



## Cambridge International AS Level

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ENVIRONMENTAL MANAGEMENT

8291/21

Paper 2

October/November 2020

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 October/November 2020 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 **14** 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.

Question	Answer	Marks
1(a)(i)	lava flow; volcano eruption; retreating glacier; newly formed sand dune; abandoned strip mine / opencast mine; mining spoil / waste heap; <b>max 1</b>	<b>1</b>
1(a)(ii)	need to establish fertile soil; pioneer species grow; die / lose leaves; leaves rot; due to decomposers; increasing nutrients in soil; more advanced species can colonise <b>max 4</b>	<b>4</b>
1(a)(iii)	primary starts from lifeless region; secondary starts from area previously inhabited; valid example described; <b>max 1</b>	<b>1</b>
1(b)(i)	biodiversity changes as the biotic and abiotic factors change; named examples; pioneer species bind the dune; humus is added; soil fertility increases; other soil factors change, e.g. soil water; competition between species increases; new species come in and survive / some species can't survive; some species out-competed for nutrients / sunlight, etc.; climax community reached; climax species shade out / out-compete others; some release toxins into the soil to remove competitors; <b>max 4</b>	<b>4</b>

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Question	Answer	Marks
1(b)(ii)	temperature; more extreme in pioneer stage / cooler in climax stage; water; dry in pioneer stage / moister in climax stage; soil; dry and sandy in pioneer stage / moist and loamy in climax stage; nutrients; such as nitrate and phosphate increase as succession continues; <b>max 4</b>	<b>4</b>
1(b)(iii)	unique habitat; protect rare species; maintain biodiversity; important role in coastal erosion; resist action of wind / waves; prevent salt water intrusion; reduce risk of salinization of soils; dune succession leads to fertile soil development inland; <b>max 4</b>	<b>4</b>
1(c)	arrested succession caused by human interference / natural event; named example;	<b>2</b>

Question	Answer	Marks
2(a)(i)	move through the soil; leaching; move into streams / rivers; rivers drain into the sea; <b>max 2</b>	<b>2</b>
2(a)(ii)	PCBs enter water; accumulate in the tissues of small fish; pass along the food chain; as predators feed on them; become more concentrated along the food chain; large amounts found in top predators; bioaccumulation; <b>max 4</b>	<b>4</b>
2(a)(iii)	do not put in landfill; remove from landfill sites; recover, reuse or recycle; prevent leaching from landfill sites; <b>max 2</b>	<b>2</b>
2(b)(i)	thrown / dumped into the sea from land / boats; washed into waterways from landfill / industrial / agriculture sources; blown into waterways; <b>max 2</b>	<b>2</b>

Question	Answer	Marks
2(b)(ii)	<p>plastic accumulates in huge quantities; blocking migration routes;</p> <p>plastic enters marine animal's digestive systems; causing feeding problems;</p> <p>plastics interfere with fishing nets / boat propellers;</p> <p>wood floats and is a maritime hazard;</p> <p>metal can injure marine animals;</p> <p>marine litter can lead to the death of seabirds / marine animals; because of tangling / trapping;</p> <p>marine litter can wash up on beaches; and be hazardous;</p> <p><b>max 6</b></p>	<b>6</b>
2(b)(iii)	<p>legislation / government initiatives; e.g. charging for plastic bags; reducing the number of plastic nurdles / micro-beads in products; education; engaging with the fishing / maritime industry; NGO action;</p> <p><b>max 4</b></p>	<b>4</b>

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Question	Answer	Marks
3(a)	<p><b>Advantages</b> HEP once built is clean, provides a lot of power, provides areas for recreation, and a habitat for wildlife.</p> <p><b>Disadvantages</b> During construction habitats destroyed, people displaced, loss of crop growing land, loss of biodiversity, noise and dust pollution. Expensive.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p><b>please use level descriptors 1</b></p> </div>	<b>10</b>
3(b)	<p>The question requirements are:</p> <ul style="list-style-type: none"> <li>• to demonstrate understanding of the range of problems arising from different levels of economic development</li> <li>• to describe different methods of water supply</li> <li>• to assess the relative success of the different strategies used to supply potable water.</li> </ul> <p>Indicative content: Appropriate technology used, e.g. wells, boreholes, gravity fed schemes using natural slopes, harvesting rainwater, waste management (use of grey water), reduction of evaporation techniques, improved irrigation and use of drought tolerant crops.</p> <p>Relative merits and success assessed.</p> <p>Where infrastructure is available water supply still must be both sufficient and safe (disease free) so sanitation is also an issue.</p> <p>Ground water stores need preserving, e.g. aquifers. Dams to provide water reservoirs.</p> <p>Desalination is an option if affordable and the country is not landlocked.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p><b>please use level descriptors 2</b></p> </div>	<b>30</b>



Question	Answer	Marks
4(a)	<p>Purpose is to conserve and preserve the ecosystem and the biodiversity within the area while allowing local people to co-exist with the preserved area and to allow for the possibilities of controlled hunting and ecotourism.</p> <p>Core area is left alone except for scientific research, the buffer area is where some measure of human interaction with the preserved area is allowed, and the transition area is the outer area and the final barrier between the preserved area and the rest of the region.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p><b>please use level descriptors 1</b></p> </div>	<b>10</b>
4(b)	<p>The question requirements are:</p> <ul style="list-style-type: none"> <li>• to demonstrate knowledge of different methods for conservation</li> <li>• to show understanding of the barriers to success from both political and economic factors</li> <li>• to assess the success of examples cited.</li> </ul> <p>Indicative content: The different methods of conservation could include National parks, nature reserves, SSSIs, zoos and safari parks. Breeding and release programmes. Education and involvement of local population, ecotourism, controlled hunting including bans and seasons, and use of legislation.</p> <p>Appropriate descriptions of the methods chosen and assessment of relative success.</p> <p>Issues raised could include problems of poaching, use of rangers and law enforcement personnel, loss of land to local people unless they are involved, economics of protection, difficulties of enforcement, political will and education.</p> <p>Money is also a factor – the local people need to see an advantage such as income from tourism and controlled hunting in order to change their ways, involvement of NGOs such as conservation charities, often areas needing conservation have low levels of economic development and funding isn't available to support the projects</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p><b>please use level descriptors 2</b></p> </div>	<b>30</b>

Question	Answer	Marks
5(a)	<p>Raw sewage enters plant and is filtered by large screens to remove debris before entering a sedimentation tank where the heavier solid wastes can settle and are removed and dried or used in other ways.</p> <p>The liquid and lighter waste is transferred to filter beds where anaerobic bacteria digest the organic material over time and clean water is released, or, this is transferred to an activated sludge tank to be digested by anaerobic microbes to release clean water.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"><b>please use level descriptors 1</b></div>	<b>10</b>

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Question	Answer	Marks
5(b)	<p>The question requirements are:</p> <ul style="list-style-type: none"> <li>• to show understanding for the need for sewage treatment and the environmental problems if it is not treated before release</li> <li>• to demonstrate knowledge of the health problems arising from sewage and sewage sludge</li> <li>• to show understanding of the environmental problems caused by the accidental disposal of sewage and sewage sludge.</li> </ul> <p>Indicative content:</p> <p>The impact of raw sewage in rivers is to lead to oxygen depletion and the loss of species. Sensitive indicator species are present or absent depending on the level of oxygen. The sewage can also be a source of disease for humans using the water for recreation.</p> <p>Sewage works receive all sorts of wastes from hospitals, farms, industry and domestic residences. As a result, this substance can contain high levels of pathogenic microbes, poisonous substances such as cadmium, cyanide, etc.</p> <p>The sludge is used as a fertiliser on cropland and as such is a potential hazard and may leach into the water from the land. The sludge is dumped in landfill where it can leach into groundwater, streams and rivers as well as aquifers leading to potential health risks.</p> <p>Credit references to algal blooms particularly those with toxic effects on animals.</p> <p>Assessment of health issues especially those where general outbreaks of illness, e.g. cholera has occurred following spillages or floods due to extreme environmental events.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;"> <p><b>please use level descriptors 2</b></p> </div>	<b>30</b>

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Question	Answer	Marks											
	<p><b>Section B descriptor levels:</b></p> <table border="1"> <thead> <tr> <th>Descriptor</th> <th>Award Mark</th> </tr> </thead> <tbody> <tr> <td>Consistently meets the level criteria</td> <td>Mark at top of level</td> </tr> <tr> <td>Meets the criteria, but with some inconsistency</td> <td>Middle, mark to just below top mark</td> </tr> <tr> <td>Meets most of level criteria, but not all convincingly</td> <td>Just below middle, mark to just above bottom mark</td> </tr> <tr> <td>On the borderline of this level and the one below</td> <td>Mark at bottom of level</td> </tr> </tbody> </table> <p><b>Section B (part a),</b></p> <table border="1"> <tr> <td><b>Level descriptors 1</b></td> </tr> </table> <p><b>8–10 marks</b> The response:</p> <ul style="list-style-type: none"> <li>• contains few errors</li> <li>• shows a very good understanding of the question</li> <li>• shows a good use of data or the information provided, where appropriate</li> <li>• provides a balanced answer</li> </ul> <p><b>5–7 marks</b> The response:</p> <ul style="list-style-type: none"> <li>• may contain some errors</li> <li>• shows an adequate understanding of the question</li> <li>• shows some use of data or the information provided, where appropriate</li> <li>• may lack balance</li> </ul> <p><b>1–4 marks</b> The response:</p> <ul style="list-style-type: none"> <li>• may contains errors</li> <li>• shows limited understanding of the question</li> <li>• shows little or no use of data or the information, where appropriate</li> <li>• lacks balance</li> </ul>	Descriptor	Award Mark	Consistently meets the level criteria	Mark at top of level	Meets the criteria, but with some inconsistency	Middle, mark to just below top mark	Meets most of level criteria, but not all convincingly	Just below middle, mark to just above bottom mark	On the borderline of this level and the one below	Mark at bottom of level	<b>Level descriptors 1</b>	
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Question	Answer	Marks
	<p><b>Section B (part b):</b></p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-bottom: 10px;"> <p><b>Level descriptors 2</b></p> </div> <p>Responses:</p> <p><b>Level one, 25–30 marks</b></p> <ul style="list-style-type: none"> <li>• fulfil all the requirements of the question</li> <li>• contain a very good understanding of the content required</li> <li>• contain a very good balance of content</li> <li>• contain substantial critical and supportive evaluations</li> <li>• make accurate use of relevant vocabulary</li> </ul> <p><b>Level two, 19–24 marks</b></p> <ul style="list-style-type: none"> <li>• fulfil most of the requirements of the question</li> <li>• contain a good understanding of the content required</li> <li>• contain a good balance of content</li> <li>• contain some critical and supportive evaluations</li> <li>• make good use of relevant vocabulary</li> </ul> <p><b>Level three, 13–18 marks</b></p> <ul style="list-style-type: none"> <li>• fulfil some requirements of the question</li> <li>• contain some understanding of the content required</li> <li>• may contain some limited balance of content</li> <li>• may contain brief evaluations</li> <li>• make some use of relevant vocabulary</li> </ul> <p><b>Level four, 6–12 marks</b></p> <ul style="list-style-type: none"> <li>• fulfil limited requirements of the question</li> <li>• contain limited understanding of the content required</li> <li>• may contain poorly balanced of content</li> <li>• may not contain evaluations</li> <li>• make limited use of relevant vocabulary</li> </ul>	

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Question	Answer	Marks
	<p><b>Level five, 1-5 marks</b></p> <ul style="list-style-type: none"><li>• fulfil a few of the requirements of the question</li><li>• contain a very limited understanding of the content required</li><li>• are likely to be unbalanced and undeveloped</li><li>• evaluative statements are likely to be missing</li><li>• make no use of relevant vocabulary</li></ul>	