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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Environmental Science 5441/6441

ESC2 The Lithosphere

Mark Scheme

2005 examination – June 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

June 2005 **ESC 2**

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

Question 1

Filler/concrete/ballast/aggregate/driveways/roads/beach nourishment/repair;
clay;
sand;
lime(stone)/chalk/$CaCO_3$;
pottery/paper/filler/pharmaceuticals/paint/pigments/ceramics/tiles/named medicine/
cosmetics/plastics; 5
[**R** construction, pavements, path, building, drainage]

Total marks = 5

Question 2

(a) Granite;
basalt/whinstone;
gabbro;
rhyolite;
dolerite;
pumice;
obsidian;
agglomerate;
peridotite;
syenite;
diorite; MAX 2

(b) High/intense heat;
intense pressure;
grain size change;
deformation of rock structure e.g. bedding planes disappear;
minerals reform/new minerals form/recrystallisation;
carbon dioxide/water may be driven off;
minerals may become parallel because of pressure; MAX 3
[**A** examples: limestone – marble, shale/mudstone – slate – schist – gneiss]
[**R** melting]

(c) (i) Hard/difficult to break/strong;
[**R** tough]
resists wear/abrasion/durable/erosion/weathering;
can be cut to shape; MAX 2

(ii) Attractive/aesthetic ref.;
easy to cut/carve/sculpt/craft/mould;
large blocks/natural jointing;
locally available/cheap;
carboniferous not porous/cutstone is impermeable; MAX 3
[**R** cement/limewash]

Total marks = 10

Question 3

(a) (i) Samples left intact;
same sample size;
equal depths of probes;
readings taken over same time; MAX 2

(ii) (Re) calibrate/wash temp probes;
same storage conditions e.g. temperature/humidity;
replicates/more samples;
equal wattage/height of bulbs;
take readings at same times;
insert probes in same position; MAX 2

(b) (i) Water heats up/cools slower than soil/minerals/may keep soil cooler/
hotter/H_2O has a higher specific heat capacity/thermal capacity; 1

(ii) Albedo/colour/organic matter content/humus/texture/pores/aeration/
compaction/mineral content; 1
[**R** structure]

(c) Dry soil;
weigh (dry) soil;
[no "dry soil" MAX 3]
bunsen/heat in oven – organic matter will be lost/bake sample/burn/desiccate/
ref. suitable temp 100 °C+;
reweigh;
to constant mass;
EITHER
difference = weight of organic matter;
express as %;
OR
$\frac{\text{dry weight - incinerated weight}}{\text{dry weight}} \times 100$;; MAX 4

Total marks = 10

Question 4

(a) Rate of formation slow/much slower than loss; 1

(b) Weathering or named;
[**R** erosion]
breakdown/decomposition of rock;

humification;
formation of humus/decomposition/decay of organic matter;

chelation;
incorporation of minerals into (organic) compounds/ref (humic) acids/
secondary decomposition;

organic sorting/mixing/capillary action/leaching/eluviation/illuviation/podsolisation/
translocation ;
movement within soil of minerals/organic matter/particles/ions;

aggregation;
peds/particles join together;

MAX 2 for processes only
MAX 2 for descriptions only MAX 4

(c) Ref. to interception;
(veg) reduces raindrop impact/rainsplash;
reduces run-off/gullying/soilwash;
reduces wind/increases shelter;
uses/absorbs H_2O;
increased organic matter;
improved structure;
root binding;
(bare) soil drying = wind erosion; MAX 5

Total marks = 10

Question 5

(a) (i) Q: "do you/your family work at quarry?";
increase sample size/ask more people/repeats;
sample at more than one time/longer period;
equal/representative number of males/females;
equal/representative number of locals/visitors;
equal/representative ages;
calculate percentages correctly;
no leading questions/more-open ended questions;
ref. to stratification; MAX 4

(ii) Timing of operations;
sound barriers: earth mounds/baffles/engine cowlings;
waste water treatment/containment;
spray tyres/use water browsers/dust capture;
work within contours/bunds/neutral colours for buildings;
controlled blasting/microsecond blasting to reduce vibration/air blast;
transport ref. : limit speed/numbers/weight of lorries; MAX 3
[**R** ships]

(b) Protect landscape/visual beauty/scenery;
[**R** Areas of Outstanding Natural Beauty]
encourage quiet recreation;
support local economy; MAX 2

(c) Most are in uplands/rocks near surface/allowed because of national interest/
local economic role;
existing mining agreements (before national park designation)/
composed of economic rocks/minerals; MAX 1

Total marks = 10

Question 6

(a) (i) Nitrate (ions)/NO_3^-/ammonium/NH_4^+; 1
[**R** ammonia]

(ii) Faeces/urine/animal waste/excretion/decomposition of animals;
rain;
lightning;
dust/aeolian deposition;
fixation/named legumes/nitrogen fixing bacteria/rhizobium;
[**R** nitrifying bacteria]
fertilisers;
weathering; MAX 3

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

(CO_2 absorbed by plants in photosynthesis;)
organic molecules are formed/glucose/carbohydrates/proteins/fats/organic molecules;
herbivores eat plants/carnivores/food chain/consumers and producers;
(CO_2 released in respiration;)
C/CO_2 released in excretory products;
C found in soil as organic matter/humus;
CO_2 (dissolves) in atmosphere → carbonic acid/HCO_3^-;
((acid) rain/washout removes C/CO_2 from atmosphere;)
CO_2 (dissolves) in ocean/ref ocean = carbon sink;
C/CO_2 used by organisms in oceans → shells/skeletons/coral reefs;
formation of sediments/sedimentary rocks/fossil fuels/lithification/coalification;
uplift/extraction;
named/weathering;
erosion/denudation;
vulcanism;
vegetation burning/combustion of fossil fuels releases CO_2;
named/storage/release of CH_4/padis/ruminant/hydrates; 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