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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Environmental Science 5441

ESC2 The Lithosphere

Mark Scheme

2007 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 2007 **ESC2**

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

Question 1

Statement	True	False
The primary purpose of a Country Park is to protect wildlife		✓
The main use of china clay is in brick-making		✓
The cut-off grade is the deepest ore that is economically worthwhile extracting		✓
Cost benefit analysis can be used to resolve land use conflicts	✓	
Both sand and gravel are used to make concrete	✓	

Total marks = 5

Question 2

(a) (i) Uptake/addition of water/chemical binding of water;
altering structure of rocks or minerals/shape/increasing bulk/swelling/expanding; 2

(ii) Hydroxyl ion/ OH^- / H^+;
reacting with/splitting/breaking <u>minerals;</u> 2
[**A** feldspar]

(iii) Carbonic acid/ H_2CO_3 /acid rain;
dissolving/attacking/breaking down minerals/rocks; 2

(b) (i) Andalusite; 1

(ii) Metamorphism; 1

(iii) Radioactive decay/nuclear decay/magma/mantle; 1

(iv) Weight/mass (of sediments/overlying rocks/overburden); 1

Total marks = 10

Question 3

(a) Same mass of soil in each subsample;
soils from similar positions/depths;
samples taken at same time;
similar storage;
distilled water;
similar timing/tests done at same time;
same volume of indicator solution; MAX 3

(b) (i) Dry/lose water; 1

(ii) Burn off OM; 1

(c)

Conclusion	**Valid**	**Invalid**
The most important factor that influences infiltration rate is the number of earthworms		✓
The highest organic matter content occurs at a neutral pH		✓
There may be a link between pH and earthworm numbers	✓	

3

(d) pH affects biota/OM;
biota drag in/increase OM;
ref to decomposition;
OM breakdown releases acids; MAX 2

Total marks = 10

Question 4

(a) (i) Proteins/bones/DNA/RNA/nucleic acids/ATP/ADP/phosphorylation/
phospholipids/(plasma) membrane; 1

(ii) No gaseous stage;
low solubility; 2

(iii) Weathering;
dust/rain/sea spray;
death/decay/decomposition;
excretion/urine;
egestion/guano/manure/faeces/organic fertiliser;
volcanic eruption; MAX 3

(b) Death;
decomposition/breakdown;
denitrification;
nitrate/ammonium ions/nitrogen/ NO_x/NH_3 released;
ref to nitrifying bacteria/nitrification/ ammonium ions/NH_4^+ converted into nitrite ions/ NO_2^-;
nitrification/nitrite ions/ NO_2^- converted into nitrate ions NO_3^-;
nitrogen fixation/$N_2 \longrightarrow NH_3$;
uptake/absorption of nitrate/ammonium ions by plant;
plant tissue/assimilation/incorporation into plant tissue;
plant eaten by animals/student eats plant/animal/rat;
digestion;
absorption;
assimilation/incorporation into student tissue/tongue; MAX 4

Total marks = 10

Question 5

(a) Improve soil crumb structure/flocculate clays;
alkaline/adjust pH in acid soils;
oxide/ used in cement;
bonds well with bitumen/ roadstone;
attractive/easy to cut/sculpt/forms large blocks;
qualified ref to porosity/permeability; MAX 3
[**A** locally available/cheap]

(b) House/road building increase/increased demand for aggregate or cement; 1

(c) Conflict resolution;
arguments for and against/allows public consultation/get views of public;
open to public/public can attend;
ref to plan/government policy;
inspector makes recommendation/writes report;
Secretary of State takes decision; MAX 3

(d) Land take/loss of amenity/aesthetic loss;
visual pollution/landscape loss/eyesore/scarification;
habitat loss;
qualified air pollution/dust;
alkalinity/turbidity;
noise/wildlife disturbance/blasting;
vibration;
road damage;
landslides; MAX 3

Total marks = 10

Question 6

(a) Dangerous;
contaminated/needs treatment/preparation;
expensive to treat;
unstable/subsidence; MAX 2

(b) (i) Stop urban sprawl/prevent merging of urban areas/
protect historic towns/encourage brownfield sites; 1

(ii) Leapfrogging;
increases commuting/freighting/separates activities that should be close;
often unattractive/unmanaged/poor quality;
inflationary house or land prices;
loss of green space in city/infilling/overcrowding;
restricts named economic activity;
weak designation/can be overruled/some activities allowed/golf courses/mining; MAX 2

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

Texture/ref to sand silt clay;
thermal capacity/temperature;
sands may be low in nutrients/sands free draining/sands liable to leach;
sands may warm up quickly;
clays may be cold;
clays prone to waterlogging/compaction/clays hold water;
ref to cation exchange/reduce leaching;
loams ideal;
structure;
correct consequence of structure;
depth;
root anchorage;
aeration/oxygen;
active transport/nutrient uptake/respiration;
pH;
pH6.5/slightly acidic optimal;
nutrient availability;
biota/decomposers/detritivores;
organic matter content;
water - holding capacity; 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