UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
GCE Advanced Subsidiary Level

MARK SCHEME for the November 2004 question paper

8290 ENVIRONMENTAL SCIENCE

8290/01 Paper 1, maximum mark 100

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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*.

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UNIVERSITY of CAMBRIDGE
International Examinations

Grade thresholds taken for Syllabus 8290 (Environmental Science) in the November 2004 examination.

	maximum mark available	minimum mark required for grade:		
		A	B	E
Component 1	100	73	60	40

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.

November 2004

GCE AS LEVEL

MARK SCHEME

MAXIMUM MARK: 100

SYLLABUS/COMPONENT: 8290/01

ENVIRONMENTAL SCIENCE

Paper 1

UNIVERSITY of CAMBRIDGE
International Examinations

Answer all questions

1 (a) Fig 1.1 shows the distribution of tectonic plates.

(i) Name the type of plate boundary at places X and Y

X = Destructive, Y= Constructive **(2)**

(ii) The cross section in (Fig 1.2) shows the general shape of the earth's surface and structure of the crust at area X on Fig 1.1.

Label Fig 1.2 with the letters A, B, C and D to show: a descending plate, and island arc, an ocean trench and an active volcanic area.

A = a descending plate **B = an island arc**
C = an ocean trench **D = an active volcanic area**

One for each correct located label. **(4)**

(b) Fig 1.3 shows the location of the continents approximately 200 million years ago.

Use Fig 1.3 to explain the present position of the continents.

A correct description of the current location in relation to the past = 2
The mechanism of continental drift with reference to convection currents = 1, ocean floor spreading = 1,
a 'plastic' aesthenosphere = 1, location or examples = 1 **(6)**

2 (a) Distinguish between erosion and weathering.

Erosion = the denudation of the earth's surface by agent such as river, glaciers, wave and wind

Weathering = the reduction of rocks, mechanically or chemically **(3)**

(b) Fig 2.1 (Photograph) shows part of the upper course of a river and its valley.

(i) Describe how frost action might have contributed to the weathering of the cliffs and accumulations of debris shown in area A.

Freeze - thaw process = 2, collection of scree at the base of the slope = 1 **(3)**

(ii) Explain how river erosion has helped to produce the valley at point B.

Credit for valley shape = 1 and processes = 2
Valley cross profile is broadly V valley side = 1
Periodically fast flowing river in a mountain area = 1
The river erodes vertically creating a V shaped profile = 1 **(3)**

(iii) Describe the size and shape of the boulders to be seen in the river bed.

Large = 1 and rounded = 1 **(2)**

(iv) Outline the processes that would have shaped the boulders in the riverbed.

A description of attrition (2 points) **(2)**

(c) Under what conditions would the boulders shown in the riverbed in Fig 2.1 have been deposited?

Transported in flood = 1 and deposited with a loss of energy due to lower velocity = 1 **(2)**

3 (a) (i) Describe the relationship between electromagnetic wave length and frequency.

Ultra violet to gamma has increasing frequency and shorter wave length. Infra-red to radio waves have longer length and lower frequency **(2)**

(ii) Explain why the radiation emitted by the Earth differs from that emitted by the sun.

The higher the temperature the greater the proportion of short wave radiation emitted. Therefore the sun emits ultra-violet and visible light whilst the cooler earth, whilst absorbing short wave radiation, emits long wave radiation **(3)**

(b) State <u>two</u> purposes, other than weather maps, of satellite images.

Credit 1 mark for each of two valid examples, e.g. volcanic eruptions, land use, water pollution, atmospheric pollution **(2)**

(c) Fig 3.1 is an image taken across part of Western Europe taken by satellite. (2)

(i) How does the image distinguish between thin and dense cloud.

White opaque indicates deep/dense cloud = 1
Grey and grey broken = thin cloud = 1 **(2)**

(ii) Name the type of weather system shown at A in Fig 3.1.

Depression, cyclone or low-pressure system **(1)**

(iii) Describe the pattern of air movement in the region of A.

Anticlockwise circulation/or location. **(1)**

(iv) Suggest how satellite images can be used in making weather forecasts.

Two well developed points = 2 x 2
Less well developed = 1 up to four.
An unqualified list = max 2 **(4)**

4 (a) Within an ecosystem what do producers and consumers use as food.

Producers involves the conversion of inorganic raw materials (carbon dioxide/water) onto organic compounds. Produces plants or primary producers = 2

Consumers include sheep, camels, humans who cannot make their own organic compounds. Rely completely upon autotrophs either directly or indirectly = 2 **(4)**

(b) Explain why the sun provides the ultimate source of energy for all organisms in an ecosystem.

Most food chains begin with green plants = 1 they trap it and use it to produce food; or for sunlight energy to be absorbed by chlorophyll in photosynthesis **(2)**

(c) Explain the role of each of the following in photosynthesis.

Light provides energy for the chemical reactions of photosynthesis; splits water to provide hydrogen atoms for the reduction of carbon dioxide

Water is the solvent for all chemical reactions; transport of minerals and sugars around plants; a source of hydrogen atoms to reduce carbon dioxide

Chlorophyll is the green pigment, absorbs light from the visible part of the electro magnetic spectrum, which is transformed into chemical energy **(4)**

(d) Fig 4.1 shows the absorption spectra for chlorophyll a, chlorophyll b, and a group of pigments called cartinoids.

(i) Use Fig 4.1 to suggest why leaves containing chlorophyll appear green.

The green pigment absorbs a lot of red and blue light from the visible part of the electromagnetic spectrum = 1. Most of the green light is reflected = 1 **(2)**

(ii) Before leaves fall from tree chlorophyll breaks down. The leaves turn red or orange at this time. Explain this change.

Pigments such as carotene reflect orange, yellow and red light.
Blue, orange, red absorbed by healthy leaf;
⇒ green transmitted/reflected
Only blue absorbed when chlorophyll broken down;
⇒ orange/red also transmitted/reflected **(2)**

5 (a) Ecosystem, population and community are terms used to describe aspects of the biosphere; define each term.

Ecosystem is the interaction of the community with the physical environment

Population refers to all members of a species living in a particular area at the same time

Community is all the different populations of organisms which live together **(6)**

(b) Many areas of coastal sand dunes show a pattern of young immature dunes close to the sea with older mature dunes inland. Over the course of time vegetation and soils develop within this pattern.

Fig 5.1 shows a transect across an area of coastal sand dunes.

(i) By how many times does the amount of organic matter increase between sites 1 and 3?

4.5. Credit 2 marks for a correct total. If the calculation has a correct procedure but incorrect total award 1 mark **(2)**

(ii) Name <u>one</u> site at which there is likely to be a climax plant community.

Site 5 or woodland. **(1)**

(iii) Suggest why the numbers of species per unit area increase between site 1 and site 4.

Award 3 marks for a correct description of plant succession
Reference to: time, adaptation and diversification and soil is needed **(3)**

(c) (i) What would be the likely properties of the soils to be found (i) in site 2 (ii) in site 5?

(ii) In each case award up to 3. In each case: soil texture = 1 and humus content = 1. One floating mark for a relevant point
Site 1 Sandy, porous, immature, alkaline
Site 5 Brown earth or podzol. Humus rich, well developed profile
Less porous, neutral pH **(5)**

6 (a) Fig 6.1 illustrates a model of the atmospheric heat transfer system. It has been suggested that global warming results from disturbance to this system.

(i) State <u>two</u> inputs into the atmospheric heat transfer system.

Two from: insolation, earth reflected heat, earth emitted heat,
heat reflected by greenhouse gases **(2)**

(ii) State <u>one</u> output from the atmospheric heat transfer system.

Radiation **(1)**

(iii) How might this system be disturbed by human activity?

Pollution caused by fires, industry e.g. SE Asia, Moscow deforestation, greenhouse gases **(2)**

(b) Fig 6.2 shows how global temperatures have risen between 1860 and 2000.

(i) Describe the pattern of global temperature change in Fig 6.2.

Although there are fluctuations no general increase up to the late 19^{th}/early 20^{th} century. = 1
Steady increase 1900 to 1940 then levels = 1
Accelerated increase after 1980 = 1 **(3)**

(ii) Which factors might have contributed to the changes in temperature over the past 30 years?

Credit 3 points tied to global warming and the recent increase
Natural change accelerated by human activity
Pollution by greenhouse gases: industry and transport post 1980's increase particularly in LEDC's **(3)**

(c) Outline the possible impact of global warming upon either the climate or the biosphere.

Reference to climatic change and its effects upon a vegetation zone or region (scale = continental to local) e.g. Sahel, TRF, European Zones or climatic hazards such as: drought, storm intensification, warmer summers etc.
Credit up to 5 for effects and up to 2 for reasons and or examples. **(5)**

7 Fig 7.1 shows variations in Moose and Wolf populations on an island between 1960 and 1995. On this island wolves are the predators of moose.

(a) (i) What is the meaning of the term *predator?*

A species dependent upon the consumption of another.
Credit 2 marks for a full definition with or without an example. **(1)**

(ii) Using data from Fig 7.1 describe and explain the changes in the population of Moose and Wolves between 1960 and 1995.

For full marks there must be reference to the interaction between both populations. Award 2 for the description and 2 for the explanation **(4)**

(b) Fig 7.2 shows how the size of the human population of a region changed over time. The carrying capacity of the region is also shown.

(i) Describe how the size of the human population is related to the carrying capacity.

Rising population to the carrying capacity = 1
Continues to rise beyond the carrying capacity = 1
Checks to population growth reduce the population size to below the carrying capacity = 1
Population growth recovers = 1 **(4)**

(ii) What effects would technological improvement have upon the situation shown in Fig 7.2?

Technological improvements lead to increases in food supply and standards of living = 1 thereby raising the carrying capacity = 1 or permitting further population growth = 1 (max 2 marks) **(2)**