

**MARK SCHEME for the May/June 2007 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.

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

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### Section A

(Answer **all** questions in this section)

**1 (a) (i) What is meant by the term marine pollution?**

The deposition of waste/debris by human activity

or

material derived from human activity that has a damaging effect upon water and marine ecosystems [1]

**(ii) Name *one* type of marine pollution that is organic and *one* that is inorganic. For each type state a likely source.**

1 organic type. e.g. sewage (1) source drains/nearby settlements (1)

2 inorganic type e.g. oil any form of solid debris (1)  
source as appropriate (1)

[4]

**(iii) Explain why most marine pollution comes from the land and remains in coastal waters.**

The major sources of pollution are derived from settlements, industry or agriculture (1). Heavy materials are deposited close to the shoreline and daily tidal action prevent a seaward movement of material (1). [2]

**(b) Describe the natural processes that would cause the pattern of pollution described in the following statement that was made by a sailor.**

*“A river of polystyrene cups and bits of plastic stretches across the ocean. There isn’t a clean spot in the Atlantic Ocean from Bermuda to the African coast”.*

Debris deposited at sea may float and be spread across oceans by currents e.g. equatorial current and counter currents. Credit two distinct points. [2]

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(c) The International Convention for the Prevention of Pollution from Ships prescribes minimum distances from shore that pollutants can be dumped. These are shown in Fig. 1.1.

(i) Explain why the minimum distance for the dumping of treated garbage and sewage is different from that of untreated garbage and sewage.

One mark for each of treated and untreated sewage and garbage. Treated waste is less harmful/non-toxic will sink or disperse easily. Untreated waste needs distance from the shore to enable dispersal, sinking or decomposition. [2]

(ii) Explain why oil discharges are only permitted beyond the distance shown in Fig. 1.1.

Oil will form slicks and if washed ashore is environmentally damaging (1). At sea it will eventually disperse or coagulate and sink (1). [2]

(iii) Give two reasons why The International Convention for the Prevention of Pollution from Ships has not always been successful in controlling marine pollution.

Credit two separate points or a single well-developed point that could include: controlling illegal dumping, achieving international agreement, variations in the age and safety of ships, the global scale of the issue. [2]

(d) Fig. 1.2 shows the geographical distribution of the 8 largest oil tanker accidents that occurred between 1962 and 2000.

(i) Give one reason for the distribution of oil tanker accidents as shown in Fig. 1.2.

On major shipping route; close to dangerous coastal waters. [2]

(ii) Outline and assess the effectiveness of one technique that is used to remove large oil spills from the areas they have polluted.

As the process of decomposition by bacteria 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.

None of these are ideal; booms do not work well in rough seas, dispersants, although effective on the surface, cause the oil to sink and pollute the seabed. Credit 2 marks for the method and 1 mark for the evaluation. [3]

[Total: 20]

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2 (a) Fig. 2.1 shows how the size of the rabbit population changed after rabbits were introduced into Australia.

(i) What is meant by the term *carrying capacity*.

The largest population (1) that the resources of a given environment can support (1) or similar valid points. [2]

(ii) Explain the changes to the size of the rabbit population shown in Fig. 2.1.

Credit two linked points that should contain; after the initial rise in population the rabbit population fluctuates by rising to a point above the carrying capacity following a fall caused by exceeding the carrying capacity. The trend is towards stability. [2]

(b) Fig.2.2 shows three different models for world human population growth.

(i) Describe and suggest a reason for the pattern of population growth between 1830 and point X on the graph.

Exponential rise (1) followed by reference interactions between birth rates and death rates (1/2) or justified by reference to socio-economic factors (1). [3]

(ii) Describe and suggest a reason for each of the projections for population growth after point X on the graph.

- projection A

High growth (1) due to birth rates continuing to exceed the death rate or as the carrying capacity increases so does the capacity for population growth (1). [2]

- projection B

Stable population (1) with birth rates and death rates about equal (1). [2]

- projection C

Declining population (1) due to death rates exceeding the birth rate or population size exceeds the carrying capacity (1). [2]

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(c) Farmers in many parts of the world lose vital crops due to insect pests. The population of such pests can grow at an exponential rate, if unchecked. The diagram compares biological and chemical control of spider mite pests in crops of cucumbers.

(i) For each method of control, describe the trend in spider mite population shown in Fig. 2.3.

Pesticide control introduces sharp fluctuations: mite population rises soon after spraying (1).

Biological controls are effective in keeping the mite population low with minor fluctuations (1). [2]

(ii) Suggest why chemical control and biological control had different effects on the spider mite population.

Pesticides do not completely eradicate the mite population that can later recover. Biological controls introduce specialised predators that target the mite population (e.g. lady birds/bugs). [2]

(iii) Suggest why biological control is often seen as being less damaging to the environment than chemical control.

Three environmentally related points needed.

Biological controls can specifically target a pest. Pesticides can pollute the soil and, through seepage, nearby rivers. Without excessive usage they are not always effective. [3]

[Total: 20]

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### Section B

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

- 3 (a) **Fig. 3.1 depicts a river drainage basin as a system containing flows and stores. Use Fig. 3.1 to describe how, in a drainage basin, natural processes can achieve a balance between inputs and outputs of water.**

Answer should refer to the following:

Inputs = precipitation (some will validly refer) to upstream river water.

Outputs = evapotranspiration and the river.

The stores, although variable in the length of water retention, are temporary (vegetation and surface depressions are short term, soil moisture and groundwater are long term). The flow such as infiltration and through flow transfer water between stores. The state of balance relies upon inputs = outputs.

Band 1 answers (7–10 marks) need to mention how balance is achieved through all components of the system.

Band 2 answers (4–6 marks) although there is some reference to balance, answers lack clarity on the passage of water through the system. Other answers may dwell upon the system and ignore the state of balance.

Band 3 answers (1–3 marks) should contain some relevant material but answers may be poorly developed or list/ repeat the system. [10]

- (b) **With reference to examples with which you are familiar, discuss how efforts to achieve a sustainable supply of water can have positive and negative effects upon human activity and the environment.**

The question requires candidates to use examples to illustrate their answer and the positive and negative effects of water management should relate to these examples. The question divides as follows:

Named examples e.g. Nile, etc.

What are water supply issues affecting the population of the drainage basin and the surrounding regions.

What does the expression 'a sustainable supply of water' mean for the chosen area.

What measures (e.g. dams, use of aquifers, controls of usage etc) have been undertaken?

Positive effects to include: maintenance of water supply needs for the present and the future, environmental, economic and recreational benefits such as lakes/reservoirs, benefits to people, farmers and industry.

Negative impacts include: socio-economic issues upstream and down-stream from a dam; environmental impacts such as salinisation and loss of water elsewhere, local climatic change.

Band 1 answers will use examples to write well-balanced and evaluative answers and be fully cognitive of sustainability, relevant water supply measures and at least three negative impacts and three positive impacts.

Band 3 answers may be vague about sustainability and whilst the examples measures should be valid, the assessment of positive and negative impact may be confined to up to 2 examples of each.

Band 4 answers will have relevance but be vague about sustainable supplies and appropriate scheme. Impacts may be listed and lack development or be confined to 1 example of each. [30]

**[Total: 40]**

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**4 (a) Describe the relationship between climate and biomes shown in Fig. 4.1.**

Candidates are required to interpret from the triangular diagram that its base refers to moisture and the vertical to temperature.

Marks should be awarded on the basis of temperature change (3) moisture (3) and the related biomes (3). Retain 1 mark for the strength of the description of the relationship. [10]

**(b) With reference to two of the biomes shown in Fig. 4.1, describe how human activity has affected the biotic and abiotic factors that maintain the stability of the ecological system.**

Candidates are expected to choose two of the biomes contained in Fig.4.1 and recognise the ecosystems that lie within their choice. For each biome the following are needed:

A description of the characteristics of the biome and related ecosystems including the biotic and abiotic factors important to sustaining it.

The nature of the human activity e.g. mining, forestry, urbanisation, reservoirs, soil deterioration, global warming.

The effects of the disruption upon both biotic and abiotic factors e.g. for rain forest this could include: loss of biodiversity, climatic change, soil erosion.

The question of stability i.e. to what extent is the natural system recoverable. Human activity is important to the stability and maintenance of the natural system through sustainable management.

Band 1 answers must contain a good balance considering two biomes. In each the characteristics of the biomes will be clear and the nature and impact of human activity well developed i.e. clear links between disruption and abiotic and biotic factors. Answers at this level should contain some information on sustainable management.

Band 3 answers may lack balance or develop two relevant but brief descriptions. Answers should contain reference to the natural systems, human activity and abiotic and biotic impacts. Sustainable management will probably not be included.

Band 4 answers, although broadly relevant, will lack specific detail on particular ecosystem and generalise about human activity and its impact. Some answers may contain brief lists of information. [30]

**[Total: 40]**

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5 (a) Outline *three* ways that could be used to monitor changes to the Earth's biosphere.

By monitoring we literally mean 'keeping an eye on things' with a view to future management. The biosphere can be monitored at a variety of scales and candidates need to select three ways in which this can be achieved. Award marks on the basis of 3 5 3 marks with one floating mark. 1 mark is for a correct selection and 2 marks are for the elaboration.

Ways of monitoring could be selected from: direct observation by satellite or ground survey, biodiversity, biomass, atmosphere composition, mapping, historic records. [10]

(b) With reference to an endangered environment you have studied, assess the extent to which conservation methods can be secondary to political and economic pressures.

The choice is entirely up to the candidate and hopefully there will be some inclusion of local knowledge. Candidates can select a single endangered environment for an in-depth analysis or review some broader issue through two examples.

The thrust of the question lies in the contest between economic and political pressure on the use of resources and the need for conservation. Conservation measures have varied levels of success and can be administered through: designation (National Parks, SSSI's, Heritage etc), local controls, government action; or prompted by pressure groups.

Economic/political pressures are usually directed towards exploiting resources e.g. wood, land, minerals, water supply, urban expansion etc.

Examples of endangered environments that have experienced or are experiencing this contest of priorities include: on a large scale, Tropical Rain Forest (Amazonia, Central Africa, SE Asia), The Alaskan Tundra, The Siberia Taiga, Coral Reefs (e.g. Great Barrier Reef) or on a smaller scale: rural/urban fringe areas, smaller National Parks (Yosemite or Lake District). As long as the in-depth knowledge is sufficient the scale can be reduced to a very small scale e.g. a local pond/lake or area of woodland.

Band 1 answers should be relevant and well-balanced in terms of both sides of the argument. There should be a strong evaluative emphasis and decisions to conserve or develop are not clear-cut and often difficult to administer.

Band 3 answers may contain a poor balance by considering one side of the argument. Answers at this level may become over-emotional and lack the objective evaluation the question requires.

Band 4 answers should be relevant and, in addition to an absence of balance and evaluation, lack depth. At this level some candidates may list information rather than elaborate upon points. [30]

[Total: 40]

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

|               |  |             |
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| <b>Band 3</b> | <b>The candidate demonstrates the following abilities where appropriate to:</b>  | <b>13-</b>  |
| <b>A</b>      | <ul style="list-style-type: none"> <li>select and use some accurate and relevant knowledge; integrate knowledge from a limited range of areas;</li> <li>show an adequate understanding of the concepts involved;</li> <li>demonstrate a limited range of awareness of personally derived and studied knowledge;</li> </ul> |             |
| <b>B</b>      | <ul style="list-style-type: none"> <li>select and use a form and style of writing appropriate to purpose and subject matter;</li> <li>communicate the ideas clearly and in a logical way;</li> </ul>   |             |
| <b>C</b>      | <ul style="list-style-type: none"> <li>undertake some analysis of issues and problems and make a superficial evaluation;</li> <li>develop arguments and draw conclusions;</li> </ul>   |             |
| <b>Band 4</b> | <b>The candidate demonstrates the following abilities where appropriate to:</b>  | <b>6-12</b> |
| <b>A</b>      | <ul style="list-style-type: none"> <li>select a limited range of accurate and relevant knowledge;</li> <li>integrate knowledge from a very limited range of areas;</li> <li>show a modest understanding of the concepts involved;</li> </ul>   |             |
| <b>B</b>      | <ul style="list-style-type: none"> <li>select and use a limited style of writing, appropriate to purpose and subject matter;</li> <li>communicate ideas with limited clarity;</li> </ul>   |             |
| <b>C</b>      | <ul style="list-style-type: none"> <li>demonstrate limited analysis of issues and problems with limited evaluation;</li> <li>develop limited arguments and draw limited conclusions;</li> </ul>  |             |
| <b>Band 5</b> | <b>The candidate demonstrates the following abilities where appropriate to:</b>  | <b>1-5</b>  |
| <b>A</b>      | <ul style="list-style-type: none"> <li>select and use some relevant knowledge;</li> <li>integrate knowledge from a very limited area;</li> <li>show a restricted understanding of the concepts involved;</li> </ul>  |             |
| <b>B</b>      | <ul style="list-style-type: none"> <li>when producing written communication:</li> <li>select and use a very limited style of writing appropriate to purpose and subject matter</li> <li>communicate with limited clarity;</li> </ul>   |             |
| <b>C</b>      | <ul style="list-style-type: none"> <li>undertake a very limited analysis of issues, problems and evaluation;</li> <li>recognise some arguments and conclusions</li> </ul>  |             |