

MARK SCHEME for the May/June 2015 series

8291 ENVIRONMENTAL MANAGEMENT

8291/22

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.

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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
- volcanic 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

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Section A

- 1 (a) (i) Before urbanisation: interception by trees; absorption by roots; store in the vegetation; transpiration; store in soil moisture; infiltration to water table; percolation to groundwater;

After urbanisation: overland flow; surface run-off; floodplain (saturated/higher water table); river channel.

Award a maximum of four marks for either, before or after urbanisation. The answer may include comparative statements. [6]

- (ii) Urbanisation induced flooding; reduced infiltration into soil; concrete surfaces; increased surface runoff; increased overland flow; high water table in floodplain; drains/sewers; increased discharge of river; more rapid rise to peak discharge.

The answer should include an explanation linking some of the above points. [3]

- (iii) Dams/diversion channels/dredging the channel/floodplain restoration/planting vegetation on floodplain/wetland restoration/river engineering. [1]

- (b) (i) Freshwater store: creates a reservoir of freshwater behind the barrage gate; the barrage gate prevents seawater moving into the freshwater reservoir; prevents mixing of freshwater and seawater;
Flood prevention: during heavy rainfall as the reservoir fills; the barrage gate is lowered; excess water flows out into sea to maintain a standard water level in the reservoir;
Preventing the inundation of seawater: when a high tide coincides with heavy rainfall; excess water is pumped out into the sea; to maintain the level in the reservoir/to prevent contamination of freshwater by seawater.

Award two marks for an explanation of each of the benefits. Award up to two marks for use of Fig. 1.2/Fig. 1.3.

Please use level descriptors 1

[8]

- (ii) Pollution from the urban catchment area; an example of a non-point source of pollution; containment leaks; increasing concentration of organic pollutants; ecological disruption.

Award one mark for a suggestion and two marks for a suggestion which is developed. [2]

[Total: 20]

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- 2 (a) (i) A succession is a change or progression; in the plant community; seral stages; developing over time to (a natural climax). [2]
- (ii) Plagioclimax. [1]
- (iii) Cultivation techniques / harvesting / ploughing / harrowing; returns land to an earlier stage in the succession; cutting / mowing / grazing; removes biomass / plant growth; selective removal often of shrub seedlings; use of fertilisers; encourages the growth of grass plants and outcompetes / removes broad leaved herbaceous shrubs.
- Award a maximum of two marks for each way.* [4]
- (iv) Climate change / desertification / drought / flood / fire; e.g. fire, removes woody material.
- Award one mark for a named natural event and award one mark for the impact of this event.* [2]
- (v) Other species establish in the community; herbaceous plants; shrubs; tree seedlings; there is increased primary productivity; biomass increases as plants increase in size / height; different heights of vegetation develop; there is stratification into vegetation layers, e.g. canopy layer; diversity increases; a stable, climax community is established.
- An explanation linking some of the above points is required. Credit changes in abiotic factors during succession. Award a maximum of four marks if there is no reference to Fig. 2.2.* [5]
- (b) The management strategy preserves the old woodland; creates new habitats and an ecological corridor connecting different areas to conserve biodiversity; areas are planted with suitable fast-growing plant species; this increases organic material in soil; different types of vegetation are growing and provide different environments; different habitats for animals; stratification of vegetation / different heights of vegetation; increases the availability of niche; different types of shelter / nesting / breeding sites; using successive plantings of species imitates natural succession and colonisation of land by specialists / competitors; the landscape has different stages of succession with different communities; there is variation in the biodiversity in the different ecosystems of woodland, grassland and wetland.
- A description requires six of the above points. Award a maximum of four marks if there is no reference to Fig. 2.3.* [6]

[Total: 20]

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Section B

- 3 (a) There are large withdrawals in North Africa and the Middle East; in arid, drought-affected regions, where the supply from surface water is limited and where demand outstrips the supply of water from surface water. Water withdrawn from groundwater is greater than the annual recharge in these areas and also in some of the mid-range areas. In Southeast Asia as a result of high population density or in North America where water demand from both agricultural and industrial sectors is high and there are increasing demands upon groundwater. Pollution of surface water sources also increases the demand upon groundwater. Low withdrawals are found in South America, Canada and North Europe, in areas of plentiful supply of surface water or areas of low population density.

A balance between a description and an explanation of the variation is required.

Please use level descriptors 1

[10]

- (b) *The question requirements are:*

- *to explain the risks and issues arising from the depletion and degradation of groundwater from supply*
- *to outline measures used to manage the problem*
- *to assess the effectiveness of measures*
- *to select and use examples*

Indicative content:

The impact of human activity upon the quantity and quality of water stored in groundwater should be outlined. Risks to the quality of groundwater due to the pollution of groundwater from metals, nutrients, organic compounds and salt water intrusion should be explained together with the risk to quantity of water stored, where the amount of water withdrawn is greater than the annual recharge. Issues of water crisis where water demand is greater than the supply available and where demand continues to increase due to population growth should be considered. Measures include water conservation, reducing the amount extracted from groundwater for industry and agriculture by re-cycling and re-using water, preventing the pollution of groundwater and the artificial recharge of aquifers.

Please use level descriptors 2

[30]

[Total: 40]

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- 4 (a) Fig. 4.1 shows a correlation between the two variables oxygen concentration and fish numbers. The trend should be described using data from Fig. 4.1. An explanation of the relationship should consider how water pollution from various sources has resulted in the depletion of oxygen in the water. An explanation should link pollution to increased nutrient levels in the water, to the process of eutrophication and the increased activity of decomposer organisms resulting in the oxygen depletion and the formation of dead zones.

Good use of the data requires an overview of the overall trend, a description of the mass of fish caught and the dissolved oxygen concentrations levels at each section and this should be balanced with an explanation.

Please use level descriptors 1

[10]

- (b) *The question requirements are:*

- *to show an understanding of the pollution problem*
- *to describe the measures to prevent and control the pollution*
- *to assess the impact of the measures on the pollution problem*
- *to select and use an example*

Indicative content:

The main focus of the essay is the control and prevention of pollution. The impact of human activity resulting in the pollution problem should be considered. The ecosystem chosen can be either aquatic or terrestrial but the measures discussed should be linked to the chosen example. The prevention and control of pollution, can be considered either from the perspective of conservation management or water management.

Please use level descriptors 2

[30]

[Total: 40]

| | | | |
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- 5 (a) The increasing use of resources by a population, up to a point of over-consumption and overpopulation should be described. The concept of the carrying capacity and the possible outcomes in relation to this should be considered. There should be an explanation of the term carrying capacity and reference to the use of resources by a population, the over-consumption of resources and subsequent effects upon the carrying capacity and population growth. Answers may refer to population models.

A balance between a description and explanation of the relationship is required.

Please use level descriptors 1

[10]

(b) *The question requirements are:*

- *to show an understanding of optimum population size*
- *to describe population policies aimed at balancing a country's resources and population size*
- *to evaluate the policies*
- *to select and use examples from LEDCs and MEDCs*

Indicative content:

This essay should consider the impact of population growth upon the country's resources and the concept of an optimum population size. Population policies aimed at stabilising population growth, achieving a balance between population size and a country's resources include for example: limiting fertility, controlling fertility, family planning, improving the standard of living, education and economic incentives.

Please use level descriptors 2

[30]

[Total 40]

| | | | |
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| 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

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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