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M03/715/S(2)M

MARKSCHEME

May 2003

ECOSYSTEMS AND SOCIETIES

Standard Level

Paper 2

12 pages

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 (ü) 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 note 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 front cover.
Section B: Insert the total for each question in the Examiner column on the front cover.
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 front cover check your addition to ensure that you have not made an error. Check also that you have transferred the marks correctly to the front cover. **The IBO carries out 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 of answers. If the candidate has attempted more questions than is necessary, but has specified which questions have been answered on the front cover, mark only these questions. If the candidate has not specified which questions have been attempted, mark the required number of questions 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: Ecosystems and Societies SLP2 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 penalising them for 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 B

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.

SECTION A

1. (a) (i) maize: inputs – outputs = 298 – 294;
= 4 kg ha^{-1} *(units needed)*; ***[2]***

ryegrass: inputs – outputs = 298 – 304;
= –6 kg ha^{-1} *(units needed)*; ***[2]***

(ii) ryegrass: produces a net loss of nitrogen from the soil; ***[1]***

(b) (i) $30 \times 70 = 2100$ kg ha^{-1}; ***[1]***

(ii) atmosphere: lost as nitrogen gas from the soil surface and plants;
consumed by animals (as a constituent of plant material) and removed by the animal from the field;
leached away; ***[2 max]***

(c) add more fertilizer;
plant wheat / maize / other crops;
plant legumes (*e.g.* clover);
plant crops in rotation; ***[3 max]***

(d) (i) *The answer should clearly describe the process of eutrophication.*
enhanced levels of N and P leads to increase in algal growth / algal blooms;
as algal blooms are decomposed by bacteria, respiration leads to diminishing oxygen levels;
water quality decreases, so less oxygen for other organisms; ***[3]***

(ii) changing agricultural practice, *e.g.* different crops;
contour plowing;
timing fertilizer application to minimise impact;
adopting different fertilizer (synthetic, slow release);
treating drainage water (removing N and P);
clean up and re-oxygenate water course;
oxygen enrich water course;
harvest (remove) algae; ***[3 max]***

(e) loam soils contain a good balance of sand, silt and clay particles;
therefore have airspaces for root penetration;
and good drainage;
and the clay humus complex for mineral retention;
and water retention; ***[3 max]***

SECTION B

2. (a) named organism (*e.g.* water flea, peppered moth, blood worm, rat tailed maggot, *Asellus*, *Gammarus*, stonefly larvae, *etc.*);
organism can be used as an indicator;
by abundance of organism (either high or lower levels than expected) / by colour of moths' wings *etc.*;
reference to the Trent biotic index or similar;
polluted and unpolluted sites should be compared; ***[4 max]***

(b) baseline study – important to know what the physical and biological environment is like;
there should be an understanding of the development in terms of impact;
there should be an assessment of impacts during and after development;
there should be monitoring of environmental conditions during and after development;
should contain non-technical summary;
should inform decision making;
often difficult to put together a complete baseline study due to lack of data;
often all impacts are not identified;
information and suggestions in EIA are often not acted upon; ***[7 max]***
Give credit for references to actual EIA.

(c) research provides baseline data;
monitoring enables changes as a result of *e.g.* pollution, to be detected;
without research and monitoring it is difficult to argue objectively or legally that an environment is under threat;
research provides an understanding of complex interrelationships in ecosystems and enables them to be managed more sustainably;
research provides data as an educational tool making society aware of what is happening to the environment;
monitoring can be used to "police" the system and ensure non-infringement of standards; ***[6]***

Expression of ideas ***max [3 marks]***

Total [20 marks]

3. (a) catastrophic extinction events;
past extinctions occurred suddenly over relatively short time periods;
caused by definitive environmental catastrophes *e.g.* meteorite strikes, volcanic eruptions, earthquakes *etc.*;
animals / plants died from both the initial event and the short term environmental turmoil that followed;

long term change model;
gradual environmental change leading to gradual species extinction yet apparent in a rock record (that provides a condensed view of time);
climate induced change is the most likely cause;
the most notable example being the extinctions caused by glaciation; ***[4 max]***

(b) *e.g.* tiger (endangered);
endangered because of habitat (forest) loss due to agriculture;
loss of food source as traditional food source is being used by humans;
hunting for hides, trophies, medicine;
destroyed because regarded as a nuisance / pest;
ecological role is as top carnivore;
loss would lead to an increase in herbivorous mammals;
ethical issues surrounding loss (rights of future generations, rights of species);
human guilt of allowing this to happen;

e.g. crocodile (now removed from endangered list);
was endangered due to excessive hunting for skins, meat and trophies;
and due to threat to humans and livestock;
and due to habitat degradation (loss of water quality);
ecological role is as top carnivore;
loss would lead to imbalance in food pyramid;
no longer endangered because of education (no longer seen as "evil");
ban on hunting;
legislative protection;
controlled culling / hunting of certain crocodile species now being considered; ***[7 max]***

(c) *arguments for zoos*
individuals organisms are protected in a controlled environment;
education of public through visits may make them more likely to support conservation campaigns;
genetic monitoring can take place;
captive breeding enables higher rates of reproductive success;
benefit of artificial insemination;
number of offspring surviving to adulthood is higher so species numbers increase more effectively;
studying species so understanding improves, helping management outside zoos;
holding species while habitats are restored;

arguments against zoos
ethical arguments against keeping animals in captivity for profit;
conserving species is just used as an excuse;
poor conditions or treatment in zoos leading to physiological and psychological problems with the animals;
captive animals unable to adapt to life back in the wild;
small genetic pool; ***[6 max]***
personal justification *(needs to be more than just arguments for or against)*;

Expression of ideas ***max [3 marks]***

Total [20 marks]

4. (a) age-sex pyramids are useful because they allow patterns to be clearly seen;
wide base indicates a high birth rate and expanding population;
allow estimate of population numbers;
gender imbalances can be seen;
proportions of fertile population can be seen;
all of these factors will affect population growth;
however, the pyramids do not give specific information about socio-economic conditions;
e.g. use of contraception, government policies;
enable "how much" not "why" questions to be answered; ***[6 max]***

(b) the area of land (and water) required to support a defined human population at a given standard of living;
takes account of the area required to provide all the resources needed by the population and to assimilate all its wastes;
it is the inverse of carrying capacity;
[2 max] *for definition.*

ecological footprints tend to increase in size with socio-economic development;
technological advancement produces a larger footprint as more resources are needed and more waste is produced;
populations at a lower economic level have footprints that are easier to define (fewer resources used from outside their immediate area); ***[5 max]***
[3 max] *for discussions.*
Give credit for examples e.g. hunter gatherer in Tanzania have a smaller footprint than urban population of New York.

(c) *arguments for population control*
population growth is not sustainable even with an expanding resource base;
greater environmental pressure on the planet is inevitable;
ethically it is wrong to overpopulate the planet (what right have we to disproportionately consume resources?);
smaller family size allows for greater / higher standard of living measured in capital resources;

arguments against population control
goes against tradition and culture;
as technology advances resources are used more efficiently, therefore environment will be able to support a larger population;
population control by society / government is an infringement on basic human freedom;
curbing population growth will produce a demographic population that is top heavy (old people predominate) and dependent;
larger families are vital in a society where family labour is essential to domestic and economic survival;
forced population control doesn't always work;
population growth is an indicator of an expanding resource base; ***[6 max]***
Give credit for use of examples.

Expression of ideas ***max [3 marks]***

Total [20 marks]

5. (a) *e.g.* the Aral Sea, Former Soviet Union;

sustainable use of water resources means using them at a rate that allows natural regeneration and minimizes damage to the environment;
this has not happened in the Aral Sea which has been shrinking in size due to excessive removal of water from feeder rivers;
water was taken and used to irrigate cotton fields by the Soviet government;
high rates of evaporation together with high applications of chemical fertilizers led to salinization;
and pollution of remaining water resources;
this has had a knock-on effect on local communities as water supplies were decimated;
and local farming and fishing industries collapsed; ***[6 max]***

(b) global warming will lead to changes in global water budget;
with increased melting of glacial ice and ice caps;
and will cause changes in precipitation (amounts and distribution);
evaporation rates will change;
seasonality will vary which could be significant in water supply;
increased flood risks in certain areas;
and expanding desert zones with water shortage; ***[5 max]***

(c) economic factors will be central – whether or not a country can pay for sanitation and water purification;
technological factors – if the technology is available;
often Governments will be reluctant to impose limits if multinational companies will then be deterred from locating there;
monitoring water quality in remote rural areas can be very difficult;
the political priority might be development first, environment later;
the political structure might favour short term profits rather than long term environmental protection;
cultural inertia – reluctance to change the way in which resources have always been used; ***[6 max]***

Expression of ideas ***max [3 marks]***

Total [20 marks]