Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT **8291/22**

Paper 2 **May/June 2016**

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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Section A

Question	Answer	Marks
1(a)(i)	increase from November to February / gradual increase in water level, to a maximum depth in February; decrease March to October / gradual decrease to a minimum level in October / water store depleted in October; *(Credit a rise and fall in water level without reference to months for 1 mark.)*	**2**
1(a)(ii)	5.0 m – 0.2 m; = 4.8 m; OR identifies the highest point in February (allow between mid-January to mid-March), 4.5–5.0 m and identifies the lowest point in October, 0–0.5 m; correct calculation with these figures;	**2**

Question	Answer	Marks
1(a)(iii)	high precipitation, input of water into the lake or lagoon / low precipitation, reduced input into the lake or lagoon; precipitation increasing December to January, 199–220 mm; precipitation decreases to 9 mm in July; high temperatures throughout the year; lower and decreasing minimum temperatures as water recedes and rainfall decreases; temperature lowest in August, 14–28 °C; evaporation is greater than input from precipitation, water level falls / precipitation is greater than output by evaporation, water level rises; ref. to wet and dry seasons; *(Award a maximum of 4 marks if there is no reference to data from Fig. 1.1. Credit other links to the water cycle, e.g. infiltration; interception;.)*	**6**
1(a)(iv)	there are other inputs and outputs from outside the local water cycle; example, e.g. run-off to a river; percolation to groundwater; groundwater flow; springs;	**2**

Question	Answer	Marks
1(b)	*use of Fig. 1.2:* threats from the H.E.P. projects; further development of H.E.P. in the river basin as indicated by H.E.P. planned projects; e.g. damming of rivers for H.E.P.; the construction of larger dams; specific reference to damming of the rivers feeding the Pantanal wetland, e.g. on the River Taquari, very close to the Pantanal; *(Maximum 2 marks.)* *use of Fig. 1.3:* e.g. threats from agricultural activity, e.g. cattle ranching; urban development; infrastructure; *(Maximum 2 marks.)* *disadvantages of dams:* e.g. silting of dams; effect on natural water flow; effect on the water cycle; water quantity; ecological disruption; *(Maximum 2 marks.)* *pollution*: e.g. water pollution, from ranches due to organic effluent; pollution due to run-off from the towns and cities into rivers; sewage from towns; water and air pollution from roads, airports and river transport; other ways in which human activity leads to pollution of water stores, e.g. deforestation for agriculture, mining, tourism, fishing;	8

Question	Answer	Marks
	other threats linked to human activity: e.g. climate change; changing weather patterns; increased flooding; increased drought; reduction in the quantity of the freshwater store through extraction; *(Maximum 6 marks if no ref. to Fig. 1.2 and Fig. 1.3.)*	

Question	Answer	Marks
2(a)	as height increases there is more photosynthesis; more light is available; higher trees in the canopy absorb more light as leaves are in direct sunlight / less light is transmitted through the vegetation to the lower layers of the canopy; ref. to data, e.g. anomaly / at 40% available light a higher the rate of photosynthesis of approx. 450 AU, compared to 20% available light and a lower rate of photosynthesis of approx. 200 AU; increasing light energy available for absorption by chlorophyll / chloroplasts;	4
2(b)(i)	pyramid of numbers shows the number of organisms, the pyramid of biomass shows the mass of organisms / species; at each trophic level; *(Accept reference to producers, primary, secondary and tertiary consumers or herbivores and carnivores for trophic level.)*	2

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Question	Answer	Marks
2(b)(ii)	*description:* *pyramid of numbers:* smaller at the pyramid base, wider above, decreasing after the base; *pyramid of biomass:* wider at the base, smaller at the top and decreasing from base to top; *explanation:* there are fewer organisms at the producer level with the large biomass; compared to organisms greater in number and lower in biomass in the levels above; many primary consumers can feed on one large organism / tree; OWTTE	**4**
2(c)(i)	logging; clearing of land for agriculture; clearing of land for plantations; population increase; urban development; *(1 mark for each reason. Accept alternative suggestions.)*	**2**

Question	Answer	Marks
2(c)(ii)	*use of data and examples from Fig. 2.4:* large number of protected areas covering the country; distribution of the protected areas throughout the extent of tropical rainforest from north to south; distribution of the protected areas in relation to the main towns, e.g. the national parks are closest to the populated areas; comparatively national parks cover a larger area of tropical rainforest; managed resource protected areas are found where the extent of rainforest is greater; special reserves / species management areas and strict nature reserves cover smaller areas and are fewer in number; *(Maximum of 4 marks.)* *specific conservation strategies to prevent further deforestation and exploitation:* national parks allow visitors and tourism; promote education and awareness; sustainable economic activity; *habitat / species management areas:* allow ecotourism; carry out forest conservation; species conservation and research; wildlife management: *strict nature reserves:* use a preservation strategy; protect endangered species; no human activity; *managed resource protected areas:* allow the sustainable use of natural resources, e.g. legal logging and sustainable land use in conservation areas; with community involvement in developments; *(Maximum of 6 marks if there is no reference to Fig. 2.4.)*	8

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Section B

Question	Answer	Marks
3(a)	The areas with insufficient freshwater occur in Africa, Asia and Europe. Areas with less than 1000 cubic metres include, for example, Saharan Africa, the Middle East. Areas between 1000 and 2500 cubic metres per person per year include, for example, the United Kingdom, China and areas of Sub-Saharan Africa. These are distributed close to the Tropic of Cancer. Areas which have between 1000 and 1700 cubic metres per person per year include, for example, East Horn of Africa, India, S. Africa, E. Europe. Reasons could include reference to arid countries, drought-affected regions, areas of infrequent rainwater and thus freshwater. Countries of high population density, which have insufficient freshwater available per person due to domestic demand, and countries with high demands for agriculture, irrigation, and industry may also be considered. please use level descriptors 1	10

Question	Answer	Marks
3(b)	*The question requirements are:* • *to consider ways of managing insufficient water supplies* • *to consider the difficulties in achieving a sustainable water supply* • *to assess the extent to which difficulties are being overcome* • *to use examples.* **Indicative content** There may be reference to either increasing supply or reducing demand. Ways of managing insufficient water supplies by increasing supply include, for example, the use of desalination, use of groundwater from deep wells, pipelines, importing water, rainwater harvesting. Ways of managing insufficient water supplies by reducing demand include, for example, water conservation, water recycling, water reuse, water reclamation, water-efficiency measures, water protection, pollution prevention. The difficulties include, for example, the availability of technology, cost, climate change, population growth further increasing demand, energy requirements (e.g. for desalination) and water pollution. **please use level descriptors 2**	30

Question	Answer	Marks
4(a)	More economically developed countries show a slight increase in population from 1950 to present from less than 1 billion to approximately 1 billion with a projected stable population to 2030, then slightly declining to 2050. Less economically developed countries, including the least economically developed countries, increased more between 1950 and present and projected to increase until 2050. However the rate of increase begins to slow in less economically developed countries, except for the least (of the less economically developed countries), which have increased at a faster rate and are projected to continue at the same rate of increase up to at least 2030. The less economically developed countries contribute the greatest increase in population. The changes should be explained with reference to birth rates and death rates, changing birth rates, and decreasing death rates due to improved medical facilities and sanitation, demographic transition and newly industrialised countries. **please use level descriptors 1**	**10**

Question	Answer	Marks
4(b)	*The question requirements are:* • *to refer to population models* • *to consider economic and social development* • *to assess the sustainability of population growth* • *to use example of countries at contrasting levels of economic development.* **Indicative content:** The population models of Malthus and Boserup could be referred to. There may be reference to other models, for example, the demographic transition model. The growing demands of populations as a result of population growth should be considered. Whether these growing demands will impact upon the resource availability in the provision of food, raw materials and energy and ultimately lead to the depletion of non-renewable natural resources should be considered. Alternatively populations will become sufficiently developed and technologically advanced to resource and sustainably use of natural resources and alternatives. An assessment of the impact upon the economic and social development can be illustrated through the use of examples. **please use level descriptors 2**	30

Question	Answer	Marks
5(a)	Benefits for health include the sanitation benefits of the removal of waste water directly piped from housing and industry and the production of potable, clean and safe drinking water. The benefits for the environment include the provision of recycled water, which can be reused in agriculture and industry. Water which is released into the environment is environmentally safe and does not cause pollution. Health problems can result from the disposal of sludge containing pathogens, for example, bacteria and the risk of contamination, if water is reused without further treatment. Risks to the environment occur as a result of seepage and methane production. Sewage sludge needs further processing. Energy resources are required for the processes involved in the treatment of sewage and transport is required for the removal of solid waste and sludge. Pollution can arise from untreated water being used on land and then leaking into water courses. Land is required for the tanks and leakage from storage tanks can occur. Chemicals are used in the process. Problems also arise from the disposal of metals, nutrient enrichment of water courses, dumping of sludge at sea leading to marine pollution. **please use level descriptors 1**	**10**

Question	Answer	Marks
5(b)	*The question requirements are:* • *to show an understanding of river pollution* • *to outline river management policies* • *to assess the effectiveness of the policies* • *to select examples of rivers.* **Indicative content:** Answers could use examples of rivers and examples of pollutants from the local area or case studies. Management policies should be linked to these examples and to the source and mode of pollution, including pollution from domestic, agricultural and industrial sources. **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

Section B descriptor levels:

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 poor balanced 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