

MARK SCHEME for the May/June 2008 question paper

8291 ENVIRONMENTAL MANAGEMENT

8291/01

Paper 1, 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 Soil texture can be determined by the method shown in Fig. 1.1 and represented on the triangular diagram in Fig. 1.2.
- (a) (i) **What is meant by the term *soil texture*?**
The composition of the soil according to varying proportions of different sized particles. [1]
- (ii) **Describe how the apparatus in Fig. 1.1 separates a soil into textural classes.**
Particles pass through a series of meshes with graduated hole size = 1
Shaking moves particles which separate into different classes = 1 [2]
- (iii) **A 100g sample of dry soil was separated into 20g of class A particles, 60g of B particles and 20g of C particles.**
Locate the composition of the soil by marking an X on Fig. 1.2.
Correct intersection = 1 [1]
- (iv) **Write the labels sand and clay into their correct positions within the triangle shown in Fig. 1.2.**
clay (C) at the top = 1, sand (B) bottom right = 1. [2]
- (b) Fig. 1.3 shows a profile of a soil that has formed under moist temperate conditions.
- (i) **Describe and explain the characteristics of layers A and B in Fig. 1.3.**
two marks for each
layer A: mixture of humus and soil skeleton material (1); dark in colour (1), possible leaching, credit eluviation
layer B: lighter colour due to leaching (1), acid pH (1), more silica (1), credit illuviation [4]
- (ii) **Outline three ways in which the soil profile in Fig. 1.3 might change as a result of the removal of the overlying cover of vegetation.**
1 removal (farming, industry, etc.) removes the humus layer = 1
2 hardening of the A and B horizons due to exposure = 1
3 chemical processes are reduced = 1 [3]
- (c) (i) **Explain how a combination of human activity and natural processes caused the soil erosion shown in Fig. 1.4.**
vegetation clearance removes roots which bind soil particles and exposure dries the surface = 2; rainfall (storms or seasonal) encourage surface drainage and rapid erosion of the unconsolidated surface = 2 [4]
- (ii) **Outline one strategy that could be adopted in order to prevent soil erosion to the extent shown in Fig. 1.4.**
a description of one strategy e.g. forestation, agricultural practice, intercropping, etc.
1 mark for stating the strategy and 2 marks for the description comprising 2 brief points or one developed point [3]

[Total: 20]

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- 2 Fig. 2.1 is a barometric chart showing weather conditions across part of Europe.
- (a) (i) Write the labels anticyclone, cyclone and cold front in their correct positions on the barometric chart (Fig. 2.1).
1 mark for each [3]
- (ii) Draw an arrow to indicate surface wind direction at position T on Fig. 2.1.
correct location [1]
- (iii) Describe the weather conditions that are likely to occur at positions X and Y in Fig. 2.1.
X has extensive cloud cover/drizzle or steady rain = 1
Y has clear skies and sun = 1 [2]
- (iv) Use Fig. 2.1 to forecast how the weather conditions at position Z are likely to change over the following 24 hours.
two valid points (= 1 mark for each) relating the passage of the depression across point Z [2]
- (b) Fig. 2.2 contains a satellite photograph of Hurricane Ivan and a map to show its path and development from a tropical storm into a hurricane.
- (i) State two conditions that encourage a tropical storm to intensify into a hurricane.
warm oceans release energy into the system; a smooth ocean surface without obstacles; such systems can be self energising; time [2]
- (ii) Why are wind speeds in excess of 100km per hour characteristic of hurricane conditions?
credit two valid points
intense low pressure = 1; with a steep pressure gradient = 1;
air spiralling into a vortex increases energy = 1 [2]
- (iii) Describe the weather conditions in the eye of the hurricane.
central area of clear skies (1); lowest atmospheric pressure (1) or calm ringed by cloud and hurricane force winds (1) [2]
- (iv) Storm surges are one of the damaging effects produced by hurricanes. A storm surge is caused by the rise in sea level generated by a hurricane. Explain why this rise in sea level occurs and why it can be damaging.
low pressure raises sea level = 1 and strong winds drive the sea onshore = 1
wave moves great distances across the land surface (1) [3]
- (c) Explain one way in which nations can limit the damaging effects of hurricanes.
as nothing can be done to stop the hurricane the answer is concerned with mitigation
valid points include: warning systems, evacuation, structural reinforcements, wind brakes
1 mark for the method and 2 marks for how [3]

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Section B

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

- 3 (a) Levels of atmospheric pollution can vary from place to place in the urban area shown in Fig. 3.1.

Outline three reasons for these variations.

[10]

Notionally there are three marks for each reason with 1 mark awarded for the source; atmospheric pollution can include noise. The causes can be: traffic, domestic, industry and open land. Variations are caused by the influence of vegetation, distance and shelter from pollution sources, road width, building height.

7 to 10 marks answers must include three ways and stress the reasons for variations

4 to 6 marks answers may be less well balanced with either two developed reasons or a lack of development of the three reasons

1 to 3 marks should contain one developed point or three identifications without any development

- (b) With reference to one or more urban areas, with which you are familiar, evaluate the measures that have been used to reduce atmospheric pollution.

[30]

The generic mark scheme should be used for final assessment.

Urban pollution reduction methods include:

traffic reduction methods (controls, park and ride, using public transport)

fuel pollution measures (catalytic converters, unleaded petrol, diesel, low sulphur mixtures, etc.)

Industry: scrubbing chimneys, cleaner fuels, better locations

energy conservation methods

open land (parks, etc.)

Candidates need to select appropriate urban areas and relate the measures to their examples.

Band 1 Answers should be evaluative and contain good development of at least four methods that must be related to actual examples.

Band 3 Answers should cover at least two methods with some development. There may be some vagueness in linking the methods to examples

Band 4 Answers should cover at least one method in which one should be developed. Expect poor development of examples.

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4 (a) Fig.4.1 is a scatter plot of energy consumption and wealth for a number of nations. These nations can be grouped into three general types (labelled A, B and C in Fig.4.1). Give reasons for the relationship between energy consumption and wealth for each of the three types of nations. [30]

Three groups of nations are present:

- A LEDCs, low energy and low gnp with less development, there is low consumption and investment in energy
- B NICs, rapidly developing nations with lower gnp but high use of fossil fuels
- C MEDCs, high energy and very high gnp/with high use of fossil fuels, electricity, etc. in home and by industry

- 7 to 10 marks all three categories should be identified and given two valid reasons
- 4 to 6 marks either two reasons are identified and developed, or three given limited consideration
- 1 to 3 marks one clear reason is identified and developed, or there are up to three brief statements

(b) Assess the extent to which More Economically Developed Countries (MEDCs) have different attitudes and policies towards the sustainable use of fossil fuels than Less Economically Developed Countries (LEDCs). [30]

The question looks at the sustainable use of fossil fuels and the linked attitudes and policies of LEDCs and MEDCs.

The continued use of fossil fuels in MEDCs e.g. USA, UK, Germany, Japan leads to:

- high dependence upon oil and natural gas, to a lesser extent coal for the production of electricity for use industrially and domestically;
- pressures of diminishing reserves, war and increased costs of imports means that they are being driven towards alternative energy;
- environmental pressure and international protocol encourage the use of cleaner fuels;
- pressure towards energy conservation in home and industry;
- some nations resist protocols and others willing to accept

LEDCs e.g. Africa, South Asia or NICs (India, China, Brazil) form a diverse range of economies. Their underdeveloped or rapidly developed economies impose different priorities such as:

- the continued and expanding use of available sources of energy, as with India and China expanding their use of coal;
- limited GDP leads to limited capital reserves for cleaner energy/alternative fuels;
- some developing nations with limited reserves of fossil fuels have developed other sources of energy e.g. alco-fuels in Brazil;
- government policies resist 'Western' intervention;
- current industrial revolution in LEDCs dictates use of fossil fuels.

Band 1 Answers should develop at least three points in relation to LEDCs and three for MEDCs. Answers at this level should be discursive and relate both aspects of the debate, i.e. policies and attitudes.

Band 3 There may be some imbalance with two or three points raised with respect to MEDCs and LEDCs. The discussion may appear shallow with either policies or attitudes dominating the answer.

Band 4 There should be at least one point developed for each group of nations with others less developed. Candidates may not give the differences between LEDCs and MEDCs, and much consideration and political issues will not be developed.

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5 (a) **Seismic zonation involves mapping areas that are most vulnerable to seismic activity. Suggest reasons for the distribution of severe, moderate and weak seismic activity shown on the map of the San Francisco region in Fig. 5.1.**

The area surrounding San Francisco Bay has areas that are prone to violent, moderate and weak seismic activity. These variations are a product of geology and proximity to fault-lines (particularly the Haywood Fault which is a branch of the San Andreas Fault). The main points being building close to:

- material dumped from the 1906 earthquake
- bay sediments (soft sands and clays) are prone to severe earthquakes and liquefaction
- sandstones on the peninsular moderate earthquakes and on hard igneous rocks weak earthquakes
- close to the active Haywood Fault and the San Andreas Fault, severe earthquakes.

7 to 10 marks candidates should elaborate upon at least three of the above points

4 to 6 marks at least two points should be mentioned with one developed

1 to 3 marks at least one point mentioned with limited development

(b) **Assess the methods that can be adopted to limit the damaging effects of earthquakes in densely populated areas. Use examples from both developed countries (MEDCs) and developing countries (LEDCs) in your answer.** [30]

It is valid to consider both preventative and post-event measures. The answer must consider densely populated urban areas as they apply to LEDCs and MEDCs; the scale is up to the candidate.

Preventative measures include:

- building design including deep foundations, flexibility (ability to sway), floating or sliding foundations, few storeys;
- building density as widely spaced low density building offer fewer dangers from falling debris;
- re-housing in less prone areas;
- earthquake monitoring: seismic patterns, seismic gap;
- education.

Post-event includes:

- rescue and aid which varies according to the levels of economic development
- evacuation
- economic assistance
- self-help

Evaluative statements will relate to degrees of success or failure of the chosen methods with reference to the greater loss of life and damage in LEDCs.

Band 1 Answers should contain a balance of at least three well developed from each of prevention and post-event measures. Evaluations should be related to both LEDCs and MEDCs. Expect good knowledge of the exemplar material.

Band 3 Answers may well lack balance or contain up to two measures from each group. Some answers may be wide ranging but lack detail. Evaluations although present will be superficial. Moderate development of examples.

Band 4 Answers, although relevant, will lack detail and evaluations. The answer may be poorly balanced and lack reference to examples.

[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 were 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, 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	<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:	
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. 	