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ASSESSMENT and QUALIFICATIONS ALLIANCE

## General Certificate of Education

# Environmental Science 5441

## ESC2 The Lithosphere

# Mark Scheme

*2008 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.

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**Environmental Science**

**June 2008** **ESC2**

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

**Question 1**

| Description | Mineral/Rock | |
|---|---|---|
| | Gravel/sand/aggregates | ; |
| | Granite/rhyolite/diorite/sand(stone) | ; |
| | Sand | ; |
| | Lime(stone)/chalk/$CaCO_3$/ calcium oxide/hydroxide | ; |
| | China clay/kaolin | ; |

**Total marks = 5**

**Question 2**

| | | | | |
|---|---|---|---|---|
| **2** | (a) | (i) | Igneous; | 1 |
| **2** | (a) | (ii) | Minerals/silicates; | 1 |
| **2** | (b) | (i) | Breakdown/decomposition <u>of rocks</u>/decay/disintegration/wearing away;<br>in situ;<br>produces regolith/solutes products;<br>[**R** denudation] | MAX 2 |
| **2** | (b) | (ii) | Loss/movement of ions/nutrients/minerals/particles/salts;<br>in solution/dissolves; | 2 |
| **2** | (c) | (i) | Contain different minerals/proportions of minerals;<br>(minerals) vary in resistance/hardness/solubility;<br>different structures/bedding planes/folds/faults/compaction/porosity/ permeability;<br>valid comparison eg sedimentary v igneous v metamorphic; | MAX 2 |
| **2** | (c) | (ii) | Breaks up rock; OWTTE<br>exposes/increases surface area/permeability;<br>named chemical process;<br>[**R** acid rain/solution] | MAX 2 |

**Total marks = 10**

**Question 3**

**3** (a) DNA/proteins/nucleic acids/(co) enzymes/amino acids; 1

**3** (b)

| Reservoir | Form or equation |
|---|---|
| | |
| | G |
| | I |
| | H |
| | F |
| | J |

5

**3** (c) (i) Atmospheric nitrogen/large reservoir unavailable to plants/animals;
nitrogen acts as a limiting factor/limits growth/productivity;
plants/animals depend on bacteria/nitrification;
ref Haber process;
requires lots of fossil fuel energy; MAX 2

**3** (c) (ii) Rapid/ (qualified) movement (between reservoirs)/ easily/ (qualified) taken up by plants;
leaching;
pollution/contamination of aquifers/rivers/eutrophication;
atmospheric wash-out; MAX 2

**Total marks = 10**

**Question 4**

**4** (a)

1. Select 2 similar sites;
2. ref control;
3. replication;
4. same mass of seeds/unit area/planting density/pattern;
5. plant at same time;
6. timescale at least 1 year;
7. test soils OM before and after;
8. similar storage techniques;
9. dry soil;
10. weigh (dry) soil;
11. bunsen/heat in oven – organic matter will be lost/bake sample/burn/ ref suitable temp 130 °C +;
12. reweigh;
13. to constant mass;

**EITHER**

14. and 15. difference = weight of organic matter;
express as %;

**OR**

14. and 15. $\frac{\text{dry weight – incinerated weight}}{\text{dry weight}} \times 100$;;

MAX 6

MAX 4 for OM technique/ MAX 4 for investigation/ plan

**4** (b) (i) Wider range of plants will be able to tolerate the pH;
increased nutrient availability;
more soil biota/organisms;
for decomposition/aeration/structure; MAX 2

**4** (b) (ii) Source of nutrients/named;
soil binding effect/improves structure;
water retention/less leaching;
more soil organisms/biota;
increases thermal capacity; MAX 2

**Total marks = 10**

**Question 5**

**5** (a) **X** = limestone/chalk/$CaCO_3$; 1

sand/fine particles;
gravel/coarse particles/aggregates/crushed rock;
water; MAX 2

**5** (b) (i) Urbanisation/increased construction/increased road building; 1

**5** (b) (ii) **Causes**
quarrying/dredging/mining;
use of fossil fuel/transportation;
use of equipment/machinery;

**Effects**
habitat/landscape destruction/land take/reduced biodiversity/landslides/subsidence;
reduced photosynthesis/less vegetation;
less $CO_2$ uptake;
increased acid rain/global warming/named pollutant;
increased dust/noise;
visual/aesthetic pollution/scarification;
groundwater contamination/turbidity/sedimentation; MAX 4

MAX 3 if only causes
MAX 3 if only effects

**5** (c) 0.75 × 1.6;
1.2 (MkWh); 2

**Total marks = 10**

**Question 6**

**6** (a) (i) Stop merging;
stop sprawl;
protect historic towns;
encourage brownfield development; MAX 3
[**R** protect countryside]

**6** (a) (ii) Scenery/visual beauty;
landscape protection;
quiet recreation/enjoyment by public/understanding;
(local) economic purpose/employment etc; MAX 2
[**R** refs to AONBs/habitats/natural environments]

**6** (b) **Greenbelts**

1. road building;
2. leapfrogging;
3. encourages commuting;
4. exemptions eg golf courses;
5. protects poor quality land;
6. green wedges;
7. increases house prices;
8. designation waived in 'national interest';

**Resolutions**

1. CBA;
2. planning boards/authorities;
3. public inquiries;
4. EIAs;

**National Parks**

1. tourists v locals;
2. second homes;
3. national parks increases house prices/lack of affordable local housing;
4. limited employment;
5. national park authorities do not own land = persuasion policies;
6. unwanted designations;
7. traffic congestion;
8. afforestation;
9. quarrying;
10. reservoirs;
11. wind farms/HEP/nuclear/energy generation;
12. MoD;
13. agricultural change/intensification;
14. conflicting recreational activities;
15. intensive/inappropriate tourist developments eg cafes;

**Resolutions**

1. CBAs;
2. planning boards/authorities;
3. public inquiries;
4. EIAs;
5. postcode house purchasing policy;
6. space zoning;
7. time zoning;
8. prohibition;
9. honey pots;
10. wardens/rangers;
11. mitigation strategies eg traffic management/screening;

MAX Six conflicts
Four resolutions
Two examples 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**