
ENVIRONMENTAL MANAGEMENT

8291/11

Paper 1

May/June 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.

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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.

Question	Answer	Marks
1(a)(i)	constructive / divergent;	1
1(a)(ii)	heat originates from core; radioactive decay in core; (convection) currents in the mantle; hot magma has a lower density; causes the crust / plates to move / pull, apart; the plates become thinner / faults form; magma, flows into any gaps / upward; forming new (oceanic) crust;	max 3
1(a)(iii)	dating rocks show youngest closest to ridge and oldest far away; the new rocks are gradually being moved from where they were formed; normal (magnetic polarity) closest to the ridge and the reversed (magnetic polarity) are further away; most recent rocks formed in normal polarity; the pattern of magnetic reversals is parallel to the ridge; new crust is formed along the length of the ridge; pattern of magnetic reversals same on each side of the ridge; therefore, both sides must be moving apart; minerals record magnetic orientation when magma cools; changing polarity recorded overtime; thickness of reversals equal on each side of ridge; thickness shows how fast sea seafloor was being made at that reversal;	max 4
1(b)(i)	8 000 000 cm / 3 000 000 years; 2.67 cm / yr;	2

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Question	Answer	Marks
1(b)(ii)	<p>forecast where eruptions are likely to take place / identify areas at risk / hazard mapping; plan where buildings should be allowed; raised roads; plan for evacuation; methods of communication / alarm / warning system; education in school / work about how to respond; protective / survival equipment / shelters provided to population; trained rescue teams / emergency services; cranes / equipment to clear rubble available; monitoring volcanoes (remotely or by collecting samples)/monitor chemical analysis; monitor increased seismic / earthquake activity; measure ground tiltmeters; review historic records; extensive cooling of lava with water;</p>	max 4
1(c)(i)	<p>the shape of coastline / continents; the shape of the coastlines fit together like a jigsaw; this indicates they were once joined together but now have moved apart;</p> <p>rock types glacial deposits / rock types line up / patterns match; evidence that in the past these continents were joined and had the same environmental / geological, conditions; evidence that glaciers spread out across these continents when they were joined; evidence that swamps which formed coal measures extended across continents;</p> <p>fold mountains; fold mountains are the same (range) in South America and Africa; evidence that continents were joined as same geological conditions;</p> <p>fossil (sites of unique fossils are found) line up in bands; these organisms could not have crossed the oceans; freshwater species / land species could not be found in salt water; continents must have been previously joined to allow movement / travel / spread of animals; no evidence of land bridges found; same conditions occurred in continents next to each other to allow same organisms to occur;</p>	max 6

Question	Answer	Marks
2(a)(i)	0.45–0.06; 0.39 m;	2
2(a)(ii)	0.70 m and 0.24 m; 0.46 m;	2
2(a)(iii)	beach area / coastal area is flooded; reference to impact on tourism / leisure activities; beach material / sand dune is washed away; reducing protection of the land from sea / waves; build coastal defences; access to fishing platform reduced; reference to impact on economy / food supply; storm waves / high tide may now reach the road; cause loss of access to this location; storm waves / high tide may damage property; greater risk of flooding for buildings; reduce value of property; increase insurance cost; population must move away; reference to loss of coastal habitat / species;	max 4
2(a)(iv)	burning fossil fuels / relevant human activity; releases carbon dioxide (greenhouse gas) OR methane; limits the escape of (infrared / longwave radiation) out going radiation; causing the increase in temperature (of the atmosphere); warmer seas water volume expands; high temperatures cause ice caps and glaciers to melt;	max 4
2(a)(v)	planting trees / making a forest; in an area which has been cleared / never had a forest; increase photosynthesis rates; trees use carbon dioxide; that would be stored in plants; as the forest grows / expands more plants photosynthesise; reducing carbon dioxide in the atmosphere means less radiation absorbed;	max 4

Question	Answer	Marks
2(a)(vi)	changes occur over very long-time periods; difficult to measure / calculate emissions; difficult to measure once emissions have reacted; hard to separate natural change from human change; example of natural contributors (volcanoes); air pollution is quickly moved away from its source; difficult to identify the source of a pollutant; requires international co-operation to monitor; (LEDC's) do not have resources / equipment / motivation to monitor; lack of data from before human impact;	max 4

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Question	Answer	Marks
3(a)	<p>General trend in each category described: Precipitation peak at 1995 (180 mm) followed by landslide peak at 1996 (9) Precipitation peak at 2002 (210 mm) same year landslide peak at 2002 (60) Precipitation peak at 2007 (230 mm) same year landslide peak at 2007 (29)</p> <p>Explanations: High precipitation infiltrates rock layers making them weak and layers may slide. If landslides have occurred the previous years may be less likely despite high rainfall. May be a delay between high rainfall and landslide depending on nature of geology. Depend on population density in an area. May depend on human intervention to stabilise an area. Consider steepness of slope. Occurrence of earthquake activity.</p> <div data-bbox="324 587 790 660" style="border: 1px solid black; padding: 5px; width: fit-content;">Please use level descriptors 1</div>	10

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Question	Answer	Marks
3(b)	<p><i>The question requirements are:</i></p> <ul style="list-style-type: none"> • To outline how unstable slopes can be managed to reduce the level of risk. • To compare approaches in LEDC's and MEDC's. • Evaluate the success of the projects. <p>Indicative content:</p> <p>It is expected that candidates will discuss a number of methods whereby slopes can be managed, for example terracing, drainage, planting, protection of slope. Various types of large-scale civil engineering projects, gabions, concrete structures, mesh nailed on cliff faces, cutting embankments using the local geology.</p> <p>In comparing examples from LEDC's and MEDC's candidates are expected to look at case studies, think about costs of large engineering projects and why they may be justified, what the slopes are used for and how they are managed. Planning where the highest risk is both financially and human. Consider how the priorities may differ across the World. Consider why the costs of engineering projects may be higher in a MEDC compared to an LEDC.</p> <p>In comparison, low cost options soft engineering planting and terracing considering long term sustainability of a project. Evaluating where there has been success</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>The North Atlantic warm current travels from the equator to Europe where it increases the temperature. At the North Pole where the cold water sinks down and releases its heat energy to the atmosphere. Cold dense water travels towards the equator and then sweeps past Antarctica. From Antarctica, the current spreads into the Pacific and Indian ocean where it warms and becomes shallower. The surface currents are driven towards the Atlantic from the Pacific and Indian ocean. The ocean stores heat energy from the Sun. Ocean water evaporates to create rain and storms. Ocean currents help to distribute heat energy around the World. Water is heated close to the equator and moves to colder areas to distribute the heat energy. Cold currents are dense and sink, warm currents are buoyant and rise.</p> <div data-bbox="324 587 790 660" style="border: 1px solid black; padding: 5px; width: fit-content;">Please use level descriptors 1</div>	10

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Question	Answer	Marks
4(b)	<p><i>The question requirements are:</i></p> <ul style="list-style-type: none"> • Outline the positive effect of renewable energy sources. • Outline negative effect of using renewable energy sources over fossil fuels. • Use examples of different energy sources that are used or appropriate for different countries. <p>Indicative content:</p> <p>Candidates will consider the positive impact of renewable energy sources, life span of renewable structures, once built will provide ongoing supplies, solar panels can address the high demands for air conditioning systems, improved batteries making solar more feasible, government support. Cuts down on fossil fuel requirements, quarrying / mining fuels / disposing of nuclear waste, building of large power stations, emissions involved carbon dioxide, lead, sulfur dioxide, nitrous oxides, particulate matter. Can be produced small scale at home, improves efficiency as no need to transport electricity, electric cars improving. It is expected that candidates will consider the conflicts which may occur when building a renewable project, how turbines impact on a landscape, production costs and material requirements for solar panels, how tidal barrages impact on wildlife, then go on to consider how the impact changes over the lifespan of a project. This is contrasted with the ongoing impact of a non-renewable source, the impact of building a power station accompanied by the exploration for fuel and the emissions produced.</p> <p>A range of examples could be used to support appropriate energy choices for countries.</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>Renewable energy sources output is variable. Need to use a range of options. Limited time when turbines will be in production as wind is unreliable. Challenges maintaining the infrastructure for energy provision for whole island. In winter when water is at lower temperature takes more energy to generate steam. May need to resort to fossil fuels as power station back up. Straw fired plants use a material that is grown locally, limits food supply The milk has to be cooled. Ethanol powered tractors as made from crops- in a year where crops are weak government may need to decide between food and fuel. Plan is suitable for current population but is it sustainable for an older population or if many people move to the island.</p> <div data-bbox="324 622 790 694" style="border: 1px solid black; padding: 5px; width: fit-content;">Please use level descriptors 1</div>	10

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Question	Answer	Marks
5(b)	<p><i>The question requirements are:</i></p> <ul style="list-style-type: none"> • Outline how energy policies meet social responsibilities. • Outline how energy policies meet economic responsibilities. • Outline how energy policies meet environmental responsibilities. • Use examples of countries at different stages of development. <p>Indicative content:</p> <p>It is expected that candidates will consider the importance of energy supply for society, providing a reliable, safe source at reasonable price, that the emissions are not detrimental to human health, if public transport or cycling is encouraged then the infrastructure is needed. People need to be able to easily move around for work, business, education, leisure time. Cost must be affordable so people are able to have warm, clean homes, cook, wash clothes.</p> <p>Economic responsibilities for energy supply require a reasonable price for businesses, manufacturing costs, transport costs, sustainable sources. Prices must allow businesses to be competitive when importing / exporting. Supply must be reliable as many factories need to be in operation continuously as it takes lots of energy to power up and down.</p> <p>Environmental responsibilities include selection of sites for renewable projects, environmental impact assessment, selection of building materials for projects. Using non-renewable sources consider sustainability and range of emissions produced. Consider the measures in place for monitoring and reducing emissions, clean air act, choice of clean fuels, location of power stations.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-top: 10px;"> <p>Please use level descriptors 2</p> </div>	30

Section B descriptor levels:

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

Level Descriptors 1**Level one, 8–10 marks**

The response:

- contains few errors
- shows a very good understanding of the question
- shows a good use of data or the information provided, where appropriate
- provides a balanced answer

Level two, 5–7 marks

The response:

- may contain some errors
- shows an adequate understanding of the question
- shows some use of data or the information provided, where appropriate
- may lack balance

Level three, 1–4 marks

The response:

- may contain errors
- shows limited understanding of the question
- shows little or no use of data or the information, where appropriate
- lacks balance

Section B descriptor levels:**Level Descriptors 2****Responses:****Level one, 25–30 marks**

- 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

Level two, 19–24 marks

- 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

Level three, 13–18 marks

- 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

Level four, 6–12 marks

- fulfil limited requirements of the question
- contain limited understanding of the content required
- may contain poor balance of content
- may not contain evaluations
- make limited use of relevant vocabulary

Section B descriptor levels:**Level five, 1–5 marks**

- fulfil a few requirements of the question
- contain a very limited understanding of the content required
- are likely to be unbalanced and undeveloped
- evaluative statements are likely to be missing
- make no use of relevant vocabulary