UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
GCE Advanced Subsidiary Level

MARK SCHEME for the June 2005 question paper

8291 ENVIRONMENTAL MANAGEMENT

8291/01 Paper 1 (Lithosphere and Atmosphere), maximum 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 initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

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 discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the June 2005 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

Grade thresholds for Syllabus 8291 (Environmental Management) in the June examination.

	maximum mark available	minimum mark required for grade:		
		a	b	e
Component 1	80	56	48	32

The thresholds (minimum marks) for Grades C and D are normally set by dividing the mark range between the B and the E thresholds into three. For example, if the difference between the B and the E threshold is 24 marks, the C threshold is set 8 marks below the B threshold and the D threshold is set another 8 marks down. If dividing the interval by three results in a fraction of a mark, then the threshold is normally rounded down.

June 2005

GCE AS LEVEL

MARK SCHEME

MAXIMUM MARK: 80

SYLLABUS/COMPONENT: 8291/01

ENVIRONMENTAL MANAGEMENT

Paper 1 (Lithosphere and Atmosphere)

Section A (Answer all questions in this section).

1 (a) Fig. 1.1 shows the structure of the earth and the behaviour of seismic waves generated by an earthquake.

(i) What are *seismic waves*? [1]

Shock waves transmitted by an earthquake, volcanic eruption or explosion.

(ii) Distinguish between P and S waves. [2]

P waves are longitudinal/push and pull/compressional.
S waves are transverse/shake/shear.

Reference to speed or seismogram recording = 1 mark only.
Allow one mark for primary and secondary waves.

(iii) Why are P waves refracted when passing from the mantle to the core of the earth? [1]

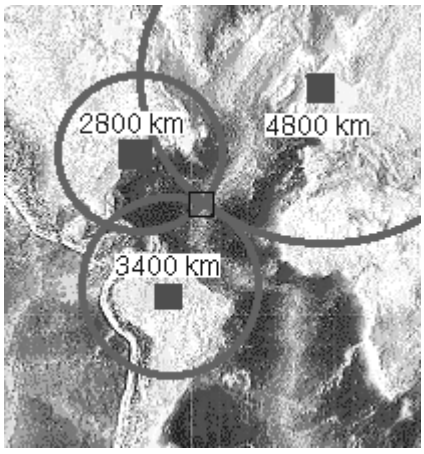
Change of density from solid mantle to liquid outer core (1) produces refraction

(iv) Describe and explain the formation of a shadow zone for P and S waves. [3]

P wave refraction and S waves disappearing as they pass through the liquid outer core creates a zone where no shock waves are recorded

(v) Suggest how seismic waves obtained from more than two seismometers can be used to locate the focus of an earthquake. You may use a labelled diagram to illustrate your answer. [3]

- the seismogram records will give the time and distance between the station and the event.
- drawing a circle on a map around the station's location, with a radius equal to the distance, shows all possible locations for the event.
- plot circles for two other stations. The point at which the three circles join indicates the focus.



(b) Fig. 1.2 contains information on a shallow focus earthquake.

(i) Explain the terms *epicentre* and *focus* of an earthquake.

Epicentre = to point on the earth's surface immediately above the earthquake focus. (1)
Focus = The point at which the earthquake occurs and generates shock waves. (1)

(ii) What are L waves and why do seismographs show them arriving after the P and S waves? [2]

L waves are surface waves/Love waves vibrate at right angles to propagation and Rayleigh waves have vertical and horizontal displacement.

(one valid point = 1) travel at slower speeds (1) credit travel further (1)

(iii) Describe the likely effects of the passage of L waves through: an area of loose sediment e.g. river or lake deposits. [2]

greater vibration/liquifaction produces greater damage
or shock waves magnified (1)
an area of compact rock
less vibration as compact due to consolidated particles. (1)

(iv) Outline <u>two</u> ways in which buildings can be constructed to reduce the possible damage caused by an earthquake. [4]

Award 2 marks for each of two valid points; 1 mark for a correct reference and 1 mark for how it reduces the damage.
e.g. Low or single storey, deep foundations, soft storey, flexibility or will wobble without collapse

(20)

2 (a) Fig. 2.1 is a generalised map of the global pattern of air movement and air pressure at sea level. It does not show the effects of major continental areas.

(i) Outline how the movement of air shown in Fig. 2.1 is influenced by atmospheric pressure and the Earth's rotation. [4]

Air moves from high pressure to low pressure (1).
The earth's rotation deflects air to the right of the pressure gradient in the northern hemisphere and left in the southern/coriolis force (2)
An example (1) or amplification (1)

(ii) Describe and explain the effects of large continental areas upon this pattern of air movement in summer. [3]

Continental areas have low pressure in summer (1) because of intensive heating (1).
Air is drawn into the low pressure region (1) **or** in areas usually experiencing NE or SW winds (1).

(b) Fig. 2.2 contains a climatic chart for San Francisco and a map of California.

(i) Describe the pattern of temperature and rainfall for San Francisco.

Temperatures: Winter for latitude mild at 10° C/ Summer cool at 18° C.
Rainfall: Winter peak 100 (December and January) per month.
Summer dry at 0 (July August)

(ii) Some places on the same line of latitude as California have mean winter temperatures of 8°C and mean summer temperature of 26°C. Explain why San Francisco's annual temperature characteristics are different from those other places. [3]

Maritime weather keeps winter temperatures higher (1)
Californian current (1) and cool on-shore winds keep the temperatures low (1).

(c) Describe the succession of weather events that are likely to have occurred as Hurricane Mitch (Fig. 2.3) passed over Jamaica. [6]

Credit for three stages.
Front: calm then build up of winds from north to speeds of 200 kph/high dense cloud/heavy rain.
Middle: eye is a calm area of about 20 to 30 km diameter/clear skies/humid.
Rear: return of strong winds from the south, return of rain and clouds. Hurricane then subsides.

For 6 marks there must be reference to the whole event.
For a list credit worthy features up to 4. **[20]**

Section B (Answer one question from this section).

3 (a) Fig. 3.1 contains data about levels of different types of air pollution from cities. Compare the data and suggest reasons for the differences in the levels of air pollution. [10]

Credit should be given for descriptions supported by reasons. Although many candidates may give each city a separate description, a comparative format is better and less time consuming.

Mexico City and Los Angeles show the highest levels of pollution: high ozone and carbon monoxide reflecting motor transport, particulates, cars and industry. LA with lower lead level is reflection of emission controls.

London and Delhi have lower pollution levels (London the lowest) indicating in London fewer industrial pollutants/less burning of fossil fuels/emission controls/but high carbon monoxide through transport. Delhi is low on nearly all due to lower levels of economic development, less car ownership, lower fossil fuel usage. High particulates due to dirty factories and urban dust.

Award
8 to 10 marks for a comparative account which refers to all four cities and is supported with reasons.

4 to 7 on a scale ranging from brief descriptions or poor balance with few reasons up to adequate comparison/ 2 or 3 good descriptions but reasoning limited

1 to 3 for very weak answers descriptions generalised and lacking comparison. Weak or no reasoning.

(b) Using examples of urban areas with which you are familiar, describe and evaluate the measures currently being undertaken to manage either land or air pollution. [30]

Use must be made of the generic mark scheme to finalise the mark for this essay. It is an either/or question and should candidates detail both land and water, both should be marked and a mark given on the basis of the better section; it is possible for such answers to achieve full marks.

Management of urban land can include:
- urban domestic waste
- industrial waste
- litter
- air from industry/transport/household/smells
- urban dereliction at a variety of levels (LEDC's and MEDC's)
- ground acidity
- parks and open land.

Management of air pollution in urban areas can include:
- controls on traffic (catalytic converters, preventative measures)
- industrial pollution controls (emission controls, chimney scrubbing etc.)
- laws/fines for industrial accidents or negligence
- controls on domestic waste
- noise controls.
- the monitoring of air pollution.

Band 1 answers should balance issue with management and use detailed examp answers should consider at least four major issues and show an understanding of issue and the management policy. Strong evaluation is vital.

Band 3 answers may give brief consideration to a wide range of issues/or one or two issues in some detail. Management strategies will be mentioned but brief or over-generalised and exemplar material although present, will lack detail.

Band 4 answers may lack balance/give brief consideration to issues and management and contain flimsy examples. However the top of band 4 will possibly be a pass and although weak it should be relevant.

4 (a) Describe how biotic and abiotic processes have worked together to produce the soil profile in Fig. 4.1. [10]

The picture shows a brown earth.

Candidates should recognise that the soil profile extends from the surface down to the parent rock material and that the example contains a series of well developed horizontal layers. Abiotic factors include: parent rock/weathering/temperature/water; biotic factors include vegetation/soil, fauna/humus.

Notionally 5/6 marks for correct profile features and 4/5 for processes

For 8 to 10 marks, candidates should identify: grass/black humus layer/eluviated deposits of iron and aluminium/weathered fragment mixed with B horizon material. Processes to include/humification, eluviation/downward percolation of water/weathering of parent rock.

For 4 to 7 marks, expect varying level of profile identification and weaknesses on processes. Answers may be disjointed and some may list data

For 1 to 3 marks, expect generalised answers/lack of clear horizon features and lack of clarity on processes.

(b) Using examples you have studied, describe how human activity can cause soil erosion as well as achieve a more sustainable use of soils. [30]

Candidates can choose their own examples and there should be a balance between soil erosion and management.

Under erosion such misuses as: overgrazing/overcropping/lack of recovery time/downslope ploughing/effects of machinery/use of chemical fertilisers. i.e. human activity which encourages infertile soils and compaction. These can lead to sheetwash, rills and gullying.

More sustainable usage means better management and can include: education and training/ multiple cropping/better animal husbandry/shelter belts/drainage or irrigation/organic fertilisers.

Band 1 answers will use case studies and produce balanced detailed answers which are relevant to their environment. Such answers will be clear about sustainable usage and the need to maintain production.

Band 3 answers should be relevant but the case studies may lack depth or development of the full range of factors. Management techniques may not have context of sustainability.

Band 4 answers will range from a clear fail to a minimum pass. To achieve a pass there should be relevance even though there is a lack of detail, balance and structure.

5 (a) Using examples in each case, outline the differences between renewable and non-renewable resources.

Answers must clearly state the difference between renewable and non-renewable resources. Renewable refers to resources which occur as a flow in nature and can, therefore, be used repeatedly. These include water, wind, solar, geothermal and, as long as they are not used faster than they can be replenished, forests and soils. Non-renewable resources, once used, cannot be replaced within a reasonable span of time. Fossil fuels are an obvious choice but we can also include metal ores, land and some forest and soils.

For 8 to 10 marks, definitions should be clear and accurate and candidates should provide a good range of examples.

For 4 to 7 marks although definitions may be clear, expect fewer examples and some confusion between particularly renewable and recyclable resources.

For 1 to 3 marks, there will be reference to renewable and non-renewable although it may be general and examples may be confused or lacking.

(b) Describe and explain how policies aimed at encouraging the use of more sustainable sources of energy in MEDC's (More Economically Developed Countries) might differ from those of LEDC's (Less Economically Developed Countries). [30]

This is a comparative answer which should draw out how MEDC's and LEDC's have different priorities often dictated by differences in technology, investment, commitment and available resources. Policies are influenced by economic, environmental and social demands internal to a nation and externalities such as international protocol.

MEDC's through technology, education, wealth have commitments to fossil fuels as well as the facility and motivation (most!) to develop alternative sources of energy.

Many LEDC's are currently passing through their phase of industrialisation and many, for internal reasons, must opt for available resources e.g. coal or oil. Whilst many have developed HEP, such schemes are expensive and reliant upon external finance or debt. International protocol would have LEDC's adopt cleaner fuels at the expense of fossil fuels. Of course, for countries like India with its vast reserves of coal it might be argued that its continued use is sustainable.

Band 1 answers will identify the difference between LEDC's and MEDC's, draw contrasts and comparisons and evaluate the concept of sustainability. Top quality answers might even point out that there are in fact very small differences in stated policies but pragmatics dictate otherwise.

Band 3 answers should be relevant, understand sustainability but have a weaker comparative style. Points may be listed and some answers lack balance.

Band 4 answers at the top end should at least be relevant and give examples.

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

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. marshall 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	• 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:**	
A	• select and use a 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	• 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 and use 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	