

MARK SCHEME for the October/November 2006 question paper

8291 ENVIRONMENTAL MANAGEMENT

8291/02 Paper 2, maximum raw mark 80

This mark scheme is published as an aid to teachers and students, 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.

The grade thresholds for various grades are published in the report on the examination for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses.

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

CIE is publishing the mark schemes for the October/November 2006 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

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Section A

(Answer all questions in this section)

- 1 (a) Fig. 1.1 is a cross section of a river valley showing how water is stored and transferred.

- (i) Name the processes occurring at point A, B and C in Fig.1.1.

One mark for each:

A = Percolation

B = Transpiration

C = Evaporation

- (ii) Describe the effects that each of the following would have upon the stores and transfers within Fig 1.1:

[6]

Credit 1 mark for two points clearly described

- **during a long dry summer**
would increase water loss through evaporation and transpiration, lower the water table and reduce river discharge
- **following heavy rainfall when the soil moisture content is high**
as soil moisture storage is high, rain would transfer to surface runoff increasing the rate at which water enters the river; possibly leading to flooding
- **following the removal of the trees on the valley sides.**
water loss through transpiration would decline; rainfall would transfer to surface runoff even though soil moisture content is lower; again leading to flooding

- (b) Fig. 1.2 contains information on the impact of the Aswan Dam upon the River Nile and its flood plain.

- (i) Suggest two benefits associated with the construction of the Aswan Dam.

[2]

Credit two reasons that should be expressed as a sentence.

e.g. To store water for irrigation of the lower Nile.

Reasons can include: flood management, irrigation, HEP, domestic water supply.

- (ii) Suggest one reason why the daily discharge from the River Nile changed after the dam was constructed.

[1]

Water trapped behind the dam to regulate flow /reduce annual flooding.

- (iii) Explain why the sediment concentration in the river water at Aswan changed after the dam was constructed.

[2]

Sediment trapped in behind the dam = 1 mark

Less water downstream means less energy and deposition.

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(iv) Suggest and justify one reason in each case for the following disadvantages associated with the construction of the Aswan Dam:

- **whilst the area of irrigated and cultivated land has increased, agricultural productivity per unit area has decreased.**
In deserts (1 mark) irrigation leads to salinisation (1 mark) and soils become deprived of replenishment from the annual floods (= 1mark)
- **the Nile Delta is no longer stable and is experiencing erosion.**
Prior to the dam the delta was stable.
A delta depends upon a supply of alluvium. The Aswan dam holds back water and traps sediment (1 mark). The deltas distributaries become deprived of both (1 mark) and erosion by the sea now exceeds deposition by the river. (=1 mark)
- **whilst there are economic benefits to Egypt, there have also been social disruption and cultural losses.**
There are a number of points candidates could raise; credit accordingly. HEP benefiting a nation that is poor in fuel resources with energy for industry and domestic supplies.
Other points include: loss of land, loss of antiquities, and a lake for recreation.

Credit two linked points for each.

[20 marks]

2 (a) What is the meaning of the terms; biomass, biodiversity and trophic level? [3]

Biomass is the total mass of dry organic matter in a community or area.
Biodiversity is a number of different species in a given area.
Trophic Level is a level in a food chain that indicates the status at which organisms feed.

(b) Fig 2.1 illustrates a simplified food chain to be found in tropical grasslands.

(i) What is the initial source of energy for this food chain? [1]

Sun

(ii) Only about 10% of the energy available in one trophic level is transferred to the next trophic level in the food chain. Explain why energy is lost from the food chain at each stage. [2]

Energy is lost through respiration or faeces or excretion. Not all of an organism from the lower trophic level is consumed.

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- (c) **Fig.2.2 shows changes to agriculture which have occurred between 1930 and the present day. With reference to Fig.2.2 outline three ways in which these changes could lead to a reduction in biodiversity.**

Although depicting the English countryside the issues associated with the mechanization and extensification of agriculture occur worldwide. Credit should be given to answers that use Fig 2.2 with examples from their own locality. Credit 2 marks for each of three well developed points on the basis of 1 for a correct identification and 1 for the reason.

Enlargement of field's leads to:

Loss of indigenous woodland with its ecosystems (habitats, wild life, disruption to food chains.

Removal of hedgerows that may contain the final vestiges of the original woodland ecosystem. Hedgerows contain fauna and flora that are rapidly disappearing.

Mechanization can lead to exposure of the soil to direct sunlight, wind and introduce problems of erosion. This leads to a loss of a climax soil with its biota.

On a large scale removal of vegetation can lead to climatic change with subsequent effects on ecosystems.

- (d) **The Spanish Steppes suffer from aridity: temperatures can be high and rainfall low. It is hard for vegetation to survive under these conditions. Fig. 2.3 shows part of the Spanish Steppes and Fig. 2.4 the climate of the Spanish Steppes. Explain how the spread of agriculture to create more pasture and cereals could lead to soil erosion and the formation of desert.**

Award 4 marks for desertification and 4 for soil erosion

The photograph shows an area of woodland and meadow; the chart the temperature and rainfall characteristics of a marginal region in which rates of evapo-transpiration may well exceed annual precipitation.

Desertification or the formation of desert/semi-desert from a previously vegetated surface (= 1 mark) is usually a product of over grazing and cropping (= 1 mark); an loss of vegetation → water cycle is disrupted through the absence of a return to the atmosphere → no convectional rainfall and drier conditions (2 marks)

Soil Erosion refers to the removal of the soil by natural processes following cultivation or grazing (=1 mark), exposure of the soil to natural elements (= 1 mark), period rainfall turns to surface runoff (sometimes sheet wash) (1 mark), soil is washed down slope with resultant gullies/rills etc. Some may mention downslope ploughing which also encourages rill development.

[8]

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Section B

(Choose **one** question from this section)

- 3 (a) **Fig. 3.1 shows some of the demands on an area of land in a rural location. Briefly explain how conflicts of interest may arise as a result of these different demands.**

Candidates need to focus upon the zones of conflict within Fig 3.1 and notionally there are 3 marks for each and one for a correct interpretation of 'conflicts of interest'. Hopefully interpretations of Fig 3.1 will relate to areas familiar to the candidate.

Community needs may include: land for building, farming, recreation, transport;

Conservation refers to preservation of open land/ biodiversity/landscape

Public enjoyment refers to recreation needs, footpaths, access, parks etc.

Each can conflict with the areas contained in the model.

For 8 to 10 marks equal balance should be given to each conflict of interest with reference to: identifying which components conflict with each other (= 1 mark); for two points describing why and its possible effect)

Answers in the 4 to 7 mark range may correctly identify the zones of conflict but lack certainty about why and its effects. Other answers may develop one or two area of conflict; for one up to 3 marks and for two up to 6 marks.

Answers in the 1 to 3 mark range could cover one point or show a lack of understanding. Expect brief descriptions or unsubstantiated lists.

- (b) **Using examples you have studied describe and evaluate the role of National Parks in protecting areas of ecological importance that are under threat from human activity.**

[30]

Candidates should be able to develop examples with which they are familiar. Although most National Parks are areas of ecological importance this does form the important focus of the question. Such areas include: Tropical Rain Forests (e.g. Gola), Wild and scenic Landscapes (Yosemite, Lake District), Unique environments (Galapagos, Nature Reserves, Coral reef, wetlands) etc.

Answers should:

Identify more than one example.

Explain why it is ecologically important

Describe the pressures it is under from human activity.

To explain the role of the National Park answers should outline and explain:

- its designation as a National Park
- its public management policies (e.g. public access, information, ecotourism, honeypots, restrictions, education)
- its role in maintaining research (SSSIs), preservation and conservation,

Finally the degree of success of the National Park should be assessed. This can be done within each part of the essay or as an evaluative conclusion to the essay.

Band 1 answers should be clear about the role of National Park designation for the area they have chosen. They must consider the roles of research and conservation along with the need to both attract and manage visitors. There should be a strong element of evaluation.

Band 3 answers may be poorly balanced by focussing upon a limited number of role or, although relevant, lack detail and evaluation.

Band 4 answers should have some relevance but are likely to be brief and lack evaluative comment.

Some candidates can become quite emotional about such topics and the assessment should be confined to the relevant content.

[40 marks]

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- 4 (a) **Fig. 4.1 shows the countries and rivers surrounding the Baltic Sea and some of the environmental problems in the area. Outline three reasons why managing pollution in the Baltic Sea is difficult.**

Award three marks for each of the three reasons with one floating mark
 The map contains a lot of information and it is important that answers focus upon the difficulties encountered in managing pollution.
 The wide range of pollution sources makes one form of control pointless unless pollution controls are extended to all contributors e.g. industry, domestic, agriculture, wartime dumping and shipping.
 The Baltic Sea is almost enclosed and it is unlikely that polluted water will escape. Thus it remains and builds up.
 The pollutants come from a large number of countries and all would need to follow internationally set standards for any management policy to be effective. Additionally the particularly polluted rivers cross international boundaries making management even more difficult.
 For 8 to 10 marks answers must focus on the problem of management and for each reason, identify the management problem and give a minimum of two explanatory points.
 For 4 to 10 marks expect a poor balance or a lack of explanation.
 Answers getting between 1 and 3 marks may well contain irrelevant material and will certainly contain inaccuracies and lack explanation.

- (b) **Giving examples describe and explain how oceanic ecosystems are threatened by human activity. Using one example assess the extent to which such issues can be managed.**

[30]

Although a similar theme to question 3, the topic of marine ecosystems is more specific.
 Candidates should recognize that marine ecosystems cover a wide range of ocean and sea environments extending from the Polar Regions (Arctic and Antarctic Oceans) to the equator. Marine ecosystems do extend into the neighbouring air and land by providing habitats and continuations of food chains.
 These can include deep and shallow water, unusual environments (Sargasso Sea), Coral etc. Equally the nature of human activity can be varied and include: oil spillage, industrial/agricultural and domestic waste, litter, fishing, dumping, weapon testing, tourism.
 Within the context of the above answers should contain information on the ways in which marine ecosystems are affected. Overfishing can certainly reduce biodiversity, biomass and upset food chains and webs (e.g. whales, krill, sardines). Pollution will contaminate marine environments and can include nitrates, phosphates, PCBs, oil, ships (paints containing copper, arsenic etc).
 The effects of these can be direct oil slicks or indirect by entering the food chain.
 Management strategies depend upon local policies as well as international agreements. International protocol relies upon all contributing nations do their bit; the Rio process has failed to reach agreement. Other strategies are more local e.g. National Parks, Marine Parks, Ecotourism are mechanisms. Pressure groups have had some impact in raising public awareness and encouraging action
 Band 1 answers should fulfil the spirit of the question. Example should be well worked and all parts of the question considered i.e. the nature and fragility of marine ecosystems, human pressure and an evaluation of the management policies.
 Band 3 answers may well contain relevant descriptive points but be weak on explaining the ecological impacts of human activity; such answers are often superficial. At this level there may be some emotional responses within a poorly balanced answer.
 Band 4 answers should contain some relevance but are likely to be very descriptive with poorly developed examples.

[40 marks]

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- 5 (a) Table 5.1 contains the results of a survey. It shows the percentage of people who think that environmental problems are the 'most important' or 'a very serious' issue in their country. Briefly outline the similarities and differences for the results:

- when Industrialised Countries as a whole are compared with Developing countries as a whole.
- when individual countries within each type of country (Industrialised and Developing) are compared.

[10]

Award marks on the basis of an interpretation of the data, quoting examples and giving brief reasons. Notionally 5 marks for each bullet point.

Switzerland, Finland and Ireland clearly have a larger number people who are most concerned in contrast to Japan, USA and Great Britain. The richer industrialized nations use fossil fuels and place a greater importance upon their traditional industrial infrastructure. Ireland, Finland and Switzerland have less heavy industry, a cleaner environment and probably as a consequence are more concerned about their environment.

In contrast the Developing nations have more who do not regard it as a priority; with the exception of The Philippines they also have a larger number of respondents in these categories. Developing Countries are reliant upon rapid industrial growth and prioritize differently. Overall the respondents have greater concern for their environment due to the high levels of environmental damage but do not regard such matters as being of prime importance.

Answers in 8 to 10 marks range should contain a good balance and a clear interpretation of the data using actual examples from the table.

Answers in the 4 to 7 range may points out the differences by wandering around the data but fail to convey the broader picture. Such answers may lack clear explanations. Answers may well lack a balance between the two categories.

In the 1 to 3 range candidates may not move beyond quoting the data; possibly as a list. Correct explanations will either be absent or very brief; simple a short statements.

- (b) **To what extent have agreements between nations and the action of pressure groups been effective in managing the Earth's biosphere in a more sustainable way?**

[30]

The question is concerned with an evaluation of the measures aimed at conserving the Earth's biosphere. Candidates may well support their local knowledge with information on international protocol, pressure groups such as Greenpeace, and the work of the WWF etc.

Answers should outline the scale of the issue through reference to loss of biomass and biodiversity illustrated through reference to examples such as TRF, Sahel, Temperate Forests, Tundra, Marine Ecosystems and cultivated land. These losses being due to over exploitation and poor management. Such issues have strong links topics such as global climatic change, the sustainable use of resources, desertification and soil erosion.

The need for agreements to be made lie in the global context of the issues.

The Rio Protocol of 1991, reinforced in Buenos Aires in 1995 was concerned with Sustainable development. It stressed:

A. Need for international cooperation in: the international trade in wild species; migratory species; global environmental degradation; biodiversity valuable to all countries

B. Species protection agreements include: Habitat protection agreements Ramsar Convention on Wetlands; World Heritage Convention; Man and the Biosphere Program.

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The Rio agreement had the key aim of conserving all ecological elements as well as the interactions between them. This kind of approach is crucial in poor countries, which rarely have the means to put together ex situ conservation projects such as gene banks, zoos and botanical gardens. It also guarantees access to data on natural resources and to the results of research carried out.

Other protocols (Kyoto, Montreal) were more concerned with Fuels, energy and Global Warming and have an indirect influence upon conservation of the biosphere. Protocols have their weaknesses and these should contribute to the evaluative statements. The weaknesses include: voluntary participation, lack of enforcement, insufficient funding, disagreements between industrialized and developing countries. Pressure groups and organisations such as Greenpeace and the World Wildlife Fund for nature also play an important part in researching, raising public awareness and advising on both a local and national scale.

The answer should draw upon elements of success through Ecotourism (Brazil and Peru) and National Parks and elements of failure with reference to forest fires continued loss of biomass, economic and social pressure and of course climatic change.

Band 1 answers should consider and evaluate both international agreements and the role of pressure groups in the management of the biosphere. Although the question is concerned with the global scale candidates at this level may well draw upon more localized examples to illustrate their answer.

Band 3 answers will provide a more limited coverage and develop either the Rio protocol or the action of pressure groups in greater detail. Although relevant answers may be superficial in their coverage.

Band 4 answers will lack the necessary knowledge to outline and evaluate the roles required in the question. Some relevance may be achieved through considering issues relating to the biosphere without detailed reference to its management.

[40 marks]

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. marshal evidence, draw conclusions and make 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	<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 a limited range of 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; 	
Band 4	The candidate demonstrates the following abilities where appropriate to:	6-12
A	<ul style="list-style-type: none"> select and use some 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	When producing written communication: <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 	

[40 marks]