CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary Level

MARK SCHEME for the May/June 2015 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 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

CAMBRIDGE
International Examinations

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) A: perched
B: unconfined
C: confined

Award two marks if all three aquifers are correct. For one correct aquifer award one mark. [2]

(ii) Perched aquifer A: water is stored in a porous / permeable layer; above the main water table;
confined aquifer C: impermeable rock above; and below the aquifer;
unconfined aquifer B: water is stored within a permeable / porous layer, below the water table; impermeable rock below the aquifer.

Award two marks for each type of aquifer.
*Accept ecf from **(a)(i)**.* [6]

(iii) A: accessibility; wells are shallow and easy to dig; useful for people to supply their own water; springs often emerge close by;
C: deep (underground water); water is filtered as it passes through the rocks; water is uncontaminated / pure water quality; can easily flow due to pressure / artesian wells; quantity of water.

Award one mark for each of two points. [2]

(b) (i) Renewable water; from an external source; water from precipitation; infiltrating / percolating (into, the groundwater store or aquifer). [2]

(ii) Groundwater store / natural recharge: gains from; precipitation; infiltration, percolation, seepage; from surface water, rivers, lakes; from artificial water storage; groundwater flow from aquifers out of the area;
groundwater store losses: water is lost from groundwater naturally through evapotranspiration; to the river; groundwater flow to aquifers out of the area; loss due to the artificial storage of water;
extraction: water is lost due to human activity; for domestic supply; for agriculture; for use in the economy, e.g. industry;
conclusion: the impact upon the quantity of water stored in the groundwater; depletion of the groundwater store;

use of data:

gains	107 400 + 323 000	= 430 400;
losses	–548 700 – 97 000	= –645 700;
difference / overall loss	–645 700 + 430 400	=(–215 300 million litres).

A balanced answer will include each of the elements above. Award a maximum of five marks if no data from Fig. 1.2 is used.

Award six to eight marks for a response which shows a very good understanding of the question, good use of data and the information provided, and is a balanced answer.

Please use level descriptors 1

[8]

[Total: 20]

2 (a) (i) e.g. land iguana ⟶ snake ⟶ hawk

Award two marks for three correct stages. Award one mark for two correct stages. [2]

(ii) Habitat: the place / area where the organism lives / an example of organism and habitat location from Fig. 2.1 / Fig. 2.2;

Niche: the role of the organism in the ecosystem; an example of the role in the ecosystem; reference to Fig. 2.1 to illustrate the concept of a niche; or an example of organisms with the same habitat but occupying different niches, e.g. Galapagos penguin, marine iguana, flightless cormorant from Fig. 2.2. [4]

(iii) The importance of both land and marine environments should be emphasised; e.g. organisms feeding at sea / living / breeding on land; an example of this relationship from Fig. 2.1 / Fig. 2.2;
the impact of human activity upon the coastal environment; pollution from the land affecting the marine ecosystem, e.g. sewage; marine pollution, e.g. oil spill affecting the coastal shores.

Award one mark for each of two points and one mark for each elaboration or example used. [4]

(b) (i) Collecting specimens / litter / fishing without a permit / introduction of foreign organisms / feeding the organisms / disturbing the behaviour of species.

Award one mark for one suitable way and a further one mark for a developed point. [2]

(ii) Zoning pattern;
core area on the outside; vulnerable species found in the outer area; no visitors in the most vulnerable areas; largest area;
buffer zone: transition between the core and developed zone; allows ecotourism; education; research; community activity; allows activity which is not destructive, e.g. grazing;
developed zone at the centre; roads / human settlements / towns / port; human activity away from vulnerable areas; a relatively small area of the island; restricts development; Charles Darwin research centre; monitoring of species.

A balanced answer should contain reference to all zones and use information from Fig. 2.3.

Please use level descriptors 1

[8]

[Total: 20]

Section B

3 (a) A description of the regional differences in the data shown in Fig. 3.1 should include reference to the overall number of threatened species and the relative contributions from each of the three categories for most regions. Regions should be compared and contrasted, for example: South America has the most overall threatened tree species with more than 70% and the largest percentages of both vulnerable and endangered species. Europe has the lowest overall percentage of threatened species with less than 2% but only in one category (vulnerable). Asia has the largest percentage of critically endangered species, approximately 15%. Approximately half of all threatened species are in the endangered and critically endangered categories in both Asia and North / Central America.

A balanced answer is achieved by reference to most regions, all threatened categories and supported with data from Fig. 3.1.

Please use level descriptors 1

[10]

(b) *The question requirements are:*

- *to describe the threats to the ecological quality and extent of forests*
- *to describe the measures that can be used to manage forest ecosystems*
- *to evaluate the measures*
- *to select and use examples of forest ecosystems from one biome*

Indicative content:

Threats to the extent of the forest result from the destruction of large areas of forest for agriculture, cattle ranching, mining, urban development, infrastructure development and the demand for fuel-wood and timber. Ecological quality of forests is threatened by afforestation, the use of monoculture, planting non-native exotic species and the fragmentation of forest areas. Climate change will impact both upon the extent and ecological quality of forests. Measures include, for example, the establishment of protected areas, forest reserves and conservation. Sustainable practices include for example: forest regeneration, reforestation, sustainable wood extraction, selective logging, agroforestry, terracing, soil conservation, plantations, ecotourism, sustainable agriculture, practical small-scale initiatives, and the use of alternative non-wood products.

Please use level descriptors 2

[30]

[Total: 40]

4 (a) An answer should sequence the process of eutrophication and refer to the indicators shown in Fig. 4.1 A, for example: the enrichment of the water due to an enhanced input of nutrient and the increased growth of algae to form an algae bloom / mat. As a result of light being blocked from the plants in the water, they are unable to photosynthesise and die. This leads to decomposition of the dead plants and algae, and a build-up of organic sediment as shown in Fig. 4.1 B. An increase in the population of decomposers depletes the oxygen supply in the water leading to the death of fish and other aquatic organisms, including invertebrates. The effect upon the community of organisms and biodiversity of the ecosystem should be considered.

A balanced answer requires both process and effects and reference to Fig. 4.1.

Please use level descriptors 1

[10]

(b) *The question requirements are:*

- *to describe sources of nutrient enrichment*
- *to suggest measures to prevent and to reduce river / lake pollution*
- *to evaluate the management strategies*
- *to select and use an example of a river*

Indicative content:

Sources include, for example, fertilisers from agricultural run-off, detergents from domestic waste, sewage, animal waste from farms. Measures include for example local and regional policies, waste management, sewage treatment works, agricultural policies including controlling the use and timing of fertiliser treatments and public awareness of pollution. Both sources and measures should be linked to the specific example of a river.

Please use level descriptors 2

[30]

[Total: 40]

5 (a) An answer should outline factors affecting net primary productivity of ecosystems including temperature, variation in light intensity, the availability of water due to precipitation and minerals from soil. The type and density of the vegetation may also be considered. Agricultural systems are included and may be compared to natural systems. There may be reference to variation in the productivity of agricultural systems as a result of human impact upon the land or increased primary productivity through the use of fertilisers and irrigation. There may be reference to the distribution of the major biomes.

A balanced answer will outline three factors and use data from Fig.5.1.

Please use level descriptors 1

[10]

(b) *The question requirements are:*

- *to express an understanding of the issues relating to the resource demands of a population*
- *to describe measures which allow the sustainable use of resources*
- *to evaluate the measures in terms of sustainability*
- *to select and use examples from MEDCs and LEDCs (countries at different levels of economic development)*

Indicative content:

Examples of countries at different levels of economic development are provided to compare the USA with Brazil, India and China. Answers need to demonstrate an understanding of how lifestyle, economic development and population growth can increase the demand for resources to an unsustainable level. The main focus of the essay should be on the methods which allow a more sustainable / more efficient use of resources and the careful management of resources to meet these growing demands; in order to reduce the environmental impact of the population, and keep the ecological footprint low. Achieving sustainability of resources (the supply of food and other raw materials and energy) through for example: agricultural improvements, genetic engineering, high-yielding crops, organic farming, H.E.P., other renewable resources, reducing waste, reusing and recycling. An assessment of how far countries can reduce the environmental impact of the population should be discussed.

Please use level descriptors 2

[30]

[Total: 40]

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

6–8 marks / 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

3–5 marks / 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

1–2 marks / 1–4 marks
The response:
- may contain errors
- shows limited understanding of the question
- shows little or no use of the data or information, where appropriate
- lacks balance

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 poorly balanced content
- may not contain evaluations
- make limited use of relevant vocabulary

Level five, 1–5 marks
- fulfil a few of the 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