
ENVIRONMENTAL MANAGEMENT

8291/11

Paper 1

May/June 2017

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 will not enter into discussions about these mark schemes.

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Section A

Question	Answer	Marks
1(a)(i)	breakdown / decomposition / disintegration / wearing down / eating away; of rock / objects etc.; in situ or OWTTE; at or near the Earth's surface; by a range of factors / named factor, e.g. rain;	2
1(a)(ii)	indistinct / hard to read / see text; cracking / pitted / chips; smoothing out / rounding; growth of lichen / plants; discolouration / staining;	3

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Question	Answer	Marks
1(a)(iii)	<p><i>One mark for a factor. Allow additional marks for a developed point for a factor. Max. two marks for a list of factors without explanation.</i></p> <p><i>One mark max. for ref. to valid rate comparison / magnitude.</i></p> <p><i>Candidates may use rock type in the context of igneous vs. sedimentary or may relate to particular rocks, or describe general properties.</i></p> <p>hardness; makes it more resistant to mechanical damage;</p> <p>mineral composition, e.g. acidity / solubility; affects the response to water / acidic precipitation / growth of plants, e.g. lichens;</p> <p>structure of rock, e.g. density of joints; affects resistance to mechanical damage;</p> <p>porosity / permeability; the more access given to water the greater the weathering;</p> <p>sedimentary weaker / OWTTE than other types; made up of grains; <i>ORA</i></p> <p>igneous formed through heat; harder;</p>	3

Question	Answer	Marks
1(a)(iv)	<p><i>One mark for stating a factor / simple description and a second mark for explanation.</i></p> <p>exposure, e.g. shelter / shade / height of stones; increased exposure leads to increased weathering;</p> <p>aspect; e.g. facing prevailing / persistent wind;</p> <p>vegetation, e.g. plant roots; plant growth can break into rock;</p> <p>groundwater, e.g. height of water table; affects amount of exposure to water;</p> <p>presence of atmospheric pollution; leads to chemical damage;</p> <p>local climate; different areas have different climates affecting weathering;</p> <p>vandalism / human activity; leads to damage and increased chance of weathering;</p> <p>treatment of stone; a coating will reduce rate of weathering;</p>	4

Question	Answer	Marks
1(b)(i)	<p><i>One mark for naming the type:</i> (soil) creep;</p> <p><i>Three marks for explanation:</i> wetting / drying; particles slide over each other;</p> <p>freezing / thawing; lifts the particles, which settle in different place;</p> <p>heating / cooling; expansion pushes particles away from each other leading to movement;</p> <p>deforestation; removes support of roots / barriers to movement;</p> <p>traffic vibration; leads to particles moving;</p> <p>gravity / gradient; this pulls / moves the soil down the slope;</p> <p>pressure from upslope; forces particles to move;</p>	4

Question	Answer	Marks
1(b)(ii)	<p>slope-angle reduction; reduces the effects of gravity;</p> <p>afforestation; tree roots provide support / barrier to movement;</p> <p>drainage; removes water in controlled way to reduce effects on movement of soil particles;</p> <p>surface protection; reduces effects of factors that cause creep, e.g. precipitation;</p> <p>allow other valid methods, e.g. concrete retaining wall; netting; steel pins;</p> <p>spray with concrete; to stabilise the surface; to hold the mass of soil in position;</p> <p><i>Accept other valid methods with explanation.</i></p>	4

Question	Answer	Marks
2(a)(i)	–55;	1
2(a)(ii)	75 / 12; 6.25; <i>Full marks for correct answer.</i>	2
2(a)(iii)	evaporation; from surface water bodies, e.g. the ocean; transpiration / evaporation / loss of water / evapotranspiration; from plants;	2
2(a)(iv)	(with increasing altitude) less weight of air bearing down from above / fewer air molecules above a given surface than a lower one OWTTE;	1
2(a)(v)	<i>One mark for a minimum of two named gases and one mark for valid reference to proportions.</i> nitrogen 78% / mostly nitrogen / largest proportion is nitrogen; oxygen 21%; water vapour (variable); trace / very small amounts of argon / noble gases / carbon dioxide;	2
2(b)(i)	the volume of air expands / increases; the air temperature falls / cools / decreases;	2
2(b)(ii)	<i>Max. two marks per reason.</i> winds; force air over mountain barrier; the Sun; warm air rises / ground warms air; leading to convection; weather system; results in development of a front;	4

Question	Answer	Marks
2(c)	<p><i>Max. three marks per reason. Each point must be linked to effects on people for credit to be award. Loss of life if unqualified is credited only once.</i></p> <p><i>Examples may include:</i></p> <p><i>high wind speeds:</i> resulting in damage to property and crops; economic losses;</p> <p><i>extreme heat / cold:</i> damages infrastructure; affects agriculture / human health;</p> <p><i>heavy precipitation:</i> leads to flooding; water-related diseases;</p> <p><i>snow:</i> avalanches; damages infrastructure;</p> <p><i>hurricanes (tropical cyclones) etc.:</i> result in strong winds / heavy precipitation; resultant damage;</p>	6

Question	Answer	Marks
2(c)	<p><i>drought:</i> leads to loss of crops; loss of livestock; dehydration; fires;</p> <p><i>lightening:</i> fires; loss of life from being struck;</p> <p><i>Accept other valid explanations.</i></p>	

Section B

Question	Answer	Marks
3(a)	<p><i>description:</i> May include: higher in the northern hemisphere than southern, highest in coastal areas, concentrations at particular latitudes result in an east-west banding pattern, highest levels in a broad belt either side of the Tropic of Cancer, medium levels in rest of northern hemisphere and almost as far as the Antarctic Circle in southern hemisphere, lowest levels sub-Saharan Africa, central South America, N.W. Australia, Antarctica and the Southern Ocean.</p> <p>Anomalies against the pattern may be identified.</p> <p><i>reasons:</i> Population density, level of development and economic activity, concentrations of industry, high rates of car ownership, global wind patterns, amounts of sunlight governed by presence / absence of cloud most land in the northern hemisphere, etc.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">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"> • <i>to show an awareness of the international nature of atmospheric pollution</i> • <i>to use examples of the management of atmospheric pollution</i> • <i>to give arguments for and against the statement.</i> <p>Indicative content:</p> <p>Candidates may refer to atmospheric pollution from greenhouse gases, CFCs, acid pollution, smog etc. and show understanding that pollution is often exported.</p> <p>Management responses may include technological solutions, such as carbon capture or regulatory solutions, such as banning CFCs. Legislation to include penalties for exceeding targets.</p> <p>It is likely that candidates will agree that international agreement is essential because of the dispersal of pollutants by winds, but may cite instances of both successes and failures or indeed argue that local management techniques are just as important. They may quote a range of international protocols and may refer to the likelihood of countries withdrawing from some agreements.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Please use level descriptors 2</p> </div>	30

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Question	Answer	Marks
4(a)	<p><i>reasons why type A should prove more hazardous:</i> Steep-sided slopes will encourage more rapid movement of lava and mudflows (lahars) and prove more unstable with respect to mass movements. The lava originating from melted plate material is more viscous / sticky, more likely to solidify within/close to the vent leading to a built-up of pressure and explosive eruptions. Acidic type lava at a destructive plate boundary is more likely to have a higher gas content, leading to more violent / unpredictable eruptions.</p> <p><i>reasons why type B might prove more hazardous:</i> Those who chose this type will find it harder to cite evidence to support their case. They may argue that lava affects a wider area as it more fluid and will travel longer distances, eruptions on this type of boundary are more frequent and therefore the disruption/damage is more continuous. Ash clouds may be referenced for either.</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Please use level descriptors 1</p> </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"> • <i>to describe a range of possible strategies to monitor and analyse volcanic hazards</i> • <i>to evaluate their success</i> • <i>to use examples from different areas of the world.</i> <p><i>Indicative content:</i></p> <p>Monitoring strategies may include gas analysis, seismic activity (seismometers), monitoring of ground deformation (tilt meters), groundwater monitoring, satellite monitoring, etc.</p> <p>Answers should consider how effective some methods might be and the possible differences in techniques used according to the nature of the volcano and the level of economic development in the area.</p> <p>Analysis involves historic data, hazard mapping, identifying people and structures at risk etc.</p> <p>Credit awarded for level of detail in examples provided.</p> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> Please use level descriptors 2 </div>	30

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Question	Answer	Marks
5(a)	<p><i>description:</i> The system progressively develops from a tropical depression to a category 5 hurricane by the time it crosses the Philippines and then starts to diminish in force over the South China Sea, finally losing momentum inland over East Asia. The wind speeds increase steadily and then decrease. The hazard may be described in terms of wind speed or suggested energy released / damage.</p> <p>Answers will suggest the likely effects of the storm at different points in its development including devastation of places in its immediate path over the Philippines and a comparison to the effect on Hainan and the mainland.</p> <p><i>explanation:</i> Typhoon is deriving its energy from the warm tropical waters of the Pacific, moving over progressively cooler areas of sea reduces its energy, resulting in lower wind speeds, landfall results in more friction with the surface and removes the energy source. Coriolis force / spin of the Earth affects route and results in deflection to the right / northwards.</p> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; 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"> • <i>to provide evidence of how accurate forecasting can be used to manage the effects of extreme weather events</i> • <i>to make an assessment of the importance of forecasting</i> • <i>to refer to examples of both frontal depressions and tropical cyclones.</i> <p>Indicative content:</p> <p>Answers are likely to include the use of satellite imagery, automatic weather stations, weather balloons, radar, various measurements of changes in pressure and wind speed, monitoring of the jet stream.</p> <p>Answers may conclude that forecasting is more important in countries with higher levels of economic development (or argue vice versa), more important in the short term than the long term, more effective in the case of some events than others.</p> <p>Answers may suggest the potential effects of the low pressure systems and how forecasting will lead to the protection of people and property and the importance of warning systems and evacuation planning.</p> <p>Answers may refer to other methods of managing these events to assess the importance of accurate forecasting.</p> <div style="border: 1px solid black; padding: 5px; text-align: center; margin: 10px auto; width: fit-content;"> <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 balanced 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