Cambridge Assessment International Education
Cambridge International Advanced Subsidiary Level

ENVIRONMENTAL MANAGEMENT **8291/22**

Paper 2 **October/November 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.

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This document consists of **16** printed pages.

Question	Answer	Marks	Guidance
1(a)(i)	regional, biotic community characterised by a dominant form of vegetation type (and distinct climate);	1	*Allow large scale ecosystem.*
1(a)(ii)	**A** Tropical rainforest; **B** Desert; **C** Tundra;	2	*1 mark for any 1 correct.* *2 marks for any 2 / 3 correct.*
1(a)(iii)	*temperature range:* between 1.5 degrees centigrade to 21 degrees centigrade; *precipitation range:* between 520 mm to 2350 mm;	2	*Accept a range from just above 0–2 and 20–21.* *Accept a correct calculated difference.* *Accept a range from 500–600 and 2300–2400. Accept a correct calculated difference.*
1(a)(iv)	latitude / altitude / soil;	1	
1(a)(v)	conditions do not usually change abruptly; there is a gradual change in climate .e.g. becoming drier / wetter; transition in terms of vegetation from one biome to another;	2	*Accept a well described example e.g. desert to savannah grassland / shrub-land to forest.*
1(b)(i)	input of nutrients from precipitation is greater than output by runoff; nutrient flow from the biomass to the litter store together with the nutrient input from precipitation, is balanced with the flow of nutrients to the soil store; balanced with the uptake of nutrients by the vegetation from the soil store; vegetation / biomass have proportionally the largest nutrient store compared to soil / litter; (rapid) decomposition of dead plant material and incorporation into soil; (rapid) uptake of nutrients and incorporation into biomass; or (rapid) recycling of nutrients; inputs from weathering equal losses by leaching;	4	

Question	Answer	Marks	Guidance
1(b)(ii)	*human activity impacting on the forest:* *photograph X* : part of the forest is cleared by burning / slash and burn; for subsistence agriculture; *photograph Y* : large tracts of forest are clear-cut by logging for; urban development / infrastructure / mining / commercial agriculture (e.g. oil palm plantation); *photograph Z* : the forest is largely deforested; replaced with grass for cattle-ranching; *impacts on the community of organisms in the ecosystem:* fragmentation of habitats; loss of habitats; reduction in food supply; loss of nesting / breeding sites; loss of biodiversity; a wide range of species threatened with risk of extinction; *impacts on the environment on the hydrological cycle / climate:* reduced evapotranspiration; reduced precipitation; carbon sink reduction; increased surface run-off; *impact on soil:* removal of the biomass store; removes input to litter store; reduces soil nutrient store; increased leaching of nutrients; soil erosion / soil degradation; soil compaction by trampling;	8	*Max.6 marks if there is no reference to Fig.1.3. or Fig.1.2.*

Question	Answer	Marks	Guidance
2(a)(i)	input: precipitation / river / groundwater flow; output: evaporation / evapotranspiration / river / groundwater flow;	1	*Both correct for one mark.* *Accept evapotranspiration for evaporation from vegetation.*
2(a)(ii)	*water table can rise – an explanation linking:* increased rainfall; increased infiltration; pores in underground, porous store fill with water / saturated; *water table can fall – an explanation linking:* increased temperature; increased uptake of water from soil by vegetation; increased evaporation (from vegetation) / evapotranspiration; reduced precipitation; less infiltration; decrease in saturated zone; increase in extraction of water for human use;	3	*Credit reverse arguments only once i.e. increased / deceased precipitation / rainfall.*
2(a)(iii)	reduced soil / vegetation cover; increase in impermeable surfaces; less infiltration; increased surface run-off; increase in poor quality runoff-from land surface; water collected from drains; increased discharge to streams / river;	4	*Award up to 4 marks for single points or award 2 · 2 marks for 2 developed points.*

Question	Answer	Marks	Guidance
2(a)(iv)	less permanent vegetation cover; soil surface exposed for long periods between crops; increased loss of nutrients from soil; increased leaching; increased nutrient in surface run-off; increased nutrient in groundwater flow due to infiltration and percolation through permeable layers into the groundwater; increased use of fertilisers on land; irrigation water; enhanced nutrient load; eutrophication;	4	*Accept alternative agricultural effects e.g. grazing animals.* *Award up to 4 marks for single points or award 2 · 2 marks for 2 developed points.*

Question	Answer	Marks	Guidance
2(b)	*description of water quality:* a decrease in water quality immediately following the discharge of organic pollution; as shown by the initial increase in density of organic pollution / increase in organic matter; decrease in dissolved oxygen; followed by a gradual improvement in water quality downstream; decreasing organic pollution with distance downstream / gradual decease in organic matter; gradual increase in oxygen levels; *explanation:* sewage effluent / discharge; contains suspended solids / organic matter; increases turbidity; oxygen levels decrease due to decomposition; by decomposer organisms / e.g.; use oxygen in respiration; increased BOD; decreasing organic matter levels are due to the breakdown of organic matter; dispersion / dilution; increased oxygenation of water; due to aeration of water; decreasing microbial activity; the gradual increase in concentration of mineral ions can be linked to the release of minerals from the decomposition of organic material;	8	*Award notionally 4 marks for description and 4 for explanation.*

Question	Answer	Marks	Guidance
3(a)	Different conservation methods protect approximately 30% of the tropical savannah ecosystems in Tanzania, almost one third of the country. Selous is the largest of many game reserves. National parks, for example the Serengeti and Ngorongora conservation area cover an extensive area. National parks e.g. Ruaha are generally smaller and fewer in number than the game reserves. These offer the most protection for wildlife with hunting banned and human activity restricted to traditional land use practices. Wildlife is conserved for intrinsic value, moral, ethical and aesthetic reasons and ecotourism is encouraged. However these have the smallest area of land designated. The largest areas of conservation and most numerous are the game reserves. These areas protect wildlife because the wildlife has an amenity and economic value. By establishing game reserves the natural environment is protected; destruction and development are prevented and wildlife protected. Tourism with safari holidays and hunting expeditions generate income. Hunting is controlled under licence and so wildlife populations are protected from becoming vulnerable or threatened with extinction. However poaching of wildlife is a problem. Game controlled areas cover large areas of land. People can live, cultivate the land and keep livestock in these areas. The use of the land and resources other than wildlife, are not restricted under law and hunting is restricted under licence. This offers wildlife some protection through the sustainable use of the land which can benefit both humans and wildlife. Anti-poaching units are situated close to the national parks. However the number of anti-poaching units indicates the problem with the illegal poaching of wildlife and emphasises the threat to and vulnerability of the wildlife. **Please use level descriptors 1**	**10**	

Question	Answer	Marks	Guidance
3(b)	*The question requirements are:* *to describe two different methods of managing the natural environment for wildlife* *to evaluate two different methods of managing the natural environment for wildlife* *to use examples.* **Indicative content:** Other methods of managing the natural environment for wildlife by preserving the natural environment and conserving the wildlife, include for example a nature reserve, wildlife sanctuary, species protected area, forest reserve, ecological island, marine reserve or biosphere reserve. For example a marine park can effectively conserve coral reefs or a tropical rainforest is preserved by establishing a forest reserve. Evaluation of the two different methods should consider how effective the methods are in preservation and conservation, the extent to which human activity is controlled, the extent to which threats to the wildlife have been reduced. **Please use level descriptors 2**	30	*Any scale is appropriate e. g. from biosphere reserve or a local conservation group.* *Methods must be different to part (a).*

Question	Answer	Marks	Guidance
4(a)	The number of rivers being dammed increased between 1890 and 1930. During the 1930s there was no further increase with 9 rivers dammed each decade and fewer rivers were being dammed during 1940–1950, only 8 during the decade. During 1950 to1960, 20 free flowing rivers were dammed, more than double the number of large rivers previously dammed in any decade. Since 1960 the number of large rivers being dammed per decade has gradually decreased until 1990. Very few large free flowing rivers have been dammed since1990, only 2 per decade. Reasons for the increases in the number of dams built up to 1960 include a greater dam building capability and investment in dam building projects. Economic development and increasing energy demands has increased the demand for hydroelectric power schemes. Increased demand for a reliable domestic water supply and increasing demand for irrigation water for agriculture has resulted in the need for more reservoirs to store water. Reasons for the decrease in the number of dams built since 1960 may suggest that by 1960 major rivers were already dammed so fewer large rivers have been dammed additionally and more dams were constructed on rivers that were already dammed. Alternatively, even larger but fewer dams have been constructed for example, The Three Gorges Dam in China. Increasing awareness of the disadvantages of building large dams for example, earthquake risk and more opposition to dam building for social, economic and environmental reasons. **Please use level descriptors 1**	10	*Answer requires a description of the changes together with suggested reasons for the changes.* *Credit manipulation of data e.g. a calculation of change or percentage change as part of the description.* *Award 4 marks for description and 2 marks for use of data and 4 for explanation.*

Question	Answer	Marks	Guidance
4(b)	*The question requirements are:* *to consider the advantages of dams and reservoirs* *to consider the disadvantages of dams and reservoirs* *to evaluate the use of dams and reservoirs* *to use examples of dams and reservoirs.* **Indicative content:** Advantages of building dams and reservoirs include, for example flood protection, a water store for drinking water and irrigation water for agriculture and recreation activities. Hydroelectric power generation provides a renewable clean energy source. Employment opportunities are provided by dam-building projects. Disadvantages of dams include the fragmentation of rivers and the effect on the natural flow of the water with a change in the amount of water and rate of flow, downstream. Many people can suffer because of the downstream effects of dams. The transport of sediments in the river downstream is restricted and sediment builds up in the dam. There may be a reduction in the fertility of farmlands due to the loss of minerals and irrigation by seasonal floods. Habitats are destroyed, freshwater species and ecosystems are affected. There may be a loss of fisheries with a corresponding loss of livelihood for people dependent on the fisheries. Dams are expensive to build and maintain and dust and noise are problems during dam building. There can be forced displacement of people as many people are evicted from their lands and homes to make way for dams. Specific advantages and disadvantages should be evaluated through the use of examples. **Please use level descriptors 2**	30	

Question	Answer	Marks	Guidance
5(a)	Trends show overall increases in the use of all resources with the largest increase in the use of construction materials from 1 billion tonnes in 1900 to 28 billion tonnes in 2010 while biomass has increased from 6 billion to 20 billion. There is a lower rate of increase between 1900 and 1950 followed by a higher rate of increase in the use of all resources between 1960 and 2010, particularly in the use of construction resources since 2000. There are fluctuations in the changes and some anomalies to the overall increasing trend with decreases in the use of resources in some years, for example in construction materials 1944–45 or the use of industrial raw materials 1990–94. Increases in the use of resources are linked to population growth and economic development. Increased urbanisation, large urban construction projects and infrastructure development have increased the demand for construction resources. Industrial development and population growth and particularly the increase in large newly industrialised countries have increased demand for both industrial raw materials and energy resources. The use of alternative, renewable energy resources may explain the slowing in the rate of increase in the use of coal, gas and oil resources since 2000. An increase in biomass is due to increased demand for food resources by an increasing global population, and in the demand for biomass as a renewable energy resource. **Please use level descriptors 1**	10	*Answer requires a description of the trends for resources and the use of use of data from Fig. 3.1.together with reasons linked to specific resources.* *Award 4 marks for description 2 marks for use of data and 4 for explanation.*

Question	Answer	Marks	Guidance
5(b)	*The question requirements are:* *to consider policies affecting the size of the population to prevent overpopulation* *to consider the sustainable use of resources by a population* *to consider the extent to which the sustainable use of resources will be effective in* *to use examples* **Indicative content:** Policies aimed at controlling population size include for example fertility control, family planning incentives, migration, education and employment opportunities. The sustainable management of resources may include for example, reference to the use of renewable energy resources; a policy of reduce, reuse and recycle; the efficient use of all raw materials; the efficient production of food and sustainable agriculture and pollution control preventing the contamination of water resources. It may be suggested that the carrying capacity of a country can be increased through the sustainable use of resources thereby supporting a larger population and reducing problems of overpopulation. Alternatively It may be argued that some countries have already reached or are close to the carrying capacity, thus using resources sustainably and sustainable management cannot solve overpopulation issues. | **Please use level descriptors 2**		30	

Section A and 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

Section A and Section B descriptor levels:

Section B (part a),

Level descriptors 1

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

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

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

Section A and Section B descriptor levels:

Section B (part b):

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

Section A and Section B descriptor levels:

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