

**MARK SCHEME for the May/June 2012 question paper
for the guidance of teachers**

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

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

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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
- [max 3]** the number shows the maximum number of marks available for the question where there are more marking points than total marks available
- [max 3] when part of the marks of a question must come from part of the mark scheme, this is indicated by non-bold marks showing the internal maxima for different parts of the question
these non-bold marks are also used to show marks for bands where banded mark schemes are used
- 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

Answer all questions in this section.

1 (a) (i) 1 mark for correct use of data and 3 for the explanation

rivers are temporary stores as they flow towards the sea or a lake, therefore the residence time is short (1); the biosphere has short term loses and gains via groundwater and transpiration (1); atmospheric moisture occurs within a continuous cycle (1)

lakes and reservoirs: although more permanent stores they are drained by rivers and for human consumption (1) **[4]**

(ii) award 1 mark for correct use of the data and 3 for the explanation

ice and glaciers contain ice and compressed snow particles for a long time due to cold temperatures and volume of ice (1)

oceans and seas are vast in area and depth and therefore retain water for longer (1)

groundwater can occur at great depths and transfers slowly (1) **[4]**

(iii) unlike other data, residence time indicates the permanence and reliability of a store (1), e.g. (ref. to water supply from rivers and lakes) **[2]**

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(b) (i) the confined aquifer has impermeable rock above and below (1 mark)

the unconfined aquifer has impermeable rock as a basement and can lose water to the surface (1) **[2]**

(ii) it is a balance between:

gains from the recharge area into the confined aquifer (1); from infiltration into the unconfined aquifer (1); both derived from precipitation (1) and losses from extraction via wells (1) and evaporation (1 mark)

credit can also be given to seepage into the river (1), with a max of 4 marks

a max of 3 marks if there is no specific reference to confined/unconfined aquifers **[4]**

(iii) credit 1 mark for each source (2) and 1 mark for each description of how they get into groundwater (2)

agriculture: chemical spills, pesticides, livestock waste, fertilisers; washed off by surface runoff and infiltrates

industry: septic tanks, cleaning chemicals, solvents, oil; spillage leakage and improper handling

residential: waste water, improper handling and storage of household items such as paint, detergents, fertilisers, cleaning agents

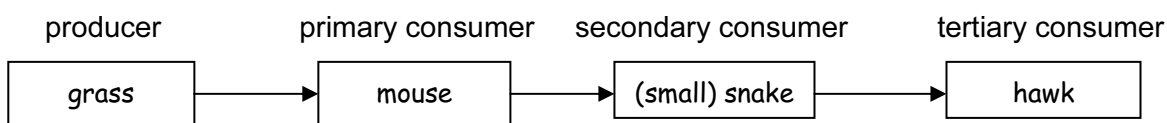
credit other valid examples **[4]**

[Total: 20]

2 (a) (i) food chain: a flow of energy through an ecosystem; each organism in the chain feeds on and obtains energy from the previous link

trophic level: a feeding level within a food chain or the stages in the energy transfer model **[2]**

(ii)



[2]

(iii) between each trophic level there are losses due to respiration, through excretion or because not all of an organism has been eaten; credit two examples of losses **[2]**

(iv) the numbers of organisms at each trophic reduce because of their energy demands (1), rabbits feed off a large number of grass individuals and foxes a smaller number of rabbits (1,) thus a large number of rabbits feed on grass and through excretion and respiration make less energy available for foxes (1); through competition for food there are fewer foxes than rabbits (1)

reserve one mark for use of the data **[4]**

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- (b) (i) award 1 mark for pointing out the limited relationship and 3 marks for the supporting evidence
max 3 if there is no reference to data
the following may be referred to:
Asia 7900/160 and Africa 6000/198 rank high in both and Oceania bottom in both;
Europe 2100/479 is 5th in Fig.2.3 but 1st in Fig.2.4
North and South America alter slightly due to the change in rank for Europe **[4]**

- (ii) award 2 marks for each of three factors with a maximum of 4 if there is no reference to continents

ideally answers should focus on factors such as urbanisation, poaching, climatic change, conservation etc. Followed by examples from continents

Europe has many more protected sites (479) reflecting its concerns and ability to develop conservation sites (NP's, SSSI's, heritage sites etc.)

Asia and Africa also have extensive conservation areas and wildlife parks in response to national and international concerns (Chitwe in Nepal and Serengeti in Africa)

Africa and Asia are experiencing rapid urbanisation; high levels of poaching and in the case of Africa increasing aridity

S. America is experiencing exploitation of natural habitats with economic pressures often exceeding conservation

credit similar valid references to Oceania and North America **[6]**

[Total: 20]

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Section B

Answer one question from this section.

- 3 (a) marine pollution is derived from land based discharge and pollutants (sewage, industrial chemicals and waste, agricultural waste, radio-active waste) carried to seas and oceans by rivers. This occurs in all oceans and from all populated continents

atmospheric inputs are due to winds dispersing pollutants; again extensive

marine transport deposits petrochemical waste plus a variety of debris

marine dumping is the indiscriminate and often illegal depositing of waste into oceans and seas

in contrast pollution from oil has a very narrow range of dispersal (tankers and oil rigs) furthermore it either sinks or decomposes

8 to 10 mark answers must contain a comparative emphasis and consider most elements of the table. Three reasons will be clearly stated

4 to 7 mark answers may tend to list elements of the table and provide limited reasoning. There should be at least two reasons stated

1 to 3 mark answers will either be very brief or simply restate the data in the table **[10]**

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- (b) the question requires:
description of three effects
ref. to examples
assessing the difficulties in managing the marine environment

marine ecosystems comprise deep and shallow oceanic water, coral reefs, continental shelf and coastal fringes
marine pollution can destroy the balance in marine food webs at a number of levels e.g. loss of Krill or reef destruction

oil spills have a localised but devastating effect on marine wildlife e.g. Exxon Valdez (the Gulf spillage was small by comparison)

continental shelves particularly where close to densely populated continents are heavily polluted with agricultural, industrial and domestic waste

marine pollution is difficult to manage as it is an international problem and very difficult to monitor

international agreements and monitoring groups can control to within the 50km limit but beyond this dumping etc is permitted

Band 1 answers cover the question requirements and make good use of exemplar material. These answers will clearly assess the issue of management (25 to 30 marks)

Band 3 answers may stress the 3 effects but assessment of management is superficial or only a brief treatment. Examples will be briefly stated and poorly integrated into the answer (13 to 18 marks)

Band 4 answers may be brief or only consider 1 or 2 effects. There will be limited consideration of the management of marine pollution. Examples may not be developed (6 to 12 marks)

[Total: 40]

- 4 (a) this is a predator-prey relationship
as the number of rabbits rises, the population exceeds lynx
the first peak for rabbits is then followed by a rise in the lynx population causing the former to steeply decline
the decline in rabbits reduces the lynx food supply and its population then declines

from 1890 the rates of change reduce and the fluctuations steady indicating a stabilisation and lowering in the population of both groups with suggested explanations

8 to 10 mark answers should cover the start, widely fluctuating and steadying stages in the relationship. There will be tight reference to the graph and appropriate suggested explanations

4 to 7 mark answers are likely to make a reference to predator-prey relationships, and then wander off into a description not related to Fig 4.1. Other answers may over-develop the detail of the graph and lose sight of the predator-prey relationship

1 to 3 mark answers will be brief and fail to relate the relationship in the graph **[10]**

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- (b) the question requires:
 assessment of the relative merits of safari parks
 assessing the relative merits of zoos
 selection of appropriate examples

zoos and safari parks offer different opportunities for the conservation of wildlife each in their own way achieving their objectives
 as candidates are expected to select their own examples
 the indicative content is generic

[30]

zoos	safari parks
a safe confined environment	an open patrolled/monitored environment
a limited living environment possibly alien to the animal	a natural environment retaining the habitats indigenous to the animal
controlled but guaranteed feeding, no hunting therefore limiting an animals natural instincts; this can lead to stress	feeding in a natural environment retains the animal natural instincts; competition between species is retained; less stressful for the animal
controlled breeding; important with endangered species;	monitoring instead of controls; species remain endangered;
species can be re-introduced into the wild	re-introduction does not always work
research opportunities in a controlled environment	research opportunities in a natural environment
educational opportunities for many more people	educational value if you can afford it; opportunities for ecotourism which preserves environments and money
medical assistance readily available	medical assistance achieved through a monitoring process

Band 1 answers will clearly address the ways in which zoos and safari parks offer different opportunities. Examples should be selected and at least 5 comparative points developed (25 to 30 marks)

Band 3 answers may treat zoos and safari parks separately and lose the comparative emphasis. At least three comparative points should be developed (13 to 18 marks)

Band 4 answers may be brief, con-comparative and make poor use of examples (if any). At least one comparative point should be evident in the answer (6 to 12 marks)

[Total: 40]

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- 5 (a) global warming will affect both the quantities in each store and effect transfers from gas to liquid to solid

good quality answers will mention interactions within the table as well as the uncertainty as to what might actually occur

the following points raise some possible scenarios

deep groundwater is unlikely to be affected in the foreseeable future

ocean water and freshwater lakes may increase as glacier and snow melts

locally atmospheric water may either increase or decrease in time

shallow ground water and soil water may diminish due to increased evaporation

salt water lakes may become salt pans and some freshwater lakes reduce

8 to 10 mark answers will clearly refer to changes in the amount of water and the best answers will indicate relevant uncertainties

4 to 7 mark answers may treat each store separately and ignore how compartments may interact. Other answers may be vague

1 to 3 mark answers will be brief about changes and not indicate that water changes state

[10]

- (b) the question requires:

identifying how global warming and climatic change might affect the supply of water

selection of a country

assessing how it is planning to cope which changes to its natural supply of water

climatic change is already having an effect, greater than people expected:

water: rising global temperatures will lead to an intensification of the hydrological cycle, resulting in dryer dry seasons and wetter rainy seasons, and subsequently heightened risks of more extreme and frequent floods and drought

changing climate will also have significant impacts on the availability of water, as well as the quality and quantity of water that is available and accessible

melting glaciers will increase flood risk during the rainy season, and strongly reduce dry-season water supplies to one-sixth of the World's population

agriculture: declining crop yields are likely to leave hundreds of millions without the ability to produce or purchase sufficient food supplies, especially in Africa

at mid to high latitudes, crop yields may increase for low levels of change in temperature, but will decline at higher levels of temperature change

health: higher temperatures expand the range of some dangerous vector-borne diseases, such as malaria, which already kills one million people annually, most of whom are children in the developing world

further, heat waves associated with climate change, and increases in water borne diseases, will result in increased health problems

coastlines: melting ice and thermal expansion of oceans are the key factors driving sea level rise

in addition to exposing coastlines, where the majority of the human population live, to greater erosion and flooding pressures, rising sea levels will also lead to salt water contamination of groundwater supplies, threatening the quality and quantity of freshwater access to large percentages of the population

for example, according to some estimates a 1 metre rise in sea level will displace 80 percent of the population of Guyana

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coping with the problem:

candidates need to select an example and assess two ways in which it attempting to cope with the issue

these could include: dams and reservoirs, groundwater extraction, desalination, wells, river diversion

the selection might vary according to the level of development of the country

Band 1 answers should be clear about the wide range of effects climatic change is having. Their example should be well selected and the water supply measures developed

(25 to 30 marks)

Band 3 answers will contain at least two references to the effects of climatic change but these descriptions may be brief. Similarly measures for supplies of water may be brief and sometimes dislocated from the example

(13 to 18 marks)

Band 4 answers may be brief and lack clarity on the effects of climatic change. The examples will be weakly developed with only brief references to water supply (6 to 12 marks)

[Total: 40]

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Generic Mark Scheme

Band	Level Descriptors	Marks
Band 1	The candidate demonstrates the following abilities where appropriate to:	25–30
A	<ul style="list-style-type: none"> select and use a very good range of accurate and appropriate knowledge; integrate knowledge from a wide range of areas; show a good understanding of the concepts involved; make good use of knowledge derived from personal experience and study; 	
B	<ul style="list-style-type: none"> select and use a form and style of writing appropriate to purpose and complex subject matter with facility; communicate complex ideas clearly and accurately, in a concise, logical and relevant way; 	
C	<ul style="list-style-type: none"> analyse issues and problems well and evaluate them appropriately; develop complex reasoned arguments and draw sound conclusions on the evidence; 	
Band 2	The candidate demonstrates the following abilities where appropriate to:	19–24
A	<ul style="list-style-type: none"> select and use a good range of accurate and appropriate knowledge; integrate knowledge from a wide range of areas; show an understanding of the concepts involved; demonstrate a range of awareness of personally derived and studied knowledge; 	
B	<ul style="list-style-type: none"> select and use a form and style of writing appropriate to purpose and complex subject matter; communicate complex ideas clearly and accurately, in a concise, logical and relevant way; 	
C	<ul style="list-style-type: none"> analyse issues and problems and evaluate them competently; develop complex reasoned arguments and draw conclusions on the evidence; 	
Band 3	The candidate demonstrates the following abilities where appropriate to:	13–18
A	<ul style="list-style-type: none"> select and use some accurate and relevant knowledge. integrate knowledge from a limited range of areas; show an adequate understanding of the concepts involved; demonstrate a limited range of awareness of personally derived and studied knowledge; 	
B	<ul style="list-style-type: none"> select and use a form and style of writing appropriate to purpose and subject matter; communicate the ideas clearly and in a logical way 	
C	<ul style="list-style-type: none"> undertake some analysis of issues and problems and make a superficial evaluation; develop arguments and draw conclusions; 	

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Band 4	The candidate demonstrates the following abilities where appropriate to:	6–12
A	<ul style="list-style-type: none"> select a limited range of accurate and relevant knowledge. integrate knowledge from a very limited range of areas; show a modest understanding of the concepts involved; 	
B	<ul style="list-style-type: none"> select and use a limited style of writing, appropriate to purpose and subject matter; communicate ideas with limited clarity; 	
C	<ul style="list-style-type: none"> demonstrate limited analysis of issues and problems with limited evaluation; develop limited arguments and draw limited conclusions; 	
Band 5	The candidate demonstrates the following abilities where appropriate to:	1–5
A	<ul style="list-style-type: none"> select and use some relevant knowledge; integrate knowledge from a very limited area; show a restricted understanding of the concepts involved; 	
B	<p>When producing written communication:</p> <ul style="list-style-type: none"> select and use a very limited style of writing appropriate to purpose and subject matter communicate with limited clarity; 	
C	<ul style="list-style-type: none"> undertake a very limited analysis of issues, problems and evaluation; recognise some arguments and conclusions 	