UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level

MARK SCHEME for the May/June 2006 question paper

8291 ENVIRONMENTAL MANAGEMENT

8291/01   Paper 1

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 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*.

The minimum marks in these components needed for various grades were previously published with these mark schemes, but are now instead included in the Report on the Examination for this session.

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

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UNIVERSITY *of* CAMBRIDGE
International Examinations

Section A

1 Three major effects of polluting the Earth's atmosphere are:

- global warming,
- stratospheric ozone depletion
- acid deposition.

(a) (i) Use the equations below to describe how cfc's contribute to the depletion of stratospheric ozone. **3**

uv radiation splits off chlorine atoms = 1 mark
chlorine atom disrupts ozone molecules causing them to break up = 1 mark
Cl is regenerated to continue the process = 1 mark

(ii) Describe **two** ways in which the hole in the Ozone layer over the Antarctic (Fig. 1.1) changed between 1980 and 1991.

Award 1 mark for shape and 1 mark for size. **2**

(iii) Describe **one** way in which the depletion of stratospheric ozone can affect

- people
- agricultural production. **2**

1 mark for each point. For people, points such as: cataracts and skin cancer = 1 mark; and for agriculture there is reduced production due to decreases in rates of photosynthesis = 1 mark.

(b) Fig.1.2 is a model showing the atmospheric processes that contribute to Global Warming.

(i) Name **two** Greenhouse Gases. **2**

Award 1 mark for carbon dioxide and a second mark for one of methane, nitrogen oxide, cfc's.

(ii) Explain how Greenhouse Gases contribute to Global Warming. **3**

They allow short-wave radiation to pass through to heat the Earth's surface and lower atmosphere = 1

Outgoing long-wave radiation is trapped causing gradual heating of the Earth's lower atmosphere = 1

Increased concentration of gas leads to increased trapping of radiation and heating = 1

(iii) Describe **one** piece of evidence that could suggest that global climates have warmed and cooled in the past. **2**

This aims to draw the distinction between enhanced global warming and natural processes. Award 1 mark for naming the evidence and 1 for its description e.g. ice core samples, warm interglacials, recent climatic fluctuations, tree rings.

(c) (i) Describe and explain the difference between acid deposition at points **A** and **B** on Fig. 1.3. **4**

Award 2 marks for each of **A** and **B**.

A = dry particulate deposition from factories, homes and traffic, deposited close to place of origin; produces SO_2 and NO_2.

B = Gases rise and are transferred by wind and mix with water vapour to produce acid rain. This is deposited over lakes, vegetation, agricultural land etc.

(ii) Describe the effects that acid deposition has upon **one** of the following:

buildings **or** woodland **or** lakes. **2**

The question requires reference to one effect

Buildings are affected by corrosive particulates and acid rain which causes brick and stone work to rot.

[20 marks]

2 (a) Fig. 2.1 shows the processes operating at destructive plate boundary **A** and constructive plate boundary **B**.

(i) Why are the processes operating plate boundary **A** regarded as being destructive whilst those at plate boundary **B** are constructive? **2**

Convergent boundaries **A** involve subduction and destruction of crustal material = 1

Divergent boundaries **B** experience the upwelling of magma along fractures caused by plate divergence; new crust is formed from these basaltic lavas = 1

(ii) What is the difference between magma and lava. **2**

Magma is molten material under the surface that has risen from the mantle/ aesthenosphere/lower crust. = 1 mark

Lava is molten rock that flows on the surface = 1

(iii) Describe one difference between the lava produced from each of these plate boundaries. **2**

At divergent (constructive) boundaries the lava is mainly basaltic/rich in ferromagnesian minerals/runny = 1 mark

At convergent (destructive) boundaries the lava is more acid (e.g.rhyolite, trachytes and andesite).

References to rock chemistry and viscosity are acceptable.

(iv) Identify and describe one feature other than a volcano which could be produced at either of these plate boundaries. **2**

1 mark for a correct identification and 1 mark for the description.
e.g. mid-ocean rift, fold mountains, island arcs, ocean trench.
(credit features not processes)

(b) Fig. 2.2 provides information on the impact of eruptions by Mount Etna between 1983 and 2001.

(i) State four different types of volcanic eruption that occurred during the 2001 eruption sequence. **4**

Fissure eruptions, cinder cones, eruption vents, lava flows.

(ii) State two pieces of evidence that could have been used to predict the route taken by volcanic lava during the 2001 eruption. **2**

Credit two clearly stated points taken from evidence on the map.

The 2001 eruption took place off the southern flank of Etna thus lava followed local relief features.

The path taken by previous southerly lava flows (e.g. 1983 lava flow) = 1

Recent lava and cinder cones point to possible eruption sites = 1

Local relief features whereby lava flows into valleys = 1

(iii) Suggest three ways in which economic activity was disrupted by the 2001 eruption. **3**

Three marks to be awarded for three clearly stated effects:

destruction of: roads to the south, cable car, buildings.

Therefore disruption to the local tourist economy.

(iv) Describe how seismic activity, ground deformation and gas emissions could be used to predict a volcanic eruption such as that depicted in Fig.2.1. **3**

Award one mark for a clear statement about how the evidence is used to predict a volcanic eruption.

- seismic activity; rhythmic seismic tremors heralds an eruption as magma moves within the volcano = 1

- ground deformation; swelling and collapse of parts of the volcano plotted by using tilt meters, laser and sight = 1

- gas emissions; increases in emissions of sulphur dioxide, sulphuric acid in lakes and rivers indicate gases escaping from the magma within the volcano = 1

[20 marks]

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Section B
(answer one question from this section)

3 (a) The results of an environmental impact assessment of a quarry construction in Swaziland are given in Fig.3.1. Outline **three** reasons why its impact upon the environment is likely to be mainly negative. **10**

Indicative content to include:

Negative points:

Disruption to local roads, local traffic and pollution (noise and dirt).

Through construction and operation of the quarry: noise, spoiling of the landscape, dirt, waste tips.

In decommissioning: sheet erosion, recovery problems.

Award

8 to 10 marks for an account that refers to three negative impacts derived from the table.

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 with generalised descriptions or lists. Answers lack detail.

(b) Describe and explain the impact of mining upon an area with which you are familiar. For the area you have chosen, assess the extent to which landscape restoration methods have been successful. **30**

Although the final mark should be derived from the generic mark scheme answers should include the following indicative content.

Indicative content: The question aims to give candidates the opportunity of using case studies which are either local and/or studied by the candidate. Answers should contain:

A clear area identification e.g. Rondonia (Brazil) or a valid local name.

The characteristics of the mine to include: what is being extracted, extraction methods, environmental (landscape, ecology, pollution) impacts, economic impacts and the extent to which recovery is possible and has taken place.

An evaluative account of the extent to which recovery is possible and has taken place.

Band 1 answers will use a case study and produce balanced detailed answers that are relevant to their area. Such answers will be clear about at least 4 impacts of the mine/quarry usage and be evaluative in reference to restoration.

Band 3 answers should be relevant but the case study may lack depth or development of the full range of factors. Answers should contain reference to **either** two detailed descriptions of impacts **or** three/four brief outlines. The final part may be weakened through a listing of points or unclear evaluation.

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. Such answers will lack evaluative statements.

[40 marks]

4 (a) Describe three ways in which satellites have made a contribution to our understanding of weather and climate. **10**

Indicative content.

Weather refers to day-to-day changes whereas climate is an averaging of weather conditions, often over a period of 25 years or more.

Currently Meteosat, NOAA and NASA images can plot cloud cover, wind systems, surface and atmospheric temperatures and can be used to track weather systems and make forecasts.

They are used to: measure temperatures of the sea surface and cloud cover, measure ice cover and vegetation and therefore become indicators of climatic change.

They can produce vertical temperature profiles of the atmosphere and measure the concentration of gases e.g. ozone.

Award

8 to 10 marks for an answer which contains reference to both weather and climate, recognizes what satellite images can provide and has three clear uses.

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. Answers should be relevant.

1 to 3 for very weak answers with generalised descriptions or lists. Answers lack understanding and detail.

(b) With reference to examples you have studied, describe and explain the methods used to reduce atmospheric pollution. Discuss the extent to which these methods have proven to be successful. **30**

Indicative content.

Answers should recognise the nature of atmospheric pollution in urban areas as being: industrial and domestic smoke/pollutants, traffic, waste and noise. It is then possible to describe, explain and evaluate the methods used to reduce atmospheric pollution. The choice of urban area is up to the candidate and methods could include:

For traffic: lead free petrol, catalytic converters, controls on motor vehicle usage, park and ride, public transport, reduced street parking.

For domestic pollutants: cleaner energy and reducing the use of fossil fuels.

For industry: cleaner fuels, relocation, chimney scraping/cleaning/height.

Noise: legislation, public awareness.

Legislation on pollution levels from: clean air acts, environmental protection acts, environmental agencies.

Evaluative points should look towards the level of success or failure of the methods used in the analysis.

Band 1 answers will use a case study and produce balanced detailed answers that are relevant to their area. Such answers will be clear about the causes of urban atmospheric pollution and analyse 4 or more distinct reduction methods. The question is not about the reduction of one type of pollution.

Band 3 answers should be relevant but the case study may lack depth or development of the full range of factors. Answers may well overdevelop one of the types of pollution and thus be poorly balanced. An answer developing two types of pollution can go the top of band 3. The final part may be weakened through a listing of points or unclear evaluation.

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. Such answers will be lacking in evaluation and may provide a simple account of one type of pollution. A band 4 answer must contain at least one type of pollution and its reduction methods.

[40 marks]

5 **(a)** Describe the relationship between climate and soils shown in Fig. 5.1.   **10**

The interrelationship includes:

Low temperatures and precipitation up to 350 mm supports tundra vegetation and therefore tundra soils. A tundra vegetation cover is maintained permafrost, summer waterlogging and short growing season.

A grey earth occurs in areas of deciduous woodland with higher precipitation and temperature. Deeper brown earth soils are a product of a base rich leaf litter and warmer conditions.

.   With increasing aridity and higher temperatures soil vegetation becomes more xerophytic and soils thinner.

Award 8 to 10 marks for answers that consider how each of the three components (temperature, rainfall and vegetation) produces the soil changes shown on the chart. Top answers will refer to the gradual change.

Award 4 to 7 marks for answers that refer to one or two of the components and although relevant, lack precision on the soil changes. Other answers may be flimsy in detail and vague about temperature, precipitation and vegetation.

Award 1 to 3 marks for answers that either fail to address the three components or do not relate them to soil types. Answers at this level may repeat the chart without outlining the inter-relationships.

(b) Using examples you have studied, describe how human activity can affect rates of soil erosion. Assess the extent to which this problem can be successfully managed.   **30**

Indicative content.

Answers should consider soil erosion as a natural process in order to give human activity a correct context. Under natural conditions soil erosion occurs on slopes and is a result of rainsplash, surface and subsurface flow and gully erosion. Gravity combined with wind and water.

Human activity can both initiate and accelerate soil erosion in a variety of locations by:

agricultural activity involving over-farming/deforestation/ploughing etc.

building which over-steepens slopes and disrupts natural drainage/this can include road and rail cuttings.

Most candidates will focus upon agriculture and deforestation and full marks can be awarded for such answers. A correct balance will combine natural processes and human activity.

Band 1 answers must achieve a balance of natural processes and human activity. The case studies should be clearly described, processes explained and the essay address the extent to which human activity accelerates the problem.

Band 3 answers will be relevant and contain weaknesses in explanation and evaluation; they should contain clear descriptions and use case studies. There may be a lack of balance with an emphasis upon either physical processes or human activity. Answers that focus entirely upon one aspect can move to the top of band 3.

Band 4 answers may contain poorly developed case studies, weak descriptions and poor explanations and evaluations. Non-discursive lists of information lie in band 4.

[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   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:	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 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	