Cambridge International AS Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary Level

ENVIRONMENTAL MANAGEMENT **8291/23**

Paper 2 **May/June 2018**

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.

Cambridge International is publishing the mark schemes for the May/June 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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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)	living organisms;	**1**
1(a)(ii)	there is a wide variation in the residence time for water stores of each type; water stores have different volumes / locations / size; rates of input / output vary; different factors can change over time; e.g. rivers will vary in size, each river will have a different value, and so (a range of values);	**2**
1(b)(i)	mining waste / industrial waste / toxic metals;	**1**
1(b)(ii)	dam burst, waste sludge released, flowed into the river;	**1**
1(b)(iii)	increased turbidity / an increased concentration of suspended particles; reduced light penetration / less light for plants in water; reduced photosynthesis / death of plants; reduced oxygen levels; less respiration; death of animals / organisms in water; reduced biodiversity; increased concentration of metals in water; water contamination; reduced quality of water as drinking water for human consumption / agricultural use / water supply for livestock;	**4**
1(b)(iv)	where the river flows into estuary, a concentrated area is visible, extending over a wide area with decreasing intensity; due the sea currents / tide; extending both out to sea and along the shoreline; disperses / dilution / mixing of the pollution with a large volume of sea water;	**2**

Question	Answer	Marks
1(b)(v)	death of aquatic organisms; reduced food supply for both aquatic and land based organisms; effect on food chains / web; effect on population size of species; reduced biodiversity; bioaccumulation; degradation of the marine environment; detrimental to the aesthetics of the coastal environment; negative economic effects / fishing industry / human food supply / effect on tourism; *Fig.1.1*: describes an effect linked to the nature reserve; reduces breeding / nesting sites of the endangered leatherback turtle;	**4**
1(c)	management of leakage, seepage, run-off from industrial sites; eliminating or reducing pollution at source; reducing waste discharge; recycling of waste water to reduce input into river; enforced legislation controlling the discharge of industrial waste; monitoring of rivers by suitable organisations to identify changes in water quality; risk assessment; clean-up operations; *management of any form of river pollution not just industrial:* reducing agricultural run-off through appropriate management; management of domestic waste by water treatment and waste treatment.	**5**

Question	Answer	Marks
2(a)(i)	abiotic; e.g. soil / water / light / nutrient; biotic: e.g. trees / plants / vegetation / microorganisms / fungi;	**2**
2(a)(ii)	*Light and plants:* light is absorbed by leaves; primary productivity / photosynthesis; energy is transferred in food chains; *minerals and plants:* plant absorb minerals / nutrients from soil; used for growth / secondary productivity; stored as biomass; *temperature and decomposers:* leaf litter provides food for decomposers / detritivores; process of decomposition returns nutrients to soil; higher temperatures increase the rate of microbial action and thus rate of decomposition; *precipitation and trees:* weathering of parent rock releases nutrients; nutrients are dissolved in solution; tree roots absorb nutrients from the soil; *water and vegetation*: vegetation cover prevents excessive run-off; water from precipitation infiltrates the soil; plants absorb water from the soil in roots	**4**

Question	Answer	Marks
2(a)(iii)	loss of nutrients from the ecosystem; as nutrients are removed from the ecosystem when a crop is harvested; nutrients are not recycled; there are no deep roots to utilise nutrients from the weathering of bedrock and increased leaching; loss of soil fertility; the soil surface is more exposed; there is often no permanent vegetation cover / the vegetation cover is reduced; increased runoff results in soil erosion / soil degradation; removal of vegetation / biomass; habitat destruction;	**4**
2(b)	maintains / restores some natural vegetation; provides habitats for organisms; food chains / webs / niche; conserves / increases biodiversity; preserves natural predators of pests; reduces need for artificial pesticides; organic matter is introduced through as leaf fall; (organically) fertilises the soil; reduces need for (artificial) fertilisers; maintains a hydrological / soil balance; permanent vegetation cover; reduces soil exposure / increase soil stability / reduces wind erosion; other economic benefits; co-operation between land use for agriculture and logging;	**5**

Question	Answer	Marks
2(c)	supports nature conservation; offers environmental benefits; protects ecological balance; reduces pressure on natural resources; economic benefits; natural unspoilt areas have a value; provides opportunities for income generating activities; e.g. game reserve entrance fees / safari tours; helps create job opportunities for locals e.g. employment as rangers / guides; diversifies the economy; improves the income levels for locals; money raised can be used for the maintenance and management of the areas; for conservation / environmental management projects; socio-cultural benefits; local traditions are preserved; local community can be involved in providing services e.g.; educate the public on conservation;	**5**

Question	Answer	Marks
3(a)	All regions show an increase in the area of irrigated land. The regions with largest increase by area are Asia (99.9 million ha.) followed by South America and the lowest is Oceania (1.7 million ha.) and Europe. Although North America (7.2 million ha.) and Africa (6.9 million ha) have similar increases in area of land irrigated however the area of land irrigated has almost doubled in Africa. Reasons for the variation in the percentage of cultivated land that is irrigated may include reference to such factors as climate, climate change, population growth, increasing demand, availability of water and economic development. The increased demand for food production with increasing population size has resulted in an increased area of land devoted to agricultural crops in Asia which has the largest percentage of irrigated land. Expanding populations require increased agricultural productivity using high yielding crops which require high levels of irrigation. The scarcity of water available for irrigation in large areas of Africa explains the lower percentage of land irrigated, even though population increase demands increased food production. Although the area of land irrigated has doubled it remains the lowest percentage. **Please use level descriptors 1**	**10**

Question	Answer	Marks
3(b)	*The question requirements are:* *to describe the impact of agricultural use on freshwater supplies* *to use examples* *to describe management strategies aimed at protecting natural supplies of water.* **Indicative content:** Water resources such rivers and groundwater used to supply of water for agricultural use should be considered. The over extraction of water from rivers for agriculture can impact on water flow to other bodies of water. This can result in a river drying-up and salinisation. The over-extraction of water from aquifers can lead to aquifer depletion, salt water intrusion and the salinisation of freshwater supplies. The overuse of water for irrigation can lead to pollution of water supplies due to the use of fertilisers and the increased run-off from land. Examples such as the Aral Sea or the Murray River can be used to exemplify these points. Management strategies can be aimed at protecting the quality or quantity of water supplies. Include strategies for preventing the pollution of rivers and groundwater such as the timing of fertiliser treatment and intercropping. Strategies which reduce the demand for water or conserve water supplies include for example, using drip irrigation, rainwater harvesting and using recycled water for irrigation. **Please use level descriptors 2**	**30**

Question	Answer	Marks
4(a)	At first, the time interval taken to increase the global population by 1 billion is much longer (e.g. 123 years between 1804 and 1927), There is low growth rate in the global population. Subsequently there is an increasingly shorter time interval between each billion of population added (e.g. 32 years between 1927 and 1959). Population growth rate is increasing as birth rate increases. Population continues to increase at an increasing rate of growth. With higher birth rates and exponential growth of the population between 1959–1999, the time intervals for each billion added to the global population decreases from 15 to 13 to12 years. However, the time interval of 12 years between 1999 and 2011, to add another billion to the population, remains the same and population growth rate is beginning to slow as economic development and population control begin to impact upon birth rate. **Please use level descriptors 1**	**10**
4(b)	*The question requirements are:* *to define an optimum population* *to use examples* *to refer to population policies* *to describe the effectiveness of policies in population management* **Indicative content:** An optimum population should be considered in relation to the carrying capacity of the environment and a balance between resource levels and population size. Policies aimed at controlling population size include, for example, control of fertility, family planning incentives, migration, education and employment opportunities. Policies and their effectiveness will be dependent on the examples chosen. **Please use level descriptors 2**	**30**

Question	Answer	Marks
5(a)	Impacts resulting from a rise in sea level include: inundation of sea water, increased tidal surges, the increased flooding of low-lying land and salt water intrusion. This results in the destruction of shoreline vegetation, a diminishing availability of freshwater and the increased salinisation of soil, changes in the suitability of the land for growing crops and a change in the water cycle. There is a reduction in land available for habitation and the cultivation of crops, leading to a loss of livelihood and the threat of evacuation of an island population. A rise in the water table and transition zone and a decrease of the freshwater zone in Fig.5.1 should be described. **Please use level descriptors 1**	**10**
5(b)	*The question requirements are:* *to describe the impact of climate change/global warming on global water stores* *to discuss the management of changing water resources* *to use examples* **Indicative content:** The impact on water stores include: an increased volume of saltwater stores in seas and oceans; decreased volumes of freshwater stores in glaciers and ice caps; changes in precipitation and atmospheric moisture; changes in river, freshwater lake, and soil moisture levels, and an effect on vegetation stores. Examples of methods of adapting to changing water stores include, for example, adaptation planning, capturing rainwater, the use of desalination plants, water conservation and water rationing measures or changes in agricultural practice, for example, the growing of salt-tolerant crops and drought resistant crops. **Please use level descriptors 2**	**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 a 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