

**MARK SCHEME for the October/November 2008 question paper**

**8291 ENVIRONMENTAL MANAGEMENT**

**8291/02**

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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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### Section A

Answer **all** questions from this section

- 1 (a) Table 1.1 gives the average values for annual net primary productivity (NPP) and biomass for two ecosystems.

ecosystem	NPP/g m <sup>-2</sup>	mean biomass/g m <sup>-2</sup>
savanna grassland	900	4000
temperate deciduous forest	1200	30000

- (i) Explain what is meant by the following terms:

**ecosystem**

a community in which energy and matter (= 1) are transferred between the environment and organisms (= 1), credit valid alternatives.

**net primary productivity**

is the amount of energy left after respiration (= 1) determined by Gross Primary production – Respiration (= 1)

**biomass**

the total dry mass of living organisms (=1) in a given area or community (= 1) [6]

- (ii) Suggest **one** reason for the difference in NPP for savanna grassland and temperate deciduous woodland.

Lower and seasonal rainfall (1); a statement that points out the relationship between rainfall and productivity (1); credit references to descriptions of vegetation and its productivity. [2]

- (iii) Explain why values for mean biomass are greater than those for NPP in both ecosystems.

Biomass includes the productivity of previous years/volume of biomass. [1]

- (iv) For the woodland the biomass value is over 20 times greater than the NPP value. For the savanna the biomass value is about 4 times greater than the NPP value. Briefly explain why.

The woodland biomass has a much longer lifetime or alternative. [1]

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- (b) Read the following Greenpeace news report on biodiversity then answer the questions that follow.

As the two-week long world summit on biodiversity drew to a close, Greenpeace described the outcome as major failure – a missed opportunity to stop the global loss of life in the world's forests and oceans.

At the beginning of the conference, Greenpeace presented a roadmap to recovery, a global map of the last intact forests, and a network of marine reserves on the high seas, calling governments to take action line 4

The need for a moratorium on high seas bottom trawling, the most destructive form of fishing, is now being blocked by a few key countries line 7

Despite the exploitation of the Amazon by illegal and destructive logging providing timber products to internal and external markets, the Brazilian Government has blocked any meaningful collaboration at a regional and international level. line 9

(a moratorium is a legal authorization, often by an emergency law)

- (i) In this report a 'roadmap' is a plan or a route.  
Give two reasons why Greenpeace suggested 'a roadmap to recovery'. (line 4)

Current excessive rates of exploitation dictate a long period of recovery (= 1) in which ecosystems need to re-adapt themselves to their environments (= 1) this can only be achieved by governments cooperating and setting up long term strategic plans. (= 1) [2]

- (ii) Suggest why a moratorium on high seas trawling is proposed in the roadmap. (line 7)

Current levels of trawling have the potential to render species extinct (= 1), therefore the need for international agreed laws that limit or prohibit trawling (= 1). [2]

- (iii) Outline the effects that illegal and destructive logging would have upon the food webs found within tropical rain forests. (line 9)

TRF forms a prolific primary producer level at the base of the food web (= 1) its removal has a knock-on effect on all consumer trophic levels by removing the primary source of energy (= 1) [2]

- (iv) Some nations rejected the recommendations made by Greenpeace. Discuss the possible reasons for this.

Two well developed points or up to four moderately developed points.  
Nations rejected the recommendations for mainly economic reasons and to a lesser extent political and social reasons.  
Economic pressures relate to the need for exports and revenue driven by debt and development. Some nations resent pressures from MEDC's. In some countries forest exploitation is linked to crime and corruption. In other areas the socio-economic structure of communities relies upon clearing forest (e.g. slash and burn, shifting cultivation). [4]

[Total: 20]

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2 (a) Fig. 2.1 is a simplified model showing the passage of water in part of a drainage basin.

(i) What is meant by the terms:

**drainage basin**

the total area drained by a river + tributaries, defined by its watershed

**infiltration.**

the passage of water from the surface into the soil.

[2]

(ii) State the process occurring at points A and B in Fig. 1.1.

*transpiration or evapo-transpiration (A) and surface runoff (B)*

[2]

(iii) Describe how a balance between water gain and water loss would be maintained in a drainage basin.

There should be two points that show how the gains in water from precipitation, ground-water (= 2) should be balanced by the losses through evapo-transpiration and flows such as rivers, runoff and groundwater (= 2).

[4]

(iv) Describe how the flows in Fig. 2.1 would respond to conditions of heavy rainfall following a wet winter.

Due to waterlogging or a high water table surface runoff would replace infiltration (= 1), water would pass rapidly in rivers producing peak discharges and possibly flooding (= 1).

[2]

(b) Fig. 2.2 shows some of the characteristics of River Murray drainage basin in South East Australia.

(i) Less than 50% of the water received by the River Murray actually reaches the sea. Outline four reasons for this significant loss of river water.

Reasons can include:

- Distance, the length of the river network with seepage,
- evaporation in the semi-arid climate
- high rates of transpiration
- losses due to irrigation for agriculture
- consumption by urban communities
- storage in reservoirs

[4]

(ii) Describe and explain the pattern of salinity between the reservoir and the sea within the River Murray system shown in Fig. 2.2.

Two marks for the description and two marks for the explanation.

The description should include general trends (= 1) and fluctuations (= 1).

The explanation should refer to progressive accumulation downstream and fluctuations e.g. Murrumbidgee River.

[4]

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(iii) Suggest one strategy that could be used to relieve the problems of either water supply or water quality in the River Murray Basin.

One developed point is needed.

- more sustainable agriculture
- increases in number of reservoirs
- tapping groundwater supplies

[2]

[Total: 20]

### Section B

Choose **one** question from this section

3 (a) The Chagga people of Tanzania effectively maintain biodiversity by practising agroforestry. This is shown in Fig. 3.1. Describe *three* ways in which this system of agricultural land-use helps to maintain biodiversity.

Award three marks for each of the ways, with one floating mark.

The original forest cover is partially cleared (= 1) and uses several layers of trees and bushes (= 1) to provide shelter and maintain indigenous fauna and flora (=1).

Crowns of original rain forest protect the soil (= 1), ground surface and lower vegetation (= 1) from storms and wind erosion (= 1).

Roots bind the soil together (= 1), prevent erosion (= 1) and help maintain the ecosystem (= 1).

Livestock are part of the system (= 1), graze on open patches and eat nuts, grass and waste (= 1), their dung is vital as a manure (= 1).

Irrigation is valid in terms of maintaining crops and pasture.

7 to 10 mark answers need a balanced input of three ways and an emphasis on maintaining the ecosystem and biodiversity.

4 to 6 mark answers might develop one/two ways with the other either omitted or poorly developed. Reference to the ecosystem may be briefly or superficially covered.

1 to 3 mark answers may develop one way and/or all or the remainder as simple statements.

[10]

(b) Using examples you have studied, explain how National Parks help to conserve ecosystems. For the examples you have chosen, assess the extent to which they have been successful in achieving their objectives.

Candidate should select at least one example of a National park and emphasise the conservation of ecosystems.

Answers should outline the role of National Parks in achieving conservation through the following:

Designation as a National Park defines the status of the area.

The prime objective is the management of region and establishment and enforcement of policies that protect and conserve. Thus the job of wardens/park rangers/information centres and in some countries, policing of the area.

Administration and control of landowners within the park: e.g. forestry, farmers, ministry of defence, industry, homeowners.

Promotion of visits to 'honeypot sites', ecotourism, information centres.

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Controls on visitors: designated footpaths, restricted areas, designated car parks etc.  
All measures have the purpose of conserving the landscapes and ecosystems within National Parks. Some parks have a sole purpose of preserving ecosystems e.g. coral reefs for others conservation of the ecosystems forms part of a broader plan.  
Evaluations relate to the degree of success or failure of policies and can include: success criteria and pressures such as economic, political, exploitation, criminal activity etc.

Band 1 answers should select two examples and express a clear understanding of the role of National Parks. Answers at this level should contain at least four policies with relevant evaluations.

Band 3 answers may be less well balanced with one park well answered and at least two policies that receive some evaluation.

Band 4 answers although relevant will have scant coverage of at least one National Park. The answer will be weak on policies and evaluations may be brief statements without any justification. [30]

[Total: 40]

**4 (a) Briefly describe the possible effects of global warming upon the flows and stores in the global hydrological cycle illustrated in Fig. 4.1.**

The answer should be brief and notionally five marks are available for stores and five for flows although with most answers these will be linked; these could include: increased evaporation from oceans/seas with resultant increases in precipitation and increases in stores; increased evaporation from land areas producing aridity and reduction in lake/reservoir stores, decreases in groundwater flow and stores; reduction of snow and ice thereby initially increasing river flow but ultimately reduction; snow and ice melting increases the ocean and sea stores.

7 to 10 mark answers should refer to at least three combined changes to flows and stores. The best answers will refer to data from Fig. 4.1.

4 to 6 mark answers may treat flows and store distinctly and be poorly balanced. There should be one /two moderately developed analyses of flows and stores.

1 to 3 mark answers will cover one or more points very briefly; possible list information and lack clarity. [10]

**(b) Using examples with which you are familiar discuss the advantages and disadvantages of conserving water supplies through the construction of dams and reservoirs.**

Examples may well include: Nile, Colorado, Three Gorges as these are very well documented. Answers should include advantages and disadvantages in relation to the dam and reservoir, upstream and downstream.

Such schemes target drought prevention, water supply, flood prevention and HEP; tourism and recreation are additional benefits.

Disadvantages include: loss of settlements, salinisation, silting, hazard risk (damage to the dam), upstream flooding, and alterations to the natural upstream drainage pattern.

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Band 1 answers should develop their advantages and disadvantages out of the  
There must be reference to the three elements of the question namely: dam and re  
upstream and/or downstream.

Band 3 answers may be poorly balanced and weighted towards advantages or  
disadvantages.

Band 4 answers will have poor development of an example and make superficial reference to  
advantages and disadvantages. [30]

[Total: 40]

- 5 (a) **Fig. 5.1 show a pattern of forest regeneration following clearance of the original climax vegetation cover. Describe how biotic and abiotic processes work together in stages A, B, and C of this model.**

Basically this is a question about the process of recovery following clearance of climax tropical rain forest. Notionally there are three marks for each stage with one floating mark.

**A** = the climax uncut tropical rain forest.

**B** = A sere after 15 years with bushes and small trees.

**C** = A plagioclimax group with trees interspersed with open ground.

Candidates who combine the three stages into a coherent and relevant description of the succession can achieve full marks.

In each stage credit should be given to the description of the stage, the development of the soil and other relevant factors such as dominance, adaptation, microclimate etc.

For 7 to 10 marks answers must refer to each stage with clear reference to how plant communities both develop and adapt.

For 4 to 6 marks there may be better reference to one or two of the stages with relevant but weak analysis of biotic and abiotic factors.

1 to 3 mark answers may amount to very simplistic lists, very poor reference to processes or one fairly well developed element. [10]

- (b) **Describe the damaging effects of forest clearance upon soils and hydrological systems within a deforested region, and beyond that region. Assess the extent to which it has been possible to restore areas affected by such deforestation.**

Deforestation can affect both hilly and level landscapes and its effects will be different; candidates can choose both or one of the two.

In upland areas deforestation for either agriculture or timber can destabilise slopes through: exposure, the absence of roots to bind the soil, increases in surface runoff and active soil erosion. This can affect the discharge pattern of rivers because: channels become clogged with sediment causing flooding, increased runoff causes flood discharges that continue downstream e.g. The Himalayan foothills of Nepal and Northern India.

Restorative measures can include: selective or strip cutting of timber, terracing, cross slope ploughing, replacement of woodland, dredging of rivers and reinforcement of stream banks.



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Deforestation in lowland areas exposes the soil to direct sunlight, winds and the erosion. Additional problems include the production of hard pan (hardened laterites) impermeable and prone to surface runoff, water-logging. Loose exposed soils are also prone to stream bank erosion etc.

The preventative measures, with the exception of slope terracing, are similar to those of hilly regions.

Band 1 answers should clearly develop and area affected by deforestation and refer to the 'knock-on effects' in other areas. There should be a clear assessment of the restorative measures undertaken.

Band 3 answers will be lacking in analysis and evaluation. The effects of deforestation will be stated but loosely analysed. Restorative measures likewise will receive brief coverage.

Band 4 answers although will be superficial. Effects may be stated but not analysed. Expect very limited reference to restoration and very little assessment. [30]

**[Total: 40]**