

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

GCE Advanced Subsidiary Level

**MARK SCHEME FOR the November 2002 question papers**

**8290 Environmental Science**

**8290 /1** Paper 1, maximum raw mark 100

**8290 /2** Paper 2, maximum raw mark 80

These mark schemes are published as an aid to teachers and students, to indicate the requirements of the examination. They show the basis on which Examiners were initially instructed to award marks. They do 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*.

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

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UNIVERSITY of CAMBRIDGE  
Local Examinations Syndicate

**NOVEMBER 2002**

**GCE Advanced Subsidiary Level**

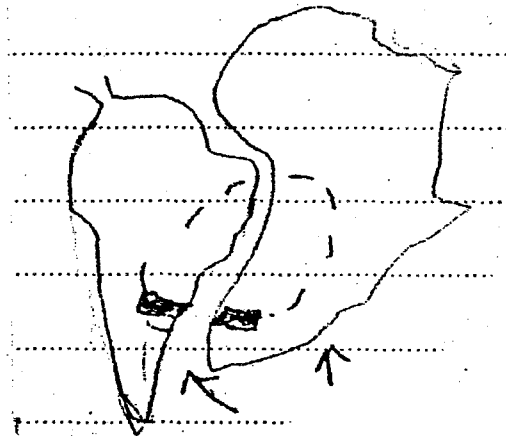
<b>MARK SCHEME</b>
<b>MAXIMUM MARK : 100</b>
<b>SYLLABUS/COMPONENT :8290 /1</b> <b>ENVIRONMENTAL SCIENCE</b> <b>(Paper 1)</b>



Page 1	Mark Scheme	Syllabus	Paper
	AS Level Examinations – November 2002	8290	1

- 1
- (a) continental drift; (1)
- (b) (i) Pangaea; (1)  
(ii) Gondwanaland / Laurasia; (1)  
(iii) tectonic plates; (1)

- (c) (i) region of semi- molten rock / its temperature reaches 5000° C ;  
found between the crust and core;  
mainly composed of silicate rocks / rich in iron and magnesium ;  
extends about 3000 km from the surface; (1)
- (ii) they are less dense than the mantle; (1)
- (iii) surface of the mantle moves due to convection currents | explanation of these; (1)
- max. 2

(d)



-  similar / matching mountain belts;  
 area where fossils of mesosaurus found;  
(western) S. America and W. Africa fitting like a jigsaw; (3)

TOTAL MARK = 11

Page 2	Mark Scheme	Syllabus	Paper
	AS Level Examinations – November 2002	8290	1

(2)

(a) silt (middle layer) sand (bottom layer); (1)

(b) (average) size of particles is sand > silt > clay; (A clay lightest/smallest, sand heaviest/largest; )  
heaviest/biggest particles settle first / settle more quickly; (2)

(c)	Soil A	sand 50%	silt 20%	clay 30% ;	
	Soil B	sand 10%	silt 20%	clay 70% ;	
	Soil C	sand 80%	silt 10%	clay 10% ;	(3)

(d) high % of sand means a high permeability /  
high % of clay means a low permeability;  
high % of clay means a high water holding capacity /poor aeration/  
high % of sand means a low water holding capacity/good aeration;  
high % of clay (probably) means a higher level of (some)  
nutrients / fertility/era ; (3)

(e) organic  
eluvial  
illuvial  
weathered mineral  
parent rock  
( 5 correct or 4 correct) (2)  
( 3 correct or 2 correct) (1)

MAX = 2

TOTAL MARK = 11

Page 3	Mark Scheme	Syllabus	Paper
	AS Level Examinations – November 2002	8290	1

(3)  
 (a) range increases as distance from the sea increases;  
 smallest range is on the west coast; (2)

(b) largest distance from the sea;  
 due to high specific heat capacity of water;  
 other areas nearer the sea warm up more slowly / cool down more slowly;

OR

higher / mountainous region;  
 temperature decreases with altitude;  
 much warmer in winter / only slightly cooler in summer;

MAX = 3

(c) (i) it is wetter in the west / dry region is mainly in the south east;  
 (ii) (moist) winds come from the west;  
 rise over the mountain range, cool and condense;  
 therefore the west is wetter / the east is in the rain shadow; (3)

(d) warm (N)W winds;  
 in winter;  
 cold E winds;  
 in winter;  
 warm ocean currents;  
 from the N (W);  
 cold ocean currents;  
 from the S (E);

MAX = 2

TOTAL MARK = 11

4

(a)  
 (i) B; (1)  
 (ii) A; (1)  
 (iii) C, (A) (1)  
 (iv) D; (1)  
 (v) H; (1)  
 (vi) O; (1)

(b)  
 1 production of chemical fertilisers / land drainage; (1)  
 2 use of the internal combustion engine / high temperature combustion; (1)

TOTAL MARK = 8

Page 4	Mark Scheme	Syllabus	Paper
	AS Level Examinations – November 2002	8290	1

5

- (a) oxygen is dissociated by UV radiation /  
 $O_2 \rightarrow 2O$ ;  
 an oxygen atom / free radical combines with an oxygen molecule /  
 $O_2 + O \rightarrow O_3$ ; (2)
- (b) a chlorine atom / free radical reacts with ozone /  
 $Cl + O_3 \rightarrow ClO + O_2$ ;  
 (but) the chlorine atom / free radical is regenerated by/ reacting  
 with an oxygen atom / free radical /  
 $ClO + O \rightarrow Cl + O_2$ ; (2)
- (c) lowest at the South Pole;  
 increases then decreases with distance from the S. Pole; (2)
- (d) energy from / of the radiation causes oxygen molecules  
 to dissociate / split up /  
 $O_3 \rightarrow O_2 + O$ ;  
 MAX = 1
- (e) banning/ lowering the use of CFCs in one named example,  
 international agreements / protocols /  
 substitution by 'ozone friendly' chemicals;  
 MAX = 1

TOTAL MARK = 8

6

- (a)
- (i) 24 hours; (1)
- (ii)  $4 \times 365.25$  days / 1461 days; (R) 1460 (1)
- (iii)  $23.5^\circ$ ; (1)
- (iv) summer; (1)
- (b) correct location;  
 correct angle (correct inclination of axis or correct value quoted); (2)
- (c)
- (i) A is ultraviolet B is visible C is infra-red;  
 3 correct answers or 2 correct answers (1)
- (ii) the Sun is hotter than the Earth / the Earth does not reflect all  
 the radiation that it receives; (1)

TOTAL MARK = 8

Page 5	Mark Scheme	Syllabus	Paper
	AS Level Examinations – November 2002	8290	1

7

- (a) carbon dioxide concentration is increasing;  
rate of increase is rising;  
(A) carbon dioxide concentration is accelerating;; for two marks  
annual peaks and troughs are fairly constant in magnitude;  
correct figure reference; MAX = 2
- (b) peak due to carbon dioxide concentration at a maximum /when  
photosynthesis is at a minimum;  
trough due to carbon dioxide concentration at a minimum /when  
photosynthesis is at a maximum;  
due to more photosynthetic activity in the northern hemisphere;  
due to greater landmass / biomass;  
MAX = 2
- (c) CO<sub>2</sub> - burning fossil fuels / deforestation / respiration / aerobic decay;  
CH<sub>4</sub> - cattle / termites / anaerobic decay/marshland/land fill;  
NO<sub>x</sub> - lightning / burning fossil fuels / denitrification;  
3 correct answers (2)  
2 correct answers (1)  
MAX = 2
- (d) methane;  
 $\frac{0.015 \times 100}{1.72}$  / 0.87%; (2)  
(give one mark if wrong gas is named but the calculation is correct)
- (e) absorbs less energy per molecule / does not exist as long /  
does not last as long / has a smaller residence time; (1)

TOTAL MARK = 9

Page 6	Mark Scheme	Syllabus	Paper
	AS Level Examinations – November 2002	8290	1

8

(a)

- (i) large area / ecosystem;  
which has a characteristic vegetation / dominant vegetation;

(2)

(ii)



desert  
savannah  
tundra



temperate grassland  
tropical rainforest  
woodland and chaparral



coniferous forest  
deciduous forest

(4 or 3 correct answers)  
(2 correct answers)

2

1

MAX = 2

- (i) A is tropical rain forest;  
B is tundra;  
C is savannah;  
D is desert;

(4)

(b)

- (i) limited range of high temperatures / high average temperature;  
high rainfall;  
rapid nutrient recycling;

MAX = 2

- (ii) higher availability of water (for part of the year);  
tundra has a period of long daylight hours / 24 hours of sunlight;

(2)

TOTAL MARK = 12



Page 7	Mark Scheme	Syllabus	Paper
	AS Level Examinations – November 2002	8290	1

9

- (a) omnivores;  
detritivores / decomposers; (2)
- (b) lynx (mainly) ate snowshoe hares; (1)
- (c)
- (i)  $150,000 \pm 5,000$ ; (1)
- (ii) the fraction of the population that was caught <sup>total population</sup> and area occupied by the snowshoe hare population; (1)
- (d) size of both populations fluctuated;  
about a ten year cycle (approximately);  
hares (usually) outnumbered lynx;  
hare maxima always came before a lynx maxima;  
MAX = 2
- (e) low lynx nos means few hares eaten therefore hares increase in no/ore;  
more hares means more food for lynx therefore lynx increase in no/ore;  
large nos of lynx eat most hares therefore hares decrease in no;  
therefore lynx starve and decline in no, etc.;  
MAX = 3
- (f) as size of hare population increases, food / grazing / territory  
becomes less available / competition increases / disease increases;  
therefore population reaches a maximum;  
then crashes; (3)

TOTAL MARK = 13

Page 8	Mark Scheme	Syllabus	Paper
	AS Level Examinations – November 2002	8290	1

10

(a)

(i) B;

(1)

(ii) C;

(1)

(iii) A;

(1)

(iv) D;

(1)

(b) Z;

(1)

(c) decreasing birth rate / decreasing no of females of childbearing age / recent outbreak of disease to which children are particularly vulnerable;

(1)

(d) X is an LDC, Z is an MDC and Y is somewhere in-between the two;

(1)

explanation of differences in birthrate;

(1)

explanation of differences in deathrate;

(1)

explanation of differences in 65+ age group;

(1)

for any pairs of countries linked plausible cultural, economic or social reasons;

MAX = 3

TOTAL MARK = 9