

MARKSCHEME

November 2004

ENVIRONMENTAL SYSTEMS

Standard Level

Paper 2

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General Marking Instructions

*After marking a sufficient number of scripts to become familiar with the markscheme and candidates' responses to all or the majority of questions, Assistant Examiners (AEs) will be contacted by their Team Leader (TL) by telephone. The purpose of this contact is to discuss the standard of marking, the interpretation of the markscheme and any difficulties with particular questions. It may be necessary to review your initial marking after contacting your TL. **DO NOT BEGIN THE FINAL MARKING OF YOUR SCRIPTS IN RED INK UNTIL YOU RECEIVE NOTIFICATION THAT THE MARKSCHEME IS FINALIZED.** You will be informed by e-mail, fax or post of modifications to the markscheme and should receive these about one week after the date of the examination. If you have not received them within 10 days you should contact your Team Leader by telephone. Make an allowance for any difference in time zone before calling. **AEs WHO DO NOT COMPLY WITH THESE INSTRUCTIONS MAY NOT BE INVITED TO MARK IN FUTURE SESSIONS.***

You should contact the TL whose name appears on your "Allocation of Schools listing" sheet.

Note:

Please use a personal courier service when sending sample materials to TLs unless postal services can be guaranteed. Record the costs on your examiner claim form.

1. Follow the markscheme provided, do **not** use decimals or fractions and mark only in **RED**.
2. Where a mark is awarded, a tick (✓) should be placed in the text at the **precise point** where it becomes clear that the candidate deserves the mark.
3. Sometimes, careful consideration is required to decide whether or not to award a mark. In these cases write a brief annotation in the **left hand margin** to explain your decision. You are encouraged to write comments where it helps clarity, especially for moderation and re-marking.
4. Unexplained symbols or personal codes/notations on their own are unacceptable.
5. Record subtotals (where applicable) in the right-hand margin against the part of the answer to which they refer (next to the mark allocation for Section A). Do **not** circle sub-totals. **Circle the total mark for the question in the right-hand margin opposite the last line of the answer.**
6. For Section B, show a mark for each part question (a), (b), *etc.*
7. Where an answer to a part question is worth no marks, put a zero in the right-hand margin.
8. Section A: Add together the total for each question and write it in the Examiner column on the cover sheet.
Section B: Insert the total for each question in the Examiner column on the cover sheet.
Total: Add up the marks awarded and enter this in the box marked TOTAL in the Examiner column.
9. After entering the marks on the cover sheet check your addition to ensure that you have not made an error. Check also that you have transferred the marks correctly to the cover sheet. **We have script checking and a note of all clerical errors may be given in feedback to examiners.**
10. Every page and every question must have an indication that you have marked it. Do this by **writing your initials** on each page where you have made no other mark.
11. If a candidate has attempted more than the prescribed number of questions within a paper or section of a paper, mark only the required number in the order in which they are presented in the script. Make a comment to this effect in the left hand margin.
12. A candidate can be penalized if he/she clearly contradicts him/herself within an answer. Make a comment to this effect in the left hand margin.

Subject Details: Environmental Systems SL Paper 2 Markscheme

General

A markscheme often has more specific points worthy of a mark than the total allows. This is intentional. Do not award more than the maximum marks allowed for part of a question.

When deciding upon alternative answers by candidates to those given in the markscheme, consider the following points:

- ◆ Each marking point has a separate line and the end is signified by means of a semicolon (;).
- ◆ An alternative answer or wording is indicated in the markscheme by a “/”; either wording can be accepted.
- ◆ Words in (...) in the markscheme are not necessary to gain the mark.
- ◆ The order of points does not have to be as written (unless stated otherwise).
- ◆ If the candidate’s answer has the same “meaning” or can be clearly interpreted as being the same as that in the mark scheme then award the mark.
- ◆ Mark positively. Give candidates credit for what they have achieved, and for what they have got correct, rather than penalizing them for what they have not achieved or what they have got wrong.
- ◆ Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
- ◆ Occasionally, a part of a question may require a calculation whose answer is required for subsequent parts. If an error is made in the first part then it should be penalized. However, if the incorrect answer is used correctly in subsequent parts then **follow through** marks should be awarded. Indicate this with “**ECF**”, error carried forward.
- ◆ Units should always be given where appropriate. Omission of units should only be penalized once. Indicate this by “**U-1**” at the first point it occurs. Ignore this, if marks for units are already specified in the markscheme.
- ◆ Do not penalize candidates for errors in significant figures, unless it is specifically referred to in the markscheme.

SECTION A

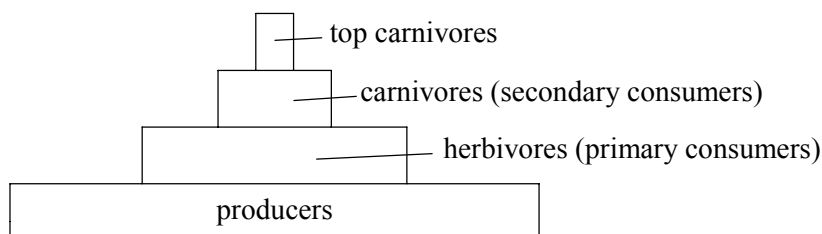
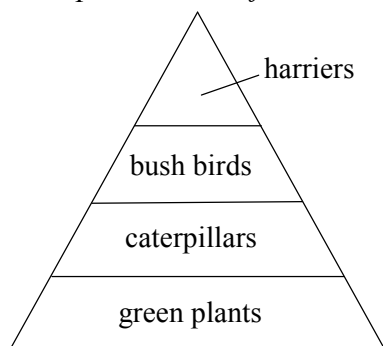
1. (a) positive relationship / species diversity increases as island area increases;
as island size increases, **rate** of increase in number of plant species decreases /
steepness of curve decreases; **[2 max]**
- (b) number of habitats increases with island area / larger islands more complex ecosystems;
larger islands have longer shores, therefore more likely to receive drifting seeds,
fruits, *etc.*;
larger islands more likely to be nesting sites for seabirds and therefore to have seeds,
fruits brought from mainland;
larger islands more likely to be conserved;
larger islands can support larger populations of a given organism and so extinction is
less likely; **[1 max]**
Any reasonable alternative explanation.
- (c) reduction in plant biomass;
reduction in number of plant species;
increase in very low “ground-living” plant species;
competition with and decline of any other herbivorous species;
trampling and soil erosion;
accelerated turnover of nutrients (especially N, P) though herbivore excretion; **[2 max]**
Any reasonable alternative explanation.
- Do not expect sophisticated ideas on island biogeography in question 1, but reward
appropriately if they appear.*
2. (a) combustion of fossil fuel;
adds sulfur dioxide and nitrogen dioxide to atmosphere;
these become dilute sulfuric and nitric acid on reaction with water in atmosphere;
pollutants may be carried by prevailing wind some distance;
example: pollutants from northern England, Scotland and Germany cause acid rain
in Scandinavia; **[2 max]**
- (b) change in pH / acidity of lakes and rivers resulting in change in species present;
loss of needles by conifers in forests;
aluminum ions in lakes cause toxicity in fish;
death of fish causes decline in predacious fish and water birds;
acid in soil causes leaching of soil nutrients; **[2 max]**
Any reasonable alternative points.

3. (a) tropical rainforest / tropical forest; [1]
Also accept the abbreviation TRF.
- (b) *describe:*
several layers in canopy / trees, shrubs and herbs;
abundance of plant material / biomass;
multi-layered complex ecosystem;
indicative of high productivity;
presence of climbing plants;
tall trees with straight trunks;
- explain:*
the result of high precipitation amounts (rainfall);
high rates of insolation (sunlight input);
due to low latitude (tropical) location;
high temperatures; [4 max]
If no "explain" points, [3 max].
If there is an incorrect answer for (a) allow error carried forward (ECF) in (b).
- (c) low latitude (tropical) regions close to equator (*do not give mark if already rewarded above*);
approximately 15 degrees north and south (*do not expect complete accuracy*);
examples: Amazon basin / Congo basin / central America / South-east Asia / far-north
Australia;
Accept other reasonable examples.
absent where high altitude modifies climate (East Africa / Andes);
distribution has been much reduced over last 100 years by clearance; [2 max]
Allow up to [2] for a good sketch-map.
4. (a) *Any three of the following for [1].*
mineral particles (sand, silt, clay) / organic material (humus) / living organisms / air / water; [1]
- (b) breakdown of rocks;
mechanical weathering;
chemical weathering;
introduction of living organisms;
biological weathering; [2 max]
Any other reasonable suggestion.

5. (a) the movement of water (vapour, liquid, solid) in, on and above the Earth’s surface / *OWTTE*;
 water continually circulates between the various storages;
 such as the atmosphere, ice-caps, oceans and freshwater bodies; **[2 max]**
Allow [1] for “bare” definition, and [1] for some explanation or development.
A well annotated diagram can receive full credit.
- (b) no inputs or outputs of matter and both inputs and outputs of energy; **[1]**
- (c) *Any two reasonable examples, such as:*
 irrigation increases evaporation and evapotranspiration;
 industry increases use of water;
 population growth increases domestic demand for water;
 withdrawal of water from underground aquifers decreases storage;
 deforestation reduces evapotranspiration / increases run-off; **[2 max]**

6. natural capital = natural resources, e.g. forest;
 that (if properly managed) can provide a long-term supply of goods and/or services, the natural income;
 yield of timber / recreation / game = natural income; **[2 max]**
[1] for each definition, with appropriate example. Award [0] if no examples given.

7. a pyramid of numbers is a model / diagram / representation of an ecosystem;
 which divides it into a number of trophic / food levels;
 showing the number of organisms / organisms per unit area in each level;
 usually the number of organisms decreases at the higher levels of the pyramid; **[4 max]**
Award [1 max] for appropriate example(s).
Award a correctly drawn and labelled diagram [2 max]. If no diagram is included award [3 max].
Accept either set of labels on either type of diagram.



SECTION B

General Essay Markscheme

Each essay is marked out of **[20]** of which **[3]** are for expression and development of ideas (EDI).

- [0]** No expression of relevant ideas.
- [1]** Expression and development of relevant ideas is limited.
- [2]** Ideas are relevant, satisfactorily expressed and reasonably well developed.
- [3]** Ideas are relevant, very well expressed and well developed.

Reward detail, sound environmental / ecological concepts, and good examples even if not stated exactly in the form given in the markscheme.

8. (a) succession = the orderly process of change in a community or ecosystem over time / *OWTTE*;
zonation = the arrangement or patterning of communities or ecosystems, over a distance, in response to differences in some environmental factor / across an environmental gradient / *OWTTE*;

named example – succession: the colonisation of lava following an eruption;

pioneer species (*e.g.* lichens);

seral communities as soil forms and adapted plant species invade;

climax community with maximum diversity;

examples of characteristic species;

named example – zonation: arrangement of sea-shore plant and animal communities into zones, *e.g.* seaweeds, barnacles, molluscs;

as the result of differences in times of exposure to air;

as the result of rise and fall of tides / effect of waves, *etc.*;

[6 max]

Allow [1] for each definition and [4 max] for appropriate example: examples must have some detail for full marks. Reward other relevant points.

- (b) initial stage, new environment more-or-less devoid of life;
pioneer community specialised plants adapted to extreme environment;
low density of producers;
low productivity;
low diversity;
little nutrient circulation;
apart from some nitrogen-fixation;
- seral communities become increasingly complex;
gross and net productivity increase;
but gross productivity increases more rapidly as biomass builds up;
nutrient circulation increases in volume and complexity as food-webs develop;

climax represents high level of complexity and diversity;

gross productivity high and biomass at maximum;

but many consumers, so respiration also high;

therefore net productivity approaches zero;

nutrient capital in biomass rather than soil;

nutrient turnover through death and decay of organisms high;

[11 max]

Any other relevant points, e.g. detailed examples.

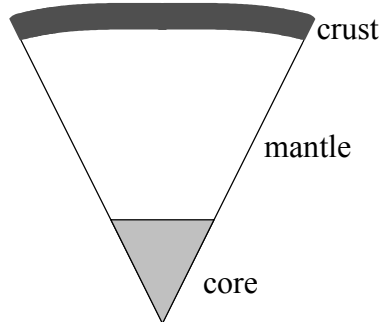
Same point cannot be rewarded in both sections (a) and (b).

Expression of ideas [3 max]

Total [20 max]

9. (a) core;
mantle;
crust;
crust differentiated into continental and oceanic material;
movement of plates in upper mantle / asthenosphere;

[4 max]



Award a correctly drawn and labelled diagram [2 max]. If no diagram is included award [3 max].

- (b) Earth's surface is made up of a series of crustal plates;
which have moved in relation to each other throughout geological time;
possibly moved by convectional currents in mantle;
where plates converge = destructive margin;
plate edge plunges downwards and plate material destroyed, earthquakes along plate edge;
where plates separate = constructive margin;
material builds up on trailing edge;
converging continental plates form fold mountains;
volcanic islands;

[6 max]

Allow credit for any relevant points, including diagrams, examples (constructive: Mid-Atlantic Ridge / Red Sea / East African Rift, destructive: West Pacific island arcs).

- (c) movement of plates has separated gene pools / giving rise to distinctive biotas;
e.g. isolation of Australia / Madagascar;
plate movement also responsible for barriers to movement such as mountain ranges;
e.g. Himalayas;
and land bridges, allowing organisms to colonise new environments;
e.g. central America allows movement between North and South America;
formation of islands through volcanic activity produces distinctive environments;
plate movement pushes continents through different climatic zones;
creating new habitats, thus promoting biodiversity;

[7 max]

Allow credit for any relevant points.

[5 max] if no examples.

Names of super-continents (e.g. Gondwana, Pangea, Rodinia, Laurasia) can be rewarded under (b) or (c) but not both.

Expression of ideas [3 max]

Total [20 max]

10. (a) numbers increase at an accelerating rate;
represented graphically as a “J” curve;
geometric increase;
an example of positive feedback;
the more a population reproduces, the more individuals there are to reproduce later; [3 max]
Any other reasonable points.
- (b) the demographic transition model shows changing patterns of fertility and mortality
in a human population as it passes through the processes of urbanisation and
industrialisation / *OWTTE*; [2]
pre-transition
birth rate high;
death rate high;
population stable or increasing gradually;
transition phase
death rate falls;
birth rate remains high;
population increases rapidly;
post-transition
birth rate low;
death rate falls;
population stable or falls slightly if not increased by immigration; [9 max]
Reward any other reasonable points / examples (countries of North America / Europe / Australasia).
Some published demographic transition models have four stages – allow appropriate credit.
- (c) statistical demographic tables;
age-sex pyramids;
allow numbers of persons entering (and leaving) reproductive period for several
decades into future to be predicted;
graphs showing total population / births / deaths plotted against time may be
extrapolated into future;
knowledge of social trends may provide additional information to make predictions
more accurate;
examples of social trends:
age of marriage / use of contraception / education levels / economic development /
family structure;
computer modelling now used extensively in many countries and international
organizations; [5 max]
Allow any other reasonable points.
*Many different predictions have been made, e.g. UN, OECD, World Bank – reward
appropriate comments.*

Expression of ideas [3 max]

Total [20 max]
