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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Environmental Science 5441

ESC2 The Lithosphere

Mark Scheme

2008 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.

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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 CO_2;
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 H_2O;
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 O_2;
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 O_2;
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