



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Education

Environmental Science 5441

ESC2 The Lithosphere

Mark Scheme

2008 examination – January series

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Environmental Science

January 2008

ESC2

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

Question 1

Process	Number
	6
	3
Nitrification	
	4
Leaching/infiltration	

Total marks = 5

Question 2

- (a) (i) Bicarbonate/hydrogencarbonate (95%)/(dissolved) carbon dioxide/
carbonate (3%); 1
- (ii) Temperature/heat;
turbulence/upwelling;
concentration gradient;
pressure;
photosynthesis;
decomposition/decay;
respiration; MAX 3
- (b) Changed photosynthesis/absorption/release CO₂;
via afforestation or deforestation;
draining/ploughing of soils;
increased aerobic decomposition;
urbanisation; (OWTTE)
release from fossil fuel/named fossil fuel; MAX 2
- (c) Absorbed by plant/ref to photosynthesis;
assimilated/in tissues; (OWTTE)
death/decomposition;
burial;
compaction/pressure/lithification; MAX 4

Total marks = 10

Question 3

- (a) (i) Samples from same depth/same number of samples/same day/weather/
location/repeats; 1
- (ii) Remove/evaporate water; 1
- (iii) 80 – 130 °C; 1
- (b) $\frac{420 - 294}{420} / \frac{126}{420}$;

= 30 (%);
- $\frac{294 - 126}{294} / \frac{168}{294}$;

= 57 (%); 4
- (c) Sands well drained/very permeable;
porosity;
macro/large pores/spaces;
clays poorly drained/impermeable/hold H₂O;
micro/small pores/spaces;
silts intermediate;
clays may suffer waterlogging; MAX 3

Total marks = 10

Question 4

- (a) 1.81; 1
- (b) Sinking to great depth (qualified);
saturated sandstone/flooding/remove saltwater;
gas pockets;
stresses/instability/subsidence; MAX 2
- (c) Mining costs/transport/infrastructure/labour;
mineral rights/land cost;
designation eg National Park/Nature Reserve;
public opposition/NIMBY;
depth;
overburden quality;
overburden nature;
drainage;
processing cost;
purity/cut-off grade;
[R quality]
market demand;
self sufficiency/security of supply;
size of deposit;
government subsidy;
salt is secondary product;
reclamation/environmental costs/pollution tax; MAX 4
- (d) (i) Sedimentary box ticked (tick/mark); 1
- (ii) Cement;
[R concrete]
glass;
blocks/building;
roadstone/paths/aggregates;
plaster;
flux/iron and steel; MAX 2

Total marks = 10

Question 5

- (a) Landscape protection;
 [R refs to AONBs]
 quiet recreation;
 economic/jobs (local); MAX 2
- (b) (i) Reduced oil/diesel pollution;
 reduced noise;
 reduced wash/bank erosion;
 reduced turbidity;
 reduced wildlife disruption/ref to breeding;
 reduced kill; MAX 3
- (ii) Loss of jobs;
 less income for National Park authority;
 reduced visitors/more visitors;
 less very wealthy tourists;
 new jobs/diversification; MAX 2
- (c) Monetary value of all aspects considered;
 if B > C proposal goes ahead/converse/ref to net figure decision; 2
- (d) Secretary of State; 1

Total marks = 10

Question 6

- (a) Long time period of formation/slower than erosion; 1
- (b) (i) Breakdown/decomposition of rock;
in situ;
regolith/solutes products; MAX 2
- (ii) movement/loss of nutrients/minerals/particles/salts;
in solution; 2
- (c) *Quality of Written Communication is assessed in this answer.*
- 1 Texture;
 - 2 influences/leaching/eluviation;
 - 3 nutrient content;
 - 4 sands well drained/few nutrients;
 - 5 clays may be waterlogged/hold nutrients;
 - 6 structure;
 - 7 peds – correct reference to;
 - 8 humus/organic matter/faeces;
 - 9 biota/soil organisms;
 - 10 correct reference to biotic activity;
 - 11 shallow soils may not offer sufficient nutrients/support;
 - 12 aeration needed to provide O₂;
 - 13 for respiration/active uptake/nutrient uptake;
 - 14 ploughing can break up pans/improve aeration/reduce compaction;
 - 15 pH determines nutrient availability;
 - 16 moisture needed for nutrient uptake;
 - 17 waterlogging reduces O₂;
 - 18 NPK/macro/micronutrients;
 - 19 correct reference to Nitrogen fixation/legumes;
 - 20 nutrient input from precipitation;
 - 21 nutrient input from (weathered) parent material; 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