;</p> <p>M8 AVP ;</p>	3	
4(c)(i)	<p>M1 5.4 – 1.5 or 3.9 ;</p> <p>M2 $M1 \div 2100 - 2033$ or $M1 \div 67$ or unrounded answer ;</p> <p>M3 M2 correctly rounded to two significant figures ;</p>	3	<p>M2 expected answer 0.0582</p> <p>M3 expected answer 0.058 = 3 marks</p>
4(c)(ii)	<p><i>any two from:</i></p> <p>M1 increased demand and because of the need for cooling systems ;</p> <p>M2 increased demand and because of the need for food refrigeration ;</p> <p>M3 increased demand and because electricity generation is difficult ;</p> <p>M4 increased demand and because electricity transmission is inefficient ;</p> <p>M5 decreased demand and because cooler regions use less energy for heating ;</p> <p>M6 AVP;</p>	2	
4(c)(iii)	<p><i>any two from:</i></p> <p>M1 predictions based on, variable data / uncertain data ;</p> <p>M2 calculations are imprecise ;</p> <p>M3 scientists do not know future trends for energy use ;</p> <p>M4 scientists cannot predict human population changes ;</p> <p>M5 possible natural climate adjustments ;</p> <p>M6 current trends may only be short term ;</p> <p>M7 AVP ;</p>	2	

Question	Answer	Marks	Guidance
5(a)(i)	M1 non-biodegradable plotted at a y-axis value of 4900 and biodegradable plotted at a y-axis value of 2400 within \pm half of a small square tolerance in plotting ; M2 using the correct key shading for both bars and bars that match width of existing data ;	2	
5(a)(ii)	M1 2 400 000 and 1 300 000 / 2400 and 1300 seen ; M2 1 100 000 / 1100 ; M3 tonnes / thousand tonnes to match data selected ;	3	expected answer 1 100 000 tonnes / 1100 thousand tonnes = 3 marks M2 ecf M1
5(b)(i)	bacteria / fungi ;	1	
5(b)(ii)	<i>any two from:</i> M1 water ; M2 biomass ; M3 carbon dioxide ; M4 methane ;	2	ignore gases unqualified
5(b)(iii)	<i>any two from:</i> M1 temperature ; M2 water ; M3 soil pH ; M4 oxygen ; M5 salinity ; M6 light ;	2	
5(c)	<i>any four from:</i> M1 visual pollution ; M2 people do not want to use, marine ecosystems / beach ; M3 entanglement ; M4 animals cannot, swim / breathe / fly / feed / named activity ; M5 mistaken for food ; M6 blocks digestion / causes starvation / toxic / harmful ;	4	

Question	Answer	Marks	Guidance
6(a)(i)	<i>any two from:</i> M1 light ; M2 mineral ions / nutrients ; M3 space ; M4 carbon dioxide ; M5 oxygen ;	2	
6(a)(ii)	invasive species ;	1	
6(b)(i)	M1 insect ; M2 wind ;	2	
6(b)(ii)	M1 fertilised ; M2 seeds ;	2	
6(c)(i)	<i>primary consumers:</i> M1 weevil and raccoon and snail ; <i>secondary consumer:</i> M2 egret ; feeds at trophic level two and three: M3 raccoon ;	3	
6(c)(ii)	M1 water hyacinth plant 1000 (units) ; M2 egret 10 (units) and eagle 1 (unit) ;	2	