

MARK SCHEME for the May/June 2013 series

8291 ENVIRONMENTAL MANAGEMENT

8291/11

Paper 1, maximum raw mark 80

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.

Cambridge is publishing the mark schemes for the May/June 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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General notes

Symbols used in Environmental Management mark schemes.

- / separates alternatives for a marking point – other valid ways of expressing the same idea are also credited
- ; separates points for the award of a mark
- [3]** indicates the number of marks available
- italic* indicates that this is information about the marking points and is not required to gain credit
italic text is also used for comments about alternatives that should be accepted, ignored or rejected
- ora or reverse argument – shows that an argument from an alternative viewpoint will be credited
- AW alternative wording, sometimes called ‘or words to that effect’ –
AW is used when there are many different ways of expressing the same idea
- () the word / phrase in brackets is not required to gain marks but sets the context of the response for credit
e.g. (nuclear) waste – nuclear is not needed but if it was described as a domestic waste then no mark is awarded
- volcanic underlined words – the answer must contain exactly this word
- ecf error carried forward – if an incorrect answer is given to part of a question, and this answer is subsequently used by a candidate in later parts of the question, this indicates that the candidate’s incorrect answer will be used as a starting point for marking the later parts of the question

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Section A

- 1 (a) (i) One point relating to a shock wave that passes through the Earth (crust) [1]
- (ii) X – Primary or longitudinal (1)
Y – Secondary or transverse (1) [2]
- (iii) L, Love or Long waves or surface waves
S waves (due to news reports) [1]
- (iv) Travelling only through the crust, **surface waves** (1) are of a lower frequency than body waves (1). Surface waves that are almost entirely responsible for the damage and destruction associated with earthquakes. Rayleigh wave roll along the ground and Love wave produce a horizontal motion: Accept vertical and horizontal motion (1).
S wave (news reports) combine with primary (refer to Love and Rayleigh waves). [3]
- (b) (i) 6,800 km (accept +/- 200) [1]
- (ii) 7–8 minutes. [1]
- (iii) Some might argue of little use (1) in terms of the longer term; however P and S waves are forerunners of L (1) waves relatively close to the epicentre; quick action in 3 minutes (1) is needed (e.g. shelter, hide beneath a table, do run out into a street etc.).
Credit 1 mark for use of Fig 1.2 and three marks for the actions that might be taken. [4]
- (c) (i) Ibaraki is over 250km more distant from the epicentre (1) and the strength of the waves diminish with distance (1). [2]
- (ii) Translated tsunami is big wave. They need:
- The sea bed to be lifted or lowered by the earthquake.
 - The epicentre to be near the surface.
 - Unlike normal ocean waves the entire mass from the sea bed is in motion.
 - The wave itself only becomes dangerous once it reaches land. Where water levels gradually become shallower, the wave will slow down but tower into a wave wall as much as 30 metres high. The first wave will usually be followed by more waves that are sometimes even more dangerous.
- Credit up to 2 marks for the earthquake and up to 4 marks for the passage of the wave.* [5]

[Total: 20]

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2 (a) (i) **A** is external or extra-terrestrial (1) and **B** is Earth bound (land sea and air) (1). [2]

(ii) *Solar.* Variation in the Sun's output which would externally vary the amount of solar radiation received by the Earth's atmosphere and surface. E.g. sun spot activity measurements made with a solar telescope from 1976 to 1980 showed that during this period, as the number and size of sunspots increased, the Sun's surface cooled by about 6° Celsius.

Orbital. The Milankovitch theory suggests that normal cyclical variations in three of the Earth's orbital characteristics are probably responsible for some past climatic change. The basic idea behind this theory assumes that over time these three cyclic events vary the amount of solar radiation that is received on the Earth's surface. Eccentricity = shape of orbit: Precession is wobbling like a spinning top; axial tilt of between 22.5° and 24.5°.

Stellar dust. Solar radiation, solar flares, mostly of ionised hydrogen (protons) and electrons; dusty regions of space absorb and scatter short-wavelength blue light more than the longer wavelength red. This effect also explains why sunsets of Earth are often red. Historic records suggest links with climatic change.

Award 2 marks for each developed point. [2]

(iii) *Credit 1 mark for understanding and 2 for elaboration.*

Volcanic activity emits ash into the atmosphere which reduces the amount of solar energy reaching the lower atmosphere and Earth's surface; this can reduce global temperatures and in extreme cases, ice ages.

Mountain building; mountains create their own climate cooling temperatures with altitude; plus alter surrounding climates e.g. rain shadows and desert.

Continental drift; a long term feature whereby continents move and contain the record of former climates e.g. reflected in coal measures, ice age.

Atmosphere/ocean heat exchange refers to heat capacity of water; heats slowly and loses energy slowly thus cooler during the day and retains warmth at night.

Surface reflectivity; ice/snow reflect sunlight (high albedo) and dark surface absorb sunlight (low albedo); as snow and ice melt less energy is reflected contributing to warming atmospheric reflectivity; energy is reflected by the Earth's atmosphere and lost; clouds reflect more light back into space than oceans; a clouds' albedo relates to its height, size and size of water droplets; cirrus cloud has a lower upper albedo than cumulo-nimbus. [6]

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(b) (i)

| greenhouse gas | source |
|--|--------------------------------------|
| <i>CO₂ (carbon dioxide)</i> | <i>burning of carbon based fuels</i> |
| <i>CH₄ (methane)</i> | cattle, peat bogs, wetlands |
| <i>N₂O (dinitrogen oxide)</i> | combustion, thermal power stations |
| <i>CFCs</i> | aerosols, refrigerators |

[3]

(ii) Award 1 mark for use of data and 4 for reasons.

CO₂ has greater concentration (356) = (1) / has the longest lifetime of 125 years = (1) with a similar rate of increase to the other gases. (CH₄ = 21 and N₂O = 206) (1).
Although with much greater global warming potential their concentration is much less (1).

[4]

- (c) 1. Global warming is a natural and fluctuation process and as such is prone to fluctuations about and average.
2. Enhanced global warming refers to the accelerated global warming effect produced by the release of greenhouse gases since the early 20th century (MEDCs) and further from the 1950s (LEDCs).

Award 2 marks natural processes and 1 mark for the anthropogenic.

[3]

[Total: 20]

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Section B

3 (a) Human activity = building at the base produces instability/ forest clearance produces soil instability; these accelerate the natural processes with exposed soils being subject to lubrication from rainfall producing landslides and flows.

8 to 10 marks answers should balance human and natural processes; recognise how they combine and contain good detail on slope instability.

4 to 7 marks answers may contain adequate detail on both contributions and lack balance. Weaker answers at this level may not recognise the interactions.

1 to 3 marks answers will lack detail on both or one of the contribution. There will be a lack of understanding of slope processes. **[10]**

(b) The question requires:

- the use of examples
- an understanding of slope related environmental hazards
- an understanding of relevant slope management strategies

Indicative content

Examples are up to the candidate and could be local or studied e.g. Hong Kong, Rio de Janeiro, Sarno.

Understanding should derive from part **(a)** with development according to the examples. The hazard becomes real when debris resting on a slope overcomes friction and due to gravity slides or flows down the slope. Such movements can be triggered by human activity, natural processes or both.

Strategies can include: afforestation, terracing, gabions or even avoidance.

Band 1 answers will satisfy the 3 requirements of the question. The detail and use of examples will be of a very good quality. The nature of the hazard will be closely connected to the management strategies. (25–30)

Band 3 answers will display an adequate understanding of the hazards and strategies, but the two may be loosely connected. The use of the examples will be weak and not necessarily connected to the analysis. (13–18)

Band 4 answers will be relevant but poor in detail and analysis. The example will be poorly linked to the analysis or absent. (6–12)

[30]

[Total: 40]

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4 (a) At B there is cold air with winds from the SSE.

In the warm sector temperatures are higher and skies may clear.

At the warm front less dense air rises over the cold air causing condensation and precipitation (some might refer to stratus cloud and drizzle).

At the cold front cooler denser air undercut the warm air of the warm section; warm air rises – cools– producing condensation with clouds and precipitation (some may refer to cumuli clouds and heavy rainfall).

At **A** winds are from the NW and are cool and moist;

8 to 10 marks answers will refer to at least four of the above with 10 marks answers all five.

4 to 7 marks answers may either lack detail in each of the stages or lack balance by developing 2/3 elements.

1 to 3 marks answers may make clear reference to one of the elements or lack detail and be confused.

[10]

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(b) The question requires:

- A description of the use of satellite photographs in conjunction with weather maps
- The use of examples
- An assessment of the short and long term forecasts of weather hazards.

Indicative content

Satellite photographs whether infra-red or visible show cloud cover often laid over outlines of land masses. The shape and density of the clouds relate to wind directions and cloud types. These can be used to verify weather observations by traditional methods.

Weather hazards such as hurricanes, intense cyclonic swirls are easily observed and their path tracked; this assists short term forecasts. Although not in the syllabus it is acceptable for candidates to refer to tornadoes. Long term hazards such as drought are recognised by large expanses of clear sky.

The assessment should outline the greater reliability of short term forecasts; although even these can be incorrect. Weather is fickle!

Band 1 answers should satisfy the three requirements of the question. Answers will be well balanced and contain effective evaluations. The details of the answer will be of a very good standard. (25–30)

Band 3 answers will be of adequate content. They may be vague about the technology of satellite photography. However the strength of the answer may be in the description of how weather hazards are observed. (13–18)

Band 4 will be relevant but of poor quality. Such answers may lack any understanding of the use of weather satellite images and give superficial reference to weather hazards. (6–12)

[30]

[Total: 40]

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- 5 (a) Emissions from factories; dry particulate deposition close to the factory; mixing with atmospheric moisture and conversion to acids that are deposited with rain.

Effects to include; damage to trees (acids on leaves increase leaf porosity and the entry of pollutants), blocks stomata; increased acidity in soils + increased toxicity in roots.

8 to 10 marks answers should contain a balance of cause and effect with very good detail.

4 to 7 marks answers may lack balance and in particular lack clarity on acid rain processes.

1 to 3 marks answers will be relevant but very weak in both or one of the elements. **[10]**

- (b) The question requires:

- to select either a rural or urban area
- understand the sources of atmospheric pollution in the selected area
- assess measures for the reduction of atmospheric pollution in the selected area

Indicative content

Answers should relate to the area selected.

Urban areas:

Causes can include: traffic emissions, industry, domestic, noise and contributing weather conditions.

Measures include: legislation e.g. clear air acts; planting trees; preserving or creating parks, traffic controls, cars emission controls, industrial chimney scrubbing; clean energy; noise reduction.

Rural areas:

Causes can include: three types of air pollution: that generated in the home by using simple, solid fuels for cooking and heat; “ambient” outdoor pollution from rural and urban sources; and secondary pollutants which form when atmospheric conditions trigger chemical reactions in air emissions.

Measures include: reducing: wood burning, chemical fertilisers, waste disposal in rivers, vehicle pollution.

Band 1 answers should satisfy the three requirements of the question with detail and assessments of a very good quality. There will be a good choice of examples that relate directly to both the causes and solutions. (25–30)

Band 3 answers will be of an adequate quality and although referring to each requirement there may be a lack of balance. (13–18)

Band 4 answers should be broadly relevant but the detail will be of a poor quality. The selected examples will be poorly developed and linked to the question. (6–12)

[30]

[Total: 40]

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Generic Mark Scheme

| Band | Level Descriptors | Marks |
|---------------|---|--------------|
| Band 1 | The candidate demonstrates the following abilities where appropriate to: | 25–30 |
| A | <ul style="list-style-type: none"> select and use a very good range of accurate and appropriate knowledge; integrate knowledge from a wide range of areas; show a good understanding of the concepts involved; make good use of knowledge derived from personal experience and study; | |
| B | <ul style="list-style-type: none"> select and use a form and style of writing appropriate to purpose and complex subject matter with facility; communicate complex ideas clearly and accurately, in a concise, logical and relevant way; | |
| C | <ul style="list-style-type: none"> analyse issues and problems well and evaluate them appropriately; develop complex reasoned arguments and draw sound conclusions on the evidence; | |
| Band 2 | The candidate demonstrates the following abilities where appropriate to: | 19–24 |
| A | <ul style="list-style-type: none"> select and use a good range of accurate and appropriate knowledge; integrate knowledge from a wide range of areas; show an understanding of the concepts involved; demonstrate a range of awareness of personally derived and studied knowledge; | |
| B | <ul style="list-style-type: none"> select and use a form and style of writing appropriate to purpose and complex subject matter; communicate complex ideas clearly and accurately, in a concise, logical and relevant way; | |
| C | <ul style="list-style-type: none"> analyse issues and problems and evaluate them competently; develop complex reasoned arguments and draw conclusions on the evidence; | |
| Band 3 | The candidate demonstrates the following abilities where appropriate to: | 13–18 |
| A | <ul style="list-style-type: none"> select and use some accurate and relevant knowledge. integrate knowledge from a limited range of areas; show an adequate understanding of the concepts involved; demonstrate a limited range of awareness of personally derived and studied knowledge; | |
| B | <ul style="list-style-type: none"> select and use a form and style of writing appropriate to purpose and subject matter; communicate the ideas clearly and in a logical way | |
| C | <ul style="list-style-type: none"> undertake some analysis of issues and problems and make a superficial evaluation; develop arguments and draw conclusions; | |

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| Band 4 | The candidate demonstrates the following abilities where appropriate to: | 6–12 |
| A | <ul style="list-style-type: none"> • select a limited range of accurate and relevant knowledge. • integrate knowledge from a very limited range of areas; • show a modest understanding of the concepts involved; | |
| B | <ul style="list-style-type: none"> • select and use a limited style of writing, appropriate to purpose and subject matter; • communicate ideas with limited clarity; | |
| C | <ul style="list-style-type: none"> • demonstrate limited analysis of issues and problems with limited evaluation; • develop limited arguments and draw limited conclusions; | |
| Band 5 | The candidate demonstrates the following abilities where appropriate to: | 1–5 |
| A | <ul style="list-style-type: none"> • select and use some relevant knowledge; • integrate knowledge from a very limited area; • show a restricted understanding of the concepts involved; | |
| B | <p>When producing written communication:</p> <ul style="list-style-type: none"> • select and use a very limited style of writing appropriate to purpose and subject matter • communicate with limited clarity; | |
| C | <ul style="list-style-type: none"> • undertake a very limited analysis of issues, problems and evaluation; • recognise some arguments and conclusions | |