
ENVIRONMENTAL MANAGEMENT

8291/11

Paper 1

October/November 2019

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 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **16** 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.

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Question	Answer	Marks
1(a)(i)	break down of rock (in situ / in place);	1
1(a)(ii)	chemical weathering, is a reaction / the minerals react with, solutions / rainwater / cause a chemical change / minerals decomposing; physical weathering involves, breaking down a rock / into smaller pieces / disintegration;	2
1(a)(iii)	mudflow; rock fall; rotational slumping; soil creep; max 3	3
1(b)(i)	heat produced by the volcanic eruption melted the ice on top of the volcanic peak; gravity caused this meltwater to flow downhill / the water flowed into the river valleys; water moved fast / had lots of energy; water carried ash / mud / dust / debris to become a mudflow; max 3	3
1(b)(ii)	Earth tremors / seismic activity increased; suggesting magma was moving and causing the ground to move; steam / gas emissions increased; heat close to surface / gas released as magma reaches lower pressures / gases come out of solution;	4
1(b)(iii)	may be a false alarm; risk loss of livelihood if they leave; risk may not have been communicated well; possible a lack of education / lack of plan; eruption may not have taken route expected / exact hazard not known; impossible to predict exactly, which settlements are at risk / scale of risk; no option for evacuation; max 2	2

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Question	Answer	Marks
1(b)(iv)	<p>Mudflow hazard areas follow existing river valleys / the shape of the land; mudflows directed here as it is where water is present to form the mudflow;</p> <p>Lava flow hazard area is located within 5 km of the volcano; lava will cool and solidify after erupting so does not flow any further;</p> <p>Pyroclastic flow hazard area 5 to 15 km from volcano; explosive volcanic products can travel further due to the power of the eruption;</p> <p>Ashfall hazard area is further out 15 to 20 km; ash is fine and is carried in the wind for greater distances;</p> <p>max 5</p>	5

Question	Answer	Marks
2(a)(i)	troposphere;	1
2(a)(ii)	troposphere temperature decreases with increasing altitude; temperature stays constant and increases at the top of the stratosphere; the temperature is constant then falls at the top of the mesosphere; in the thermosphere it remains constant till increasing at the top of this zone; max 3	3
2(a)(iii)	air pressure decreases with altitude / air at ground level is at greater pressure; air is compressible; air at ground has, more air above it / greater volume of air / greater mass of air;	3
2(a)(iv)	UV radiation;	1

Question	Answer	Marks
2(a)(v)	(exposure to UV radiation) increases risk of skin cancer; cataracts / sight loss; premature aging; sunburn; max 2	2
2(a)(vi)	(ban the use of CFCs in) refrigerants / air cooling systems / foamed plastics / aerosols; find safe alternatives to using CFCs; working together over international borders; consider safe disposal of existing products containing CFCs; Montreal protocol; measurements made by satellites orbiting Earth; max 4	4
2(b)(i)	located at distance from main settlement; sound level reduced by planting trees; which would muffle the sound; solid barriers; to reflect sound back to airport; furrows in ground; so sound is dissipated when reflected in many directions; restrict night flights; when people are most likely to notice noise; pay for double glazing for local residents; busy roads in tunnels; closure of certain roads at day / night time; max 6	6

Question	Answer	Marks
3(a)	<p>35 km depth both p- and s-waves increase in velocity due to boundary between crust and mantle, physical and chemical changes occur here.</p> <p>2890 km both p- and s-waves decrease in velocity due to mantle/ outer core boundary, drop due to change to liquid outer core, s-waves drop to zero as cannot travel through liquid, p-waves can.</p> <p>5150 km both p- and s-waves increase in velocity at transition to inner core as change to more dense and solid inner core.</p> <p>P-waves generally increase in velocity up to core mantle boundary; suddenly reduce in speed when travelling through liquid; increase again with increasing depth;</p> <p>S-waves increase in velocity up to core mantle boundary; and then stop as cannot travel through a liquid.</p> <div data-bbox="322 651 799 740" style="border: 1px solid black; padding: 5px; margin-top: 10px;">please use level descriptors 1</div>	10

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Question	Answer	Marks
3(b)	<p>The question requirements are:</p> <ul style="list-style-type: none"> to discuss management when preparing for future quakes to discuss management during quake, rescue and recovery to discuss management during rebuilding to use of examples from contrasting case studies <p>Damage and loss of life likely to be caused include, impact of a major earthquake on a population, number of fatalities, injuries, destruction of homes, businesses, loss of communication, infrastructure, economic cost, loss of tourist industry. Preparing for an earthquake is likely to include, evacuation plans, routes, ongoing monitoring of area by scientists recording and analysing earth movements, seismic activity, building design suitable, trained rescue teams, alarms, equipment to move heavy parts of buildings available.</p> <p>Management during a quake / rescue and recovery, auto shut down of systems example bullet train in Japan, gas services to prevent leaks and fires, warning alarms to go to strongest parts of building, communication on aftershocks, areas to avoid. Management of rescue, dividing teams to areas with greatest need, use of technology, cameras, infra-red, rescue dogs, co-ordinating aid from overseas.</p> <p>Management during rebuilding priorities, use of foreign investment, redesigning building to improve performance in a future quake, identifying most vulnerable people, consider costs and which are most urgent.</p> <p>Consider examples of countries with contrasting economic development, the financial challenges associated with each stage, MEDC likely to have been able to invest more heavily in buildings designed to withstand earthquakes but make also have greater density of taller buildings which may increase hazards, LEDC may have fewer buildings designed to withstand the earthquake but potentially more low-rise buildings and more dispersed population. during eruption there will be variation in communication effectiveness and speed of search and rescue service response. Rebuild costs may be far greater in MEDC as buildings and infrastructure at high spec, wages higher for builders / engineers.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;"> <p>please use level descriptors 2</p> </div>	30

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Question	Answer	Marks
4(a)	<p>Generally, where populations are at higher density the level of risk of death from tropical cyclones, floods and landslides is also high.</p> <p>For example, Central Africa, East coast population is 25–200 per km² and the risk is medium mostly with a small area of high.</p> <p>North Africa has some areas of high population density along the North coast with some pockets of >200 per km² however the risk is mostly low or unknown with very small points of medium / high risk.</p> <p>To the East of the North coast there is a linear high population density feature, following a river this matches a high-risk area of the same pattern.</p> <p>The Island off the South-East coast (Madagascar) has a high concentration of medium risk areas however the population is relatively low mostly 1–24 per km². This location means risk of tropical cyclones is very high, coastal, equatorial.</p> <div data-bbox="322 687 799 775" style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>please use level descriptors 1</p> </div>	10

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Question	Answer	Marks
4(b)	<p>The question requirements are:</p> <ul style="list-style-type: none"> to discuss how MEDCs can manage their pollutants and why they should do it to discuss consequences of pollution for LEDCs to refer to a number of pollutants and case studies. <p>MEDCs should take responsibility for the pollution they make, they are gaining economically from the energy use or industry, they have funds to research solutions and put procedure in place, have funds for defences against storm events. They are making economical gains by exporting goods but the production of goods is causing air pollution, the transport methods are also causing air pollution.</p> <p>Research solutions for cleaning emissions or storing waste gases or making emissions safe. Review manufacturing systems to ensure as efficient as possible in terms of raw materials and energy. Increase use / research into renewable / greener energy supplies.</p> <p>Consequences of enhanced greenhouse effect may include temperatures rising in ocean / sea disrupting marine ecosystems and fishing. Temperature rise causing ocean expansion and melting icecaps causing sea level to rise results in flooding of low-lying areas destroying farming, settlements, LEDCs may not have the money to build defences. Climate change may change conditions for farmers, causing drought, desertification, failure of crops and maybe abandonment of farms. Seasonal changes effect migration patterns.</p> <p>Arguments against, countries need to independently protect their population from events linked to changing climate, everyone can improve efficiency, all countries have some responsibility for the condition of the atmosphere. Pollutants to consider, carbon dioxide, carbon monoxide, sulfur dioxide, particulates, CFCs.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;"> <p>please use level descriptors 2</p> </div>	30

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Question	Answer	Marks
5(a)	<p>Scientific methods used to investigate environmental damage:</p> <p>Satellite imagery to take images of extent of glacial ice and review advances and retreats over time.</p> <p>Biodiversity surveys in ecosystems monitoring long-term changes in numbers of plants and animals.</p> <p>Temperature patterns in the oceans and on land.</p> <p>Atmospheric carbon dioxide levels recorded at regular intervals to review changes.</p> <p>Composition of atmospheric gases recorded in ice cores.</p> <p>Locations where there has been an impact on glaciers, are all regions and confidence in climate change being responsible is generally high.</p> <p>Locations where scientists are confident that climate change is having an impact on North America and Central America.</p> <p>Both terrestrial and marine ecosystems are being impacted on across almost all regions and scientists are vary widely about whether these changes are caused by climate change or if something else is responsible</p> <div data-bbox="322 620 799 707" style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>please use level descriptors 1</p> </div>	10

Question	Answer	Marks
5(b)	<p>The question requirements are:</p> <ul style="list-style-type: none"> to describe how National parks manage resources in a sustainable way to describe conflicts within a national park being managed as a resource to provide examples. <p>National park management, conservation areas to provide safe haven for particular plant or animal species to thrive, educate the general public to inform how to look after resources, numbers of people able to access an area may be restricted by gate barriers and cost of entry, planning restricting for building and mineral exploration, number of vehicles restricted within the area. Research can be carried out within the park; particular funding is available nationally and internationally to run the park. Renewables considered a sustainable way to provide future energy resources, national parks may be suitable sites for various projects. People may object to wind turbines in national parks as they are not natural and large, intrusive constructions, tidal barrages in coastal national parks may disturb food chains, biofuel powerplants may still involve large amounts of construction and access to an area.</p> <p>Conflicts that exist in national parks when considering land use, people want access to park for recreation, leisure therefore some infrastructure is needed, maybe services, hotels, restaurants shops etc., staff accommodation, emergency service provision. Conflicts exist by some recreational use, hikers, climbers accessing more remote sites, water sports on lakes, numbers limited, damage to water quality and banks. Conflicts exist between farmers who may have farmed the area for a long time and access to recreation users, use of agrochemicals, pest control. Conflicts between mineral exploration, mines and quarries, if these are allowed how can the quarry be recovered after, access for large lorries.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;"> <p>please use level descriptors 2</p> </div>	30

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Question	Answer	Marks										
Section B descriptor levels:												
<table border="1"> <thead> <tr> <th data-bbox="365 280 1120 347">Descriptor</th> <th data-bbox="1120 280 1872 347">Award Mark</th> </tr> </thead> <tbody> <tr> <td data-bbox="365 347 1120 413">Consistently meets the level criteria</td> <td data-bbox="1120 347 1872 413">Mark at top of level</td> </tr> <tr> <td data-bbox="365 413 1120 480">Meets the criteria, but with some inconsistency</td> <td data-bbox="1120 413 1872 480">Middle, mark to just below top mark</td> </tr> <tr> <td data-bbox="365 480 1120 545">Meets most of level criteria, but not all convincingly</td> <td data-bbox="1120 480 1872 545">Just below middle, mark to just above bottom mark</td> </tr> <tr> <td data-bbox="365 545 1120 611">On the borderline of this level and the one below</td> <td data-bbox="1120 545 1872 611">Mark at bottom of level</td> </tr> </tbody> </table>			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
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Question	Answer	Marks
<p data-bbox="152 217 405 248">Section B (part a),</p> <div data-bbox="152 284 454 347" style="border: 1px solid black; padding: 5px;"><p data-bbox="168 300 439 331">Level descriptors 1</p></div> <p data-bbox="152 384 315 416">8–10 marks</p> <p data-bbox="152 419 342 451">The response:</p> <ul data-bbox="264 454 1211 595" style="list-style-type: none"><li data-bbox="264 454 517 486">contains few errors<li data-bbox="264 489 909 521">shows a very good understanding of the question<li data-bbox="264 525 1211 557">shows a good use of data or the information provided, where appropriate<li data-bbox="264 560 633 592">provides a balanced answer <p data-bbox="152 632 300 663">5–7 marks</p> <p data-bbox="152 667 342 699">The response:</p> <ul data-bbox="264 702 1193 842" style="list-style-type: none"><li data-bbox="264 702 591 734">may contain some errors<li data-bbox="264 737 916 769">shows an adequate understanding of the question<li data-bbox="264 772 1193 804">shows some use of data or the information provided, where appropriate<li data-bbox="264 807 495 839">may lack balance <p data-bbox="152 879 300 911">1–4 marks</p> <p data-bbox="152 914 342 946">The response:</p> <ul data-bbox="264 949 1128 1090" style="list-style-type: none"><li data-bbox="264 949 461 981">contains errors<li data-bbox="264 984 837 1016">shows limited understanding of the question<li data-bbox="264 1019 1128 1051">shows little or no use of data or the information, where appropriate<li data-bbox="264 1054 448 1086">lacks balance		

Question	Answer	Marks
<p>Section B (part b):</p> <div data-bbox="152 284 454 347" style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Level descriptors 2</p> </div> <p>Responses:</p> <p>Level one, 25–30 marks</p> <ul style="list-style-type: none"> fulfil all the requirements of the question contain a very good understanding of the content required contain a very good balance of content contain substantial critical and supportive evaluations make accurate use of relevant vocabulary <p>Level two, 19–24 marks</p> <ul style="list-style-type: none"> fulfil most of the requirements of the question contain a good understanding of the content required contain a good balance of content contain some critical and supportive evaluations make good use of relevant vocabulary <p>Level three, 13–18 marks</p> <ul style="list-style-type: none"> fulfil some requirements of the question contain some understanding of the content required may contain some limited balance of content may contain brief evaluations make some use of relevant vocabulary <p>Level four, 6–12 marks</p> <ul style="list-style-type: none"> fulfil limited requirements of the question contain limited understanding of the content required may contain poorly balanced content may not contain evaluations make limited use of relevant vocabulary 		

Question	Answer	Marks
	<p>Level five, 1–5 marks</p> <ul style="list-style-type: none">fulfil a few of the requirements of the questioncontain a very limited understanding of the content requiredare likely to be unbalanced and undevelopedevaluative statements are likely to be missingmake no use of relevant vocabulary	