



**General Certificate of Education**

**Environmental Science 5441**

**ESC2      The Lithosphere**

**Mark Scheme**

*2009 examination – January series*

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**Environmental Science****January 2009****ESC2****Instructions: ; = 1 mark / = alternative response A = accept R = reject****Question 1**

<b>Description</b>	<b>Letter</b>
Official process used to decide whether a controversial airport terminal should be built	<b>E</b>
Designated area intended to reduce urban sprawl	<b>A</b>
Site of particular interest or appeal to visitors	<b>C</b>
Large area of naturally beautiful countryside where the landscape is conserved and outdoor recreation and education are promoted	<b>B</b>
Planning technique used to evaluate the consequences of a development	<b>F</b>

**Total marks = 5**

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**Question 2**

- 2 (a) (i) 15% sand      15% silt      70% clay; 1
- 2 (a) (ii) Mix/shake sample with water;  
let it settle;  
measure/find (proportional) depths of layers;  
calculate %s;  
**OR**  
Dry/burn sample;  
shake/sieve (to separate particles);  
record mass/weigh;  
work out % of each size;  
  
credit any reference to the order in which particles settle; MAX 3
- 2 (b) Small pore size/ref platy structure;  
[A qualify ref to gaps/small particle size increases surface area] 1
- 2 (c) Increases proportion of air in the soil;  
air warms up more quickly;  
**OR**  
would drain better;  
water has a high specific heat capacity/is slow to warm up;  
**OR**  
more air = more (aerobic) biota;  
more respiration (= heating); 2
- 2 (d) Dry soil/in oven/90–130°C and weigh;  
burn dry soil;  
cool;  
reweigh;  
constant mass;  
repeat with other samples from the field;  
% calculation/change in mass/original mass × 100%; MAX 3

**Total marks = 10**

**Question 3**

- |          |     |  |       |
|----------|-----|--|-------|
| <b>3</b> | (a) | (Relatively) undeveloped/unspoilt;<br>historical;<br>scientific value;<br>scenic;<br>recreational value/managed for recreation;  | MAX 2 |
| <b>3</b> | (b) | (i) Litter;<br>disturb wildlife;<br>trample plants/footpath erosion;<br>increase named pollution from traffic;   | MAX 2 |
| <b>3</b> | (b) | (ii) Way marking/guided tours/ref wardens;<br>information centres/interpretation boards;<br>footpaths;<br>traffic management;<br>improve/provide site facilities/toilets/car parks/picnic sites/ref space/time zoning;<br>habitat protection and repair; | MAX 2 |
| <b>3</b> | (b) | (iii) Size of sample;<br>sample at different times of the year/day/weather/repeat;<br>sample different age groups/sexes/ethnic groups;<br>sample people visiting for different purposes (eg dog walkers/<br>bird watchers);                              | MAX 2 |
| <b>3</b> | (c) | (i) Conserve/protect/enhance landscape (of aesthetic value);   | 1     |
| <b>3</b> | (c) | (ii) AONB does not promote recreation;<br>National Parks promote local employment/economy;   | 1     |

**Total marks = 10**

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**Question 4**

- 4 (a)  $\frac{1594 \times 100}{10604}$  ;  
Answer = 15%; 2
- 4 (b) ammonium ions converted to nitrite ions;  
nitrite ions converted into nitrate ions;  
dissolved in water; MAX 2
- 4 (c) Plant legumes;  
rhizobium (in root nodules);  
**OR**  
add culture of nitrogen fixing bacteria;  
Azotobacter (in aerated soil);  
**OR**  
aerate/drain the soil;  
for azotobacter/reduce denitrification; MAX 2
- 4 (d) (i) (Waterlogged conditions) may be anaerobic/soils contain less oxygen;  
(more) denitrification happens in anaerobic soils;  
by Pseudomonas (denitrificaus); MAX 2
- 4 (d) (ii) (High) rainfall (excessive) irrigation;  
(rapid/excessive/good) drainage/porous soil/sandy texture;  
(steep) slopes/large volume of water movement through the soil;  
acidic runoff/drainage/coniferous cover;  
acidic/sandstone/granite (bedrock/parent material); MAX 2

**Total marks = 10**

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**Question 5**

- 5 (a) Cropping/agriculture/less cover/exposes soil to erosion;  
less organic material to bind;  
ploughing/cultivation damages soil structure;  
more/rapid soil erosion = more sediment; MAX 2
- 5 (b) (i) 1975; 1
- 5 (b) (ii) Digging/excavation/soil/material piles release sediment/particles;  
vegetation removed/reduced (root) binding; MAX 1
- 5 (c) Aggregate: limestone/ calcareous sandstone/ $\text{CaCO}_3$ /chalk/sandstone/granite/gypsum;  
Reason: alkaline/basic/acidic rock;  
dissolve in (rain) water; MAX 2
- 5 (d) Add humus/organic matter/green manures;  
add structural material eg sand/gravel/rock dust/limestone/clay/marl;  
composting;  
encourage/do not kill soil organisms;  
prevent further erosion;  
appropriate drainage;  
permaculture/mulching/cover; MAX 4

**Total marks = 10**

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**Question 6**

- 6 (a) Sedimentary; 1
- 6 (b) Weathering/erosion/denudation;  
washed out in solution;  
transportation/leaching/eluviation;  
**OR**  
weathering/erosion/denudation;  
uptake by plants;  
plant → bird → faeces into ocean; MAX 2
- 6 (c) No gaseous phase;  
phosphate ions made available by (slow) weathering/erosion;  
moved from sediments onto land by tectonic uplift;  
moved from oceans via birds (in small amounts);  
low solubility/binds/phosphate ends in regolith rather than as a solute; MAX 2
- 6 (d) *Quality of Written Communication is assessed in this answer*
- Land take;  
habitat loss/disrupts wildlife;  
scarring/visual pollution/dereliction;  
amenity/aesthetic problems;  
noise;  
dust;  
fumes/named air pollution from traffic/lorries;  
vibration/explosions/blasting;  
sedimentation/turbidity/qualified water pollution/silt;  
toxic leachate/mine drainage;  
spoil stability/landslides;  
subsidence;  
flooding/ref to water table moving;  
treatment/disposal/safe storage of waste; MAX 8

*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