UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level

MARK SCHEME for the October/November 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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UNIVERSITY of CAMBRIDGE
International Examinations

Section A

1 (a) State one way in which land can be regarded as:
- **a renewable resource**
- **a non-renewable resource.**

One mark for each.
Land can be classed as either, dependant upon the scale of exploitation. Renewable would include farmland subject to sustainable use. Other e.g.'s small quarries any form a minor or major development where recovery is possible.
Non-renewable includes many major quarries where the scale of the excavation exceeds infilling. Other references to toxic dumping, radio-active contamination. [2]

(b) Fig. 1.1 shows how some of the worlds largest cities have increased in population since 1950 and how they are expected to have changed by 2015.

(i) Which city had the largest increase in population between 1950 and 1970?

Tokyo. [1]

(ii) By how much did the population of Mexico City grow between 1970 and 2000?

Accept 9.5 to 10 million. [1]

(iii) Describe how the populations of London, New York and Tokyo changed between 1950 and 2015.

London's population has declined from 8.5 million to 6.5 million.
New York had an increase of 2.5 million between 1950 and 1970 then steadied to 1 million over the following 45 years.
Tokyo had high growth of 20 million between 1950 and 2000 then steadies. [3]

(c) Fig. 1.2 shows some features of the Sao Paulo Metropolitan Area. List *three* effects that the growth of Sao Paulo is likely to have on land:

Credit 3 separate points contained for each topic.

- within the built up area of the city of the city
  loss of land for housing/flats/squatters
  impact of increased land values
  loss of land to industry
  increased ground pollution [3]

- in the zone between the built up area and the edge of the Metropolitan Area
  loss of agricultural land to building/reservoirs/industry
  a zone of shanty towns (favellas) causing congestion and pollution
  road, rail and airport construction [3]

(d) Rapid population growth, accompanied by urbanisation, places huge demands on the current and future provision of energy. In 2001, Brazil was the third largest energy consumer in the Western Hemisphere and the largest in Central and South America.

Fig.1.3 locates some of Brazil's major sources of energy and Table 1.1 lists the Primary Sources of Energy by percentage.

From the evidence provided in Fig.1.3 and Table 1.1 discuss the extent to which has Brazil adopted a sustainable energy policy?

Answers should emphasise the dominance of renewable energy (61.7% as opposed to non-renewable energy (30.6%) (=2 marks).
Non-renewable energy sources are dominated by oil which is mainly imported. Coal although found to the south has limited development (= 2 marks).
Renewable energy sources are going to sustain Brazil's energy supply. Hydo-electric power is a feature of the interior where river water is abundant (= 2/3 marks).
Alcofuels using sugar cane relies on agriculture and for the foreseeable future wood is available (= 2/3 marks).
Additional points concerning Nuclear fuels and reference to the absence of large reserves of oil and coal are also creditworthy to a maximum of 2 marks. [7]

[Total: 20]

2 (a) Fig 2.1 shows the effect of latitude upon incoming radiation on June 21st.

(i) Explain why the length of day and night at point A is different to point B.

Answers should refer to the curvature of the earth allowing sunlight to cover a greater percentage of the earth surface for longer at point A.
At point B the circumference of the earth is at a maximum and sunlight covers a smaller % area that directly faces the sun. [2]

(ii) Explain why summertime temperatures at point A are lower on average than point B.

Due to the curvature of the Earth (1 mark) energy is more dispersed at A than B, therefore A is cooler than B (1 mark). [2]

(b) Fig.2.2 shows the generalised energy balance of the Earth.

(i) What is meant by the term energy budget?

This is the difference between incoming radiation and outgoing radiation. [1]

(ii) Explain why there is

- **an energy deficit at point X**

  Less energy is received because of absorption and angle of incidence; losses through reflection from icecaps/oceans and radiation exceeds incoming radiation. [2]

- **an energy surplus at point Y.**

  More energy received due to the angle of incidence which is stored in both land masses and oceans. There is less loss of energy through radiation and reflection. [2]

(iii) A great deal of the energy the Earth receives is transferred from low latitudes to high latitudes: this balances the energy surplus and deficit.

Using examples describe *two* ways in which this energy is transferred.

Two developed points are needed.
Energy transfer takes place:

- through ocean currents (e.g. warm current such as the Gulf Stream and cold currents such as the Californian current (= 2 marks).
- through air masses which transfer energy from regions of high pressure to low pressure e.g. westerlies or trade winds.
- oceanic cycling whereby ocean water movement can be described as a conveyor belt (cold water sinks and moves towards the equator where it mixes upwards with warm water only to return as a warm current. [4]

(c) With reference to Fig. 2.3, describe how the Earth's temperatures and precipitation might change as a result of enhanced global warming.

The map contains a lot of information and discernable patterns.
Credit as follows:
The global generalisation is of increasing temperatures and aridity (max 2 marks).
Temperature changes are greater in the northern hemisphere ranging from 40C in warm temperate areas (or actual locations) rising to 80C in northern polar regions. The southern hemisphere show smaller temperature changes possibly due to oceanic cooling (max 4 marks).
Increasing aridity occurs over most continental areas, there is increased aridity over the oceans and increases in precipitation are confined to equatorial zones and arctic N America and Asia (max 3 marks). [7]

[Total: 20]

Section B

3 (a) Fig.3.1 shows the distribution of continents 200 million years ago and at the present. Outline three pieces of evidence that support this model of the change in the distribution of the continents.

Award marks on the basis of 1 for the evidence and two for the explanation. There is one floating mark.
The three pieces of evidence can include: jigsaw fit, paleo-magnetism, palaeontological evidence, similarities in rock type, ocean floor spreading and oceanic crust stripes, the anomalous location of rocks (e.g. coal measures). [10]

(b) Describe and explain the causes and effects of one named volcanic or earthquake disaster with which you are familiar. Describe and evaluate the measures that were used to enable the area affected to recover.

Tectonic events/natural hazards are events that are invariably sudden and can have extremely damaging effects upon both the natural environment and human activity. It is important in environmental management to understand the nature and effects of these events and how the manage these effects.

Answers should cover the following points:
A named event: volcanic or earthquake.
The causes and characteristics of the event.
Its effects upon both the natural environment and human activity.
The measures used to enable recovery after the event. This can include the natural environment and/or the human environment.

Band 1 answers will contain an in-depth analysis of one named event. Answers should be well balanced and cover each element of the question.

Band 3 answers although precise about their choice may lack balance and concentrate upon the nature of the event or its aftermath.

Band 4 answers should be relevant but will lack detail and/or balance. [30]

[Total: 40]

4 (a) List three different types of atmospheric pollution commonly found in major towns and cities.

Briefly describe the sources and effects of these three types of pollution.

The question is concerned with the sources, types and characteristics of atmospheric pollution in urban areas and their characteristics. Three different types of pollution are required and can be derived from the same source.
Award marks on the basis of source = 1 mark; content = 1 mark and effects = 1 mark. One floating mark for any part.

Heating systems/car exhausts	dissolved sulphates, chlorides, smoke, soot	loss of sunlight, increased cloud cover, reduced visibility, lung disease
"	nitrogen oxides	acid rain, respiratory infections decreased visibility
combustion of sulphur containing fuels	SO_2 smell	lung/breathing difficulties, acid rain
sun+ hydrocarbons and nitrogen oxides	photochemical oxidants	eye irritation low visibility, throat and irritation and breathing problems
traffic	carbon monoxide	decreases oxygen content of blood
incinerators, exhausts	dioxins	absorbed by skin
petrol/structural	lead	food contamination
industrial waste	iron salts, metals, acids	contamination of ground and water
sewage	organic waste	disease
traffic, industry, domestic	noise	stress related

[10]

(b) Describe and evaluate the policies that have been adopted in major urban areas to improve energy efficiency and help reduce atmospheric pollution. Illustrate your answer with examples of named urban areas and adopted policies.

This is a topic that currently features in the planning policies for many cities in both MEDC's and LEDC's. Energy efficiency and pollution should operate together. The topic is broad and candidates are not expected to cover every possible aspect of the topic. Energy efficiency usually targets reducing the consumption of fossil fuels whilst pollution measures involve reducing harmful emissions from transport, industry and households.

energy and transport	Measures combining: lead free petrol, catalytic converters, urban traffic controls, use of public services, park and ride, alternative fuels
energy and industry	use of cleaner fuels/alternative energy (electricity), chimney scrubbing, resiting industry, heat conservation measures, noise reduction
domestic use of energy	cleaner fuels (solar, electricity), energy conservation (cavity insulation etc)

Band 1 answers will be wide ranging and at this level consider each of the three categories. For each there should be at least two measures. The link between energy efficiency and reducing pollution should be clear.

Band 3 answers should cover at least two of the categories with a stated measure for each. Although relevant analyses may be brief. Clear links between energy efficiency and pollution may be understated or obscure.

Band 4 answers may be brief in the consideration of the three categories or poorly balanced with one or two of the categories covered. The linkage between energy efficiency and reducing pollution may be absent or tenuous. [30]

[Total: 40]

5 (a) Fig.5.1 shows how the temperature of the Earth's atmosphere changes with altitude. Identify, by altitude *three* layers of the Earth's atmosphere. Briefly describe the characteristics of each layer you have identified.

Troposphere 0 – 18km (=1 mark), Stratosphere 20 – 40 km (= 1 mark).
Mesosphere 47/50 to 78 km (= 1 mark).
Thermosphere 82 to over 100km (1 mark).

The second part of the question should divide into 353 marks with 1 floating mark which invariably will be awarded to the Troposphere. If candidates refer to the ionosphere it can be considered as one layer is the stratosphere and troposphere are mentioned or as two layer if either of the other two are absent or lacking in detail.

Troposphere: with height progressively cools, air density reduces, contains the weather.
Stratosphere: temperatures increase due of ozone which absorbs uv radiation, relatively stable.
Mesosphere: temperature decreases with altitude: no gases, particles nor water vapour: the coldest atmospheric temperatures.
Thermosphere: increases in temperature, lowest atmospheric density. [10]

(b) What is the evidence for the view that human activity has modified and continues to modify atmospheric processes? Explain why it is important that international agreements on the management of the atmosphere are adopted by all nations. Use examples to illustrate your answer.

Many will focus upon the impact of global warming and ozone depletion and although not the entire picture; such answers can go up to the top of band 2 in the generic mark scheme. A well balance answer may consider:

Reference to natural change (climatic/weather cycles) and enhanced change (pollution, greenhouse gases, ozone, small scale changes e.g. from deforestation or urban heat islands).

Evidence will include:
pollution leads to acid rain, smog, increased precipitation etc.
greenhouse gases to global warming and as a result climatic change, more intense weather events (hurricanes, tornadoes etc.)
ozone depletion leads to increased uv levels with consequent impacts upon crops/vegetation and people
smaller scale changes such as urban heat islands, desertification etc. are a result of more localised human activity.

The importance of agreement between nation hinges upon the issue being a global one and that the activities one nation affect others. Protocols such as Kyoto, Rio, Montreal target agreements between nations.

Band 1 answers will be well structured and give full consideration to at least three of the areas of evidence. Use will be made of exemplar material.

Band 3 answers should cover at least two of the areas. Answers may be poorly balanced or although relevant brief in outline.

Band 4 answers may get no further than 1 area of evidence or if others are covered there will be a lack of detail. Expect answers at this level to be weak on international agreements and exemplar material. [30]

[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. 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 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.	