

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**JUNE 2002**

**GCE AS LEVEL**

**MARK SCHEME**

**MAXIMUM MARK : 80**

**SYLLABUS/COMPONENT : 8290/2**

**ENVIRONMENTAL SCIENCE**

**Paper 2**

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### Section A

1 (a) (i) from the lowest – troposphere, stratosphere, mesosphere, thermosphere.

2 or 3 correct = 1 mark, 4 correct = 2

(ii) in stratosphere;

1

(b) (i) Earth – 21% O<sub>2</sub> and 78% N<sub>2</sub>;

a little CO<sub>2</sub>;

Mars – less dense/lower pressure; (R) "thin"

mostly CO<sub>2</sub>;

a little O<sub>2</sub>;

Venus – much greater pressure; (R) "thick"

mostly CO<sub>2</sub>;

a little N<sub>2</sub>;

max 6

(ii) dense atmosphere and large amounts of CO<sub>2</sub> on Venus leads to much

enhanced greenhouse effect/AW;

(high % of CO<sub>2</sub> on Mars) but <sup>much less</sup> dense atmosphere/low pressure so little reflection of <sup>heat</sup> back to surface/quantity relatively small;

2

**Total 11**

2 (a) A lag, B log/exponential, C linear, D stationary. 2 or 3 correct = 1, 4 correct = 2

(b) food supply;

nesting sites;

predation;

max 2

(c) competition for food/habitat;

reduces numbers of organisms that occupy same/similar niche;

introduce disease;

more food for birds of prey;

max 2

**Total 6**

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3 concentrated at tectonic plate boundaries;

highest concentrations at destructive plate margins;

ref. to subduction;

example;

lower concentrations at constructive plate margins;

example;

conservative plate margins/plates move past each other;

faults;

example;

max 8

**Total 8**

**Total for section 25**

## Section B

### Option 1

4 (a) tidal/geothermal/gravitational/example; 1

(b) (i) falling water; 1

(ii) in house; 1

(c) energy lost at each transformation;

mainly as heat; 2

(A) noise;

**Total 5**

5 (a) (i) lean burn engine/other examples of reduced fuel consumption; 1

(ii) enhanced greenhouse effect;

global warming;

melting of polar ice-caps;

rise in sea levels;

increased incidence of flooding;

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climate change;

increased desertification;

effects on agriculture;

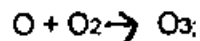
AVP;

max 4

(b) (i) NO<sub>x</sub> react with volatile organic compounds;

in the presence of sunlight;

or



2

(ii) substances/examples from incomplete combustion emitted in exhaust gases

1

*/cause disease/e.g.,*  
(iii) toxic to humans/animals;

destruction of plant material/green leaves/crops;

contributes to acid rain;

contributes to photochemical smog;

max 3

Total 11

6 (a) formation over very long time scale;

in particular conditions;

used quickly;

time/conditions needed for formation not available;

max 2

(b) (i) complex hydrocarbons formed from organic matter;

1

(ii) raised temperature "cooks" buried organic matter;

1

(iii) deeper burial raises temperature further;

kerogens break down;

2

(B) high temp/pressure converts kerogens for 1 mark if no other

(c) A – impermeable, B – porous/permeable;

1

Total 7

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7 (a) (i) fission;	1
(ii) uranium;	1
(b) fuse two nuclei;	
light nuclei;	2
(c) technological difficulties;	
uneconomic;	
hazardous waste;	
difficulties of storing waste;	
problems of re-processing;	
danger to environment;	
health concerns;	
impact of accidents;	
example;	
fear of terrorism;	max 6
	<b>Total 10</b>
8 (a) wind – variability of wind;	
large areas (of land) used;	
visual pollution;	
noise pollution;	max 2
wave – visual pollution;	
limited sites suitable;	
effect on habitats;	max 2
obstruction to shipping;	
(b) (i) increase absorption (of solar radiation);	1
(ii) to trap heat;	1
(iii) reduce losses by conduction to roof/house;	1
	<b>Total 7</b>

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9 (a) rain normally acidic;

increased acidity called *acid rain*;

caused by SO<sub>2</sub>/NO<sub>x</sub>;

released by industrial processes;

burning fossil fuels;

50%/some falls close to source as dry deposition;

remainder combines with water in atmosphere;

falls to Earth as precipitation/wet deposition;

far from source;

damages plants/trees;

lowers pH of lakes;

leaches metals in soil into lakes;

aquatic species damaged;

erosion of buildings;

max 10

(b) use sources of energy other than fossil fuels;

use low-sulphur fuel;

use gas rather than coal/oil;

install flue-gas "scrubbers" (filters);

costly;

need for limestone;

addition of limestone to lakes;

temporary solution;

ref. to catalytic converters in cars;

max 5

ref to taxes/fines on industry for pollution;

Total 15

Total for Option 55

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### Option 2

10 (a) A – permeable, B – impermeable;	1
(b) level with water table;	1
(c) they will fall;	1
(d) (i) leaching through soil;	
by run-off;	2
(ii) nitrate – fertiliser/sewage/slurry;	
phosphate – domestic/industrial detergents/fertilisers;	2
	<b>Total 7</b>
11 (a) (i) slow flow;	
through sand beds;	
film of bacteria/protozoa/micro-organisms;	max 2
(ii) contact with chlorine/ozone;	
for at least 30 min;	
kills bacteria;	max 2
(b) water in deep sources filtered through rock;	
some pollutants not leached/don't travel deep in soil;	
run-off;	
and shallow percolation;	
reaches rivers;	
effluents pumped into rivers;	max 4
	<b>Total 8</b>
12 (a) paper/card, metals, textiles, glass, plastics, veg. matter.	2 = 1 mark, 3 = 2
(b) advantage – e.g. reduces depletion of finite sources;	
disadvantage – e.g. difficulty of separating types (plastics),	
energy input may not be economic;	2

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(c) cost, shortage of sites/pressure on land use, pollution by leaching, pollution by gas production, effects of methane or CO<sub>2</sub> as greenhouse gases, explosion risks. problem with detail/development X 2    4

**Total 8**

**13 (a)** release of organic matter/nitrates/phosphates/enhanced nutrient levels;  
 increased (plant) biomass;  
 lowering of O<sub>2</sub> levels in water/lake/river; max 2

**(b)** sewage puts organic matter into water;  
 stimulates growth of decomposers;  
 use up available O<sub>2</sub>;  
 dilution further from discharge;  
 O<sub>2</sub> levels gradually return to normal; max 4

**(c) (i)** amount of O<sub>2</sub> required by decomposers in a given volume of water over 5 days in the dark at 20°C/measure of quantity of O<sub>2</sub> needed by decomposers in the water; 1

**(ii)** coarse filtration of large material;  
 sedimentation;  
 liquid filtered;  
 fermentation;  
 oxidation of organic matter;  
 further sedimentation;  
 sludge digested;  
 anaerobically;  
 by bacteria;  
 methane produced;



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can be used to power sewage plant;

sludge used as fertiliser/fuel/other;

max 5

**Total 12**

**14 (a) wet;**

cold;

moorland/coniferous forest;

rate of evaporation much lower than rate of precipitation;

max 2

**(b) high rainfall;**

low evaporation;

free drainage;

leaching of iron (and aluminium) compounds;

they form hard layer in subsoil;

max 3

**Total 5**

**15 (a) mining – subsidence;**

disruption of ground water;

may induce earthquakes;

spoil heaps / visual pollution;

toxic infiltration into ground water;

quarrying – noise;

dust;

smell;

danger from excavations;

visual impact on environment;

effects on habitats;

soil degradation;

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for either – economic problems when workings abandoned;

dredging – coastal erosion;

max 10

(b) action to reduce use/demand;

recycling;

reclamation of land;

examples;;

conversion of water-filled excavations for other use;

for leisure;

and/or wildlife;

max 5

**Total 15**

**Total for Option 55**

### Option 3

16 (a) Animals within a species normally interbreed in nature;

and produce fertile offspring;

ducks do not interbreed in nature;

offspring of toads which interbreed are infertile;

4

(b) (i) different DNA codes within a population;

give different physical characteristics;

2

(ii) e.g. peppered moth;

melanic and non-melanic forms;

melanic form camouflaged in industrial areas;

greater chance of survival;

and breeding;

melanic form dominant type in this environment;

Adapt for other examples -

max 4

**Total 10**

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**17 (a) (i) A – run-off;**

from melting snow/ice/precipitation;

intercepted by trees;

**B – uptake of water by trees;**

transpiration;

increases, moisture levels in air | cloud | precipitation occurs; max 4

**(ii) no interception of water by leaf litter in forest;**

no uptake by trees;

topsoil eroded;

washed into rivers;

silt of rivers causes more flooding;

landslides;

no tree roots to hold soil;

max 3

**Total 7**

**18 (a) cane washed;**

crushed;

sugar solution extracted from pulp;

fibre dried;

can be used to fuel plant/generate electricity;

sugar fermented to produce ethanol;

by yeast;

dilute solution is distilled;

max 5

**(b) use plants with large starch store/e.g.;**

greater number of species used;

greater store of material in plant useable;

max 2

**Total 7**

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19 (a)(i) 1983 and following years actual catch exceeded allowable catch;

younger fish removed;

less fish reach breeding size;

stocks not replenished by reproduction;

(ii) decline in numbers;

allowable catch reduced to compensate;

ref. figures quoted to illustrate from chart;

max 4

(b) trapped in nets/food chains disrupted/other valid;

1

**Total 5**

20 (a) ref. to climate;

temperature range/seasonal variation;

rainfall total/distribution;

topography/land classification;

availability of water for irrigation;

soil type;

nutrient status;

pH;

labour requirements/availability;

markets/generate exports/AW;

cultural reasons;

max 5

(b) overstocking;

overgrazing;

deterioration of grassland;

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bare areas;

erosion;

low yield;

max 3

(c) (i) plentiful/good quality grass means, cattle in good condition for breeding/high fertility;

1

(ii) animal numbers increase in good years;

leads to overgrazing in drought years/drought means pasture cannot support

higher number of animals;

higher mortality/lower fertility of animals;

may lead to famine in population;

max 2

**Total 11**

21 (a) refuge for endangered species;

animal e.g.;

plant e.g.;

captive breeding programme;

reduces chances of extinction;

possibility of release;

opportunity for research;

may assist conservation in habitat;

increase awareness/educate public;

IVF/frozen reproductive materials;

seed banks;

preserves varieties of crop plants;

gene pool;

maintains species/genetic diversity;

exchange of genetic material between zoos/botanic gardens;

max 10

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**(b) uniformity increases vulnerability to pests/disease;**

genes enabling organism to withstand changes in environment;

may be important in climate change;

hybrid vigour;

advantages of crossbreeding;

examples;;

max 5

**Total 15**

**Total for option 55**