UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level

MARK SCHEME for the October/November 2009 question paper for the guidance of teachers

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, 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.

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UNIVERSITY of CAMBRIDGE
International Examinations

Section A

Answer *all* questions in this section.

1 (a) Fig. 1.1 shows a plant succession within a temperate climatic region.

(i) With regard to plant communities, what is meant by *pioneer* and *climax*. [4]

pioneer plant: a plant (or community of plants) that is the first to colonise an area (1) generally simple or hardy plants (1) credit a definition via examples.

climax plant community: the final community stage (1) where a community of plants has achieved a balance between climate and soils (1).

(ii) Describe and explain how vegetation and soils adapt, through time, to enable the climax plant community to develop. [6]

Credit 3 detailed points as below in which 3 marks are for correct references to soils; answers should recognise that successions are a natural and progressive sequence in which one plant community replaces another;

- primary community consists of annual plants/perennial plants growing in thin soils with no or very little organic matter (1);
- shrubs and then softwood trees replace the pioneer community (1) as organic matter (humus) contributes to soil development and nutrient cycles develop (2) candidates might refer to shrub and woodland microclimates (1);
- mature hardwoods that form the climax community are a product of replacement and dominance (1), deep nutrient rich soils are formed by deep weathering and humus (1).

(b) Fig. 1.2 and Fig. 1.3 contain information on the Florida Everglades in South East USA.

(i) Explain how *one* natural biotic and *one* natural abiotic factor are important in maintaining the ecology of the wetland area shown in Fig. 1.2. [4]

2 marks for each natural factor, one biotic and one abiotic. For each award 1 mark for a correct identification and 1 mark for why.

(ii) Using the information contained in Fig. 1.3 describe *two* adverse effects tourism might have on the ecosystems shown in Fig. 1.2. [4]

Candidates should select from Fig. 1.3 and relate their choice to the environment shown in Fig. 1.2. Thus answers should refer to water pollution, forest clearance, loss of habitats etc. Award 1 mark for the identification and 1 mark for why.

(iii) Identify and justify *one* strategy that might be employed within the Everglades to help conserve its ecosystems. [2]

National park strategies can include: rules of conduct, designated areas, information centres, conservation etc 1 mark for the identification and 1 mark for the justification.

[Total: 20]

2 Table 2.1 contains data for selected regions from 1990 and 2004 on the percentage of people using improved sources of drinking water.

Table 2.1

	Sub-Saharan Africa	ASIA				Latin America & Caribbean	Europe
		East	South-East	South	West		
1990	49	71	76	73	85	83	92
2004	56	78	82	85	91	91	92

all figures are given as percentages

(a) The following questions refer to the data in Table 2.1.

(i) Which region had the largest change? [1]

South Asia

(ii) How many times greater is the increase in use in South Asia than in West Asia?

× 2 or twice **[1]**

(iii) Suggest *two* reasons why Sub-Saharan Africa has the lowest percentage use in both years. [4]

Although most reasons are economic and social there are some physical constraints, such as the arid climate, which need to be linked to the inability to provide water.

- poor economies relate to a lack of provision;
- weak infrastructure of water conservation and provision;
- traditional cultures and use of rivers/wells;
- distance and remoteness of communities.

(iv) Suggest *one* reason why Europe ranks highest and *one* reason why there has been no change between 1990 and 2004. [4]

1 Higher level of economic and social development; water conservation, purification and distribution well developed.

2 Answers that relate to a long established system. No improvement could also be due to Europe's poor regions e.g. S and SE Europe.

(b) Fig. 2.1 contains information on the Three Gorges Dam in China.

(i) Describe *three* benefits that might be obtained from this project. [6]

Award 2 marks for each benefit: 1 for the identification and 1 for its elaboration.
The benefits suggested by the data include:

- reservoir and water supply to a densely populated and urbanised area;
- reservoir and HEP (26 generators);
- promotion of economic development; the current GDP indicates a developing rather than developed nation;
- the prestige derived from an expensive scheme.

(ii) Outline *one* negative environmental effect and *one* negative social effect of the Three Gorges scheme. [4]

Award 2 marks for each. 1 for identifying the effect and 1 for its elaboration.
- environmental effects include: ecological disruption or disaster; loss of scenery; disruption to river discharge and sediment;
- social effects include: population relocation; disruption to economy; loss of historical heritage.

[Total: 20]

Section B

Choose *one* question from this section

3 (a) The Exxon Valdez oil tanker accident on 24th March 1989 was regarded as a major ecological disaster. Fig. 3.1 contains information on this oil tanker accident.

(i) Briefly describe the spread of the oil slick between 24th March and Day 56. [4]

Accident occurred to the north of the Kenai Peninsula (1) then spread south into the Shelikof Straits (1) without any significant seaward dispersion (1); dispersed by ocean currents and winds (1).

(ii) Suggest reasons for the response of the biological community at stages A, B and C on the graph in Fig. 3.1. [6]

Award 2 marks for each of the three stages. The reasons should combine the graph lines for baseline conditions and recovery.

A = immediately after the accident; maximum biological stress with high species mortality due to the oil slick.
B = recovery stages with the recovery line approaching the baseline conditions; oil allows the return/growth of species (particularly the lower parts of the food web).
C = complete recovery with baseline conditions, most oil has dispersed or sunk permitting all levels of the food web.

(b) Explain why it is difficult to control marine pollution. Describe and assess the effectiveness of *two* measures that have been used to combat effects of marine pollution hazards. Use examples in your answer. [30]

Credit 15 marks for the difficulties and 15 for the two strategies (7/8 or 8/7).

Difficulties include:
- lack of control; although there is legislation it is not enforced;
- accidental spillages, intentional dumping;
- dispersal due to winds and ocean currents;
- polluting rivers carrying industrial, domestic and agricultural waste run through different countries; all nations are responsible but agreement is difficult;
- air masses disperse gases and particulates that are deposited at sea;
- historical factors such as war relics, sunken ships;
- storm damage.

Strategies include:

- legislation to reduce pollution; e.g. The International Convention for the Prevention of Pollution from Ships prescribes the minimum distances from shore that pollutants can be dumped; often ineffective as it cannot be rigidly enforced;
- decomposition by bacteria; but the process is slow; some form of direct clean up is needed;
- oil spills are contained by floating booms then removed by pumps;
- slicks can be sprayed with chemical dispersants or by burning the oil;
- dispersants although effective on the surface cause the oil to sink and pollute the seabed.

None of these methods are fully effective and even when combined only relieve the problem. Time is the main factor in ecological recovery.

Band 1 Answers will address the three components of the question and use examples. There should be some effective assessment.

Band 3 Answers will be stronger in one or two parts of the question. Some answers will be vague and assessments will be limited.

Band 4 Answers may be poorly balanced and brief. Examples may be stated but not developed and there will be little or no assessment.

[Total: 40]

4 (a) Fig. 4.1 shows the losses and gains in forest area by continent between 2000 and 2005. Briefly describe and explain the changes in forest area shown in Fig. 4.1. [10]

Notionally award 3 marks for each of 3 categories with one floating mark.
1 = Africa and South America;
2 = North and Central America, Oceania and Asia;
3 = Europe.

Africa has greater forest loss (0.8%) due to extensive deforestation in equatorial areas and desertification in the desert margin areas.
South America has experienced forest clearance in its TRF mainly for agriculture, mining and resettlement. This has been mainly confined to Brazil and Venezuela.
North and Central America ranks third since much of its woodland regions have already been exploited with conservation of woodland in Rockies and Eastern areas. Much of Canada is too remote and cold for extensive exploitation (conifers have a quick growth cycle)
Asia has already been exploited; particularly India and China.
Europe has extensive reforestation programmes and extensive conservation through National Parks etc. Population growth is slow and urban sprawl is into agricultural land rather than forest.

(b) With reference to *one* biome you have studied, describe how ecosystems are affected by the development and expansion of commercial agriculture.
For the example you have chosen, discuss the extent to which it is possible to maintain its ecosystems. [30]

Candidates need to refer to a selected biome and review the effects of commercial agriculture upon its ecosystems. The answer falls into two sections: the effects of the development of commercial agriculture and the sustainability of agriculture and ecosystems. Good examples could be selected be from: Amazonia, Sub-Saharan Africa, Central Europe, Southern Asia.

Ecosystem effects should include:
- the nature of the agricultural development; some are eco-friendly;
- reductions in species population, food webs and biodiversity;
- loss of habitat;
- climatic change;
- alterations to ecological processes: nutrient cycling, soil;
- extent of environmental disturbance.

Sustainability:
- the extent and nature of the integration of agriculture with the ecosystems of the biome e.g. multiple cropping, preservation of natural systems (agroforestry) or complete removal of the natural system;
- recovery programmes e.g. conservation areas;
- government legislation e.g. Brazil and its cattle farmers;
- commercial priorities;
- success or failure assessments.

Band 1 Answers will contain clarity on the selection of a biome and the impact of commercial agriculture on its ecosystems. This will be balance by a related assessment of the measures maintaining ecological stability.

Band 3 Answers may favour one part of the question; possibly lack clarity on commercial farming. Details on ecology will be relevant but either brief or generalised.

Band 4 Answers will be brief and generalised in coverage. Specific detail in ecological disturbance and recovery is likely to be weak.

[Total: 40]

5 (a) Fig. 5.1 contains information on the Alaskan tundra.
Describe how global warming might affect the natural environment of the area shown. [10]

This question invites a brief description of the possible effects of global warming on a delicate environment. Answers should link climatic change with vegetation. Valid points include:
- alterations to the annual temperature regime with an expansion of the growing season from 3 to 6 months and a summer maximum of 18^{o}C;
- this will lead to a reduction in permafrost and the summer cover of grasses, mosses etc replaced by woodland i.e. the creation of new habitats and 'warmer ecosystems';
- melting of the permafrost could also lead to an expansion of marsh, peat bog etc.

7–10 marks = a good balance of climate, ecology and likely change.
4–6 marks = two parts of the answer less well covered.
1–3 marks = very brief and general in all parts of the answer.

(b) Using examples, assess the extent to which pressure groups have been effective in highlighting the adverse effects of human activity upon the Earth's biosphere.

Describe and evaluate *one* conservation method that could be used to protect endangered ecosystems. [30]

The perceived ineffectiveness of governments and protocols has encouraged the development and activities of pressure groups. They are now a major force in influencing global opinions and policies. Candidates are expected to review the role of pressure groups and then focus upon one conservation method.

Pressure groups can be classed as *light greens* (Greenpeace, Friends of the Earth, Sierra club, The Ecologist) they do not follow environmentalism as a political ideology but seek environmental emphasis. They campaign, carry out ecological research, advise, publish and demonstrate. They have been effective in raising public awareness and government action.

OR

dark greens (influenced by Deep Ecology, Gaia, Post-Materialism); they believe that all current political ideologies are corrupt and naturally lead to environmental degradation. Their impact is less clear as they have aggravated governments rather than worked with them.

The conservation method is up to the candidate and can be at any scale. Answers should contain a description and an evaluation. The scale can range from National Parks through to local small scale methods.

Band 1 Answers will be well balanced and have a clear focus upon the biosphere and its conservation. Answers will express a clear understanding and knowledge of the conservation scheme. There should be some effective assessment.

Band 3 Answers will probably cover pressure groups in a generalised form and have a stronger section on a conservation method. Evaluative statements will be brief.

Band 4 Answers will tend to be brief and lack detail in both parts of the answer. Examples will be poorly developed and assessments will be severely limited or absent.

[Total: 40]

Generic Mark Scheme

This aims to provide a scheme for marking 30 mark answers in Section B. The marks are grouped into bands from which it should be possible to locate a mark. The assessment objectives outlined are developed out of the broad objectives for the examination and guideline for locating marks for essays.

Criterion A Demonstrates relevant knowledge and understanding applied to a range of issues and problems.
Criterion B Communicates clearly in a concise, logical and relevant way.
Criterion C Marshalls evidence, draws conclusions and makes evaluations.

Balance of marks for 30 mark questions: Criterion A = maximum of 15
Criterion B = maximum of 5
Criterion C = maximum of 10

Band	Level Descriptors	Marks
Band 1	**The candidate demonstrates the following abilities where appropriate to:**	**25–30**
A	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• undertake some analysis of issues and problems and make a superficial evaluation; • develop arguments and draw conclusions.	

Band 4	The candidate demonstrates the following abilities where appropriate to:	6–12
A	• 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	• select and use a limited style of writing, appropriate to purpose and subject matter; • communicate ideas with limited clarity;	
C	• 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	• select and use some relevant knowledge; • integrate knowledge from a very limited area; • show a restricted understanding of the concepts involved;	
B	When producing written communication: • select and use a very limited style of writing appropriate to purpose and subject matter; • communicate with limited clarity;	
C	• undertake a very limited analysis of issues, problems and evaluation; • recognise some arguments and conclusions.	