UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level

MARK SCHEME for the May/June 2007 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   Slope stability is a result of natural processes and human activity

(a) (i) Name *one* physical weathering process that produces angular fragments of rock.
Frost action or freeze-thaw; organic weathering if justified.   [1]

(ii) Name *one* chemical weathering process that produces fine grains of sediment.
A chemical weathering process i.e. one of carbonation, hydrolysis, hydration, solution.   [1]

(iii) Describe the role of water in *one* of the processes you have named in *either* (i) *or* (ii).
For either **(i)** or **(ii)** the description should contain two related factors; there is no credit for renaming the process.
e.g. Frost action involves the water that has collected in cracks/joints expanding due to freezing (1) causing expansion and cracking into angular fragments (1).   [2]

(b) Fig. 1.1 shows a hill slope in which weathered angular fragments of rock rest on the surface.

(i) Describe and explain the distribution of fine and large sediment on the slope shown in Fig. 1.1.
Credit 2 for description and 2 for explanation.
The description should include; fine material at the top of the slope (1) with debris progressively increasing in size down slope (1). For full marks there must be some reference to an increase in size down slope.
The explanation should include: due to gravity and greater mass large materials have the momentum to move to the lower parts of the slope (1); finer with lower mass are able to rest on the upper part of the slope (1).   [4]

(ii) State and explain one situation in which the sediment resting on the slope in Fig. 1.1 would become unstable.
The situation could involve increased lubrication; frost or more debris derived from weathering of the cliff (1). Human activity is not applicable in this case.
The process must relate to the stated situation with two related points credited. Answers should include reference to slope stability (1) disturbed by one of the situations (1).   [3]

(c) Soil erosion is a problem in many parts of the world. Erosion rates vary w
according to land use, slope angle and the extent of the surface covered
vegetation. The data contained in Table 1.2 were obtained from research into
slope failure in the middle hills of Southern Nepal.

Table 1.2

category of land use	soil loss tonnes/hectare	slope angle	extent of surface covered by vegetation/ % of the area within the category
forest	0.1	all slope angles	95
partly cleared forest	5.0	steep slopes	50
grassland site 1	0.1	gentle slopes	90
grassland site 2	0.5	medium slopes	75
rice terraces upper slopes	8.0	steep slopes	8
rice terraces lower slopes	0.2	gentle slopes to flat	0.2
bare ground	18.0	most slope angles	5

Describe and explain how land use, slope angle and the percentage cover of vegetation have produced the variations in soil loss shown in Table 1.2.
There are 9 marks for this answer and although there are a notional 3 marks for each of the three components, land-use, slope angle and vegetation cover, marks should be awarded on the basis of the following bands.

Band 1 (7 to 9 marks). A full answer that considers soil loss in terms of each of the three components. Answers should bring out the inter-relationships between each factor; discrimination between 7 to 9 marks will relate to the quality of these inter-relationships.

Band 2 (4 to 6 marks). Answers should be clear about variations in soil loss but explanation may either lack clarity or depth on the three factors or develop two of the factors in some depth. Discrimination between 4 and 6 marks will relate to the quality of the process explanations with inter-relationships between them being unclear.

Band 3 (1 to 3 marks). Poor quality answers that contain limited reference to differences in soil loss with explanations brief or generalised or incomplete.

One or two of the factors may be omitted. For 9 marks expect some reference to soil loss without an explanation.

Completely irrelevant or unanswered questions deserve a mark of 0.   [9]

[Total: 20]

2 (a) (i) **What is meant by the terms *low atmospheric pressure* and *high atmosph***
pressure?
Answers must refer to both high and low pressure. There must be reference to air
density or to weight per unit area.

(ii) **Explain how variations in atmospheric pressure at sea level will cause a**
horizontal movement of air across the Earth's surface.
There are two elements needed for 2 marks: air movement from high pressure to
low pressure (or anticylone to cyclone) plus reference to the relative density of air
particles inducing a compensatory flow from high to low pressure. [2]

(iii) **For *either* the northern hemisphere or the southern hemisphere, describe**
how the Earth's rotation will influence the horizontal direction in which air
moves between areas of different atmospheric pressure.
Credit mentioning of the coriolis force due the earth's rotation (1) causing air to be
deflected to the right of the pressure gradient in the northern hemisphere and left
in the southern hemisphere (1). [2]

(b) **Fig. 2.1 is a cross-section between two places, X and Y, showing the likely**
passage of weather events associated with a temperate cyclonic weather
system.

Fig. 2.2 is a barometric chart of a temperate cyclonic system.

(i) **Mark the positions A, B and C from Fig. 2.1 onto their correct positions along**
line X–Y on the barometric chart (Fig. 2.2).
1 mark for each correct location. [3]

(ii) **Describe and explain the weather conditions occurring at points A, B and C.**
3 marks for each of three locations (**A**, **B** and **C**); for each 1/2 or 2/1 for description
and explanation.
A = heavy rain from cumulo-nimbus clouds due to cold air undercutting warm air at
the cold front causing vertical turbulence.
B = clearer sky with patchy cloud, warmer, lower pressure due to warm sector
conditions with no undercutting by colder air thus less upward turbulence.
C = drizzle from stratus cloud/overcast due to warm air gently rising over cold air at
the warm front. [6]

(iii) **Explain why charts such as Fig. 2.2 are useful in making short term weather**
forecasts.
Two clear points linking the small scale or relatively fast passage of the low
pressure system making predictions easier (1).
Likely weather conditions can be tied to air movement (1). [2]

(iv) **Outline and justify *one* method that could be used to make reasonably**
accurate *long term* weather forecasts.
Ignoring superstitions, answers need reference to making long term forecasts.
Credit 1 mark for the method and 2 for the justification. e.g. Satellite images (1)
reveal a global picture in which air mass movement and cloud cover and type can
be seen and tied to understanding global patterns.
Credit reference to other methods: historic records, detailed and local recording of
weather events, weather cycles etc. [3]

[Total: 20]

Section B
(Answer **one** question from this section)

For each of these questions, mark guidance is given in the form of specific creditworthy points in part **(a)** and for part **(b)** an indicative content that should be used with the generic mark scheme.

3   (a)   **Describe the trends in Primary Energy Consumption by Energy Source between 1970 and 2025, that are shown in Fig. 3.1.**
Notionally award two marks for each source of energy. For each there must be reference to such trends as steady increases, fluctuations, accelerations. For each energy source credit two relevant points.   [10]

(b)   **To what extent do developing countries find it more difficult than developed countries to conserve non-renewable resources? Illustrate your answer using examples you have studied.**
The key elements of this question are: the use of types of non-renewable resources, the need to conserve non-renewable resources, the contrasting priorities of LEDCs and MEDCs.

Non-renewable resources include the fossil fuels, metals and in some areas, land. The need to conserve non-renewable resources include: depletion, pollution, protocols, environment.

The contrasting priorities of LEDCs and MEDCs include:
wealth and technology
supply and demand
environmental issues (local and international)

Band 1 answers must give balance and full consideration to the key elements of the question. Use should be made of examples of both LEDCs and MEDCs. Top quality answers should be evaluative and in this question particularly refer to dissenting nations such as the USA.

Band 3 answers may be limited to relevant information concerning wealth and technology, but material on the resource base of nations and how they prioritise may either be lacking or vague. Although there should be some reference to examples these may be vague or detached from the description.

Band 4 answers should contain some substance and relevance. They will however be limited in content and examples may either be absent or included as an appendage.   [30]

[Total: 40]

4   (a) **Fig. 4.1 contains data on emissions of CO_2, per person and from the country**
       whole, for selected countries in 1995.
       Outline *three* different ways in which CO_2 emissions per country compare or
       contrast with emissions per person for selected countries.
       Award mark on the basis of 3 for each group with a floating single mark. 1 mark for
       identification of a group and 2 marks for one well developed supportive point or two
       brief supportive points.
       For example, the data can be divided as follows:

- Countries with high output per person and for the whole country e.g. USA, Russia
  and the UK.
- Countries with low output per person and high output for the whole country e.g.
  China and India.
- Countries with high output per person but low national output e.g. Canada and
  Iceland.
- Countries with low output per person and low national output e.g. Brazil and
  Nicaragua.
- Countries that occupied approximately the same position in both charts e.g. Japan,
  Poland.   [10]

(b) Outline the extent to which current trends in global warming are a produ~~~~ human activity. Describe and explain the possible impact of global warmi~~~~ upon agricultural activity and human settlement.

The first part of the question is concerned with the debate about whether or not current patterns of global warming are due to natural climatic cycles or enhanced by human activity.

The global climatic record reveals long term natural cycles including glacial and interglacial periods and short term warm and cold periods (e.g. 16th century cold period and glacier readvances or 13th/14th century warm periods). These temperature cycles supported by the use of ice core samples point to low and high greenhouse gas content, the geological and written historic record. Recent enhanced global warming is evidenced by; recorded average temperatures, increased greenhouse gas content, economic development in LEDCs and MEDCs, natural phenomena such as glacier melt, climatic change etc. The argument for the impact of human activity is seen in the close positive correlation between these factors.

The impacts of global warming could include:
Agriculture;
 increased drought in areas such as sub-Saharan Africa
 earlier growing seasons (temperate climates)
 extension into new lands
 redistribution and spread of pests e.g. locusts
 intensification of climatic hazards and related effects e.g. drought/heat/fires
 rising sea levels and loss of land.

Human Settlement;
 rising sea levels and loss of land
 increases in pollution e.g. photochemical smogs
 changes to the use of energy (pollution control in cities, reductions in use of fossil
  fuels) and effects on transport and industry
 developing urban land to minimize energy consumption.

Band 1 answers will give both parts of the question balanced consideration. Both sides of the global warming debate are needed along with impacts on agriculture and settlement. For the latter answers should include at least three points and agriculture and two points on settlements.

Band 3 answers may lack balance and give the global warming debate either a one sided view or be generalised. The second part of the question may give a number of points brief consideration or deal with one/two aspects of settlement on agriculture in greater depth.

Band 4 answers although broadly relevant, may give global warming scant or one-sided coverage. The impacts of global warming will tend to be brief. [30]

[Total: 40]

5 (a) Fig. 5.1 shows the pattern of the tsunamis generated by the Indone~~~~
earthquake of 26th December 2004. Explain how and why the impact of the~
tsunamis varied between places A, B and C on Fig. 5.1.
Answers should contain a balance of 'how and why'. The difference in impact of the
tsunamis is a product of distance and whether or not they are interrupted by land or
approach coastlines directly.

The tsunamis were generated from N. Sumatra and radiated across the Indian Ocean.
Place **A** received the full intensity being closest to the epicentre. Place **B** received the
lower impact due and place **C** similarly lower impact (slightly stronger than **B**). [4]

A tsunamis travelled the shortest distance and were received earlier uninterrupted by
distance and land masses. [2]

B although closer than **C** the Indian sub-continent causes the tsunamis to be
refracted, thereby losing energy; waves have a more oblique passage across beaches
also reducing energy. [2]

C the Kenyan coastline directly faces Sumatra and the tsunamis travelled a longer
distance without any land mass interference. [2]

(b) **With reference to examples you have studied, describe and explain the measures
that countries might adopt in order to reduce the damaging effects of volcanic
eruptions and earthquakes.**
The nature of the event dictates that measures will involve damage mitigation or
precaution, pre-event research/prognosis and after event rescue/recovery. Many of the
measures that need to be undertaken are for each type of event similar; although the
effects are different. Candidates have an opportunity to develop case studies or use
personal experiences.
e.g. A for an earthquake: precautions/mitigation include building construction,
evacuation procedures, services (police, medical, etc.), education; pre-event research
or prognosis involves seismological evidence, seismic gap theory, historic records and
any quirks of nature (animal behaviour); rescue and recovery involve the operation of
public services (medical aid, preventing fires, maintaining amenities), rebuilding, rescue
procedures.

Band 1 answers will consider examples of both events with a high degree of accuracy
and detail. The three measures should be given a balanced treatment with respect to
the nature of the event.

Band 3 answers should consider both events although one may be stronger than the
other. There may be less balance between the measures with one or two being better
developed. Details of the named event may be generalised or measures not tied to the
effects of the event. If one type of event is considered award to a maximum at the top
of band 3.

Band 4 answers may contain a poor balance in terms of the two events and the three
measures. Although the candidate may express some knowledge of the nature of
volcanic eruptions and earthquakes, poor use will be made of examples. [30]

[Total: 40]

Generic Mark Scheme

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

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	• 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;	