MARK SCHEME for the May/June 2013 series

8291 ENVIRONMENTAL MANAGEMENT

8291/21   Paper 2, 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.

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
<u>volcanic</u>	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

Section A

1   (a)   (i)   Left to right: water table, surface runoff, evaporation, transpiration.   **[4]**

(ii)   Water does circulate (1), but there are losses to oceans and atmosphere (1), water is locked in glaciers/ice or underground aquifers (1), credit some recognition that water can be moved away   **[2]**

(iii)   **A**   Soil which is porous will allow infiltration/more porous = greater infiltration (1) because of this there will be less/little runoff (1). If the soil is less porous / saturated (1) surface runoff increases (1) ORA   **[3]**

B   With low slope angles water has time to infiltrate (1) whilst with high slope angles gravity/gravitational forces move water down the slope (1) rather than infiltrating into the soil (1). As surface runoff increases infiltration   **[3]**

If only a description of the graph **max** 2

(b)   Avoiding flood risk with artificial levees, drainage (overflow) channels, channel straightening, storm drains and avoidance are important in initial planning. This requires flood assessment and planning.

Although overlapping, sustainable flood management accepts the likelihood of flooding and can include: levee management, recognising the value of flood plains, the installation or availability of flood barriers.

During a flood, emergency response, evacuation, public rescue services etc. all become important.

6 to 8 mark answers will recognise and understand the order of priorities and provide good quality detail for each

3 to 5 mark answers may only develop one or two of the priorities or lack detail

1 to 2 mark answers will be brief and superficial and indicate little understanding of the need for planning.   **[8]**

[Total: 20]

2   (a)   *biodiversity*: a measure of the number (or wtte) of living species (1) in a given area (1).

biomass: the total mass of living organisms (1), measured in dry weight/calorific value per unit area or valid reference to quantity (1) in a given area (1)   **[4]**

Only credit area once in the answer

(b)   (i)   Autotrophs obtain these inorganic nutrients from the inorganic nutrient pool, which is usually the soil or water surrounding the plants or algae (1). These inorganic nutrients are passed from organism to organism as one organism is consumed by another (1). Ultimately, all organisms die and become detritus, food for the decomposers (1).   **[3]**

If just a straight description of the diagram 1 mark

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(ii) Sunlight/energy (not heat) is absorbed by producers (1) and converted to chemical energy (1) by photosynthesis (1) Producers eaten/digested by consumers (1) some energy lost as heat/used in respiration, growth or movement (1) Organisms die and energy passes to decomposers (1) **[3]**

(c) (i) Hot humid conditions in TRF promote high productivity (1) rapid decomposition of litter (1) and rapid take up by plants (1) causing the biomass store to be larger than other stores(1).

Reference can also be made to the density of vegetation. **[2]**

(ii) Rapid decomposition and losses to the soil (1) removal by runoff (1) with little returned from the biomass (1). **[2]**

(iii) Deforestation removes the biomass store (1) leading to no return of litter (1); minerals are leached or eroded from the soil (1); all flows and stores reduce (1); Runoff and leaching increase due to rainfall reaching surface (1) examples of flows and stores (2). **[6]**

[Total: 20]

Section B

3 (a) Central to the answer is that HEP schemes are expensive to set up/maintain and require rain/rivers. Variations include the large development in Asia/Pacific, Europe/ Eurasia and North America where there is sufficient capital, technology, precipitation, rivers and demand. Large development in South America where there is demand, few alternatives and technology. There is low development in Africa, due to the climate, wealth and technology and negligible in the Middle East due to hot deserts.

8 to 10 mark answers should refer to the three groups outlined above and clearly refer to three of the following: technology, capital, demand, lack of alternatives, climate and rivers.

4 to 7 mark answers will either be vague or poorly balanced with one or two reasons being developed and some reference to data.

1 to 3 mark answers will be brief and largely descriptive. **[10]**

(b) The question requirements are:
- selection of examples
- assessments of benefits
- assessments of disadvantages

Indicative content:

Benefits include: electricity, water storage, scenic beauty, recreation, river management, improved economy.

Disadvantages include: disruption to communities, loss of agricultural land, reservoir siltation, agricultural land downstream deprived of water, dam collapse and flooding, tectonic (due to the weight of water and lubrication of faults), cost destruction of scenic beauty, pollution during construction.

Candidates need to consider advantages against disadvantages.

Band 1 answers will contain a clear use of exemplar material with a very good analysis and assessment of both benefits and disadvantages. (25–30)

Band 3 answers are likely to be limited in the selection of examples and adequate in the analysis of benefits or disadvantages. (13–18)

Band 4 answers, although relevant, will contain poor analysis and assessments. Examples may be stated and not necessarily linked to the content. (6–12)

One very well developed balanced example could merit Band 2 **[30]**

[Total: 40]

4 (a) This requires a description of the information in the pie graph.

The seepage from oil bearing rocks relates to the widespread occurrence of oceanic oil fields and that low density oil will rise to the surface. Consumption of oil results in runoff into rivers than to the sea. Oil tankers either through accidents or spillage only contribute a small percentage; most of this is oil jettisoned at sea. Surprisingly spillage through extraction contributes very little; which puts BP and Exxon Valdiz into perspective.

8 to 10 mark answers will give clear explanations for the differences with use of comparisons. The content of each contribution will be very good.

4 to 7 mark answers will give an adequate explanation with limited use of comparisons. Other answers may be very general.

1 to 3 mark answers will be poor in content; either with very weak explanations and possibly no comparative comment. **[10]**

(b) The question requirements are:
- to explain the difficulties in reducing the causes of marine pollution
- to explain the difficulties in reducing the effects of marine pollution
- to assess two strategies

Indicative content:

Reducing causes is difficult because: little monitoring, ships dump illegally, natural causes, rivers carry large volumes of pollution, wartime dumping, accidents, plus eutrophication and acidity. Particularly marine pollution is not confined to oil.

Ocean currents and wind, transport pollution thus effects on marine ecology cannot be managed; some damage e.g. to coral reefs is already irreparable. Some toxic pollution has already created dead zones. Increased acidity is due to CO_2 and part of a different issue.

Strategies: International legislation and enforcement on dumping at sea and locally – beach clean-ups and controls on river pollution.

Some examples of legislation:

The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78)

International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990 (OPRC)

International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances (HNS) by Sea

Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances, 2000 (OPRC-HNS Protocol)

The International Convention on the Control of Harmful Anti-fouling Systems on Ships

Nairobi International Convention on the Removal of Wrecks, 2007

Band 1 answers will satisfy the three requirements of the question with very good analysis and assessment of strategies. There will be good use of exemplar material.   (25–30)

Band 3 answers will be adequate in detail and weak in making assessments. Some answers may have superficial coverage without use of examples.   (13–18)

Band 4 answers will be weak in detail, contain little or no assessment and lack examples. Many answers at this level will be brief and superficial.   (6–12)

[30

[Total: 40]

5 (a) Trends: extinctions and population growth are almost parallel; with population growth low between 1800 and 1950, and then they both rise exponentially.

Reasons: after 1950 – urban and agricultural invasion of habitats (the most important); loss of habitats e.g. draining of marshes; poaching; local climatic change (after deforestation); deforestation for mining/wood/reservoirs; greenhouse gases and climatic change; Pollution (named) pollutant effect; plus some candidates may point out the natural climatic change works independently of anthropogenic causes.

8 to 10 mark answers will contain both elements of the question. The content of these answers will be precise and very good.

4 to 7 mark answers will mostly give an adequate interpretation of the graph but the reasons will be briefly stated and of adequate quality.

1 to 3 mark answers will give a vague interpretation of the graph accompanied by very poorly stated reasons.   **[10]**

(b) The question requires:
- the selection of an area of ecological importance (large or small scale)
- an understanding of the pressures that necessitate conservation
- an assessment of conservation strategies

Indicative content:

This depends on the area selected and the strategies used e.g a small scale site of special scientific interest or a large National Park. As the question requires one area the strategies must relate to this area. Very general answers covering a range of strategies applicable to more than one type of area will be self-penalising.

Strategies may include: National Parks, Wildlife Parks, local conservation areas and SSSI's as designated areas. Policies within the area may include: ecotourism, restrictions on access, controls on poaching, car parks and provided transport, information centres, education etc. Although the list is long, the strategies described must relate to the designated type of conservation.

Band 1 answers will be of very good quality. They should explore and assess at considerable depth the policies adopted to conserve species. There will be a good understanding of the pressure exerted on species within the area. (25–30)

Band 3 answers will be of adequate quality. Although conservation areas will be selected, the policies operating within the area will have poor to adequate development. Assessments will be limited. (13–18)

Band 4 answers will have poor coverage of the three requirements and lack assessment. Some answers may focus on environmental pressures rather than conservation strategies. (6–12)

[30]

[Total: 40]

Generic Mark Scheme
This aims to provide a scheme for marking 30 mark answers in Section B. The marks are grouped into bands from which it should be possible to locate a mark. The assessment objectives outlined are developed out of the broad objectives for the examination and guideline for locating marks for essays.

Criterion A. demonstrates relevant knowledge and understanding applied to a range of issues and problems.
Criterion B. communicates clearly in a concise, logical and relevant way.
Criterion C. marshal evidence, draw conclusions and make evaluations.

Balance of marks for 30 mark questions;   Criterion A = maximum of 15
Criterion B = maximum of 5
Criterion C = maximum of 10

Band	Level Descriptors	Marks
Band 1	**The candidate demonstrates the following abilities where appropriate to:**	**25–30**
A	• 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	• 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	• 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	• 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	• 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	• 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	- select and use a limited range of 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	- 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	- undertake some analysis of issues and problems and make a superficial evaluation; - develop arguments and draw conclusions;	
Band 4	The candidate demonstrates the following abilities where appropriate to:	6–12
A	- select and use some accurate and relevant knowledge; - integrate knowledge from a very limited range of areas; - show a modest understanding of the concepts involved;	
B	- select and use a limited style of writing, appropriate to purpose and subject matter; - communicate ideas with limited clarity;	
C	- 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	- select and use some relevant knowledge; - integrate knowledge from a very limited area; - show a restricted understanding of the concepts involved;	
B	When producing written communication: - select and use a very limited style of writing appropriate to purpose and subject matter - communicate with limited clarity;	
C	- undertake a very limited analysis of issues, problems and evaluation; - recognise some arguments and conclusions	