



## General Certificate of Education

# Environmental Science 5441

### *ESC2 The Lithosphere*

## Mark Scheme

### *2006 examination - January series*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

**Environmental Science**

**January 2006**

**ESC2**

**Instructions: ; = 1 mark / = alternative response A = accept R = reject**

**Question 1**

<b>Description</b>	<b>Letter</b>
Plant respiration	
Nitrogen fixation	<b>C</b> ;
Leaching	<b>E</b> ;
Nitrification	<b>B</b> ;
Photosynthesis	<b>F</b> ;
Denitrification	<b>G</b> ;

5

**Total marks = 5**

**Question 2**

- (a) (i) Allowed initial mass/weight to differ/easier comparison/  
easier to plot; 1
- (ii) Used similar volume/shape/masses/size/weight/surface area;  
exposed to similar temperature/heating/freezing technique the same;  
at the same time (either freezing/heating/weighing);  
for the same time period;  
weighing technique the same/equipment/scales;  
ref to control/ref to control of named abiotic factor; MAX 3
- (iii) Gases released;  
water evaporated/contained water/porous;  
rocks poor conductors/onion peeling/exfoliation;  
freeze/thaw/physical weathering/water expands;  
ref to sedimentary nature/structure/jointing/faults/cracks;  
ref to organic matter; MAX 2  
[R ref to crumbling/bits flaking off]

- (b) Oxidation;  
minerals gain oxygen/combines with oxygen/example eg rusting;  
**OR**  
carbonation/acid rain;  
ref to acid/carbonic acid;  
**OR**  
hydration;  
addition/uptake of water/weak chemical bonds;  
hydrolysis;  
ref to ions ( $H^+$   $OH^-$ )/incorporation of  $H_2O$  into feldspar;  
[A chelation and description for 2]
- 2 + 2        MAX 4

**Total marks = 10**

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**Question 3**

- (a) (i) B;  
(ii) C;  
(iii) A; 3
- (b) (i) Remove litter;  
dry and (graduated) sieves/mesh;  
measure/calculate percentage/proportion/weigh;  
**OR**  
remove litter;  
sedimentation/put in water and allow settling;  
measure/calculate percentage/proportion (don't need ref to sand/silt/  
clay explicitly);  
1 mark for hand test 2
- (ii) Pestle and mortar;  
weigh soil;  
dry in oven/90–130°C;  
reweigh;  
constant weight;  
difference/original mass  $\times 100$ ;  
percent; MAX 5

**Total marks = 10**

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#### Question 4

- (a) Finite/erosion faster than formation/not a renewable resource; 1
- (b) (i) **Process:**  
formation of humus/breakdown/decomposition of (D)OM;
- Effect:**  
increased fertility/source of nutrients/sugars/polysaccharides/gums/  
structure;  
binding effect/increased stability;  
water holding/increased moisture/adds moisture;  
ref to effect of acids on weathering;  
ref to heat or thermal capacity; MAX 3
- (ii) **Process:**  
movement/loss/removal of nutrients/minerals/fines/clays/  
humic particles (in suspension);  
credit process in effect
- Effect:**  
affects fertility/nutrients/ions;  
affects pH;  
ref to sorting/layers/horizons; MAX 3
- (c) (i) How much heat the soil can absorb/how much (solar) energy needed to raise its  
temperature/soils ability to absorb or retain heat; 1
- (ii) Colour/albedo;  
moisture content/waterlogging;  
texture;  
porosity/air spaces/compaction;  
organic matter/humus;  
mineral content; MAX 2

**Total marks = 10**

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**Question 5**

- (a) (i) Greenfield/building in countryside will occur;  
habitat loss;  
roads/transport;  
increased energy use/air pollution/named gases;  
increased demand for water;  
increased light pollution;  
brownfield sites unpopular/expensive to develop;  
flooding/impermeable surface; MAX 2
- (ii) Surround cities/conurbations;  
no building allowed;  
prevent sprawl/merging;  
encourage infill/brownfield development/reclamation in cities;  
encourage leapfrogging;  
ref to green wedges/building in arterial routes/  
green wedges protect pristine countryside/relinquish less valuable land/  
encourage ribbon development; MAX 4
- (b) (i) Land cheapest;  
most lowland areas already developed/used for agriculture;  
tax incentives;  
land not suitable for agriculture/other forms of development;  
conifers can withstand/are adapted to conditions/rainfall/  
temperature/acid soils; MAX 2
- (ii) Restrictions on bus/ homeowner activity/ref to planning permission/  
housing development;  
loss of local power;  
increased visitors/noise/traffic/parking requirements/pollution;  
disrupt farming;  
increased house prices; MAX 2

**Total marks = 10**

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**Question 6**

- (a) (i) Basalt;  
granite;  
gabbro;  
sandstone (used in levelling)/greywacke;  
limestone/dolomite;  
dolerite;  
diorite;  
syenite
- MAX 2

- (ii) Hard/resistant to wear/abrasion/durable;  
impermeable/waterproof/non porous;  
low solubility/inert;  
limestone bonds with bitumen;  
minerals weathering at different rates improve grip;
- MAX 2

- (b) *Quality of Written Communication is assessed in this answer.*

Parks meant for (quiet) recreation;  
landscape conservation/land take/amenity;  
habitat loss/disrupts wildlife;  
scarring/loss of visual amenity/aesthetic problems/dereliction;  
noise;  
accidents/congestion;  
dust;  
fumes/air pollution from traffic/lorries/named gases;  
vibration;  
sedimentation/turbidity/qualified water pollution/silt;  
toxic leachate/mine drainage;  
spoil stability/landslides;  
subsidence;  
flooding/ref to water table moving;  
explosions/blasting;  
access;

MAX 9

*Quality of Written Communication*

Mark	Descriptor
2	All material is logically presented in clear, scientific English and continuous prose. Technical terminology has been used effectively and accurately throughout. At least half a page of material is presented.
1	Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. Some minor errors. At least half a page of material is presented.
0	The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas.

MAX 2

**Total marks = 15**