UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level

MARK SCHEME for the October/November 2010 question paper for the guidance of teachers

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, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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Section A

(Answer *all* questions in this section)

1 (a) Fig 1.1 contains information on fossil fuel consumption for selected areas in 2004.

(i) Which areas had the highest consumption of coal, oil and natural gas? [3]

One mark for each correct answer

coal = China; oil = USA; natural gas = USA

(ii) Outline *one* way in which fossil fuel consumption in the United States is similar to that in the European Union. Give *three* reasons for this. [4]

Credit one mark for the similarity and 1 mark for each reason

They are proportionately similar (= 1 mark)
Both have reserves of fossil fuels (oil, gas and coal) (= 1 mark)
Both rely on importing fossil fuels, particularly oil
Their economies are reliant upon these fossil fuels or credit any correct way in which this point is stated. (= 1 mark)

(iii) What is the difference in total fossil fuel consumption between India and China? Outline *two* reasons for this difference in fossil fuel consumption. [5]

Credit 1 mark for the calculation and 2 marks for each reason.

Calculation = 1000 million tonnes of oil equivalent (+/- 100) = 1 mark
Differences: although both are rapidly developing nations with a need to use fossil fuels, China's industrial expansion (= 1 mark) and use of cars exceeds that of India (= 1 mark); China's reserves of exploitable coal exceeds that of India (= 1 mark); India has a more environmentally friendly attitude towards energy (1 mark); India is mostly tropical but China extends into temperate and extreme continental areas thus consumes more fossil fuels for heating etc (= 1 mark). Credit other valid differences

(b) Table 1.1 contains data on renewable energy consumption for the United States (USA) for the year 2006.

(i) Which *three* sources contribute over 80% of the renewable energy used in the US? [1]

Biomass, wood derived fuels and (HEP) (all three are needed for one mark)

(ii) Suggest why the percentage change in the use of these three sources, as stated in (i), is relatively small. [1]

One valid suggestion is needed e.g. cost, availability, already developed.

(iii) Suggest why geothermal energy and energy from waste have shown percentage change in the period 2005 to 2006. Give *one* reason for each.

Geothermal: volcanic sources are undeveloped; cost and inconvenience construction in urban areas

Waste: utilizing methane from waste dumps is new, costly.

(iv) For *either* biofuels *or* wind farms explain why, whilst they have shown a high increase in percentage energy consumption, their development is frequently criticised. [4]

Credit 1 mark for stating they are needed as fossil fuel use reduces.
Credit 3 marks for the criticisms.

Biofuels: reduce forested area (TRF), therefore can contribute to global warming, reductions in agricultural land reduces food supplies and people are resettled to create space for biofuel crops, loss of habitats and biodiversity.

Wind farms can be intrusive through noise, appearance and use of space. They are low energy producers, frequently unreliable and birds fly into them. Actually CO_2 and other pollutants are released when making the turbines.

[Total: 20]

2 (a) Explain why, at the surface of the Earth, some regions of the atmosphere are said to be at high pressure, whereas other regions are said to be at low pressure.

Credit 1 mark for an understanding of pressure and one for the difference.

The atmosphere has weight or pressure due to the pull of gravity; the actual weight or pressure is a product of air density which varies according to temperature and whether it is ascending or descending. Average pressure over the Earth's surface is 103.3g/cm^2 and high pressure exceeds this and low pressure is less. Candidate can also refer to relative spatial differences.

(b) Fig. 2.1 shows the global horizontal circulation of air.

(i) State the type of atmospheric pressure that is generally found at X and Y in Fig. 2.1. [2]

X = high pressure
Y = low pressure

(ii) Explain how differences in atmospheric pressure contribute to the global horizontal circulation of air shown in Fig. 2.1. [2]

Air moves from high pressure to low pressure areas (1 mark)
One example e.g. NE trades or air moving into the doldrums etc (1 mark)

(iii) Describe the influence the Earth's rotation has upon the global horizontal circulation of air. [2]

The coriolis force or deflection of air due to the Earth's rotation (1 mark); causes air to be deflected to the right in the northern hemisphere and left in the southern hemisphere (1 mark) as it moves down the pressure gradient (1 mark)

(c) Fig. 2.2 shows the circulation of air over southern Asia during winter (January) and summer (July) and climatic data for Calcutta.

(i) Use the data in Fig. 2.2 to explain the seasonal distribution of rainfall for Calcutta. [4]

January: cooler winter temperatures cause high pressure (= 1 mark; air is circulating away from NW India to oceanic low pressure regions (=1 mark), it receives little water vapour and is therefore dry (= 1 mark)

July: the reversal in air circulation causes moist air from the Indian Ocean (= 1 mark); this causes high levels of precipitation in the Indian sub-continent and Himalayas (= 1 mark); a result of high temperatures causing low pressure (= 1 mark)

(ii) Using the information in Fig. 2.2, describe *one* social and *one* economic hazard that might derive from the climate of this region. [6]

Award marks for using the data in Fig. 2.2 (3 for each: social and economic).
January: drought (= 1 mark); temperatures are over 20°C precipitation low (= 1 mark): therefore problems of food supply/starvation

July: very high rainfall (301 mm) (= 1 mark) for the duration of summer leads to flooding (= 1 mark), and consequent problems (loss of farmland, homes etc) (= 1 mark)

[Total: 20]

Section B

(Select *one* question from this section)

3 (a) Describe and explain the characteristics of the tectonic activity that occur at locations X, Y and Z on Fig. 3.1. [10]

This should be a straightforward question requiring details of each of the plate boundaries. Answers should specifically relate the type of tectonic activity. Credit 3 marks for X and Y and 4 marks for Z.

X = a transform boundary in which plates slide past each other (= 1 mark); earthquakes are common (= 1 mark); caused by the sudden release of pressures caused by the moving plates 'sticking' to each other. (3 marks)

Y = a divergent or constructive boundary in which plates move away from each other (= 1 mark); the release of pressure causes magma to rise and fill the gap or resultant fault lines (= 1 mark); producing basaltic volcanoes and rift valleys (oceanic or land). (3 marks)

Z = a convergent or destructive boundary in which plates move towards each other (= 1 mark); one plate becomes subducted beneath the other (= 1 mark); this subduction will produce andesitic or acid (explosive) volcanoes (= 1 mark); as well as deep seated earthquakes and fold mountains (= 1 mark). (4 marks)

(b) Select either an earthquake hazard *or* volcanic hazard with which you are familiar. Assess the extent to which the perceptions of, and responses to your chosen hazard depend more on the wealth of the country than any other factor. [30]

A slight change in emphasis from similar topics set in the past. The response a nation makes to a natural hazard frequently depends upon how the likelihood of an event is perceived. This is frequently the opposite to that which might be expected. Rich nations can afford to have a positive perception and take effective precautions whilst poor nations whilst aware of the dangers often have a negative perception and are resigned to the eventuality of a natural hazard. So!

Richer nations take precautions in building technology; have infrastructures combining police, fire services, hospitals, rescue transport and practiced evacuation procedures. Monitoring technologies such as seismometers, tilt meters, field research warn of impending volcanic or earthquake events.

Many poor nations do not have such infrastructures and technology; settlements may be remote and buildings poorly constructed. Thus earthquakes and volcanic events can be more devastating. These nations respond after the event and rely upon local support and international aid.

Assessments might question the above points. e.g. a sense of well-being might lead to complacency (e.g. Kobe or Katrina); assessments for LEDC's might be that there is little that can be done or indeed point that many nations do have adequate infrastructures and that such hazards are rare.

Band 1 answers will express good understanding of the different perceptions of rich nations and relate their responses to a volcanic or earthquake event to actual ex... Answers can contrast rich and poor nations or develop the discussion through a detailed evaluative account of one event. (25–...

Band 3 answers may lack balance with rich or poor dominating the answer; other answers may be well balanced but lack detail. Assessments may be weakly developed and probably concentrate upon the negative aspect. (13–18)

Band 4 answers will be relevant but brief in detail. Expect answers to be poorly balanced with limited development of one or two effects. The assessment of how natural disasters are dealt with many lacking clarity or be absent. (6–12)

[Total: 40]

4 (a) Describe *three* ways in which the information contained in satellite images such as that shown in Fig. 4.1 can be used to interpret current and future weather. [10]

Award 3 marks for each use and hold one in reserve for any correct additional points.

Satellite images are used to monitor and interpret weather:

- monitoring frontal systems; the pattern of cloud development indicates rising air and condensation thus the junction of warm and cold air;
- black areas represent clear skies indicating stable sunny or if at night cold conditions;
- weather systems move and the shape of the cloud formations indicates wind direction and the likely passage of the weather;
- the pattern the clouds form indicate the intensity of the weather condition and the type of weather system; e.g. cyclonic, hurricane;
- satellite images are used in conjunction with weather maps to verify conditions.

(b) Describe the characteristic features and causes of *two* different atmospheric hazards you have studied. Assess the strategies that have been adopted to limit their effects. [30]

Within the confines of the syllabus candidates may focus upon two of the following tropical cyclones (hurricanes), drought, atmospheric pollution and global warming, it is acceptable to describe tornadoes, photo-chemical smog as these may fall within the candidates field of knowledge. Thus this question is quite broad in its coverage. Credit up to 20 for the description of the hazard and up to 15 for the assessment of strategies.

Candidates will identify two atmospheric hazards.

The hazard should be described in terms of its specific characteristics: e.g. temperatures, precipitation, seasonality, wind speeds, frequency, human contribution and why it is a hazard.
Causes can be natural or anthropogenic but must detail the processes that operate to produce the condition e.g. hurricanes require the meeting of tropical air masses, a pre-event cyclonic swirl, passage across a warm (> 27°C) smooth ocean, which energises the system into a hurricane (typhoon/willy-willy).

Limiting effects should refer to prevention, preparation and recovery.

Band 1 answers will express good understanding of two atmospheric hazards and ... to studied examples. Essays should be well balanced and detailed. There must be ... assessment alleviating strategies. (2...

Band 3 answers may lack balance with more detailed reference to one hazard. Other answers may be well balanced but lack detail. Assessments may be weakly developed and probably concentrate upon recovery rather than prevention and preparation. (13–18)

Band 4 answers will be relevant but brief in detail. Expect answers to be poorly balanced with limited development of one or two hazards. The assessment of how such hazards are dealt with may lacking clarity or are absent. (6–12)

[Total: 40]

5 (a) Briefly describe the effect the open cast mine shown in Fig. 5.1 would have upon its local environment. [10]

Effects may overlap and could include:

- loss of land as under such conditions restoration would be impossible, this factor has an aesthetic aspect as well as a loss of a resource
- removal of natural habitats and disruption to the local ecology.
- pollution due to dust, spoil heaps etc
- noise due to quarry machinery, explosions, traffic.
- local traffic problems.

For 7 to 10 marks at least 4 effects should be outlined and integrated.
For 4 to 7 marks at least two effects should be outlined and although detailed may be covered as separate points rather than integrated.
For 1 to 3 marks at least one effect should be covered and will lack detail.

(b) Using examples of where economic activity has caused land to become degraded, describe and assess the methods that would enable its:

- **sustainable exploitation**
- **restoration [30]**

Candidates are expected to satisfy three elements: a selection of examples; describe and assess restorative methods in terms of the current problem and future sustainable exploitation. The question is quite broad and can include mining or other examples of land degradation, e.g. agriculture, desertification, urban sprawl (particularly shanty towns). Neither part of the question can be adequately dealt with unless there is some mention of the causes of degradation.

restoration could be: alternative usage as with a quarry, infilling, soil fertilisation, parks, demolition of shanty towns etc.
sustainable usage could be: agricultural practice, urban planning, mining or quarrying techniques (e.g. progressive infilling).
assessment: can be positive and/or negative but should be justified.

Band 1, through the use of examples, answers will express good understandi degraded land is restored and how it can be used sustainably. Essays should balanced and detailed. There must be clear assessment appropriate methods. (2

Band 3 answers may lack balance and a clear link with examples. Other answers may be well balanced but lack detail. Assessments may be weakly developed and probably concentrate upon restoration rather than sustainable methods. (13–18)

Band 4 answers will be relevant but brief in detail. Expect answers to be poorly balanced with limited development of one or two elements. Assessments are likely to be weak or absent. (6–12)

[Total: 40]

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. 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:	
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.	